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The SHORT WAVE Magazine

VOL. XXIX APRIL, 1971 NUMBER 2

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Publications Dept., 55 Victoria St., London S.W.1 . 01-222 5341

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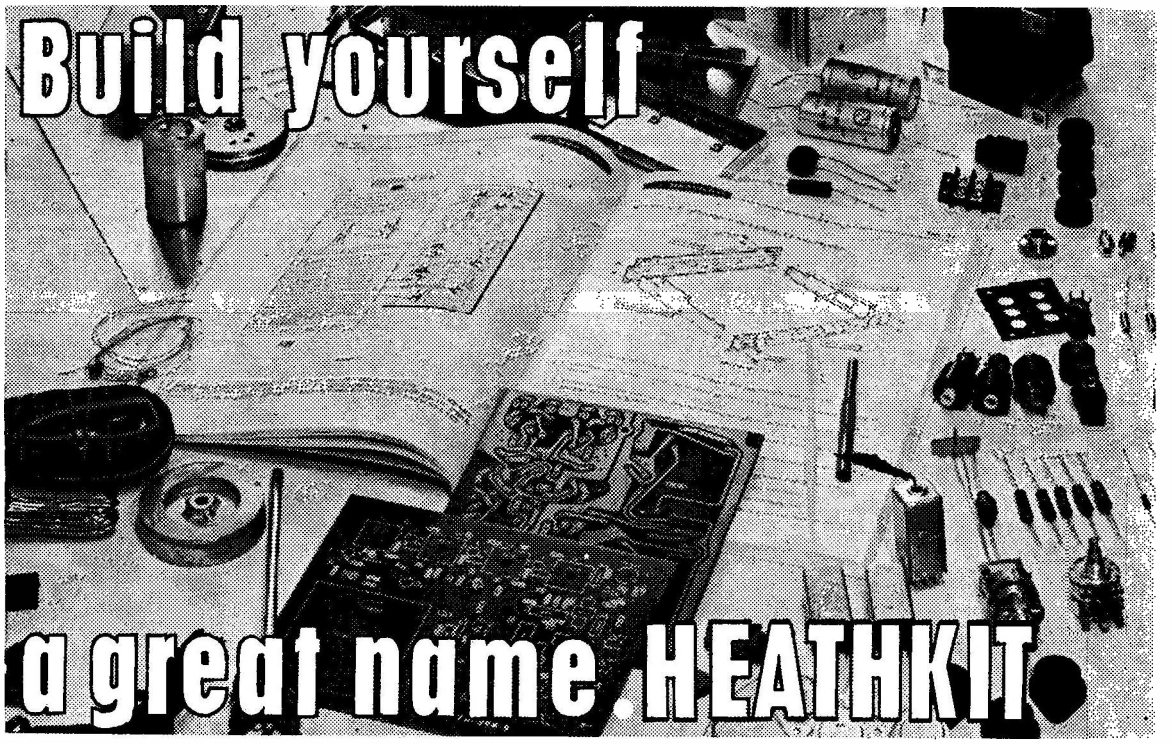

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SHORT WAVE MAGAZINE

(GB3SWM)

Vol. XXIX APRIL, 1971 No. 330

CONTENTS

Managing Editor: AUSTIN FORSYTH, O.B.E. (G6FO/G3SWM)

Advertising: **Maria Greenwood**

Published at 55 Victoria Street, London, S.W.1, on the last Friday of the month, dated the month following. *Telephone: 01-222 5341 & 5342*

Annual Subscription: *Home: 50s. (55s. first class) post paid*
Overseas: 50s. ($7.00 U.S.), post free surface mail

Editorial Address: **Short Wave Magazine, BUCKINGHAM, England**

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FOR THE RADIO AMATEUR AND AMATEUR RADIO

The SHORT WAVE Magazine

EDITORIAL

Resumption *The postal strike was called off on March 8 but at the time of writing the system was still in a disorganised state and the service far from normal.*

It is not our intention here to discuss the policies surrounding the strike, nor to attempt to go into the damage it has caused us—but to explain that in effect three issues of SHORT WAVE MAGAZINE *have been produced against a background of virtually no mail intake. This affected in particular the regular news features and the spread of small advertising. It also meant that postal copies for direct subscribers were held up and—because of the dislocation of the mails since March 8—not all subscribers received their February-March copies till some time after the resumption. Though we made all our bulk despatches for these two issues on March 10, it was not until well into the week after that most of them were delivered.*

The February issue content was affected by the stoppage on January 18, and that for the present issue because it had to be prepared for press before normal mail deliveries were resumed. For March issue, we had virtually nothing in at all. And it need hardly be added that though these issues were published on time and were ready for delivery by their due dates, it was at the cost of overcoming the difficulties associated with there being no postal contact of any kind.

Having thus written up the record, it is to be hoped that from now on the situation will become normal, and that once more we shall be able to rely on maintaining that contact with our readers which we have always enjoyed in the past, and which is so important for the production of the MAGAZINE*—that is, unless the rail strike or go-slow now looming again paralyses the postal system!*

Austin Forsyth, G6FO.

COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

SOME observant readers of the *Magazine* may have noted the mass sell-out of his gear by your conductor and wondered what the heck he is up to. No need to worry, G3KFE will continue to pollute the ether with his SSB and—more so, sad to say—his CW; the objective is to tidy up a shack that has reverted over a period of years to a somewhat jungly mess in the garage, and to operate from the comforts of a room indoors with much less space. However, in the course of the mass exodus of dust and gear that has ensued, G3KFE met up with an old friend, Oswald the only talking blackbeetle known to science. Oswald is not only a marvel, but he thinks as well(!), and, like many old-timers, is somewhat pithy when discussing the state of the bands in 1971.

Naturally, when the absence of mail from which to build up this piece was mentioned, Oswald's comment was something along the lines of "When I was on the air with G1NIT, working DX was easy; all you had to do was make the signal cover the whole band, and even more T1 than the next chap's, and all the world would come back to a Test call." Sad to say, poor old Oswald has never come to terms with the idea of a CQ—he reckons it is all Yankee propaganda, or a plot, even though G's have been doing it since 1946.

After a bit of an argument, we agreed to disagree on this one, but compromised by looking back to see how the pattern of DX operating has changed over the years.

In pre-war days, Eighty was the exclusive band, where you went with a special permission; and Forty was often claimed to be the home of a peculiar variety of telephony known to all and sundry as "spitch." Top Band, which in those days started around 1715 kHz, was very much as it is today—a band you either love and never leave, or refuse to touch with a barge-pole. There was no 15-metre band in those days, indeed this one did not become available till the early fifties. Oswald had a point when he recalled that in those far-off days there was a firm selling crystals which warranted no two crystals were ever sold for the same frequency—just think of it, a spot of your own with no QRM on Twenty! On the other hand, there was no hint of the wonderful DX-peditions giving operators a chance to work the rare county (or country, for that matter) as far too much had to be done to gain the necessary permission to transmit away from home. And anyway, pointed out our beetle friend, in those days, a country *was* a country—not a lump of soggy wet sand sticking up out of the sea. One felt almost inclined to tread on him.

It was in the post-war years that the advent of the VFO really altered things on the bands, albeit both the VFO and the use of SSB were known (and used) on the bands well before Hitler's War. And what VFO's certain of those early post-war ones were, at that! Some of the notes to be heard were a sight worse than anything that emanates from behind the Iron Curtain today; not for nothing did G2NS, in these very pages, dilate upon the usefulness of a BC-221 set to the frequency of the DX station as an aid to retrieving him when you went over to receive. But at least most of us had a superhet receiver, thanks to the war-surplus market, on which also the raw materials for one's first ten or twenty-five watt CW rig could be obtained for the expenditure of thirty bob, even if it did mean running the gauntlet of the forerunners of the permissive society down Lisle Street when doing one's shopping.

If you didn't want to build a rig, you just had to find someone who would; the only transmitter on the market was a CO-PA plus modulator made by Q-Max. Then came the opening of 21 MHz—and what a night *that* was, a deathly silence at 2359. and a wall of signals at 0001, with many a weird and wonderful bodge to get the 7 MHz PA stage to triple. How we ever worked DX phone in those days just beggars imagination.

Then along came SSB, and things went through a remarkable cycle of change. In most cases it was the previously CW-only chaps who first realised what SSB could do, and the general operating standard on Phone improved no end. Receivers began to be found to be a bit under par, and many and various things were done to make them better. Murray Crosby's product detector was one, and oddly enough, when used with his triple-triode AM-or-SSB modulator, a receiver could for the first time be built such that the overall distortion from mike to speaker was better than 0·5%. Collins started the transceiver revolution, and at the same time forced a radical rethink on receiver design by all the others. The AM transmitter manufacturers who did not have the know-how to make SSB rigs all fell by the wayside in face of the all-conquering KW-2000, at least in the U.K. At last it was possible to operate SSB without holding a degree in electronics and physics plus a battery of test-gear.

And then over the last four years or so, a revolution has come along quietly in the way of the DX standards of the average phone-only operator, coupled with a slight decline in the amount of DX available to the chap who sticks to CW—and there are still plenty of them.

* * *

Let us, therefore, look at this last revolution in a bit more detail. Take Top Band first. Back in the early 1950's, the first WAC was made on Top Band, possible because of the availability of 160m. in ZL, with an operator out there keen enough to set up skeds and *try* for the U.K. QSO. Since then, there are people about on the bands who have made WAC on *Phone* on Top Band; at least one operator has made the set three times over, once on CW, and twice on Phone, in the course of knockabout operation on the band, just keeping an ear to the ground, and coming on at the right time. WAC on Top Band has been made by a station 750 feet *below* sea level. During this last winter alone, it has been possible, for anyone with ten watts to a good aerial-earth system not only to make WAC, but to knock up two or more countries in each area, except possibly Africa. W1BB is now comfortably over the DXCC level on Top Band, and there is at least one G station tickling the fifty countries mark.

What about Forty? Here again, SSB DX is there for the taking to anyone with the wit to take it and a reasonable radiating system. On many an evening it was possible to swap the TV play for a TVI-free QSO on Forty with, say VK or JA, and to have a CN8, ZD9, or ZS come back to a Phone CQ.

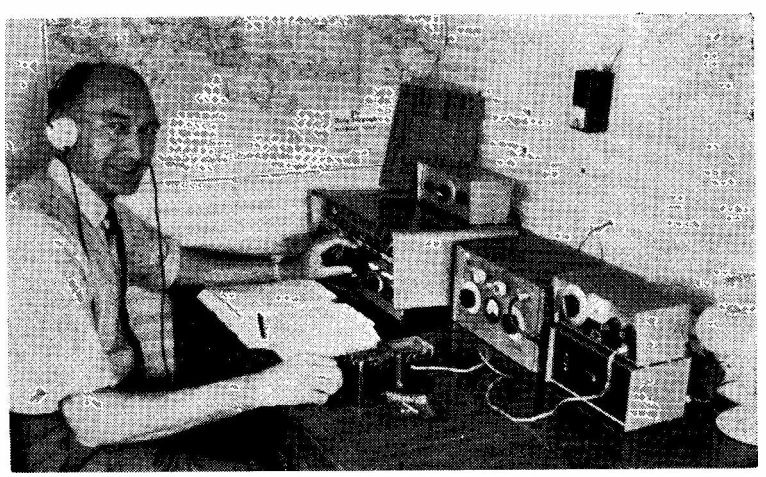
On Eighty, the activities of the DX Net, whether you agree with their methods or not, have revolutionised our ideas of SSB DX on the band. Where a few years ago, about the best you could hope for in a winter season's Phone operating was possibly a WAS—and that would take a couple of winters of hard grafting to achieve—now all sorts of rare and interesting countries are about and being snapped up by those with the savvy to go about it the right way.

What are the reasons for this revolution on the LF Bands? Not much to do with the 5BDXCC ploy, really, since the revolution was well under way before that came on the scene. No, rather by the fact that the presence of lots of people wanting to work DX was demonstrated by the presence of the DX Nets, and so an incentive was there to have a go *from the DX end.* You can't work 'em on Forty if they stick on Twenty! Another factor in this last revolution is the fact that it is now possible to engineer a Yagi for Forty that will stay airborne—and there has been a widespread realisation that LF Band verticals are practicable on almost any site if operated in conjunction with a good earth system. And a good earth system does not mean a four-foot stake in rocky ground tied to the transmitter through a bit of 7/·0076 wire—yes, your scribe has seen a station doing just that! The claimed kilowatts the big boys are alleged to be using don't do a fat lot towards making *reception* any better; and receiver improvements other than better stability don't help any either, but typical reports have gone up from 229 to 57/99 at the peak of the openings. Why? Simply because more people seem to be putting much more effort into their aerials, and reaping the benefit, in spite of the enormous rise in man-made electrical noises. Your conductor remembers receiving a bit of magnetic tape of a QSO with W1BB/1; the chap who sent it gave W1BB a 579 report—but G3KFE would not have hesitated a moment to give it a 59 plus, had it been *his* QSO. The presence of excess power could not help the receiver, even though it might have made a difference at the far end.

The old adage that if you can't hear 'em, you can't work 'em, is as true in 1971 as ever it was—and on the LF Bands at least, to hear 'em you must work on the aerial system, always run the receiver at maximum sensitivity, and have an attenuator ahead of the receiver to keep out the cross-modulation noises. But the aerial is the only thing that *really* matters.

The HF Bands

What can we say about these? Again Oswald has a few penetrating remarks to offer; he reckons that you could safely say, as a prediction before the month started, that conditions would be rather akin to those in the same month a couple of years ago. Of course there are some new ones in the way of stations, but the propagation is, as from time immemorial, defined by the time of year and the state of the sunspot cycle, with a lesser ripple of a 28-day periodicity, and a few hiccups caused by the random nature of the sunspot generation. For a majority of operators, TVI put one band or another, or even all the HF allocations, out of court for evening sessions. But then, evenings were ever the worst times to be on the HF's unless one wanted to work EU's or East-



Leslie Linkins, G3TKK, 21 Lady Ediths Park, Newby, Scarborough, Yorkshire, runs a KW-77 receiver with an A.T.5 as Tx. His aerial is a long-wire, ATU matched and the shack is a hut at the bottom of the garden. G3TKK works the LF bands, mainly on CW.

Coast W's, and the morning period, before setting off to work, is not only free from the curse of TVI, but withal is a far better time to angle for DX. Lunch-times, too, are worth a try—here, the mobile operator has a decided advantage, and can look the bands over instead of sitting in the canteen or reading a book, knowing full well that if he can once get the magic word "mobile" to the DX *or* the MC, chances are good he will get a QSO before going back to the bench or office. At worst, this sort of thing means putting the battery on trickle-charge overnight. A bit of hard work never hurt a healthy battery yet; and it's unlikely that he could flatten the battery far enough to be unable to start just by operating for half-an-hour (unless, of course, it's a real punk battery!).

TOP BAND COUNTIES LADDER

Station	Confirmed	Worked
	Phone and CW	
G3VLX	98	98
G2NJ	98	98
G2HKU	98	98
GI3WSS	97	98
G3ADH	97	97
G3XTJ	96	98
G3WPO	95	98
G3XDY	88	96
G8HX	86	89
G3YMH	67	92
G3LXD	64	83
G3KFE	61	86
G3XIV	?	63
	Phone only	
G2NJ	98	98
G3PQF	98	98
G3WPO	91	98
G3VGB	91	97
G3XTJ	81	94
G3XDY	72	89
GI3WSS	67	83

(Failure to report for three months entails deletion from this Table. Claims may be made at any time. Six months of "Nil" reports will also result in deletion.)

The sad thing about it all is that as SSB has become practically the universal method of Phone operating, the standards of the earlier years, in terms of operating techniques, have badly declined, to the point where even on SSB, one still hears the monologue types inflicting themselves on others despite being fitted with Vox or p-t-t facilities. Now that there is a licence—of a sort—available to those who are unable to pass the Morse Test, would it not be a good thing for the Ministry to reintroduce the old rule about "first year of operation on CW only," with a system of incentive licensing based on *operating*, rather than necessarily technical, improvement?

Oswald cocked his beetle's ears at that last statement—but the yowl of annoyance from the Phone-only operator is utterly irrelevant. Just as we are beginning to find out that all that hot air about full employment and productivity *is* just hot air, so on the bands are we finding all over again that to give a chap a Sideband rig does not make him a better operator. The only thing that *does* improve his Phone operating is a course of CW procedure in practice, plus preferably a good grounding as an SWL—and not one operator in a hundred coming fresh on the air these days has either qualification, leave alone both.

What else is there to note about both the HF and LF Bands over the last four years? Mainly a steady deterioration in the basic decencies of good manners. Despite a clear licence prohibition, on every side today one hears language to make a bargee shudder. Language that, were it uttered in the presence of one's XYL would cause one to lay the offender flat on the floor, yet it can be heard being used in pile-ups by people who know there are women listening and indeed operating in the pile-up, often with no more justification than the vanity of a little man who likes to think he is part of the "permissive society," but hasn't the elementary wit to see he is only exposing his own ill-manners to a world that, in general, knows better. People of this somewhat concave-witted type actually have the impudence to declare openly their support for pirate radio stations; people who are thick enough, despite their call, to connive at the operations of amateur-bands pirates instead of doing all a service by ensuring they are put down firmly, and finally.

Makes you want to take up a Good Book, doesn't it?

Forthcoming Events

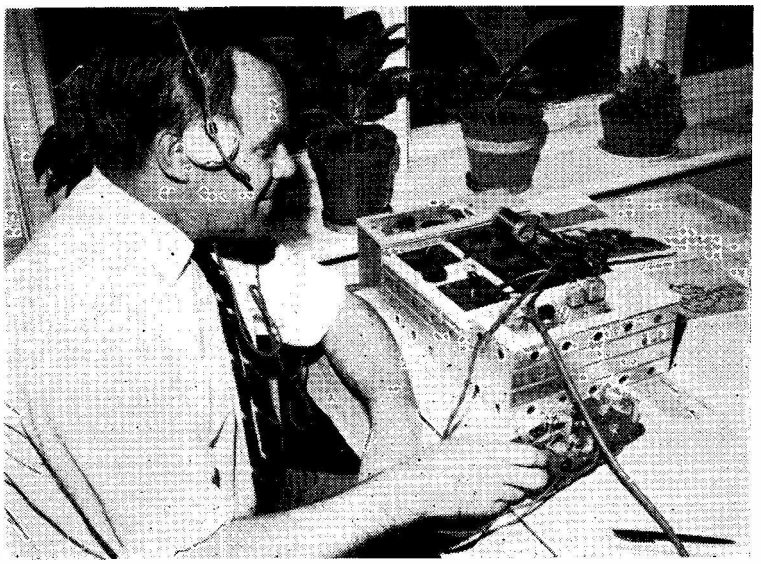
But enough of ire, however much it may be justified. As Albany said in Shakespeare's King Lear "Wisdom and goodness to the vile seem vile; Filths savour but themselves." Let us turn to more pleasant matters, such as the vital question of what is "in the pipeline" for the near future in the way of DX, or is around and takeable although not a DX-pedition.

Although the CW/RTTY leg of the **IARC Propagation Contest** is out of the way, the Phone leg comes between April 3 and April 11; 0001 on the former till 2359 on the latter. All bands 10-160m., and the object is to work as many CPR zones, and prefixes, as you can, exchanging RS plus your CPR zone number. QSO points are as follows: Mobile to fixed in same Zone, 2 points; Mobile to Fixed in a different Zone, 4 points; fixed station to a mobile in the same Zone, 1 point; fixed to a mobile in a different Zone, 2 points; all mobile-mobile, 4 points. Fixed-to-fixed contacts in a different Zone count one point; fixed station to another fixed station in the same CPR zone do not count for QSO points but only for a multipler.

Should a QSO last more than six minutes it can be re-logged for each six-minute period and counted again for another QSO point or points(!). The same station can be worked as often and for as long as you like under this rule. (This one must be designed to create QRM!—*Ed.*).

Total score equals the sum of the QSO points times a multiplier of one for each CPR zone and prefix worked on each band. Use IARC log-sheets or copies; indicate each new Zone/Prefix worked, and the QSO points

claimed. Separate sheets for each band, and all times in GMT; enter your own Zone once in each page, but the other station's Zone on each line. If for any reason you have a void line, score it cleanly right across the page. There are three classes, namely single-op single band, single-op all-band. and SWL. A certificate goes to the high scorer in each class and each CPR Zone. Logs, by June 1st, to IARC Contest Committee, L. M. Rundlett, 2001 Eye Street N.W., Washington, D.C. 20006, U.S.A. For one IRC and an s.a.e. to IARC, POB 6, 1211 Geneva 20, Switzerland, you can get QSO log sheets, a CPR zone map and an ITU prefix list, albeit it is understood that Geoff Watts *DX News-Sheet* No. 460, which will have been distributed now that the postal strike is over, will contain the CPR Zone information.



G3JFE, Len Pearson, 300 Scalby Road, Scarborough, Yorkshire with his ex-War time B2 rig—actually the "Portable Transmitting and Receiving Equipment Type 3, Mk. II", of which hundreds were made. It has a sensitive 4-valve Rx and two-stage Tx section, capable of about 40w. RF output. The G3JFE specimen has been modified for VFO working over the bands 3.5-7.0-14 MHz and gives a very good account of itself. It is operated with an aerial 137ft. long and 30/50ft. high.

Although some are in the past, the **LF WAB Contests** already mentioned in a previous CDXN come up during April. From 1500z on April 3 till 2359 on April 4, you can also have fun in the **SP DX CW Contest,** the object being to work as many SP types as possible. QSO's are to be RST plus three-figure serial number starting at 001, but the SP's will give their powiat (district) letters instead of a number. You can enter single-op single-band, single-op multi-band, or multi-op all-band. Each SP or 3Z contact counts three points, with a multiplier of one for each powiat. Final score is the sum of the QSO points times a multiplier of one for each powiat; you may work the same station on more than one band, but although he gains QSO points each time, he only counts once for multiplier. The mailing deadline is May 1, to PZK Contest Manager, POB 320, Warsaw 1, Poland.

On May 1, at 1200z, the 21st **OZ CCA CW Contest** kicks off, and it goes on till 2359 on May 2. There are two classes, single-op, or multi-op and Club stations; the single-handers have to operate for thirty hours only, the rest period of six hours being broken into not more than two periods. Bands are 80-10 metres, calling "CQ AW." Exchange RST plus serial number starting at 001. Score two points for a QSO on the same continent, three for another continent; OX, OY and OZ stations count double. The multiplier is one for each country, using the DXCC list, and taking the call *areas* of the following countries as a country *each:* W, VE, VO, PY, LU, VK, ZL, OZ, OY, and OX3. Total is the QSO points times the multiplier for all bands, postmarked not later than June 15, to the EDR Contest Committee, POB 335, Aalborg, Denmark, along with the usual declaration.

The following weekend we have another world-wide one, this time the **USSR CQ-M Contest,** again on CW. It runs from 2100 on the 8th till 2100z on May 9, on all bands 10-80 metres. You call "CQ-M," and dish out the usual RST plus serial number, receiving in return a three-figure number representing the oblast (county) if you are working one of the Russian stations. No QSO counts in your own country. A station in your own continent counts one point, with another continent three points. If an SWL entrant, score one point if you are claiming a hearing of one end of a QSO, or three if you hear both ends. Score the sum of the QSO points times the sum of the country multiplier on all bands. The classes are four; single-band single-op, multiband multi-op, and multi-band single-operator, plus an SWL class. The countries multiplier is as the DXCC Country list, plus *country*-status for some oblasts. These are Nos. 002, 013, 014, 056, 139, 105, 128, 153, 138, 098, 086, 084, 085, 087, 089, 090, 091, 092, 093, 094, 095, 096, 097, 159, 139 and 098. Incidentally, *DX News-Sheet* No. 459 carries a list of the oblasts and their Zone numbers, in connection with the recent reorganisation of the UA callsign system. Mailing deadline, postmarked before June 1st, to POB 88, Moscow, USSR.

As a matter of interest, one notes that this USSR contest makes an attempt to get out of the usual run of contests which are aimed at stirring up QSO's with the stations in the country running it, and making it a truly world-wide affair. The other point

"FIRST-YEAR-OF-OPERATION" LADDER

Top Band Only

Phone/CW Place of Honour: G3YMH, 89/17

Callsign	Date Licensed	Counties	Countries
G3ZDY	21/2/70	84	18
G3ZCC	11/4/70	76	16
G3ZEM	28/2/70	57	13
GM3ZDH	24/3/70	41	5

CW Only Place of Honour: GM3YOR, 80/10

G3ZES	3/3/70	74	19
G3ZCC	11/4/70	55	16
GM3ZDH	24/3/70	36	5

A first entry to this Table must contain a statement of the date of first licensing or of commencing operations.

of great interest is that here there is not only an SWL class, but a serious effort to make it worth while for an SWL to strain ears to hear both ends of a contest QSO, and so make himself a better SWL operator.

Good Things Gone

That VU DX-pedition to the Laccadives; VU2KM duly opened for business as predicted, and U.K. stations are known to have raised them on 40, 20, 15, and 10 metres for certain, and indeed *many* G's got their Laccadive QSO in. The cards should go to VU2KV, POB 3031, New Delhi, India, enclosing 5 IRC's, for which the cards will all go by direct air-mail.

It was understood that PJ8AA was to have operated from Anguilla, as VP2EV, using CW on all bands. However, no word of any activity in that part of the world over February 17-24 has filtered through to your conductor, either by way of his own researches on the bands, or reports of anyone working VP2EV. One must hope this was not another busted flush, and that at least some people made contact. Any comments?

Murphy at Bay

One of the faithful few who got round the strike by using STD telephone contact was G3VLX, who offers the following instance of a case where Murphy's Law apparently failed to work. Deryck had a visitor, who was new to the hobby, and so he set out to show off Amateur Radio. After a couple of streets away on Top Band, and a PAØ on Forty, they switched to Twenty, and on 14255 kHz found a bit of a pile-up with UW3AO calling QRZ? Deryck threw in a quick call, and got a "Roger." Next thing he knew he was instructed to call UA9VH/JT1, and raised his first JT1 in seconds; but of course Murphy couldn't let it pass—the visitor just couldn't appreciate the significance of what had happened!

DX-Peditions

G3VLX and G3XMD are planning a trip to GW later in the summer, and will take in Brecon and Radnorshire if present plans mature. On the other hand, they are still open-minded about which counties should be dealt with, and so would like to know of the plans of any other expeditions so as to avoid a clash on the one hand, and on the other would like to have ideas on which counties are most in demand. Letters on this one to G3XMD—*QTHR*, and not to G3VLX, who may well not be "OK in Call Book" by the time this piece comes to be read, if all his plans come to fruition.

DX on the Bands

A real shortage of reports this time, naturally enough. G3VLX seems to have spent some time on Forty, and dredged up UP2OX and LZ2KRM; but the prize of the month was 8P6AJ—or, rather, would have been if a certain HA had been blessed with some manners *and* a receiver. This pest sat on top of the 8P6AJ and called him for several minutes without letting up, till it would seem 8P6AJ must have shifted frequency or gone completely QRT—and who could blame him?

For your scribe life has been 'most all Top Band CW; and here there were a couple of interesting ones, the first being a QSO with GC2LU for Jersey—after years of looking for Jersey, Bert came up out of the blue in response to a CQ and took it from the "wanted" list. Another one was of interest in the way of a coincidence rather than as DX in any sense, when G3KFE worked a certain station who shall be nameless, swapped the usual name and QTH stuff, and logged it all down. The following morning your scribe had occasion to make a 'phone call in the way of business. After a while it transpired that the chap on the phone was the same person as had been worked the night before, over the air. Neither had prior knowledge of the other's business. Small world, ain't it!

For the rest, a fair time has been spent listening to the HF's—and to listen was all G3KFE could do, his Tx gear having been cleared out by a deluge of telephone calls, and callers, after the appearance of the Small Adv. on p.64 of the March issue, from which, incidentally, several items could have been sold many times over. With the gradual picking-up of conditions, not much time has been spent on other than Top Band and Forty. One foray on Twenty as an SWL ended a little smartly when VP8LK was pounding in at well over S9; he was swamped under a CT2, who was so persistent, despite the fact that VP8LK made it very clear he had a sked with U.K., that any hope of a QSO went West; and by the time the CT2 had gone, and the sked QS20 was over, VP8LK himself faded out with the rest of the band. One suspects there were quite a few G and VP9 stations cursing that clotheared or ill-mannered CT operator. But this, alas, happens all too often.

Just as this was going down, a telephoned report from G3ZAY (Petts Wood) of his activities on the bands added a little gravy to the stew. Martin found the upswing in conditions gave better results, particularly in the way of Pacific DX in the afternoon, around 1500z. On Twenty, Martin found himself 9V1OI, 8R1J, OA4CR, VU5KV, YK1AA and CR5SP; KG6ASK was the star turn in the gotaway line. Fifteen was clearly the favourite band for G3ZAY, who lists such as FH8CY, FP8CS, KR6RH, KR6XR, KR6EZ, KR6NW, KR6JU, KR6LY, HL9UA, EA9EA, VS6DO, YS1WPE, FY7AB, VS9MB, VK9XI,

FG7TD, 5R8AP and VU5KV; VK9DM headed the list of escapers. Not a lot to report on ten metres, the only contact of note being with UI8AAL.

G3VFA (Broadstairs), whence emanates the Joystick and its appurtenances, reports a remarkable example of very long-skip conditions on 160m. during the period February 24-26, when OK/OL stations were coming in after dark like locals, with G's conspicuous by their absence. G3VFA's best Top Band daylight contacts in February were a 549 both ways with GD3HQR, 1530-1602z—and we are glad to know he is still around and active—and with G3RWU, Lands End, 300 miles.

Proposed U.S. Phone Band Adjustments

We get it that the FCC (Federal Communications Commission, the U.S. governing body for matters radio) has put forward for consideration certain changes in the Phone areas available to American amateurs. To follow these proposals, it should be explained that there are three categories of U.S. amateur licence effective on the HF communication bands—Extra, Advanced and General. In accordance with the general policy of incentive licensing, and because most people hold the General and relatively few the Extra, the idea is that by giving the latter more frequency space for Phone operation, the others will be encouraged to go for the higher grades of licence.

The suggested new bands are:

On 80m.: 3750-4000, for Extra; 3775-4000, Advanced; and 3875-4000 kHz, General.

On 40m.: 7150-7300, Extra; 7175-7300, Advanced; and 7225-7300 kHz for General. Also 7075-7100 kHz exclusive to Extra and Advanced for DX working.

On 20m.: 14150-14350, Extra; 14175-14350, Advanced; and 14250-14350 kHz, General.

On 15m.: 21200-21450, Extra; 21250-21450, Advanced; and 21325-21450 kHz, General.

On 10m.: 28350-29700 kHz for all grades, also an exclusive Novice CW-only band at 28150-28250 kHz.

At this stage, the foregoing are stated to be proposals only — under the FCC rules they must be published for objections or amendments within three months, after which the final rulings will be made.

It is expected that there *will* be violent objections, especially from the Canadians and possibly by the Extra Class boys who may feel their territory being invaded. And the General-class licensees will feel that they are being confined to pretty narrow frequency areas. Though it will not do much to reduce congestion on the HF/DX bands, it can be seen that there is an incentive for Advanced and General licensees to go for the higher grade of ticket in order to gain more frequency space.

We are indebted to W4ZM, Arlington, Va., for these details, passed over the air during a recent sked QSO with G6FO.

Signing Off

With the postal situation approaching normality, we can give **Tuesday, April 13** as the very latest date for receipt of letter-reports for the May issue — but really it would help to have everything in *before* Easter, rather than after. The address is, as usual, just CDXN, SHORT WAVE MAGAZINE, BUCKINGHAM. We certainly hope that we shall be on an even keel by next time. *73 de G3KFE.*

GETTING THE MAGAZINE

Readers are reminded that they should be able to obtain SHORT WAVE MAGAZINE, regularly and on time, through their local (or the nearest) branch of W. H. Smith & Sons, Ltd., the newsagents and booksellers. While it is possible that copies will not be available for casual sales at the first time of asking, the bookstall manager will always be glad to put in an order for copies if asked to do so. Similarly, small newsagents not normally able to get copies easily or on time can arrange for supplies through their local (or the nearest) W. H. Smith wholesale department.

NORTHERN RADIO SOCIETIES ASSOCIATION —Belle Vue Zoo Park, Manchester

This annual Convention, now an established feature of the Amateur Radio scene and well supported from a wide area round the North-West, will take place on Sunday, May 9. Some 1000's of visitors are expected, and the exhibition will be open from 9.0 a.m. till 6.0 p.m. The members of the Association consist of Clubs in that part of the country and they will have their own stands, depicting a wide range of Amateur Radio activities, competing for the G8AYD trophy. In addition, there will be Trade stands, attractions for the children and the distaff side, with buffet service available. Talk-in stations will be operating on Top Band, four metres and two metres, with a main station on the HF bands, all signing GB2BVC. For enquiries and information, get in touch with: S. Potter, G3YKJ, 4 Drayton Grove, Timperley, Altrincham, Cheshire. (*Telephone: 061-928 6311, extn. 316,* Day or *061-980 2523,* Home).

HAVE YOU ANY

Good photographs of Amateur Radio equipment, occasions or personalities? We are always in need of pictures, in the radio amateur context, for general illustration in SHORT WAVE MAGAZINE. Any such offered should be good quality black-and-white prints, any size but post-card preferred, with details on a separate sheet, *not* on the back of the picture itself, which should be identified lightly in pencil. We are not really interested in colour transparencies, miniscule strip negatives or photographs in colour — though in exceptional circumstances they can be used, the cost of processing for reproduction in the *Magazine* is usually unjustified. All illustrations that we can use are paid for, immediately on publication. If you have any good prints that seem of general interest, send them to: Editor, SHORT WAVE MAGAZINE, BUCKINGHAM. A suitable s.a.e. must be included if return is expected.

VHF BANDS

A. H. DORMER, G3DAH

THE tedium of the long spell of poor conditions inflicted upon us during the last few weeks was happily enlivened by a brief lift coinciding with the few days of high pressure around February 25. Although, in the South, both Two and Seventy were quiet on the 23rd, the Midlands appeared to be doing rather better, certainly as far as the 432 MHz Cumulative was concerned, with both G3ZYC (*ex*-G8AUE) and G8BBB passing scores over the 25 mark, including a contact with GD2HDZ. This compares with the results achieved by your scribe in the South, who heard a total of four stations, of which only two were worked, and both those locals.

G3VFJ (Chestfield, Kent), now doing a Ph.D. in Radio Astronomy at Kent University, advised the presence of five large sunspots and a fair bit of solar noise on the 24th, and this fact, coupled with the fade-out on the HF bands, made one think in terms of a possible aurora, and the beam was kept towards the North for the next few days. Sure enough, at 1645z on Thursday 25th, the first SM was heard calling a UR2 (who was *not* heard). Both SM5BSZ and SM6CYZ/7 were around the RS56A mark at this time. However, the manifestation did not appear to be very active or widespread, and by 1845z had disappeared. PAØHVA was received at 53A, and GM3EOJ, who rarely misses, was 55A at 1820z when he was calling CQ, without apparent result. No other British stations were logged during the time though it was reported subsequently that EI6AS had been on. A watch on the North was maintained until 2100z, in case there was a stronger second phase, but nothing further transpired, although G3COJ in High Wycombe reported hearing an SM on *Ar* at about that time. The optimum beam heading appeared to be much further round to the North-West than is customary. That this was a very minor occurrence is backed up by the fact that during the day WWV was signalling "normal conditions." It may be noted that March and September are the two months during which aurorae affecting VHF are most common, so check to the North from time to time.

Tropospheric propagation was also good on the 25th, with GB3ANG being received at better strength than the closer GB3DM, at around 1600z. Both GB3CTC and F3THF were also good signals, as was GB3SC on 70 cm. The four-metre beacons appeared at normal levels, and, strangely enough, no auroral signals were heard on Four while they were being received on Two. By evening, the best DX axis was established as being North/South, and contacts into Yorkshire from Herne Bay were made at good strengths. GM3AGU/P was known to be active with SSB but was not heard here, although it is reported that he worked down into Oxfordshire.

The 26th/27th continued to show good propagation to the North on a slightly reduced distance scale, and although the DX was still there, most paths were very unstable, and little was heard in the South from above Staffordshire. Very good signals were received from G8CVD in Nuneaton and from G8DON/P, 4 km. north of Nuneaton, on the afternoon of the 27th, and a very welcome 59+ both ways came from G6CW, on SSB from Nottingham later in the evening; other Midlands stations were not greatly in evidence. By the 28th, conditions had returned to normal in the South with the Scottish beacon inaudible and the Durham signal very much down. A watch was kept on all VHF bands during the solar eclipse, but nothing untoward was observed. Admittedly, this was a partial eclipse only in this country, but it made an interesting break.

Conditions during the 432 MHz Cumulative on March 1st were poor. The abrupt change in the weather and pressure was probably responsible for this, and the impression gained was that the activity was also down for the last of the present series of Cumulatives.

Repeaters

There is talk these days about the possibility of setting up a chain of VHF repeater stations in this country. As far as is known, it is at the moment only talk, but these installations have been shown to be very popular in the States, and with the spread of NBFM on the VHF bands in the U.K., a few words on the principles of operation may be of interest, against the day when talk is translated into action.

Briefly, a repeater takes an incoming signal on one frequency and retransmits it on another. That statement is obviously an over-simplification, and the first qualification must be — which frequency? Well, again looking at what is going on in America, by far the most popular choice is two metres, and although no specific frequencies within the two-metre band have been allotted exclusively for repeater use, something fairly high up in the phone section seems popular, the two frequencies for "receive" and "transmit" being separated by 600 kHz or so. There is a certain amount of cross-band operation 220 MHz/144 MHz also, and in this country, this could well be 144 MHz and either 432 MHz or 70 MHz.

The next requirement must be a good location. After all, the basic idea behind a repeater system is that the device should be located at some suitable high point, and so give extended ranges. This brings into the picture the concept of unattended transmitter/receivers with remote

control and monitoring facilities either by landline or radio—but this would not represent an insuperable problem in this country, although perhaps special licensing and control by the Ministry may be required.

The choice of the modulation system is of supreme importance in this context. Some AM systems are in use in the States but they are being replaced rapidly by NBFM systems for the reasons which follow: Whatever appears at a high enough level at the input of a repeater AM receiver will turn on the transmitter and be reradiated on the "transmit" frequency. Therefore, if a low level AM signal, complete with noise, appears, or if severe impulsive type noise is present, the AM squelch, which is invariably fitted, may be activated and all this garbage reradiated, this because the usual AM squelch circuit is opened in the presence of a voltage rise above that set for quieting action. If the squelch biassing voltage is set too low, then the transmitter may trigger on weak signals, and inevitably will also trigger on noise, and if it is set too high, then the low amplitude signal requiring the use of the repeater to effect a contact would be incapable of actuating the transmitter. On the other hand, an FM squelch system cannot be operated by impulsive noise, or even low-level wide-band noise, because of the limiters which are an integral part of any FM receiving system, and which reject any *amplitude* modulation, speech or pulse. The FM squelch circuit controls the *audio* section of the receiver, and only lifts open in the presence of a carrier. They are, if you like, "anti-noise" operated devices in the sense that in the presence of noise only, the receiver is muted, while receipt of a carrier permits normal operation.

Another factor influencing the choice of NBFM rather than AM is the necessarily close physical proximity of transmitter and receiver, and indeed, the sharing of an antenna in some cases. Break-through and blocking are likely to be much more of a problem with an amplitude modulated system where the frequency spacing is as little as a few hundred kHz. Furthermore, unless the incoming AM signal is exactly on channel and free from drift, the performance of the repeater will be severely degraded. This is not true of an FM system.

Access to the repeater is usually on an allcomers basis, and special precautions must be taken to avoid saturation, as in the case with some of the European balloon-borne responders. In other instances, audio tones are used to open the circuit, and this principle can be extended, where the coverage areas of two or more repeaters overlap, to give selective calling.

Repeaters will have an important influence on operating habits. Long, ten-minute "overs" will be out and will be replaced by the more natural, telephone type of contact, such as is now usual with many SSB operators.

There are so many interlocking factors in the establishment of repeater stations that one cannot foresee what the final pattern might be for the U.K. In the States, most of these installations are operated by VHF Clubs and groups, with a few privately managed, the ARRL intervention being limited to licensing regulations in conjunction with the FCC. The same *modus operandi* could be applied over here, but an alternative might be to parallel the RSGB beacon service with repeaters installed and operated at selected BBC or ITV sites using their masts (as is already the case with some of our UHF/VHF beacons). Whatever the answer, there is little doubt that the establishment of a repeater system in this country would greatly add to the enjoyment of long-range operation at VHF, and one hopes that its advent will not be long delayed. American experience is that very good results can be obtained with these installations, and interesting VHF-DX is worked.

Beaconry

The increase in the number of beacons now operating on VHF has greatly facilitated the selection of the best bearing for DX at any particular time. With the advent of the better weather during the summer months, more of these beacons will be receivable over greater distances, and while the reception of one of them does not necessarily mean that contacts will always be made in that direction (since this is obviously also a function of activity) it does mean that there is a better chance of a QSO than would be the case if the beacon information were not available. It has been found to be a rewarding exercise to log reception of British and Continental beacons *daily*, noting even non-reception of them, and to correlate this with existing weather and pressure conditions, either by direct observation or by using the weather charts which appear in some of the daily papers. Combining these correlations with activity as noted from the log can then give a very useful guide for immediate and future reference.

To assist in this procedure, the Table below gives an up-to-date list of British and Continental beacons on two metres. [over

Two-Metre Beacons

FREQUENCY MHz	CALLSIGN	LOCATION
143·968	*Nil*	Near Cologne
144·002	DLØDE	Deggendorf
144·005	OE3THL	Linz
144·007	F3THF	Lannion
144·034	DJ9CRA	Cuxhaven
144·110	DLØRG	Niederhausen
144·130	GB3CTC	Redruth, Cornwall
144·150	OE7IB/P	Innsbruck
144·250	GB3GW	Swansea
144·500	GB3VHF	Wrotham
144·678	OK1KCU/1	Bournak
144·800	OH3VHF	Oulu
144·929	OH3VHF	Oulu
145·004	SM4UKV	Gryhyttar
145·068	DM2AKD	Koeniswusterhausen
145·130	ZB2VHF	Gibraltar
145·150	LA1VHF	Goustad
145·200	LA2VHF	Trondheim
145·250	LA3VHF	Harstad
145·260	OY7VHF	Faroes
145·300	LA4VHF	Bergen
145·500	ON5JP	Dinant
145·900	DLØSG	Straubing
145·950	OE1XXA	Vienna
145·950	GB3ANG	Angus
145·960	SM4MPI	Borlane
145·960	OK1KVR/1	Zaly
145·971	DLØPR	Garding
145·973	DLØSGA	GJ76b (*QRAL*)
145·975	GB3DM	Durham
145·981	DLØER	Essen
145·987	OZ7IGY	Copenhagen
145·990	GB3GI	Strabane
145·990	YU1VHF	JD29g (*QRA L*)
145·990	DLØUH	EL68f (*QRA L*)
145·995	GB3GM	Thurso
146·000	YU2VHF	HF28j (*QRA L*)

VHF Occasions

As mentioned some time ago in this Column, it was proposed to re-start the VHF Dinner Meetings which were sponsored so successfully by SHORT WAVE MAGAZINE in the early post-war period. However, from enquiries which have been made into the possible response to such an occasion these days, it seems that the more popular idea would be to make these less of a dinner and more of a *Conversatione*. Accordingly, arrangements have been made to hold the first such on Friday, June 4, at the Copdock House Hotel, London Road, Ipswich. This is on the left of the main Colchester Road some four miles short of Ipswich. The Hotel is well signposted with ample car parking facilities. Instead of a formal dinner, this will be an all-male get-together and a good buffet has been laid on. The time is from 7.30 p.m. onwards, until about midnight, and tickets for the whole event cost 90p. Although these functions have been called "VHF dinner meetings," there is no intention to exclude those who, while not at present on VHF, might wish to get a bit more gen. on what it is all about —so who better to tell them than the brethren who will be there? No formal speeches or lectures have been planned, as it is intended that this should be just a good old natter among the boys on matters VHF/UHF. Applications for tickets should be made *now* to Noel Thomas, G3ZLN, 9 Burlington Road, Ipswich. *(Ipswich 55200)*. Hope to see you there.

If this event is well supported, it will be repeated, either in this form or as a Dinner Meeting, in other centres, such as Manchester, Cardiff, Cheltenham and Nottingham, already proposed as possible venues.

Thoughts on 70cm. SSB

One hears of more and more amateurs these days who are coming back on to 70 cm., and that in itself is a very good thing. One also hears that plans are being made to come up on SSB on that band. Now, that may or may not be a good idea, depending upon the way it is proposed to approach the problem. The easiest *looking* way is to use the existing 144 MHz SSB rig and mix its output with an oscillator/multiplier chain coming out on 288 MHz, and away you go.

However, there are some snags to this method, the most obvious of which is undoubtedly the enormous in-band spurii which could be generated. To come up on the allotted SSB channel of 432·15 MHz, the two-metre rig will have to be on 144·15 MHz. But the third harmonic of 144·15 MHz will be 432·45 MHz, and there is little that can be done to eliminate this from the output. How many times have you heard a signal on 70 cm. which is actually a harmonic of a two-metre transmitter —and which is perfectly readable even without having gone through an amplifier at the higher frequency? It is possible, of course, to arrange matters so that the spurious third harmonic comes outside the communications section of the band. For example, to cover 432 MHz to 432·5 MHz— that is, to take in the CW section of the band, plus the SSB channel and Zones 1, 2, 3—one could use an oscillator coming out on 286·5 MHz and mix it with an SSB frequency between 145·5 MHz and 146 MHz. However, all *this* does is to shift the third harmonic out of the communications segment of 70 cm. and up to around 436 MHz, where it will not be very welcome either, unless suitable filtering is built in to reduce it to negligible proportions. The better approach is probably to reconcile oneself to the idea that, if you must use the two metre-rig to generate the sideband signal, then it is better to build a separate transverter to go with it. That being accepted, the next question might be—what frequencies should be used? The norm for two metres among those who are using existing HF rigs for the SSB signal favours either 14 MHz or 28 MHz for the sideband drive, with the appropriate oscillator/multiplier chain to produce the required injection frequency. But these have been shown to be less than optimum. The lower frequency makes it more difficult to filter out the 131 MHz injection frequency, and the higher often suffers because of a poorer performance of the prime mover (SSB Tx) at the top of its frequency coverage where circuits are generally less efficient. A frequency between 21·0 and 21·5 MHz, which is available on most modern prime movers, represents a suitable compromise, but will require an oscillator multiplying up to 411 MHz; this is uncomfortably close to 432 MHz and could well introduce filtering problems. Fortunately, however, there is another solution.

It has long been accepted as good practice to use the highest possible xtal oscillator frequency. This saves the cost of a long multiplier chain, and also eliminates a possible source of trouble which can arise in some designs where a low-frequency oscillator and its harmonics produce unwanted beats, in and out of band, and on "receive" and "transmit." Further, by using a high frequency xtal, it can be made to serve two purposes: Consider a xtal of 82·2 MHz. When followed by a quadrupler, or two doublers, this will result in an injection frequency of 328·8 MHz, far enough off 432 MHz to present few filtering problems.

Now take the *same* xtal oscillator, extract 82·2 MHz and inject it into a balanced mixer with the 21 MHz signal to give a sum-product of 103·2 MHz. Feed this frequency, together with the 328·8 MHz, into another balanced mixer and again take out the sum product. Result—instant 432 MHz SSB, and only one oscillator to generate unwanted signals!

Obviously, precautions must be taken, as with any design, to see that unwanted beats do not appear at unwanted spots. The use of traps and hi-Q breaks to eliminate difference products, etc., is very desirable. Obviously also, other xtal frequencies could be used in place of the one suggested. For example, the fifth harmonic of 68·5 MHz comes out on 342·5 and this may be mixed with the sum of 68·5 and 21·0 MHz to give an output on 70 cm.—but the lower the basic oscillator frequency, the more the danger of producing spurii, and the greater

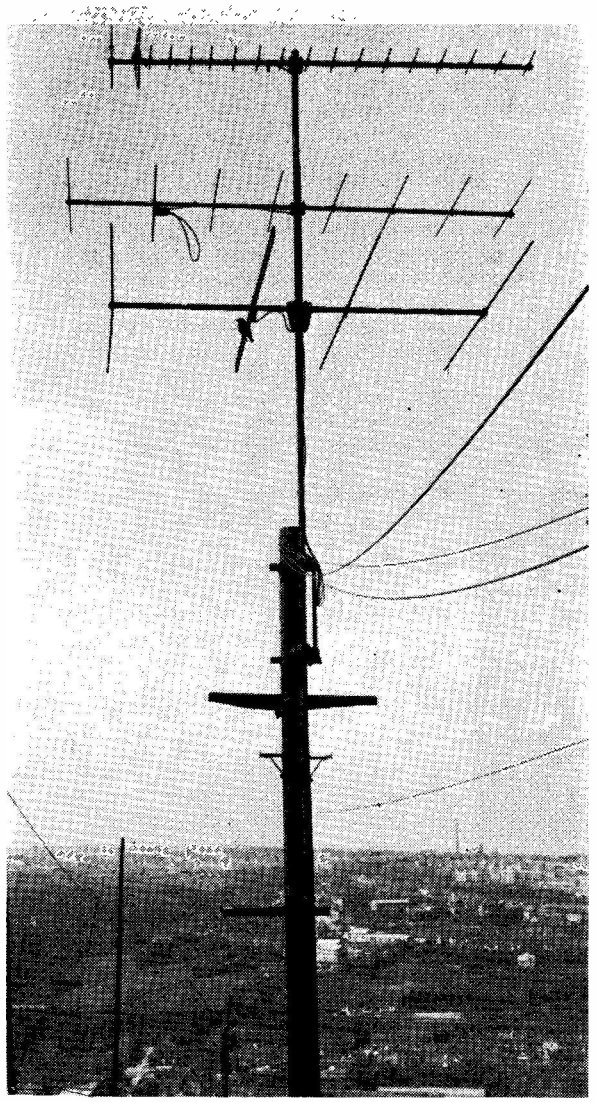
the difficulty of separating out the injection frequency from the unwanted output.

Possible TVI in certain parts of the country will also dictate the choice of xtal frequency. However, here is one possible line of approach—on which your scribe is working at the moment—which should yield good results: An 82·2 MHz xtal is being used, followed by a buffer and multiplier chain with 2N918's in all stages. The balanced mixers, and they *must* be balanced and not single-ended in this application, use 2N3819's, which could be replaced in the final version by IC's. A QQV02-6 performs as a buffer amplifier at the output frequency, and it is proposed to couple this to a QQV03-20A and thence to the 70 cm. cavity with a 4CX250A in linear configuration. Not perhaps the ultimate in circuitry, but surely worth looking at?

One other aspect of this approach which merits mention is that, since all post-mixer stages are linear, both AM and FM at 21 MHz could be injected into the first mixer, and may obviate the need for a second modulator for 70 cm. For CW addicts, and for those who like plate-and-screen modulation anyway (and who on occasions need the ultimate from their expensive 4CX250's) it suffices to inject carrier on 21 MHz and rearrange the operating potentials of the PA to give these facilities — provided, of course, that a 100-watt modulator is available.

News Items

G8CVD (Nuneaton, Warks.) is planning an extensive rebuild of the antenna system. He should have a pair of Multibeams up at 75ft., giving him 96 elements on 70 cm., and 20 elements for Two. This, at his 444ft., a.s.l., should do us all a bit of good. G8DON/P, operating from just north of Nuneaton over the last weekend in February, seems to have had a very successful foray. He was running 25 watts to a QQV03-20A with a 10-ele Yaga on a 7ft. pole. A Mosfet converter and an *Eddystone* EC-10 were used for reception at a site which Don described as "reasonably clear during the day, but full of parked cars without lights on at night!"



The VHF antennae array at G3NEW, Clif Sykes, 102 Gramfield Road, Crosland Moor, Huddersfield, Yorkshire, consisting of an 18-ele Parabeam for 70 cm., eight-element Yagi for two metres and a 4-ele job for the 70 MHz band. Rotation is by remote control and most of the accompanying gear is home-built. This can be seen to be a good location.

G8DNM was also operating portable from 1,000ft. up in the Derbyshire hills on the evening of February 27. He was installed in comfort in a heated caravan, which was just as well, since he was in a snowstorm when your scribe had a contact with him. Maurice is the father of Pat Hargreaves, G3TEY and hence the father-in-law of none other than Roger Hargreaves, G3OHH. Both are now of Mow Cop and getting ready to come up on 23 cm. If he does as well on UHF as he does on VHF, it looks as if we shall have in Roger another contestant for the leadership of the 23 cm. Annual Table!

G8CMB, late of Clowne in Derbyshire, is now G3ZPZ, Bolsover, in the same county, and is once more active on two metres. G8EJR (Sheffield) is putting in a very good signal to the South

from his 900ft. a.s.l. QTH. Although he runs only a *TW Communicator*, his signal was one of the strongest from that area in the last few days of February; those looking for a contact with Yorkshire should keep an ear open for him. G2UN (Malvern) has not been too active on Two of late as his horological activities have taken much of his time. He has now got his home-constructed clock locked to GBR, Rugby, with a counter of his own design. So, if you want to know the time, ask a doctor!

Thanet Radio Society, which has a large VHF membership, will be holding their annual dinner on April 3 at the San Clu Hotel, Ramsgate. The time is 7 p.m. for 7.30 p.m. and tickets are available now from secretary Dick Trull, G3RAD, *QTHR*. Visitors are very welcome to attend both the Dinner and the weekly meetings.

In the same area, the Broadstairs Hobbies Exhibition takes place at the Charles Dickens School, Broadstairs, during April 14-17. The VHF station on two metres will be operated under the callsign G3DNR/A.

QSU

The idea of using the Q signal "QSU" to indicate that one is listening on one's own frequency before tuning the band seems to be catching on, and already several stations have been heard using this signal, even on phone, to indicate their tuning intentions. As pointed out last month, there is nothing against this, but it will surely find its maximum value during the next CW or Open contest. How about trying it out when next the opportunity offers? Can you suggest any shorter way of conveying this information on CW? With more and more VFO's coming on to the VHF bands, we need some simple device to enable us to take advantage of this increasing practice—not everyone is transceive as yet!

Contests

The 144 MHz/432 MHz fixed station contest over the weekend March 5/6, which coincided with the IARU event, will have come and gone by the time that this Column appears, and one hopes that, in spite of the poor publicity for the contest, it will have been successful. As full a report as the disruption of the postal services will permit will appear in due course. This brings us to the UHF 1296 MHz fixed station contest of March 21, and the same remarks must apply to this event also. However, you should receive your copy of SHORT WAVE MAGAZINE before April 3/4, which is the date for the 70 MHz Open. The two-metre portable contest is over May 1/2, and this again coincides with an IARU event.

Deadline

Deadline for the next issue is **April 10,** and the address for the enormous volume of news, views, claims and comments that it is hoped is building up is: "VHF Bands," SHORT WAVE MAGAZINE, BUCKINGHAM. Cheers for now and *73 de G3DAH.*

Stop Press: London VHF Convention, as last year, at Twickenham, Saturday, April 17, tickets and information from G3GMY, *QTHR*, apply right away.

CIRCUIT FOR A TRIPLER TO 23 CENTIMETRES

FROM NOTES BY F3PJ IN "RADIO REF"

THIS tripler has many points in common with a design described in *Radio REF* for July, 1968. The block diagram is shown in Fig. 1. It is that of a classical frequency multiplier—a tripler. The essential difference lies in the *half-wave* line for the 1296 MHz output stage. This line requires a capacitor at the output of the diode to permit adjustment. Effectively, the capacity CVo of the BAY66 is 25 $\mu\mu$F, whereas this same capacity is only 2·3 $\mu\mu$F for the 1N914. There is a factor of about 10 between these two capacities, from which can be imagined the difficulties likely to be encountered at this frequency.

For setting-up, use a power of about 1 watt, set the capacitors at minimum except for CV4 which should be at about a quarter of its total capacity.

The reader is reminded that the indications given by a non-selective watt-meter or VSWR meter are insufficient if they have not been correlated with a simultaneous measurement of frequency to ensure correct operation of the tripler. (It is very easy to get output at all sorts of odd frequencies with these devices).

The maximum input power is ten watts at 432 MHz, the copper chassis used for the tripler being the heat sink for the diode. The output with non-silvered lines is approximately half this, yielding five watts at 1296 MHz. For those who may consider this power too low, attention is drawn to the existence of military radio links of 600 *milli*watts on 1·7 GHz (1700 MHz), which permits solid contact to 50 miles over flat country.

From 144 MHz on, the multiplier chain is that shown in Fig. 2. When amplitude modulating the two-metre transmitter, there is no great audible difference in the quality on 23 centimetres. The distortion due to the tripler amounts to about 10%. Poor adjustment of the tripler, notably of the idler circuits, gives greater distortion, and significant phase modulation. Modulation quality at 1296 MHz com-

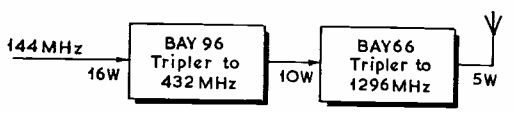


Fig. 1. Block diagram of the BAY96-BAY66 Tripler-Tripler, to give output on 23 centimetres from a two-metre drive source.

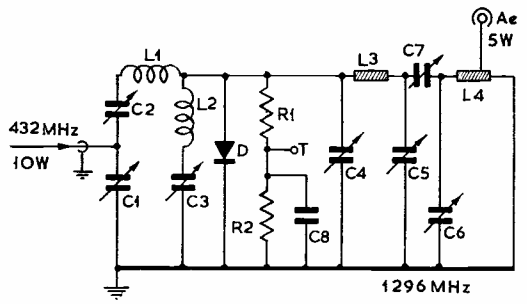


Fig. 2

Fig. 2. Circuit of the Tripler-Tripler by F3PJ. Values he uses are: C1, 12 $\mu\mu$F; C2, C5, C6, C7, 3 $\mu\mu$F; C3, C4, 6 $\mu\mu$F; all these capacitors are tubular ceramic type; C2 is soldered directly to C1. L1 is of 2½ turns, 8 mm. diameter, 13 mm. long, 16g. silvered copper; L2, one turn, 12 mm. diameter, 5 mm. between connection points, 14g. silvered copper; L3, silvered copper strip 7 mm. long, 4 mm. wide, 0.5 mm. thick, fixed between C4 and C5 at 8 mm. clear of chassis; L4, half-wave strip, 23 mm. long, as L3, at 4 mm. clear of chassis, with Ae. tap 10 mm. from cold end. The diode is a BAY66, though a BAY96 could be used with satisfactory results. Resistor R1 is 92K, and R2, 18K. C8 is .0047 μF and T a test point for excitation current indication. While the use of silvered-copper is recommended for maximum efficiency at these frequencies, it is not essential for obtaining experimental results.

parable with that at 144 MHz in itself gives a useful criterion of the correct adjustment of the triplers.

Do not try to do better than the power levels indicated, since the non-linearity at modulation peaks will result in bad distortion (and possible TVI) and could cause destruction of the BAY66.

When mounting the diode, note the very fragile anode lead. To avoid a catastrophe, fix this last of all—the chassis having been screwed to the lid of the box, the diode can be placed in position and the anode soldered directly to CV4. Check the exact positioning to avoid unexpected frequency multiples!

Constructional Comment

Assembly, using the normal technique for UHF, can be on a chassis about 4½ x 1¾ins. deep, with a skirt of 1in. or so. Construction should follow the layout suggested by the circuit of Fig. 2, using the shortest and most direct leads possible—noting in particular the dimensions of L3, L4 and their mounting in relation to the chassis. For the experienced UHF constructor there will be no particular problems here.

Aerial Note

It is rather interesting to explain that a sharp and highly directional beam for 23 cm. can be made from a ball-point pen holder as the boom and stiff wire (16g. or even 14g.) for the elements. The reflector can be 11·7 cm. long, the first director 10·3 cm. and the second 10·2 cm. The driven element is a folded dipole 10·2 cm. across the bends, with a 9 mm. gap at the centre between the ends and a separation of 17 mm. across the arms of the fold, the ends being made symmetrical by rounding them on a mandrel about 16 mm. in diameter. Spacings, in millimetres, between elements, are: Reflector to driven element, 38; folded dipole to 1st director, 19; 1st director to 2nd director, 38 mm.

The overall dimensions of such a 1296 MHz beam would be approximately 4½ins. long by 4½ins. wide. Additional directors 10·1 cm. long can be added at 57 mm. intervals, making it a "long Yagi"—though this would of course extend the boom length beyond the 5ins. or so of the normal ball-point pen holder.

Activity Note

In the last year or two, amateurs using the 23 cm. band in the Paris area have abandoned vertical antenna polarisation in favour of horizontal. Requiring lower effective heights, this polarisation is more productive of DX—although, on the other hand, it requires a more precise orientation of the parabola.

For newcomers to the 23-centimetre band, attention might be drawn to the possibility of working local stations using the 70 cm. antenna, but watch the directivity. The radiation pattern lobes will be about 25° to the normal, and consequently the direction indicated on your rotator dial will change, one way or the other, by the same amount.

RALLY DATES AND ARRANGEMENTS

Following are Mobile Rally bookings of which we have so far been notified. Organisers wishing for publicity in this space (which is, of course, free) are asked to send details as soon as possible. The basic information required includes date, location (with map or road references), general arrangements and attractions on the ground, callsign and frequency of tallk-in stations, and QTH for enquiries and QSL's, where applicable. All such correspondence should be addressed: "Mobile Scene," SHORT WAVE MAGAZINE, BUCKINGHAM, as a *separate* item for Editorial attention.

April 18: North Midlands Mobile Rally, at Drayton Manor Park, Nr. Tamworth, Staffs. (*as last year*).

May 2: Spalding Tulip Rally, at the Picnic Site, Surfleet, 4m. north of Spalding, on the A.16 road to Boston, Lincs. There will be trade stands, bring-and-buy stalls and a raffle, with refreshments available on site. There will also be facilities for overnight camping and caravan parking. Top Band talk-in is to be by G3VPR/P on 1980 kHz and G3XBS/P on 145·8 MHz, both stations opening at 10.0 a.m. Further details, with maps of the famous Tulip Fields, from R. Harrison, G3VPR, 38 Park Avenue, Spalding, Lincs., PE11-10X.

May 30: Maidstone YMCA Amateur Radio Society Rally, at Maidstone (*as last year*).

June 27: Echelford Amateur Radio Society, in collaboration with Hanworth Carnival Committee, will be organising a Mobile Rally for the London area at Hanworth Airpark.

July: White Rose Mobile Rally—date and details to be announced.

PCB MODULATOR ATK-2

FOR THE ATK-1 TWO-METRE TRANSMITTER

M. HEARSEY (G8ATK)

THE modulator discussed here was designed to be the companion unit for the ATK-1 two-metre Tx originally described in the August 1970 issue of SHORT WAVE MAGAZINE.

Basically, the ATK-2 modulator consists of three stages: (*a*) pre-amplifier; (*b*) phase-splitter; and (*c*) audio power amplifier. The pre-amp. comprises two halves of a 12AT7, the first half giving a stage gain of ×20, and the second ×30. The signal from the pre-amplifier is fed to the grid of the phase-splitter, which is again two halves of a 12AT7. The outputs of the phase-splitter are taken from the anodes of V2A and V2B to the grids of V3 and V4 respectively — quite the usual arrangement for this type of circuitry.

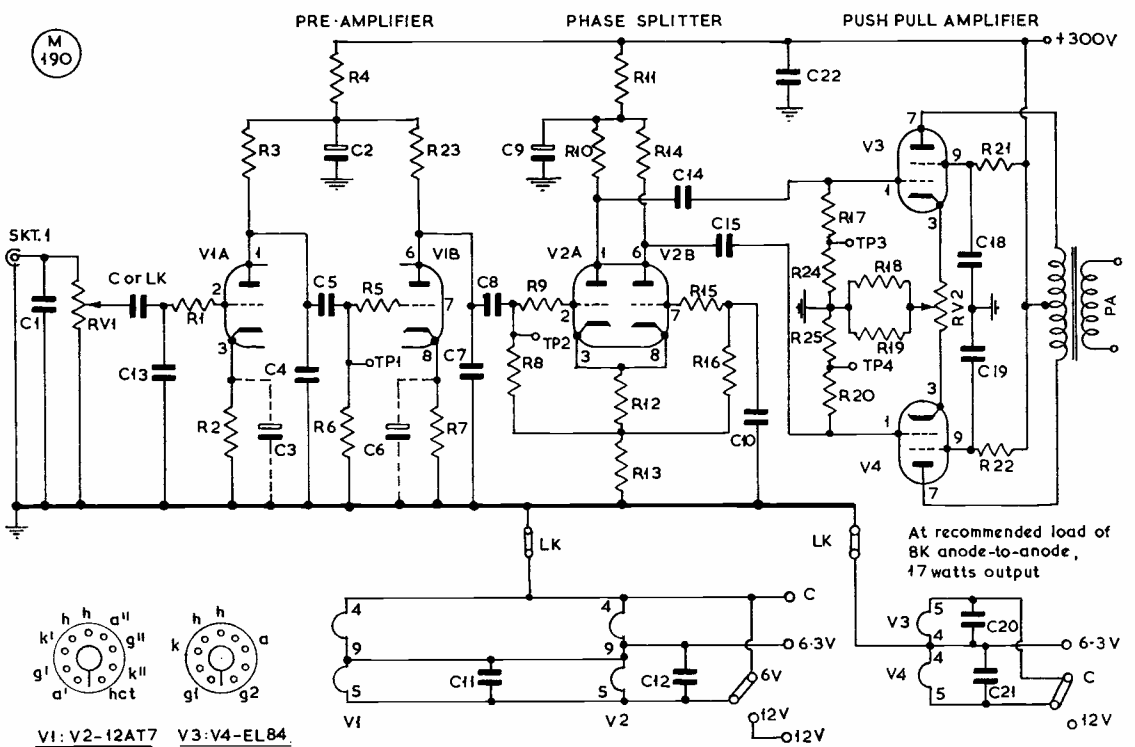
The audio amplifier runs a pair of EL84's in push-pull, anode current balance being achieved by the potentiometer RV2 in the common-cathode circuit. The output of the amplifier is fed to the primary of a modulation transformer having an impedance of 8K ohms. At this impedance—provided that the secondary winding is correctly terminated—the maximum achievable output is 17 watts audio at 4% distortion. (On two metres, this sort of audio would be sufficient to modulate an RF amplifier running 25-30 watts).

Some Technical Points

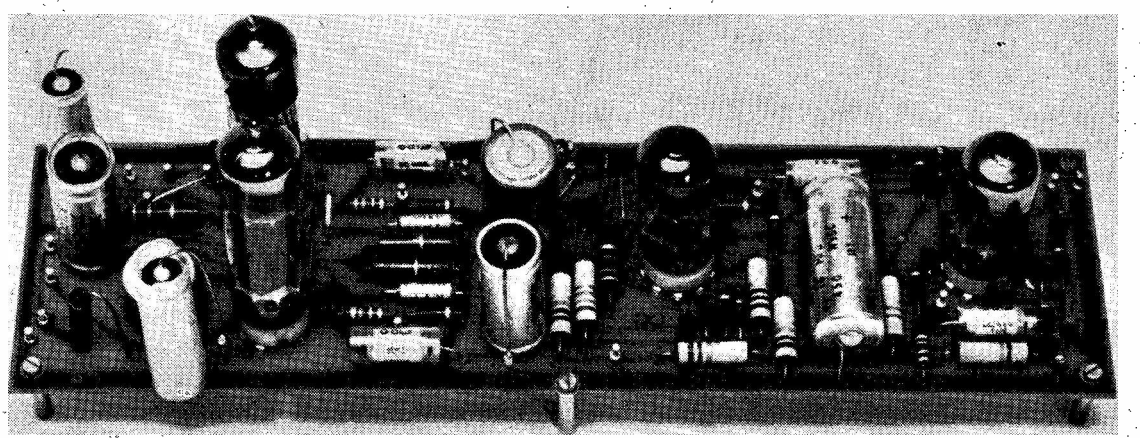
Gain: The ATK-2 modulator has been designed for an input impedance of 50K and an input level of 50 mV peak-to-peak. However, a reasonable degree of variation either way can be accepted, as RV1 is adjustable to suit individual crystal microphones. With a low-level type, capacitor C of 470 $\mu\mu$F should be fitted, the link (LK in circuit) removed and an additional pre-amp. used ahead of V1A.

Considerable gain changes can be made in the V1A, V1B sections by adding 8 μF condensers (C3, C6, dotted) across R2 and R7. These capacitors will give a further gain of about 6 dB at each stage. If the gain achieved is still insufficient, the values of R2, C3, C5, R6, R7, C6 and C8 can be changed. Suitable values and gain figures are given in the *Amateur Radio Circuit Book* (obtainable from SHORT WAVE MAGAZINE Publications Dept. at 70p.). Microphones actually used with this design have been the Foster DF70 and DF72.

Heater Voltage: The heaters are intended for



Circuit of the ATK-2 Modulator — see text.



The Microwave Modules ATK-2 Modulator as described in the article.

operation on either 6·3v. AC or 12v. DC. To select the appropriate set of links, the circuit diagram, supplied with the unit, should be examined. Two sets of links are provided to earth one side of the heaters, if required.

Alignment: After assembly and final inspection, fit V1 and with an audio generator having an output impedance of 50K ohms over a range of 300-3000 Hz at a level of 50 mV peak-to-peak, apply this to the input socket of the modulator, setting the generator frequency to 1000 Hz. Then apply heater voltage to the strip, ensuring that V1 lights up and use the high-impedance probe of an oscilloscope to monitor the level appearing at pin 2, V1A (with RV1 at half-track). Note this level. Then apply HT and transfer the 'scope probe to pin 7, V1B, noting the level obtained; ensure that about 20-times gain has been achieved. Insert V2 and transfer the probe to pin 2, V2, check the level, and ensure that something like 30-times gain is evident against the level at pin 7, V1B.

Table of Values

C	=	470 $\mu\mu$F (*see text*)
C1, C13	=	470 $\mu\mu$F, cer.
C2, C9	=	16 μF, 350v. elect.
C3	=	8 μF elect. (*see text*)
C4, C7	=	47 $\mu\mu$F, cer.
C5, C8, C14, C15	=	·01 μF, 350v.
C6	=	8 μF elect. (*see text*)
C10	=	1 μF, 150v.
C11, C12, C20, C21	=	·001 μF, cer.
C16, C17	=	8 μF, 18v. elect.
C18, C19	=	0·1 μF, 400v.
C22	=	0·25 μF, 350v.
R1, R5, R9, R15	=	10 ohms, ½w. carbon
R2, R7, R12, R24, R25	=	1000 ohms, ½w. carbon
R3	=	39,000 ohms, 1w. carbon
R4, R11, R13	=	22,000 ohms, 1w. carbon
R6, R17, R20	=	470,000 ohms, ½w. carbon
R8, R16	=	1 megohm, ½w. carbon
R10, R23		47,000 ohms, 1w. carbon
R14	=	56,000 ohms, 1w. carbon
R18, R19	=	220 ohms, 1w. carbon
R21, R22	=	47 ohms, 1w. carbon
RV1	=	50K log. potentiometer
RV2	=	100-ohm, linear
TP1-TP4	=	Test points
V1, V2	=	12AT7
V3, V4	=	EL84

Switch off and insert V3, V4, connect in the modulation transformer and terminate the secondary (output) winding with a resistor load of the correct impedance. Switch on HT and apply the 'scope probes to pin 1, V3 and pin 1, V4, ensuring that the two are out of phase. This assumes the use of a double-beam oscilloscope because a single-beam type would trigger on the leading edge and give indications of both in phase. If only a single-beam 'scope is available, check that both signals are of the same amplitude and just hope that they are out of phase. Switch off and put a meter in between the centre-tap of the mod. transformer and the HT supply, and note the current load. Then insert the meter between one of the anodes and that side of the modulation xformer, adjusting RV2 to show half the total current drain when the meter was reading full-load current (between transformer centre-tap and supply rail). Connect the 'scope probes across the load resistor(s) on the secondary side and look at the waveform obtained (which will be its shape as final output). Swing the audio generator between 300 and 3000 cycles and, watching the output waveform, ensure that no appreciable decrease in output occurs; there may be some dropping off at the ends.

Using *Mullard* EL84's with 300v. HT and an anode load of 8,000 ohms, the output should be near-enough 17 watts of audio. Finally, remove the audio generator and replace with a suitable microphone of about 50K impedance, adjusting the input on RV1 to obtain the correct modulation level.

Editorial Note: The kit described and illustrated here is obtainable from the firm of Microwave Modules, Ltd., and matches with the ATK-1 two-metre Tx, size being 11ins. x 3ins. Power requirements for the ATK-2 are 300v. at 100 mA and 6·3v., 2·2 amps. Typical power output is 15 watts into 8K, more than sufficient fully to modulate the ATK-1 10w. Tx.

GOING NBFM ON TWO METRES

SIMPLE CIRCUIT ARRANGEMENT

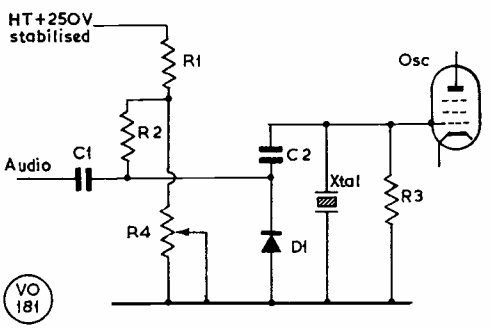
G. T. GARCIA (G8DWW)

THIS modification is quite simple and the components can usually be found in any junk box. The author, since gaining his licence, had been operating a one-watt AM transmitter on two metres —however, recently it was decided to increase the RF output. The addition of RF amplifiers proved no problem, but a system of modulation was sought which would involve little or no modification to the home-built rig being used. The circuit shown here, was put together after consultations with G8DJI during a QSO last Boxing Day.

The diode chosen was a REC-53, but any similar silicon diode, such as a BY-100, can be used if R4 is adjusted to give a suitable bias voltage.

It is also conceivable that both NBFM and AM systems could be built and arranged for switching during the hours when TVI occurs for those unfortunates who suffer from AF breakthrough.

For further information, readers are referred to the *VHF-UHF Manual*, particularly as regards the adjustments for correct deviation.



Circuit of the NBFM arrangement for application to the CO of an existing crystal-controlled transmitter. Values can be: C1, .01 μF; C2, 10-20 μμF; R1, 270K; R2, 100K; R3, 47K; R4, 47K potentiometer set at suitable bias voltage for diode used. D1 can be REC-53, BY-100 or similar. For notes on deviation, see "VHF-UHF Manual".

INDEX—VOLUME XXVIII

March opened a new Volume, the 29th in the annual series—seems astonishing that all those years have rolled by since our Editor first started this work!—and as usual each copy contained, as a free loose supplement, a general index to Vol. XXVIII, March '70 to February '71. In case anyone was missed, a copy of this Index can be obtained for just the price of a large s.a.e. from: Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SIDEBAND TRANSVERTER FOR TOP BAND

USING 7 MHz SSB TRANSMITTER

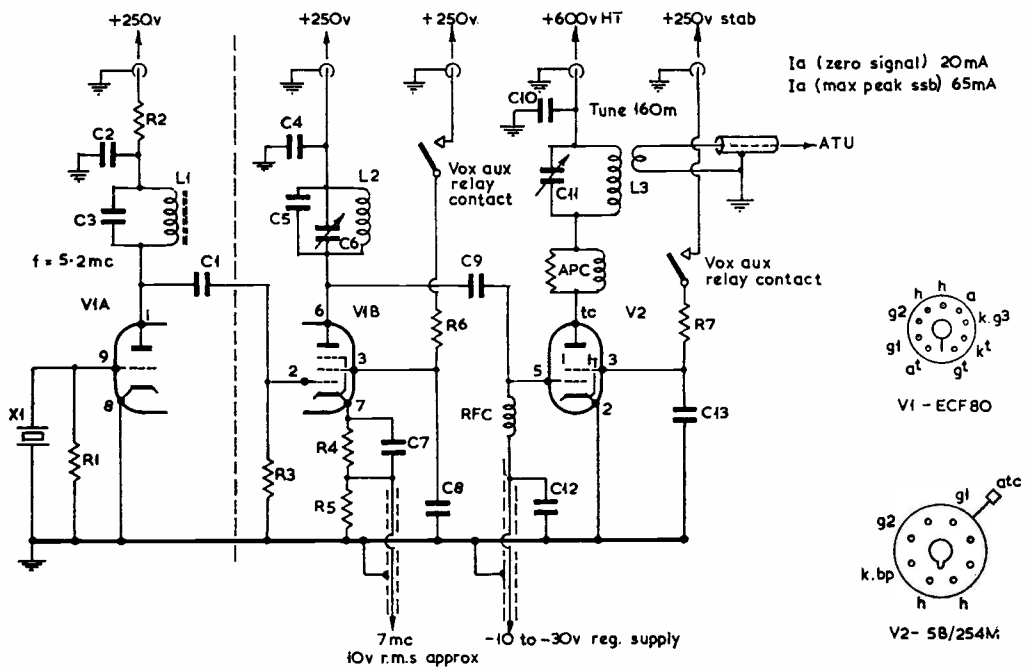
TO get going with SSB on Top Band—given the possession of a Sideband Tx already covering other HF bands—one could not find any simpler and more effective arrangement than that shown in the circuit herewith. An ECF-80 as mixer from 7 MHz drives 5B/254M as 160m. PA. Other valve combinations would of course be possible, *e.g.*, for V1, triode-pentodes such as ECL-82, 6BR8 and their equivalents, and for V2 a 5763, 807, 6L6, 6CL6 and similar output pentodes. At this frequency, the values as given would not need alteration, except perhaps in R2, R6 for a change in the V1 position and in bias for a different PA, V2.

This small transverter was built on a standard aluminium chassis measuring 12ins. x 8ins. x 2ins. with the long side going from front to rear. The oscillator-mixer was to the rear and in-line construction followed with the amplifier valve next and the tuning coil and capacitor to the front. There was sufficient room for the ATU to be mounted beside the tank circuit had this been required.

The output of a K.W. "Viceroy" Mark II SSB exciter was fed into the mixer on 7 mc and as this was using lower sideband and the crystal injection for the conversion frequency was also on the lower side, the lower sideband would appear on Top Band. Everything tuned up exactly after the GDO had set the coils; more than adequate drive was obtained from the mixer into the 5B/254M for AB1 operation —in fact the grid meter could be run up to 4 mA with full carrier insertion and at this the output could be loaded to well beyond the limit. At 40w. p.e.p. input the linearity is excellent. Reports received have indicated that the signal is very clean and entirely acceptable in every way.

Alternatives

So straightforward is the circuit that it requires no explanation in detail, and it can be copied easily and with confidence as shown here. It might be useful, however, to comment on one or two alternatives which could be tried, as it is not everyone who has a 7 mc exciter with the correct sideband output at the right power level. Some SSB transmitters of older design had *upper* sideband on the 7 mc range and this would require a 9 mc crystal to be used in place of the 5·2 mc of the lower sideband set up. Again, if the SSB rig has only 14 mc output with upper sideband, then a 16 mc oscillator will do the trick quite nicely. A word about the signal frequency drive levels: Only about 10 volts RMS is required across the terminating resistor R5 in the mixer cathode and this is just about right for most exciters using 6CL6's or the like as Class-A amplifiers. But if the output of the SSB transmitter is something



Circuit to obtain SSB output on Top Band from a 7 mc Sideband drive source. Mixing is in the ECF80, with the CO side on 5.2 mc ; as mentioned in the text, other frequency combinations can be selected to produce the 1.8 mc LSB drive for the PA (which could be any other suitable type, such as an 807 or a 6146). Values and current readings to be expected are for the 5B/254M, which is a miniaturised version of the 807. If the 7 mc SSB drive is obtained from a Sideband transmitter, such as a "Viceroy," running straight, it is essential to keep the input to the mixer down to about 10v. r.m.s.—this can be done by feeding the SSB Tx output into a dummy load, and tapping off the required drive by a potentiometer network across the load.

Table of Values

Transverter Circuit for Top Band

C1	= 2·7 $\mu\mu$F	R5	= 75 ohms, 1w.
C2	= ·005 μF	R6	= 47,000 ohms, 1w.
C3	= 60 $\mu\mu$F	R7	= 1,000 ohms, ½w.
C4, C7,		RFC	= 2·5 mH RF choke
C8, C10,		Xtal	= 5·2 mc
C12, C13	= ·01 μF	APC	= 5t. spaced on resistor body
C5, C9	= 100 $\mu\mu$F	L1	= To tune 5·2 mc with C3
C6	= 50 $\mu\mu$F	L2	= To tune 1·8 mc
C11	= 15-400 $\mu\mu$F	L3	= To tune 1·8 mc
R1	= 47,000 ohms, ½w.	V1	= ECF80
R2	= 47,000 ohms, 2w.	V2	= 5B/254M
R3	= 100,000 ohms, ½w.		
R4	= 680 ohms, ½w.		

like a pair of 6146's then perhaps the easiest way of reducing drive power is to terminate the transmitter in its dummy load and then to reduce the RF voltage across this load to 10 volts or so by means of a series condenser between the "hot" end of the load and the 75-ohm mixer terminating resistor. This may not be economical in the sense of power consumption, but at least the main rig is not disturbed in any way and is operating under correct loading and output.

For the more adventurous, it will be obvious that a little drive can be filtered off before the linears of the HF rig and the linear PA disabled when Top Band operation is desired.

How the drive at 7 mc is derived is of little consequence as long as it does not exceed the 10 volts or so required. It is also wise not to have too much drive at the conversion frequency from the crystal and the 2·7 $\mu\mu$F coupling capacitor C1 was found to be adequate for the HT used on the oscillator anode, measured as 100 volts. The fussy ones might like to stabilise this voltage, of course, and it would be a useful refinement in some cases.

If this article has given some readers ideas about using the same sort of approach for *VHF* purposes, please do *not* try it. A very different type of design must be adopted for VHF to keep unwanted products and spurious beats down to a safe level.

CHEAP GENERAL-COVERAGE RECEIVER

MODERNISED R.1155, REBUILT WITH MINIATURE VALVES AND NEW COMPONENTS

Part I

J. STEBBINGS

This is not offered as a hot and very much up-to-the-minute design. What our contributor has done is to take what was in its time a very good receiver, mechanically and electrically, and use its essential parts for a complete rebuild, modernising circuitry and components as and where necessary. The aim was to produce a good general-purpose Rx, always available for listening outside the amateur bands and as a stand-by for the station main receiver. It is also suggested that this might be a good subject for a Club Project—there must be a great many R.1155 carcases about and they can often be found as surplus, sometimes in very good condition.—Editor.

WHILST most *Magazine* readers will already have a first-class amateur band receiver, a second general-coverage receiver is often regarded as an expensive luxury. Nevertheless, it is useful to have a receiver which will tune outside the amateur bands. For instance, the set to be described will tune to the common intermediate frequencies of 465 kHz and 1·6 MHz, as well as 85 kHz and 100 kHz. Standard frequency transmissions may be picked up on 2·5, 5·0, 10·0, and 15·0 MHz and the wide tuning range enables the receiver to be used as an intermediate frequency amplifier for VHF converters with a wide choice of IF.

Short wave listeners learning to read Morse will find a wider choice of good hand-set CW; and rather surprisingly, careful searching will reveal some perfectly spaced transmissions at quite moderate speeds.

The Basis

The R.A.F. aircraft receiver Type R.1155 was available in large numbers twenty or more years ago and many must still be in existence and in working order. They may sometimes be seen in the radio shops usually in apparently very bad condition. They should not, however, be dismissed as useless scrap since they contain many usable high-quality components of a type not available today.

The writer has had such a set since about 1948, since when it has undergone much modification and repair. Finally, incurable instability and deterioration of rubber insulation indicated the need for drastic measures.

When estimating the cost of building a completely new receiver it was found that the major part of the expenditure would be for a cabinet, the tuning dial, and coil assembly. The IF cans would also be expensive items. A second look at the R.1155 revealed the brass coil box (yes—how many realise that!) with potted aerial coils, a strong and rigid chassis, a case which could be repainted, and a large tuning dial. It is true that the original slow motion friction drive was far from satisfactory but this had very soon been replaced with a two-ratio geared unit (4 to 1 and 360 to 1) which had been picked up for ten shillings. Many of the flush mounting panel drives available today would do equally well.

It was therefore decided to strip the 1155 leaving only the aforementioned components and to rebuild with a new circuit using miniature valves in the RF and IF stages. Due to the limited current output of the mains transformer which was available, a transistor audio amplifier was used in place of an output valve. This had the advantage of reducing the heat generated inside the cabinet.

The R.1155A owned by the author had a steel case and originally covered the following ranges:—18·5 MHz-7·5 MHz, 7·5 MHz-3·0 MHz, 1500 kHz-600 kHz, 500 kHz-200 kHz, and 200 kHz-75 kHz.

There were a small number of receivers which tuned 3·0 MHz to 1·5 MHz (1155N) and some models were of light but rigid aluminium construction. After the completion and alignment of the new set attention was turned to the possibility of adding to 1·5 MHz-3·0 MHz. It proved quite possible to substitute suitable coils for the existing range 5 set; but as the author wished to retain this range, the extra band was finally added with a rather tricky and complicated additional switching arrangement.

The work proved to be very time-consuming but the result was rewarding, with a clean, new looking receiver having greater coverage and a better performance than the original.

Before describing the work in detail it should be pointed out that this is *not* a project for the beginner. The R.1155 chassis is a deep and complicated one. It is difficult to work on and it is essential to have had some experience of identifying wiring from a circuit diagram for subsequent partial stripping and reconstruction. The cutting of holes in the panel and chassis without doing damage needs great care and patience.

Preliminary Work

The first step was to remove all components except the coil assembly, tuning capacitor and IF cans. This will be described in detail later. With the tuning dial out of the way, and the components remaining suitably protected, it was possible to rub down the front panel and outer case with " wet-and-dry " abrasive paper using as little water as possible on the panel.

At this stage the new panel layout had to be decided.

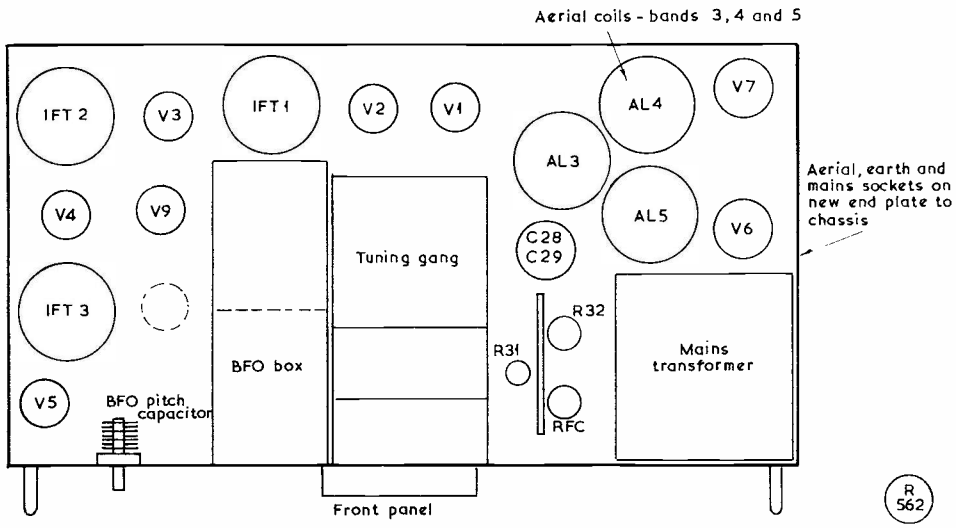


Fig. 2. Rearranged major components above chassis.

(*See* p.97). New holes were cut in the panel and chassis, and two plates were made to cover old unwanted holes in the panel. The plates were necessary at the top left and right-hand corners and were extended to fit closely to the top curve of the dial escutcheon. The rectangular cut-out at bottom right of the panel, which contained the original external plugs and sockets, was used for the loud speaker mounting. The 3-inch square speaker was mounted on a piece of 3/16in. thick p.v.c. sheet (plywood would do). This was covered with grey cloth and a piece of perforated zinc sheet. The whole assembly, including the speaker, could be placed in position from the inside using the existing bolt holes for fixing. An end-plate to the chassis for the new external connections was made and sockets were fitted for mains input, aerial, and earth. The plate was arranged to bolt on to the right hand end of the chassis so as not to increase the width. Holes in the end of the case were drilled in positions corresponding to the chassis mounted sockets. The last piece of major surgery was the cutting of a rectangle for the " drop through " mains transformer to be located between the three screened aerial coils and the panel. Fortunately, the speaker was a " thin " one and just cleared the projection of the transformer below the chassis. It was essential to ensure that the speaker and its board could be placed in position after the transformer had been mounted and wired up; otherwise removal of the speaker at any time would require prior removal of the transformer.

Needless to say, during all the metal working extreme cleanliness and care was necessary to ensure that swarf and filings did not enter the coil cans and tuning capacitor. It was frequently found that with the chassis resting a certain way up drilling and sawing could be done from the side so that metal particles fell clear on to the bench instead of getting trapped on the chassis. One of the merits of the R.1155 chassis is that it will stand unsupported on any of its surfaces except, of course, the front when the controls are mounted.

When the metal work was finished the new panel and case were sprayed with grey cellulose from an *Aerosol* can. The dial escutcheon was sprayed black and about six coats were applied to everything, with intermediate rubbing down when necessary.

Next came the stripping of components and labelling of the wiring. A circuit diagram of the R.1155 was available and anyone undertaking similar work would find one essential. A full diagram showing every coil is desirable; some of the simplified diagrams omit certain resistors and capacitors associated with the range switching. (Circuits can be obtained from advertisers in this journal).

Fig. 2 above shows location of the major components on the top of the chassis. The valve positions and numbers refer to the new circuit.

Labelling the IFT tags: On the new circuit diagram, Fig. 3, pp.98-99 and Part II, the IFT's are shown enclosed by dotted lines. All components inside these lines are contained in the cans and it is necessary to identify the tags for external connections.

Starting with IFT3 it was first necessary to remove the screening plate attached to the underside of the chassis. This was preserved for re-use. The following tags were identified and marked on the chassis with indian ink, as follows:

3 — Lead from anode (Pin No. 3 of original V4),
1 — Lead to 0·1 μF and 2·2K,
(—) Tapping to original D/F section, pair of 0·005 μF capacitors. Cut off and insulated since it was not required.
T — From internal 0·001 μF to HF choke and

diode pin of BFO valve in BFO compartment.
4 — To 56K resistor.
6 — To signal diode of original V5 (pin 5)

Fig. 4, p.98 shows the arrangement of the tags. *IFT2* was dealt with in a similar way:

3 — To anode of original V3 (pin 3),
1 — To 0·1 μF. Internal 2·2K resistor to,
HT— Red rubber covered wire to several valves. (*Note*—IFT2 and IFT3 each contain one 2·2K HT decoupling resistor; these require checking before re-use).
TC— Top cap connection of original V4,
4 — To 0·1 μF and has continuity to TC,
A — To junction of 27K and 150K. This tag is connected to an internal 100K AVC line decoupling resistor which was not used in the new circuit.

All components between the BFO compartment and the edge of the chassis both on the top and on the bottom were next removed. The BFO two-compartment box on top of the chassis was also taken out and put aside after cleaning up the pin connections to the underside of the chassis.

The coil compartment cover was also removed to expose the tag strip of IFT1. (The tags are arranged in a similar manner to those of IFT2). They were marked as follows:

3 — To anode of original V2 (pin 3),
1 — To 0·1 μF. Internal 2·2K to,
HT— Red lead to HT tag on IFT2,
TC— To cap connector of original V3,
4 — To 0·1 μF and has continuity with TC,
A — Junction of 100K, 150K and internal (Not used in new circuit).

The signal and oscillator coils: The range switch wafers W, X, Y and Z are shown in Fig. 5 and again in more detail in Fig. 6. (To appear Part II). The letters and numbers are from R.1155 circuit diagram, copied from the original R.A.F. manual.

In the aerial coil compartment switch poles XR7 and XF7 were located, leads to them were removed and the two poles were joined together and labelled (Ae) ready for connection to the new aerial terminal. (This is normally done when converting an 1155 and it may be found already done on second-hand models.)

The pole XF1 was located and the brown lead running to the next compartment was cut leaving it attached to the pole. It was labelled (1). XF1 is connected to all the aerial coils and to a 0·1 μF capacitor which may be left in place, as it will be shorted to chassis in the rebuilding. The lead to the top cap of the original V1 was labelled G1. The black lead to the front section of the tuning capacitor was left intact.

In the frequency changer and oscillator compartment the grid coil connections were labelled thus:

A2 — Switch pole YR12 connected to original V2 anode (pin 3).
B2 — Connection to the outside capacitor of a pair of 0·1 μF's on a bracket and to a 2·2K resistor. The capacitor was removed.
G2 — The top can lead to the original V2. A yellow and black lead to the tuning capacitor was left intact.
D2 — The connection to the inner 0·1 μF of the pair. This capacitor and the bracket were removed.

Finally, the oscillator coils were labelled:

A3 — Pole ZF12 connected to pin 5 of the original V2,
B3 — Pole ZR6 connected to pin 6 of the original V2,
C3— Connection to ZR12 and 0·1 μF capacitor in corner.

The lead from the 0·1 μF to a coil was cut and the capacitor left in place since it was difficult to remove it. The lead and small condenser connected to the oscillator section of the tuning gang was left intact. The valve holders and associated resistors and tubular capacitors were removed. The tag boards on the chassis and on the end wall near the gears, each with two resistors, were similarly dealt with. There were four resistors—two

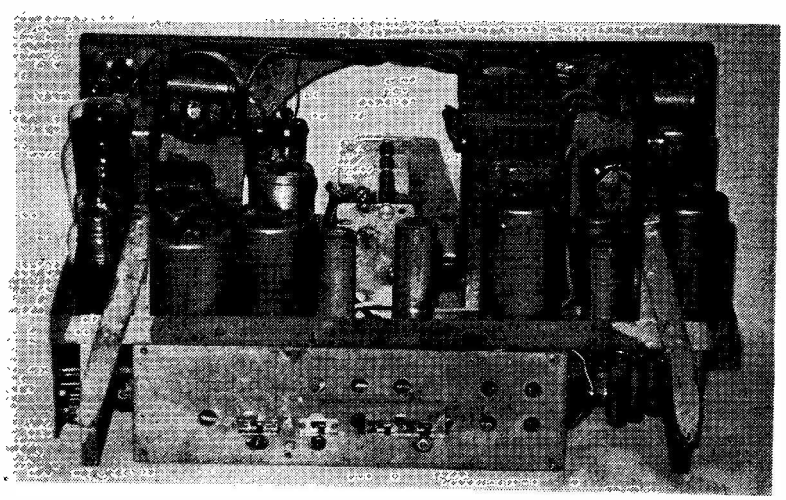


Fig. 9. Rear view of the modernised R.1155-type receiver. The lower three holes in the coil box cover are for the new Band 6 coils for 1.5-3.8 MHz coverage. The rectangular cut-outs above them are for the special switching—see text, Part II.

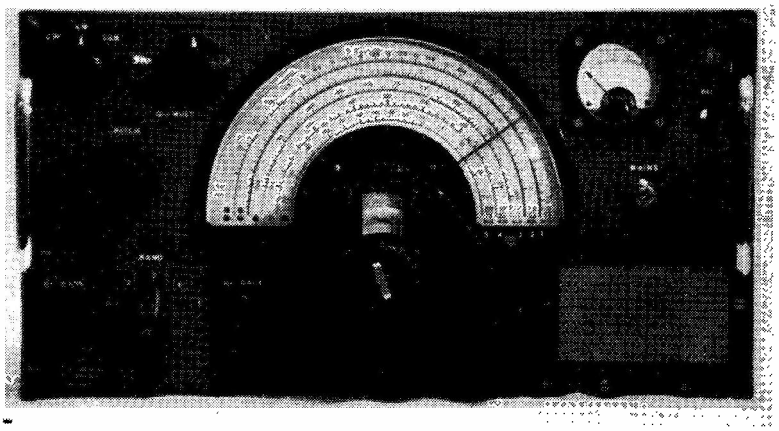


Fig. 1. Completed Rx as described. Controls to the left of the dial are: top, function switch; Q-multiplier on-off; selectivity control. Centre, BFO pitch. Bottom, AF gain, band switch and RF gain. Main on-off switch and headphone jack are near the S-meter.

220K across grid coils and two 1·5K in series with oscillator coils—which had to be left in place. The oscillator padding capacitors were identified by their odd valves as follows—93, 255, 537, 1670, 6170 pF. All other components were removed leaving only those in the boxes of Fig. 3.

At this stage the chassis contained only the coils, IF cans, and tuning capacitors with all their external connections labelled as in the new circuit diagram.

The New Circuit—RF, Mixer, IF, pp.98-99.

V1 is the signal frequency amplifier. This is coupled to the ACG line and there is a manual gain control also controlling the first IF stage V3. The mixer V2 has the oscillator anode connected to a 150v. stabilised HT supply and the IF stages V3 and V4 operate at 560 kHz the intermediate frequency of the 1155, instead of the usual 460 kHz. The detector, AGC and audio stage, V5, is followed by a transistor amplifier having an output of about 750 milliwatts into a 35-ohm speaker. (The amplifier is not shown in detail since it is not now available and any small unit with matching speaker could be used).

The BFO, V8, uses the modified tag board and coil from the 1155. Two HT supply resistors needed altering due to the lower voltage of the stabilised supply to which the new BFO is connected. The variable-pitch condenser is mounted on the front panel with the largest of the original control knobs for ease of tuning CW and SSB signals. As in the 1155 the frequency of the BFO is 280 kHz and the first harmonic beats with the IF of 560 kHz.

The Q-Multiplier, V9 was added after the set had been completed and tested, but provision was made for the panel controls at the outset and space was reserved for the valve holder. It has proved very successful after re-aligning the IF coils with the selectivity control on the point of oscillation. The circuit (which is attributed to W3FYG) does not require an additional IF coil since use is made of the main IF transformer primary winding as the oscillator inductance.

The power unit (V6 and V7) requires little comment. The rectifier (5U4G) used was from the author's spares, but such a large rectifier is unnecessary, as it is very much under run. The 8-volt negative supply for the audio amplifier having p.n.p. transistors is obtained from the filament line by half-wave rectification and smoothing.

A positive supply for n.p.n. transistors would require reversal of the diode connections and those of the electrolytics.

Rebuilding

The first job was the making and fitting of mounting plates for fixing the new B7G and B9A valve holders in the old holes for the original octal holders (Fig. 2). One extra hole in the chassis was required for V5. All valve holders had screening cans except V8.

The chassis is well provided with welded earthing tags and the system of a single earth point for each valve circuit was adopted, starting with the earthing of one filament pin of each valve holder. At the same time the centre screens of the new valve holders and any other pins requiring to be earthed were connected to the chassis tags. The remaining filament pins were then joined by a lead running to the mains transformer position.

The panel controls were next fitted to their respective holes and the dial assembly was replaced. The power unit was the first section to be wired starting with the mounting of the mains transformer and the main On-Off switch, which was a close fit between the transformer and the panel. The components for the 8v. transistor supply were mounted below the chassis near the front panel, allowing room for a trimming tool to be used on the

Table 1

Alignment Frequencies

BAND	TRIMMERS	CORES
1	16·0 MHz	9·0 MHz
2	7·0 MHz	3·5 MHz
3	1430 kHz	700 kHz
4	500 kHz	250 kHz
5	185 kHz	100 kHz
6	3·5 MHz	1·7 MHz

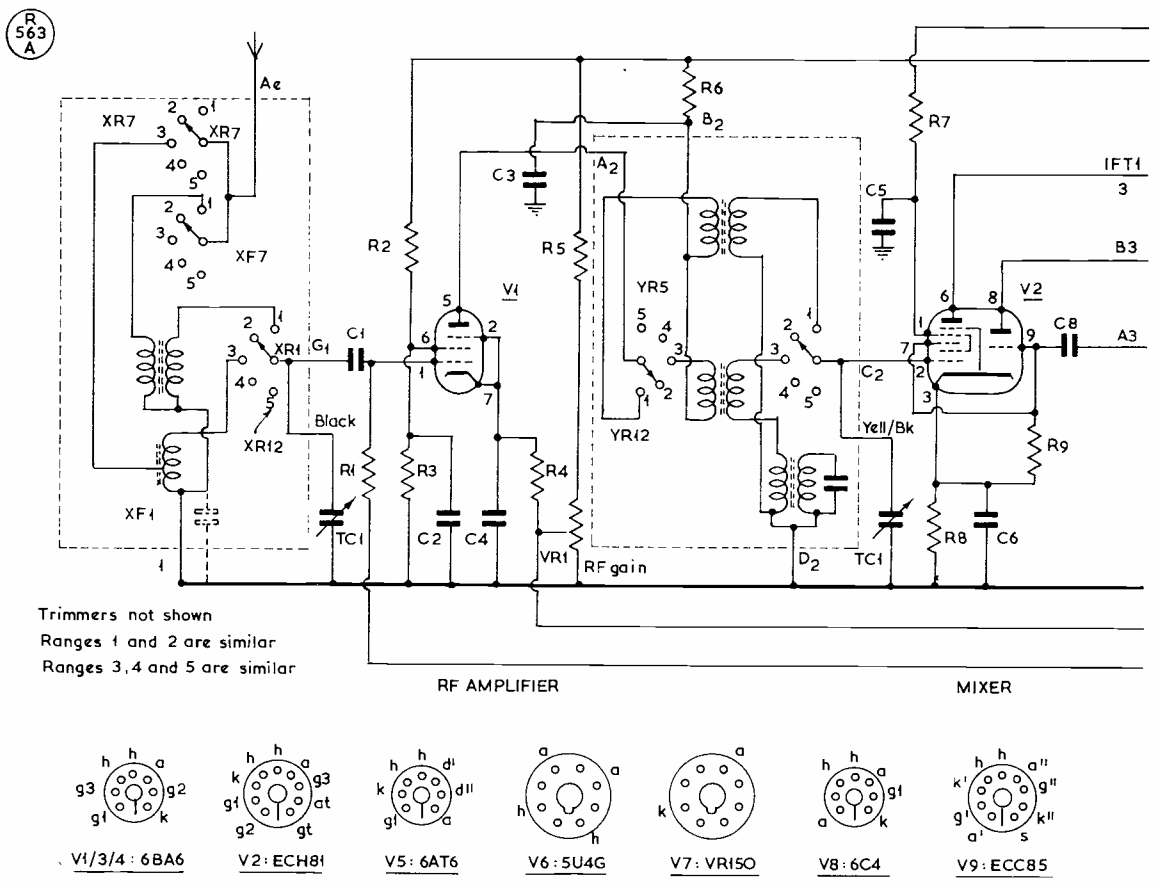


Fig. 3. Circuit of the modernised R.1155 up to IF Amplifier, V3.

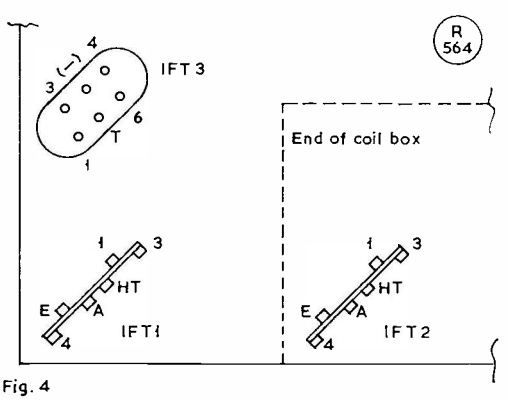


Fig. 4. Under-chassis view of IF transformer connections.

coils. All other power supply components were fixed above the chassis with resistors R31 and R32 mounted on a piece of vertical paxolin board.

Attention was next paid to the BFO box, as yet not refixed on the chassis. The component tag board was removed intact for the re-arrangement of the circuit and the inclusion of R26 and R27. The connector pins to the underside of the chassis were re-used and four of these were exposed above the chassis by cutting away the removable side cover plate. Flying leads for connections to the pitch capacitor (by now mounted on the panel) and to the function switch were then soldered to these pins before re-fixing the box to the chassis.

Further circuitry and notes to follow in Part II —Table of values herewith covers full circuit.

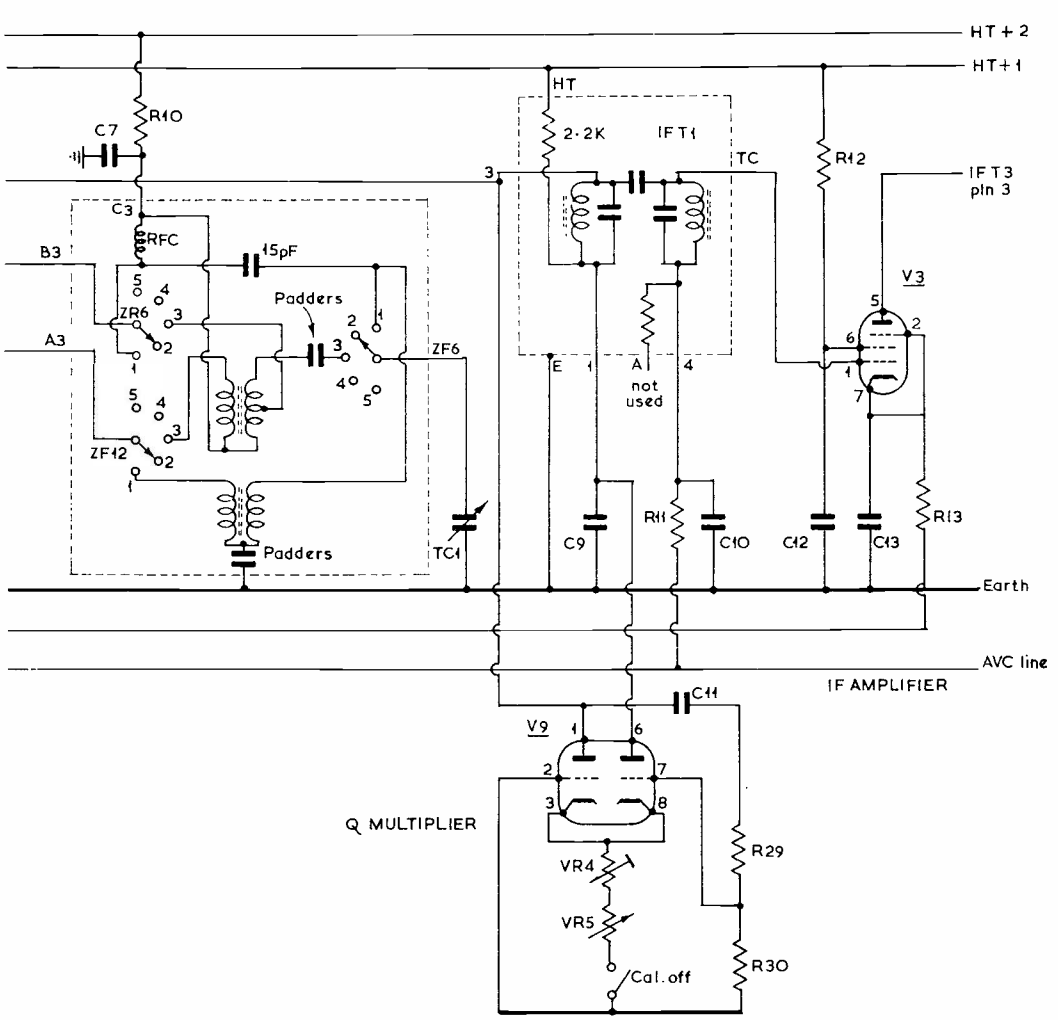


Table of Values

Fig. 3. Circuit of the Rebuild

C1, C8,
C21 = 100 $\mu\mu$F, mica
C2 = ·05 μF
C3, C4,
C5, C6,
C7, C9,
C12, C13,
C14, C15,
C16, C17,
C19 = 0·1 μF
C10, C18 = ·04 μF
C11 = 500 $\mu\mu$F, mica
C20 = 200 $\mu\mu$F
C22, C25,
C27, C30 = ·01 μF
C23 = 50 μF, 25v.
C24 = 10 $\mu\mu$F, mica
C26 = 0·25 μF
C28, C29 = 50 μF, 450v.
C31 = 2,500 μF, 12v.
C32 = 1,000 μF, 12v.
C33 = ·0013 μF, mica

R1, R11,
R14, R17,
R23 = 1 megohm
R2 = 47,000 ohms, 1w.
R3, R29 = 100,000 ohms
R4, R13,
R16 = 68 ohms
R5 = 100,000 ohms, 1w.
R6, R18 = 2,200 ohms, 1w.
R7 = 516,000 ohms
R8 = 220 ohms
R9, R34 = 47,000 ohms
R10 = 10,000 ohms
R12, R15 = 33,000 ohms, 1w.
R19 = 330 ohms
R20 = 47,000 ohms, 2w.
R21 = 33,000 ohms
R22, R24 = 220,000 ohms
R25 = 3,300 ohms
R26 = 15,000 ohms, 1w.
R27 = 56,000 ohms, 1w.
R28 = 330,000 ohms

R30 = 51,000 ohms
R31 = 5,600 ohms, 3w.
R32 = 1,100 ohms, 3w.
R33 = 1 ohm
R35 = 1,000 ohms
VR1 = 10K wire-wound potentiometer
VR2 = 500-ohm, pre-set
VR3 = 500K potentiometer
VR4 = 100K, pre-set
VR5 = 10K potentiometer

RFC = Screened RF choke, surplus R.1155
V1, V3,
V4 = 6BA6
V2 = ECH81
V5 = 6AT6
V6 = 5U4G (*see text*)
V7 = VR150
V8 = 6C4
V9 = ECC85

Notes: Coils for Band 6 modification, if used: *Osmor* types QA4 (aerial), QHF4 (mixer) and QO4 (oscillator). All resistors rated $\frac{1}{2}$-watt unless shown otherwise. Capacitors to be 350v. working except as indicated. Suitable mains transformer 350-0-350v. 100 mA, 6·3v. 3 amp., 5·0v. 3 amp. Rectifier diode to suit transistor amplifier and voltage/current involved. S-meter rated 0-4 mA.

TROPOSPHERIC PROPAGATION ON TWO METRES

THE EVIDENCE OF CLOUD CONDITIONS

J. C. FOSTER (G2JF)

THE study of propagation at VHF is a subject which requires more than a smattering of knowledge in meteorology. It is, in fact, a highly academic pursuit, generally outside the scope of the average amateur's interest and comprehension. What follows can best be described as a "rule-of-thumb guide," drawn up from hard experience gained over a considerable period of time from a station location which can only be described as unique from an amateur transmitting aspect.

Unlike other parts of the radio frequency spectrum allocated to the Amateur Service, the two-metre band (144 to 146 MHz) offers many modes of transmission, each of these depending on a particular function of the atmosphere and space which surrounds the earth. It is, however, proposed to discuss here the normal signal path, referred to as tropospheric or extended-tropospheric propagation. At the outset it should be remembered that the atmosphere immediately surrounding the earth's surface to a height of approximately six miles is known as the *troposphere*. It should also be realised that it is within this belt of atmosphere that all our weather conditions develop and it is also the medium for conveying our signals not only to the operator down the road, but also to the station located on and over the horizon.

Although there is a certain amount of signal bending taking place within the troposphere, generally speaking all signals which leak out are lost for ever. There are the isolated instances, occurring very infrequently, when for a short period of time signals are returned as they are at lower frequencies and are usually defined as *sporadic-E, auroral reflection* or *meteor* shower reflections. However, these modes of propagation are outside the scope of the present discussion.

From the foregoing, it should be apparent that every effort should be made to minimise losses into outer space by concentrating radiated power in a plane horizontal to the earth's surface. For this the aerial should be erected in as clear a position as the site permits, and where possible aerials should be stacked to lower the vertical angle of radiation.

Good *take-off* for signals, irrespective of height above sea level, is tantamount to a good radiation characteristic. The ideal location is high ground with a falling gradient in all directions, clear of obstacles. The ground beneath the aerial system should possess good soil structure as opposed to clay, gravel, rock, chalk and such substances which have a low radio frequency conductivity.

The writer is quite convinced that the ground beneath the aerial system is every bit as important at VHF as it is on the lower frequencies.

Forecasting

It is true to say that forecasting the propagational state of the troposphere at a given time is one of the most difficult problems confronting the VHF worker, especially to anyone who may be new to it. There are, however, many guides or pointers which, when considered together, produce a reasonable picture of communication possibilities. Perhaps the best indicators are beacon stations which, when monitored regularly, convey to the listener the signal-path possibilities in that general direction. To convey the maximum amount of intelligence, the beacon

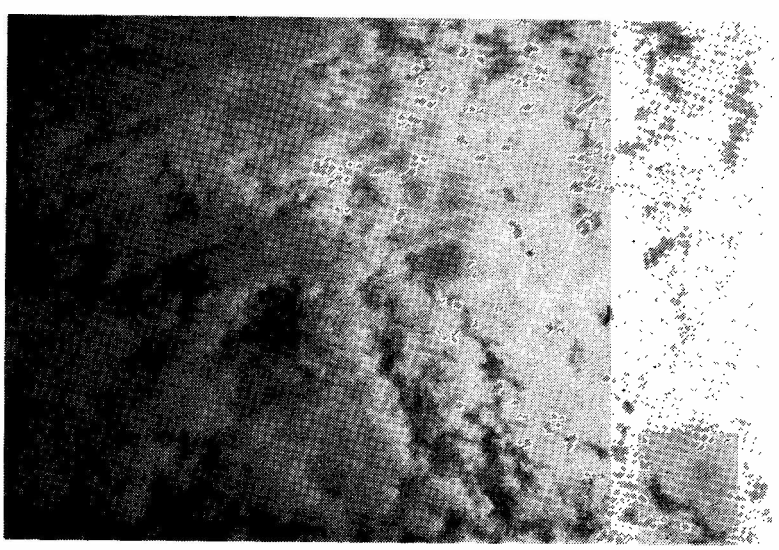


Fig. 1. High-level cirrus cloud—see text for discussion.

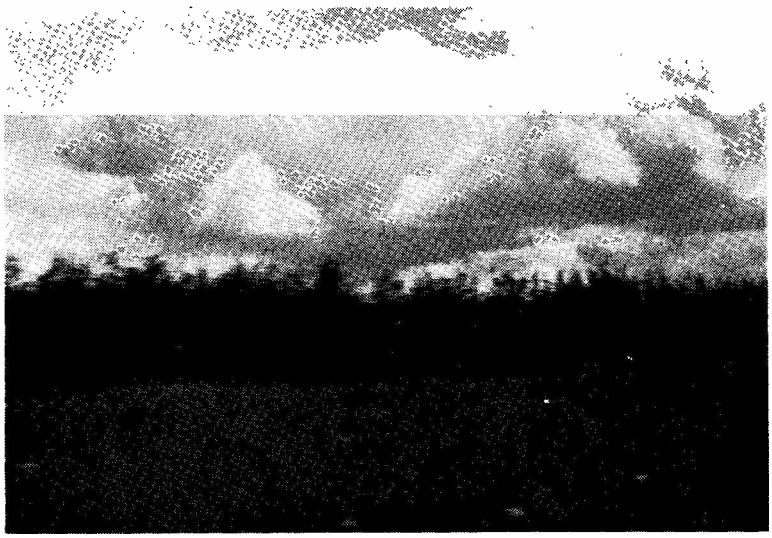


Fig. 2. Cumulus cloud appearance—heaped masses resting on a horizontal base.

should be in the range 100 to 250 miles distant from the receiver—any distance less than 100 miles is much less satisfactory but, nevertheless, it is still quite useful.

The newcomer to VHF soon becomes accustomed to the fact that *high pressure* systems usually coincide with good propagational conditions. Whilst this is true to some extent, it should be borne in mind that this assumption is an over-simplification and there are other factors which are equally important and necessary — namely the temperature of the atmosphere and also the relative humidity. Given the correct combination, so to speak, of pressure, temperature and humidity, propagation within the troposphere can and does extend out into what is known as the *extended tropospheric* range and can give communication over distances of from 300 to 1,000 miles. It should also be noted that such conditions reach their peak of performance on the approach of a frontal system—or when the baragraph shows signs of a *fall* in atmospheric pressure.

In any period of 24 hours it will be found that propagation tends to improve following sunset, reaching a peak during sunrise, followed thereafter by a fall in performance as the day temperature increases. It is well known amongst the more experienced VHF workers that the rapid increase of temperature at sun-up can give rise to really spectacular propagation possibilities, a phenomenon which is referred to as the *diurnal effect*. These conditionas are usually associated with a very steep rising temperature gradient over a relatively short period of time.

Weather Appearances

In the United Kingdom our weather is produced by four different types of high pressure (anti-cyclonic) systems. First we have the *polar continental*, which comes to us from Finland and North Russia area. It is usually a very dry system which appears to be not very productive of good propagational conditions and the weather it brings along can be described as frosty and very pleasant but cold.

Originating in North America and the far north, we have the *polar maritime* high-pressure system, which again is not always associated with good communication conditions. The weather effect that it generates is usually described as "generally fair."

In summer most of our good weather is due to the high pressure system known as the *equitorial* or *tropical maritime*, and has its origin somewhere in the region of the Azores. Without any doubt this particular system provides the foundation for most of the two-metre good tropospheric and extended tropospheric communication contacts in the United Kingdom and beyond.

The fourth system of anti-cyclonic weather which, incidentally provide the most spectacular VHF/DX, comes to us from South-East Europe. Unfortunately, its appearance is very rare, seldom more than once or twice in the year, and is known as the *tropical continental* high-pressure system. A classic instance of this system was the great opening of 1953 which to this day has rarely been equalled or surpassed.

Visual Indications

High pressure or anti-cyclonic systems wherever they originate, are often associated with good weather and high level Cirrus cloud, see Fig. 1, p.100. On the approach of a frontal system, Nimbus Cirrus cloud tends to show a drooping effect on the extremities, a sure sign that cooler air is approaching with the frontal system. For some time now it has been observed that heavy rainstorms along the path of communication do have the tendency to attenuate signals rather dramatically. It is said that the phenomenon is more apparent in the UHF regions.

Apart from day-to-day variations in atmospheric pressure, temperature and humidity, it will be ob-

Fig. 3. High nimbus-cirrus, or what is sometimes called a "mackerel sky," suggesting the possibility of good two-metre propagation.

served that certain cloud formation and visibility appear to have some connection with the propagation of signals. For instance, very heavy and ominous looking Cumulus cloud, Fig. 2, would indicate very irregular and spasmodic communication outside the normal local range of signals. On the other hand, very high Nimbus Cirrus, Fig. 3, above, or a mackerel sky, would indicate stable weather, and the possibility of good propagation.

To anyone practised in the art of forecasting propagation, very good visibility would not be regarded as necessarily conducive to good communication; on the other hand, a hazy atmosphere, as in Fig. 4, would possibly be regarded as one of the essential factors. One must however, not confuse this latter condition of atmosphere with what is known as industrial haze, atmospheric conditions existing up to 15 or 20 miles from an industrial centre.

Normally fog is not, as some people would think, an indicator of good propagation—indeed it is possible that the reverse is true and propagation is of a low order. There has been the occasional spell when fog coincided with good communication as, for example, the period when London and the Home Counties were hit for days on end by what is called *smog*.

Good communication conditions in the South of the United Kingdom may not occur simultaneously in the North or West of the country and, of course, the reverse is true for other areas. However, it will

Fig. 4. Natural hazy atmosphere, always suggestive of good VHF/DX possibilities. Note that this condition should not be confused with industrial haze, of the sort that hangs round big cities in calm weather.

be found that when a good high-pressure system has been established and it contains the right ingredients of make-up, *i.e.*, humidity and temperature, then the two-metre band will assume its fascinating role in the VHF/DX context.

From the foregoing it is quite natural and correct to assume that peak propagation conditions do occur during summer time. Statistics in this connection have been kept over the last twenty years and it is interesting to note the following: September has an average potential of 2·9 days when it should be possible to communicate over the *extended tropospheric* range 300-1,000 miles; October, 2·5 days; June 2·4 days; July, 2·3 days; and August 1·8 days.

SOME NON-AMATEUR FREQUENCY ALLOCATIONS

EXTRACTS FROM THE CURRENT GENERAL RADIO REGULATIONS

THE information summarised below has been extracted from the official documents issued by the International Telecommunications Union, Geneva. It is thought that this summary will be of interest to readers generally.

Amateur Band allocations are *not* dealt with here —they are well enough known in our context, and are given on every AT-station licence.

Some Definitions

Carrier Power: The average power supplied to the transmission line during one RF cycle under no-modulation conditions.

Effective Radiated Power: The power supplied to the aerial multiplied by the gain of the system in a given direction.

Mean Power: The average power supplied to the transmission line during normal operation.

Peak Envelope Power: The average power supplied to the transmission line during one RF cycle at the highest crest of the modulation envelope, taken under conditions of normal operation.

Band Designations

These run from No. 4 to No. 12, presumably because Bands I-III have been adopted in the European Region for the description of TV and VHF/FM frequency areas. *Band 4,* 3-30 kHz, is the VLF; *Band 5,* 30-300 kHz, LF; *Band 6,* 300-3000 kHz, MF; *Band 7,* 3-30 MHz, HF; *Band 8,* 30-300 MHz, VHF; *Band 9,* 300-3000 MHz, UHF; *Band 10,* 3000-30,000 MHz, SHF. Bands 11 and 12, above 30,000 MHz are designated EHF.

Maritime Allocations

The ship and coast station assignments cover a wide range of frequencies in the MF/HF/VHF Bands 6-8. Above the MF broadcast band, they are as follows, all in kHz:

1605-1625, ship station CW; 1625-1670, low power radiophone, 20w. maximum; 1670-1950, Coast stations; 1950-2053, Ships work Coast stations; 2053-2065, Intership working; 2065-2170, Ships to Coast stations; 2182 kHz, *Distress Frequency,* guard band 2170-2194 kHz; 2194-2440, Intership working; 2440-2578, Ships to Coast stations; 2578-2850, Coast stations; 3155-3340, Ships to Coast stations; 3340-3400, Intership working.

3500-3600 kHz is allocated to Intership working, and 3600-3800 kHz to Coast stations. *In Region I, the 80-metre amateur band is 3500-3800 kHz.*

Ship Stations, Telephony: 4063-4133; 4133-4140 SSB only; 6200-6211, SSB only; 8195-8265; 8273-8280, SSB only; 12330-12400; 12407-12421, SSB only; 16460-16530; 16537-16562, SSB only; 22000-22070; 22078-22100 kHz, SSB only. VHF 156-174 MHz, for port, docking, Intership and local Coast station working, with 156·8 MHz as the main calling frequency.

Ship Stations, CW Telegraphy: 4160-4238; 6240-6357; 8320-8476; 12471-12714; 16622-16952; 22148-22400; 25070-25110 kHz. Ship stations must be equipped for automatic change-over and listening through on the receiving frequency.

Coast Stations, Telephony: 4368-4438; 8745-8815; 13130-13200; 17290-17360; 22650-22700 kc.

Coast Stations, CW Telegraph and Facsimile: 4238-4368; 6357-6525; 8476-8745; 12714-13130; 16952-17290; and 22400-22650 kHz.

Ship and Coast stations always work cross-frequency within the appropriate band-area, *e.g.* a coast station on 4390·2 kHz would work a ship on 4085·2 kHz, and a ship on 16,512·5 kHz would work a Coast station on 17,342·5 kHz.

Some General Regulations and Recommendations

All stations (and that includes AT stations) are forbidden to make unnecessary or unidentifiable transmissions, and are not to use more power than is needed for communication. (Strict conditions are laid down for the *identification* of stations).

Administrations shall take all necessary steps to ensure that the operation of electrical apparatus or installations of any kind, *including power networks,* does not cause interference to a radio service operated in accordance with the Geneva Regulations.

No radio station may be operated without a licence. The secrecy of radio correspondence must be observed at all times.

Call-Sign Structure

Call-signs: For land and fixed stations, three letters, *e.g.* GLD; Ship stations, four letters, *e.g.* GSMD; Aircraft stations, five letters, *e.g.* GAZAA;

Land mobile stations, non-amateur, four letters followed by a digit other than 0 or 1, *e.g.* MZQP2; Amateur stations, one or two letters and a single digit, followed by a group of not more than three letters, *e.g.* G3SWM, EI6AS, the prefix letter(s) to indicate nationality.

Frequencies for emergency and/or safety purposes are: 500 kHz, 2182 kHz, 121·5 MHz, 156·3 MHz, 156·8 MHz and 243 MHz.

* * *

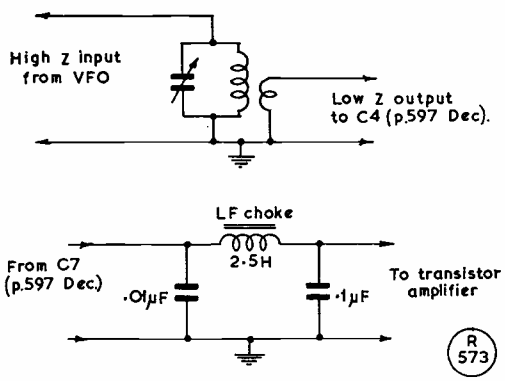
In addition to the foregoing there is a somewhat similar pattern of allocations, in separate frequency areas, for commercial aircraft operation—but nowadays most of this traffic is carried in the *VHF Band 8*, 30-300 MHz.

* * *

It is of interest to add that the ITU, Geneva, is the final world authority—accepted by practically every country, including the USSR and her satellite states—on all matters affecting technical standards and operating methods, as well as the detailed allocation of frequencies for all services, throughout the world. With the exception of the Republic of China, all countries accept ITU rulings and undertake to be bound by its decisions. In fact, the ITU is, by far, the most effective operational organ of the United Nations.

"DIRECT CONVERSION RECEIVER FOR TOP BAND"

Further to this article by G3YMP in the December 1970 issue of SHORT WAVE MAGAZINE, the author suggests that the circuitry shown in the diagrams herewith are worth incorporating to improve performance. The wideband tuned circuit from the external VFO into the Rx will be found useful in giving better coupling and suppression of spurii—always factors to be watched in direct-conversion receiver circuits. Also, the results on CW will be much sharpened up by using the filter shown in the other diagram—for the circuit on p.597, December, it goes between the point marked "C7, Audio" and the following audio amplifier.



OUR BOOK DEPARTMENT

Readers in the London area or visiting the "Wicked City" are reminded that our Book Dept. is open every day Monday-Friday, 9.30-5.15, where all the titles listed in our advertising pages can be examined. There is no botheration about buying and any purchases made for taking away are charged *less postage*—all our current advertised prices are, of course, inclusive of postage. Books selected can be packed for despatch and will be sent off either that day or the next.

Short Wave Magazine, Ltd., can be found at 55 Victoria Street, which is opposite New Scotland Yard, along from the Houses of Parliament towards Victoria Station, and not far from the Army & Navy Stores. Any bus along Victoria Street will drop you near-enough if you ask for one of these points. If coming by Underground we are about 200 yards from St. James Station on the District Line. We have a large street-level window with a display of books, and when you find the door it is only a matter of pushing it open. (Perhaps we ought to add that there is no "wickedness" that we know of round Victoria Street way!).

"SPECIALLY ON THE AIR"

Clubs or other organisations planning to put an amateur-band station on the air in connection with some public event—a hobbies exhibition, flower show, sports meeting or whatever—are reminded that, as in previous years, we can list these in forthcoming issues, under this heading. The details required for publication are: Callsign, date, nature of event, band(s) to be worked and mode(s), address for QSL's or for enquiries. This information should be sent on a separate piece of paper to: "Specially on The Air," SHORT WAVE MAGAZINE, BUCKINGHAM.

" . . . not me hogging the frequency, OM . . . "

THOUGHTS ON RUBBER CRYSTALS

METHODS OF VARYING FREQUENCY OVER USABLE RANGES

I. E. HILL (G6HL)

THE first impact of quartz crystals on the Amateur Radio world during the late twenties was a rush to build rock-bound transmitters. After the initial satisfaction of producing stable signals and getting consistent "pdc xtal" reports it was not long before operating conditions dictated that more than one crystal or some alternative should be available.

The early crystal holders comprised one fixed and one movable ground brass plate with the quartz crystal sitting precariously between the two. Very quickly someone discovered that the crystal would still perform with a small air gap between top plate and the quartz and also that this resulted in a slight change of frequency. From this it was but a short step to make the gap adjustable and the first "rubber crystal" was on the market. The frequency variation was very limited, crystal output falling off rapidly as the gap was increased.

With increased amateur activity during the 1930's it was no longer feasible to call "Test" just anywhere in a band or on one's "personal" frequency and then search the whole band for a reply. One had to select and use a limited segment of a few kHz. This necessitated the use of a VFO, various versions of which have been developed and are in almost universal use today. The crystal has been relegated to reference duties, mixing, or applications necessitating only single-frequency operation.

With the increased popularity of SSB working, extending now into the VHF bands, the effectiveness and stability of the average amateur built VFO is not all that could be desired (!). The professional communication world has discarded the VFO for transmitter control and uses either individual ovened crystals for spot frequency working or a synthesiser device giving channelised control outlets locked back to one stable frequency source. The latter solution is expensive and hardly suitable for amateur use because frequency selection is of necessity by decade switching and not the turn of a calibrated dial.

Frequency Stability

Amateur communications are generally of short duration; after a contact lasting perhaps ten minutes it is more than likely that the next will be on a different frequency and perhaps last no longer. Intelligibility for SSB working necessitates that the receiver be tuned within 50 Hz of the transmitter and maintained within this limit during the contact. Greater deviation will result in speech distortion and loss of intelligibility. A reasonable assessment of frequency *stability* required is therefore not greater deviation than ± 25 Hz per half hour, spread evenly over the period and measured at the operating frequency. Frequency *accuracy* is not so important except when working near the band edge.

The average crystal will give a stability no better than one or two parts in 10^6 per degree C change of temperature and at 30 MHz this means 30 Hz per part. A VFO will be very considerably worse and the only way to achieve reasonable stability will be to mix a low frequency VFO with a crystal oscillator to reach the operating frequency. However, a low frequency VFO multiplied up is *not* the answer because its own drift is also enhanced by the multiplication factor. So for working on the higher frequencies we look like being rock-bound or in trouble for having an unstable signal.

Varying the Frequency of a Crystal Oscillator

But all is not lost. Examination of the electrical equivalent offered by a quartz plate used in an oscillator reveals a mixture of capacity, inductance and resistance —Fig. 1. We have all tried "pulling" the frequency of a 100 kHz or 1 MHz bar by use of a parallel capacitor and perhaps done the same thing with other oscillators. Unfortunately the range of adjustment is very limited and as the capacity is increased output falls and very quickly oscillation ceases.

The alternative to changing parallel capacity is to insert and vary an *inductance* in series with the crystal— Fig. 2. It will be found that the frequency makes little movement until a critical value of inductance has been reached and thereafter a controllable range of variation is available before the oscillator starts to play tricks and becomes unstable. At 3·5 MHz this frequency range

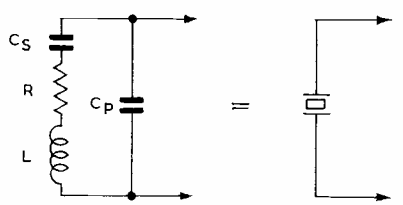


Fig.1 Electrical equivalent of Quartz crystal

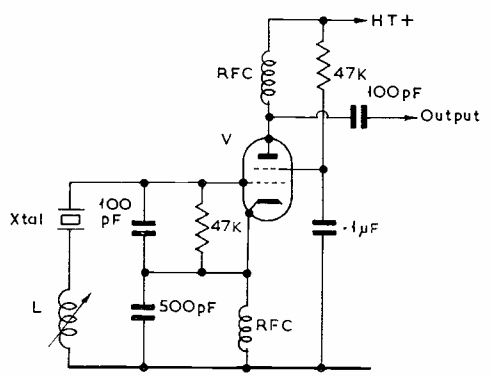


Fig.2 Crystal oscillator with frequency varied by inductance L

F 129

Fig. 1. Pulling a crystal frequency by capacity and, in Fig. 2, by inductance.

will be no more than a few kHz but as the crystal frequency is increased the range will improve to more than 30 kHz at 10 MHz. Results will however vary between crystals and crystals of different axis cuts. Some experiment to familiarise oneself with operation of a rubber crystal is therefore advisable before embarking on any application programme.

Construction

If the oscillator of Fig. 2 is going to be used to control a transmitter it must be constructed on the same lines as a VFO, the important factors being rigidity, insulation from mechanical shock, and insulation from temperature changes or deliberate temperature control in an oven. The variable inductance can take various forms; a variometer with either parallel or series coils will give easy convential 180° dial control but calibration will be non-linear and compensation difficult. An alternative is to use a coil former with ferrite insert adjusted by a threaded rod. The ferrite insert can be shaped to give a more linear calibration but few coil forms have adjusters completely free from back lash and suitable for coupling to a calibrated dial.

Yet another possible method of control, but one which the writer has not tried, is to use a ferrite core on which are two windings, one connected in series with the crystal. The other winding would be fed with DC adjusted in value by a variable resistor, thus varying core saturation and the effective inductance of the coil in the crystal circuit. It would be necessary to decouple the control winding by use of series resistors and capacitors from either side of the coil to earth, as in Fig. 3. The law of the control potentiometer could be varied to give a linear frequency read-out. However, the competent technician will devise a way of moving a shaped ferrite core into a coil, accurately lock it to rotation of a calibrated dial and compensate the whole assembly for non-linearity. The rest of us can settle for a variometer and accept a non-linear scale.

Frequency Selection

At 3·5 MHz the frequency variation is only a few kHz so direct drive from a rubber crystal at this frequency is not attractive. At 8 MHz variation can be extended to 30 kHz which, multiplied up to 144 MHz gives coverage in a sector of 540 kHz and this does become worth while. It must be remembered, however, that any 8 MHz oscillator drift is also multiplied up 18 times at 144 MHz, hence construction must be with VFO care.

An alternative way to obtain control at both low and high operating frequencies is to use the mixing technique, the higher frequency crystal operating in the variable oscillator. A few years ago the writer made a very effective 3·5 to 3·8 MHz driver by mixing a 10 MHz rubber crystal oscillator with the output of an oscillator having switched crystals 6·2 to 6·5 MHz, the latter spaced at intervals of 25 kHz. The 10 MHz oscillator was adjusted to cover 30 kHz which left 5 kHz overlap between each switched 6 MHz Crystal, the latter being pulled to exact 25 kHz spacing by use of parallel capacitors. The rubber 10 MHz crystal was tuned by a variometer. The 6 MHz crystal switch also switched in preset capacitors, tuning the mixer output 3·5 to 3·8 MHz, as in Fig. 4.

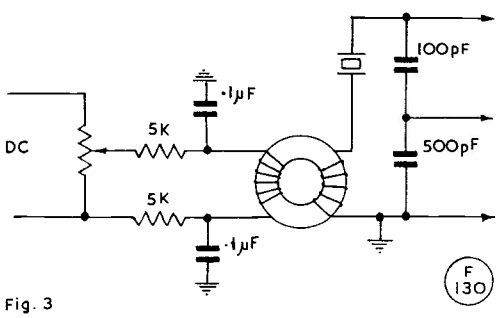


Fig. 3

Fig. 3. Suggested alternative method of varying inductance by use of a ferrite core.

The result was a very effective and stable drive unit covering 3·5 to 3·8 MHz which was then multiplied up for use in other bands. The 10 and 6 MHz crystals were of the same cut and temperature coefficient and therefore frequency changes with temperature kept very nearly in step, giving a fairly constant resultant without using an oven.

Other possible mixing combinations will come to mind but each must be mathematically examined if unwanted harmonics and mixing products are to be avoided. The easy way is to jot down first the fundamental and harmonics which can result from the two separate oscillators and then the fundamental mixing products, making sure that none can give trouble. For example, a rubber 5·25 MHz crystal oscillator could be mixed with switched oscillators in the range 1·45 to 1·75 MHz to cover the 3·5 to 3·8 MHz band. Analysis will show the following resultant frequencies:—

Harmonics				
Fundamental	2nd	3rd	4th
5·25	10·5	15·75	21·0
1·45 to 1·75	2·9 to 3·5	4·35 to 6·25	5·8 to 7·0
Mixing			
5·25 *plus*	1·45 to 1·75 — 6·7 to 7·0		
5·25 *minus*	1·45 to 1·75 — 3·5 to 3·8		

In this case neither frequency was a good selection. Mixing will give the wanted 3·5 to 3·8 output but also an attenuated 7 MHz signal. A healthy 3·5 MHz harmonic will appear from the 1·75 oscillator and there will be attenuated harmonics on 7 and 21 MHz. Not a desirable state of affairs at all!

The combination of 10 MHz and 6·2—6·5 MHz was reasonably clean and there were no unwanted harmonics or fundamental mixing products. There were some possible products resulting from harmonics joining the mixing game but these were of low enough level to be ignored.

Harmonics			
Fundamental	2nd	3rd	4th
10	20	30	40
6·2 to 6·5	12·4 to 13	18·6 to 19·5	24·8t o 26
Mixing			
10 *plus*	6·2 to 6·5 — 16·2 to 16·5		
10 *minus*	6·2 to 6·5 — 3·8 to 3·5		

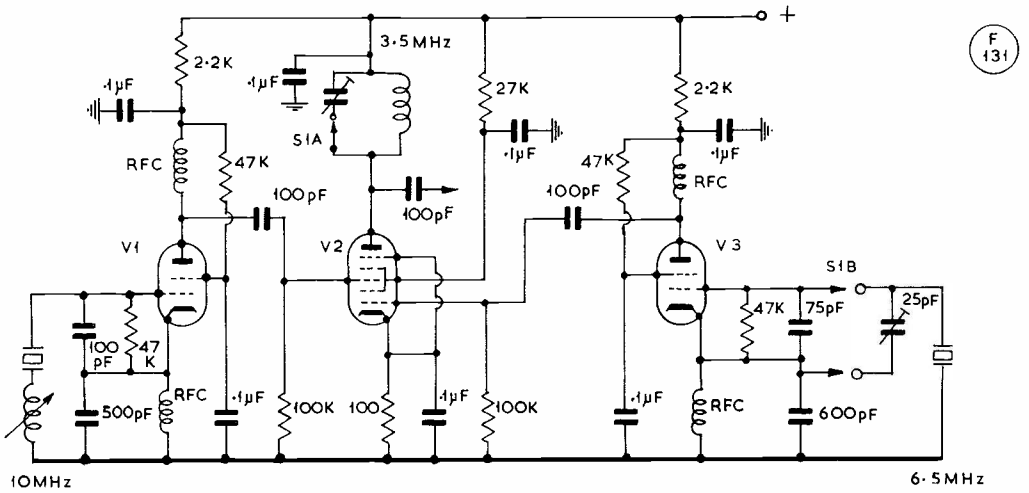


Fig. 4

Fig. 4. Obtaining 3.5 MHz output by mixing variable and switched crystal oscillators.

Mixing higher frequencies to obtain a low, as suggested above, is probably the easiest method to produce a stable, spurious-free output and it gives more scope for adjustment of the rubber crystal. Harmonics and unwanted mixing products are far removed from the wanted frequency and therefore attenuated in the tuned output.

Two Metres

For 144 MHz control it is probably best to use a single crystal oscillator and multiply up. The crystal selection can be at 6, 8, 9, 12, or 16 MHz and the output multiplied up to 144 MHz. As for all rubber-crystal oscillators the xtal itself should be a fundamental and not one operating in overtone mode. Greatest range of control will be obtained by using the highest crystal frequency but it is wise when analysing possible output frequencies to look also for and avoid anything near local TV channels. The alternative is to mix but as we need to get as quickly as possible to a high frequency, outputs should be added. This loses the advantage of temperature coefficient cancellation and therefore crystals with low temperature coefficient should be selected or an oven used.

Finally, one might profitably repeat that the rubber crystal should be treated as a VFO both in construction and application. This means effective screening, provision of stabilised power supplies and isolation by use of a buffer stage. Given these precautions short-term stability adequate for most amateur requirements can be achieved at least up to the 144 MHz band.

STAFF CO-OPERATION AT HEATH (GLOUCESTER)

The well-known firm marketing the *Heathkit* range of equipment—now widely used not only by radio amateurs but also professionally throughout the field of electronics—inform us that their staff down at Gloucester have been most co-operative during the period of the postal stoppage. Being primarily a mail-order concern, business more or less dried up as the postal strike solidified. This meant that the working staff of Heath (Gloucester), Ltd. had little or nothing to do. To help the firm, the employees suggested that they take time off without pay, as their contribution towards the loss of business. This avoided the distasteful procedure of declaring redundancies and laying people off, and enabled some annual holiday entitlements to be brought forward. Some 130 staff were affected by these arrangements. Of course, the firm maintained skeleton service to deal with telephone business and callers at the London, Birmingham or Gloucester showrooms.

USEFUL "Z CODE" MEANINGS

In commercial and military working, there is a three-letter code system, akin to the Q-Code but known as the Z-Code because each group is prefaced by that letter. The range of meanings (to be found on one of the preface pages in any issue of the *International Radio Amateur Call Book*) is not normally applicable to Amateur Radio operation — however, there are two we could usefully adopt: *ZAB*, "Your speed key is improperly adjusted;" and *ZCL*, "Transmit your call letters intelligibly." Then there is the one so often heard from commercial stations on frequencies in or very near the amateur bands: *ZAN*, meaning "We can receive absolutely nothing."

SOMETHING ACHIEVED INDEED!

In sending in his callsign GM3ZVF, for the "New QTH" page, Dr. J. L. Swanston of Kirkcaldy, Fife, remarks that "he feels he has achieved something"—his first receiver used a coherer detector and was built when he was a schoolboy in 1918!

THE GUNN EFFECT

TWO-TERMINAL SEMICONDUCTOR DEVICE FOR SHF APPLICATIONS

Hitherto, the klystron has been the microwave generator most used for development and demonstration work on centimetre wavelengths. Now, a semiconductor based on what is known as the Gunn Effect has become available for the same sort of purpose. This article, from a paper circulated by the Mullard Educational Service, discusses the Gunn device and describes its working.—Editor.

FOR many years now the reflex klystron has been used in education as a low power source of 3 cm. microwaves for demonstrations on the nature of electromagnetic radiation. Now, thirty years after the invention of the klystron, a new two-terminal semiconductor microwave generator—the Gunn device—has appeared on the scene. This article discusses what is known as the Gunn Effect.

The Gunn device requires a power supply of 7v. DC, which can be obtained from a battery as opposed to the reflex klystron which requires (typically) −150v. DC for the reflector, +300v. for the resonator and 6·3v. for the heater. At present Gunn devices are rather expensive but already a Gunn device transmitter with its battery can cost considerably less than a klystron with its special power supply. Gunn devices are available which can give up to 100mW of output power on a wavelength of 3 centimetres (10,000 MHz, or 10 GHz).

Gunn devices are already being used in "mini-radar" systems for small boats, in burglar alarms, for counting, for measuring the speed of road traffic and for many other applications where small size, simplicity of design and portability are important.

The Gunn Device

The device is named after J. B. Gunn who discovered the phenomenon now called the Gunn Effect in 1963. In 1966 Mullard Limited marketed the world's first Gunn devices. Early types had rather a limited life but those now produced have been operated continuously for 10,000 hours with no sign of degradation in performance.

The well-established Mullard range is the CXY11 series, containing a tiny wafer of *n*-type gallium arsenide mounted in a standard ceramic and metal microwave diode encapsulation which is hermetically sealed. The faces of the wafer constitute the two electrodes of the device, Fig. 1. The wafer consists of an epitaxial layer of *n*-type gallium arsenide grown on a low resistivity substrate of the same material. The substrate is metal

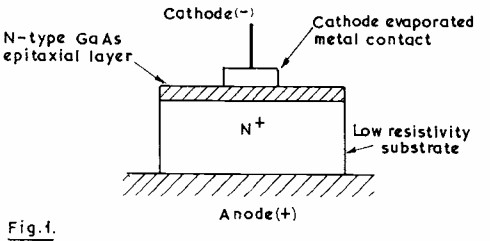


Fig. 1.

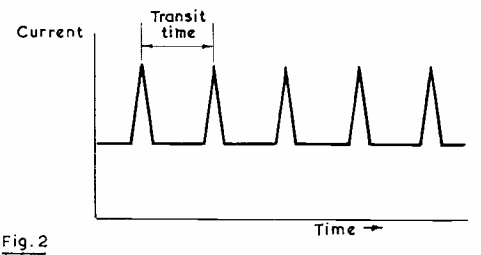


Fig. 2

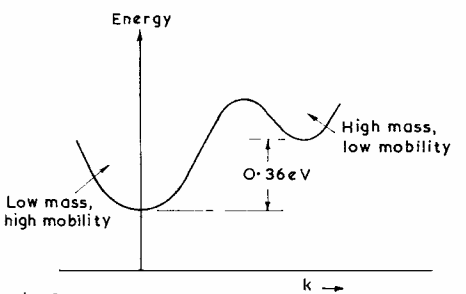


Fig. 3

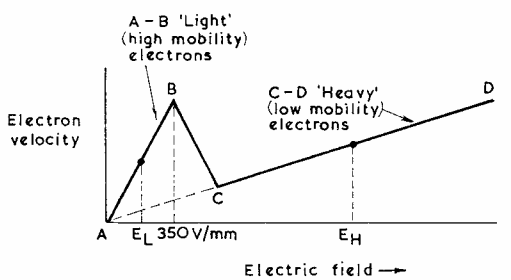


Fig. 4

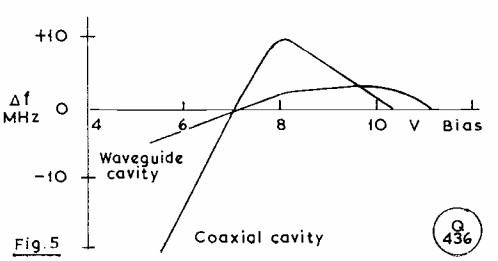


Fig. 5

Fig. 1. Typical Gunn device structure. Fig. 2. Current flow in a Gunn device. Fig. 3. Energy-band diagram for N-type GaAs, plotting energy against carrier momentum, k. Fig. 4. Electron velocity relationship. Fig. 5. Frequency v. bias for Gunn oscillators—recommended Vb (max) is 7 volts.

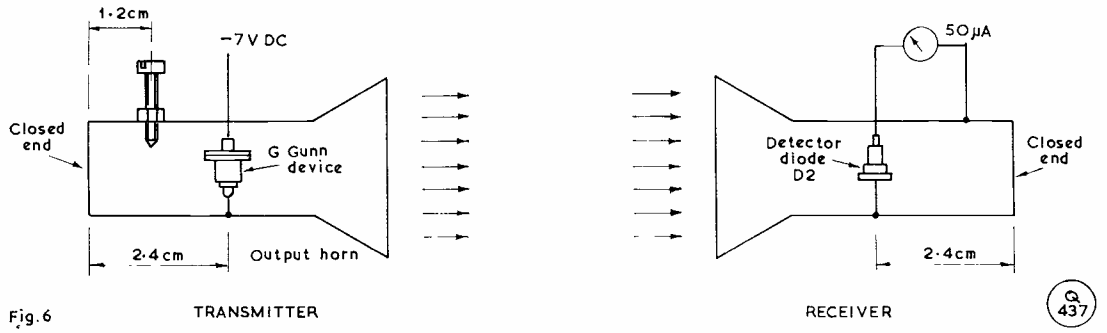


Fig. 6. Schematic diagram of basic transmitter and receiver, using the Gunn effect.

lurgically bonded to the anode terminal of the encapsulation. The other face of the wafer has an evaporated-cathode contact which is connected by a thermo-compression bonded gold wire to the cathode terminal.

The Gunn device, then, has two terminals called the cathode and the anode. However it is misleading to think of it as a diode as it has no *p-n* junction and cannot be used for rectification. When about 7v. DC is applied to make the anode positive with respect to the cathode, the current which flows is DC with superimposed pulses, as illustrated in Fig. 2.

These current pulses, which occur in the CXY11 at 10^{10} second intervals, can be used to induce oscillations in a cavity or waveguide resonator.

The Gunn Effect

It is now generally accepted that the effect is caused by high field regions called " domains " passing between the cathode and the anode. When the supply is connected a high field domain builds up at the cathode and drifts rapidly through the crystal to the anode. As the domain reaches the anode, a new domain forms at the cathode. The *transit* time of the domains through the epitaxial layer determines the *frequency* of the pulses. The frequency is thus inversely proportional to the layer thickness. The velocity of the domains has been measured experimentally and is known to be about $10^{11}\mu$m/s and so a frequency of 10GHz (λ=3 cm.) is obtained with an epitaxial layer 10μm thick.

As is well known, in the energy band diagram for semiconductor materials the valence and conduction bands are separated by an energy gap called the " forbidden gap." Electrons can be excited from the valence band to the conduction band by the application of energy—for example, by heating the crystal or by the addition of donor atoms. However, this well-known concept does not really explain the Gunn effect. To understand this we must look more closely at the conduction band. This can in fact be divided into two regions—the normal conduction band and a higher energy " satellite " band. In the satellite band the effective mass of the electrons is higher and their mobility lower than in the normal conduction band, Fig. 3.

In *n*-type gallium arsenide the majority of the conduction band electrons can be excited into the satellite band by the application of a field of about 350v./mm. As this critical field is reached the electrons in the crystal become heavier and slow down. This reduction in average velocity results in a *negative* differential resistance characteristic, Fig. 4. For this phenomenon to occur, the energy gap between the normal conduction and satellite bands must be considerably smaller than the forbidden gap between valence and conduction bands—otherwise the application of the critical field would result in the transfer of electrons across the forbidden gap and an increase rather than a decrease in the average velocity would result. Only a few known materials, notably gallium arsenide and gallium phosphide, have a suitabl band structure.

In an ordinary conductor under normal conditions the electron velocity increases linearly with the applied field (Ohm's Law). In *n*-type gallium arsenide, however, the average velocity increases at first linearly with the field, Fig. 4 A to B, and then, as the critical field of 350v./mm. is reached and electrons begin to move into the low mobility satellite band, the average velocity starts to fall (point B). Eventually, as the field continues to increase and all the available electrons have moved into the satellite band, the velocity increases linearly again (C to D). Clearly, the region BC is one of *negative differential resistance*. However, the result of applying such a bias field to the wafer is not the same as for conventional negative resistance devices.

In practice, the wafer is biased in the negative differential resistance region above the threshold value of 350v./mm. Many of the electrons coming into the crystal at the cathode are excited to the lower mobility satellite band and slow down. The situation where two types of carrier exist simultaneously is unstable and the lighter electrons flow away leaving a concentration of heavy ones behind. It follows that there is a local increase in the field since, in the negative resistance region BC, a fall in average velocity is associated with an increase in field. Moreover, the effect is cumulative, since an increase in the field causes a further decrease in average velocity. Hence a high field E_H builds up at the cathode whereas the field throughout the rest of the crystal falls to a low value E_L. The high field domain (E_H) drifts

rapidly across the wafer to the anode. As the domain reaches the anode the bias supply again causes the field at the cathode to exceed the threshold of 350v./mm. and a new domain is established. This action repeats continuously.

It has been stated that the frequency for a Gunn device depends upon the thickness of the epitaxial layer. However, it is possible to tune the frequency to a small extent by varying the applied bias. The amount of electronic tuning possible depends upon the mounting environment, only a few MHz variation being possible, as indicated in Fig. 5. Mechanical tuning, however, is far more versatile, 8 to 12 GHz being a typical achievement for variation in tuning range.

Fig. 5 is given for general information and it should be noted that the recommended maximum bias voltage for the CXY11 is 7v. The current drawn from the bias supply varies considerably from one device to another and is typically 140mA.

SIMPLE SWR DEVICE

MK.II VERSION OF AN EARLIER INSTRUMENT

J. S. CUSHING (G3KHC)

THE May '70 issue of SHORT WAVE MAGAZINE included an article on a simple SWR Bridge—an easily made job of a robust nature intended for low power Tx's, of which the prototype has been operating successfully for some years. Provided it is used in the manner suggested in the earlier article there is every chance it will function correctly indefinitely, though as the bridge contains resistors which dissipate some power there is a risk of damage if RF is applied over lengthy periods.

The obvious answer is to increase the wattage rating of the resistors in question. However, this simple remedy may cause difficulties as extra stray capacitance is introduced into circuit and the space required by larger resistors will necessitate using a bigger container. On the other hand, a larger container would allow mounting the meter in the bridge instead of externally *via* plug and socket.

Accordingly, a second model has been constructed using a larger metal box and higher wattage resistors. Circuitry follows the original exactly—except for resistors R1, R2 and R3 which are formed by wiring in parallel a number of one watt resistors. Fig. 1 illustrates the circuit employed and the caption includes a suggestion as to what value of resistor to use when making up R1, R2, R3. There is, of course, no objection to using other values—for example, instead of ten one-watt resistors of 680 ohms each, five two-watt resistors of 340 ohms could be tried. Each assembly of resistors should be checked to make sure their value is close to that specified. All parts used are subject to RF so must be selected with this in mind. In short, use carbon resistors and mica or ceramic capacitators.

Little space is needed to comment on Fig. 2, which suggests how to lay out the components. No work has been done to attempt to establish if the layout is at all critical; it is recommended, then, that on the grounds of satisfactory performance with the prototype, the parts be disposed as shown.

The bridge is used, with a minor exception or two, in the same way as any other SWR Bridge. It is assumed first trials will be with a ten-watt Tx, so the essential proceedure is as follows:

(i) Load Tx into 70-ohm load.
(ii) Connect Tx to bridge (out-socket has no connection made for the moment) and adjust VR1 for meter FSD.
(iii) Connect 70-ohm load to out-socket—if all is well meter now reads zero.
(iv) Connect bridge in 70-ohm co-ax line between Tx and ATU, tuning ATU for minimum reading of meter.
(v) Remove bridge before transmitting.

It is possible to use this bridge with higher power gear. With a sideband Tx just enough carrier is inserted to actuate the bridge, so no harm is likely to occur. If an AM/CW transmitter is involved reducing power to a safe level may prove difficult. In this case the expedient of "overloading" may be risked. The degree of risk may not be as bad as first guessed—carbon resistors will stand up to overloads of *short* duration without harm.

As the original bridge has proved itself over the years the new one was compared against it. Allowing for minor differences in resistor values and meter movements the new model performed as well as the earlier one. It seems, then, that the slight extra capacitance of the greater number of resistors has had no bad effect.

The original article stressed the bridge could not

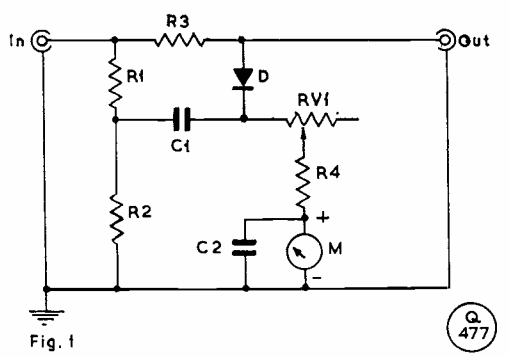


Fig. 1. Circuit of the SWR bridge, for which values can be: R1, R2, 47 ohms, rated 5 watts; R3, 68 ohms, 10-watt; R4, 1000 ohms, ½-watt. C1, C2, .005 μF; D, any small diode; meter, 0-500 μA. Note that R1, R2, could each be made up of five 240-ohm 1-watt resistors in parallel, and R3 ten of 680 ohms, rated 1 watt. Potentiometer RV1, for setting, is 25,000 ohms.

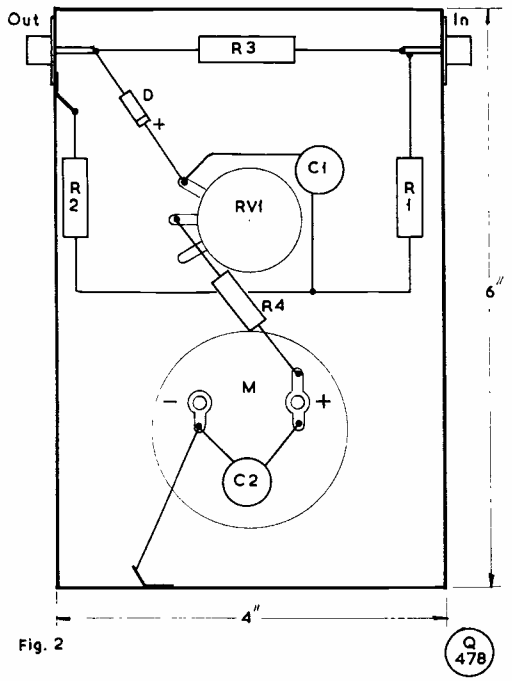


Fig. 2. General construction of the SWR Bridge, in a meta container 6in. x 4in. x 2in. deep. Note that R1, R2, R3, are shown as single resistors, for clarity.

be used to make accurate measurements. This still applies—the way to use the bridge is to aim for a reading close to zero when it may be assumed the standing wave ratio is low enough for most applications.

Fig. 3 has been included to show how the instrument is based on Wheatstone's Bridge and to give a simple account of its working. (Resistors R1, R2, R3 correspond with R1, R2, R3 in Fig. 1 and 2.) The two resistors R1 and R2 on the left are equal in value, both being 47 ohms. It follows then, that if the two resistors on the right—R3 and R1—are also of equal value the bridge will be in balance. Now, as R3 is 68 ohms, if R_L is made the same, two things occur; R_L is of such a value that standing waves may be assumed to be low and as the bridge is balanced the meter shows a null.

This simple explanation is only a first step in a complex business which the reader may follow up if he wishes. As far as this article is concerned this bridge remains useful, robust, sufficiently accurate and is the very job to make up one weekend as a change from operating.

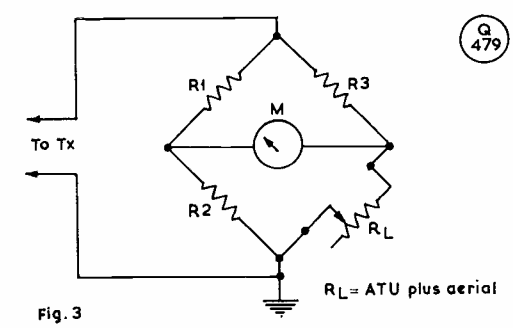


Fig. 3. Comparison of the SWR device with the Wheatstone Bridge circuit—see text for discussion.

RADIO AMATEUR FAMILIES

That note on p.557 of the November '70 issue of SHORT WAVE MAGAZINE, about father-and-son stations, inspired some research work by our statistician and record-keeper G3IDG of Basingstoke. He finds that we have in our midst several Father-Mother-Son/Daughter families in the radio amateur context, those known being G3MSK (F), G3MER (M) and G3MGL (S); G3LWB (F), G3ORU (M) and G3NRM (S); GM2HCZ (F), GM3IYL (M) and GM3NYG (D); G3GDI (widow of the late G3GNV) and her son; G3NQD (widow of G3LFL) and G3SXW (S); also G3AQY (F), G3SGL (D) and G3PIY (son-in-law). It is interesting to note that being all post-war licensed, they have become qualified by taking the R.A.E. and the Morse Test during the last 15 years or so.

WE ALWAYS WANT TO SEE

Articles of Amateur Radio interest for possible publication in SHORT WAVE MAGAZINE, in particular those covering subjects for construction. A note on how to prepare articles appears every month in the Contents page, under the heading "Authors' MSs." We pay good rates for acceptable material, immediately on publication. Articles should be offered, complete in detail and carefully checked, to: The Editor, SHORT WAVE MAGAZINE, BUCKINGHAM.

" . . . you sound a bit puffed, OM . . . "

THE MONTH WITH THE CLUBS

By "Club Secretary"

(Deadline for May issue: April 8)

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

ONCE again the time comes round for your scribe to look into the folder on his desk marked "Clubs," and reach for his typewriter. Because of the absence of much incoming mail, it will be necessary to rake back into history a little, but with the exception of any cases where there have been late programme changes which we have not heard about, or change in the address of the Secretary which has not come through, the information presented should be adequate.

One of the things that have suffered in the postal disruption, is the forward planning of the programme for most Clubs, many of whom have no doubt been thrown back on their own resources—thanks to the loss of such items as tape lectures, films, and so on. However, it is quite surprising what can be done by the lads within the group. As an example, at **Bishops Stortford** last time, G3KFE dragged out a load of his old rubbish that passes as test-gear in his station and discussed it, while SWL Rolph followed this up by showing how, with nothing but a signal oscillator and a built-in 100 kHz calibrator, along with a keen ear, one could "tweak up" the IF strip of an 888 receiver and retrack the 28-30 MHz range, achieving accurate calibration even though the 100 kHz harmonics fell neatly between two of the 100 kHz lines on the receiver scale, by locating a signal on the oscillator at 7 MHz — where the calibration could not go far out to leave doubt— and then tuning to the fourth harmonic at 28 MHz and relating this harmonic to the calibrator pip.

This practical demonstration was not thought up until about mid-afternoon on the day of the meeting, when the two chaps concerned were taking a well-earned tea-break and wondering what could be done to stop the hole in the programme. What is more to the point, it will be possible, without going outside the membership, to keep this sort of thing up till the proper business of obtaining outside speakers can be resumed. And how effective a demonstration it was is proved by the fact that the lads asked for more in future!

This Month's Clip

Since we started by mentioning the **Bishops Stortford** crowd, perhaps we had better complete their story by saying that they have a booking on the third Monday each month, unless that falls on a Bank Holiday, at the British Legion Club, located at the top of Windhill, which is the road out of the centre of the town going to Ware. As one climbs the hill, it is the last building, almost, on the right-hand side, with adequate parking space on the left as you go up the hill. The room they use is on the first floor, and is just newly redecorated, but if you arrive before 2000 clock, chances are pretty good that if you go straight into the bar you will hear Amateur Radio-type talk and be able to "make your number" before going upstairs.

Now to the **Ex-G Club,** members of which are those born in the U.K., but living abroad; mainly, of course, in the States, but many others hailing from all over the globe. The hon. secretary in this country is G2FUX, whose name adorns our Panel, but of course the Club meetings are by way of regular nets on Sunday evenings at 1900 GMT, around 14347 KHz, give or take a bit for the QRM. Look out for a large group containing, most likely W4RP and K2ONN.

One of the good things your scribe has missed of late due to the strike is the monthly copy of *Radial,* the Newsletter produced by the **R.A.I.B.C.,** for their full and associate members. The former category covers the invalid, bedfast, and blind folk interested in Amateur Radio, as SWL or licensed transmitters, while the associates are the people who give up a little of their time in various ways to make the Club the Godsend it surely is for the full members. Again there are nets to keep the gang in contact, this time on Eighty. Look for them around 3·650 3·700 MHz, at 10 a.m. on Tuesdays or 2.0 p.m. on Wednesday afternoons. There is also a Cheshire Homes net which can be heard on Thursday afternoons too, again at 1400 clock.

A third group covering a special-interest facet of our hobby is **A.R.M.S.,** the Mobile club. *Mobile News* has probably taken more of a hammering than most by the postal strike, as the deadline for the January issue fell right at the start of the period of no-post. No doubt by the time this comes to be read G3FPK will be getting mail again—and he would be delighted to enrol some new members.

Nets again; this time the **Royal Navy** crowd, who assemble on Wednesday evenings at 1900, 3720 kHz SSB, or, for the CW fans, 3520 kHz at 0900 on Sunday mornings. In addition, at 1900z on the first

The Leeds Radio Society operates its own station G3BEW, and they are usually on the air on Wednesday evenings, this being taken on one of those occasions recently. In the picture are G4AD, G3TDZ, G3AYK, G3YWX, G8EFF and some of the SWL members.

Tuesday in each month they have a QRQ run for those who want to bring up the CW speed, and give a certificate for perfect copy at twenties, and stickers for higher speeds.

The Tweed View Hotel in Berwick-on-Tweed is the Hq. of the **Border** Club; the first Sunday in the month seems to be the routine, the gathering being timed for 1500 clock.

Guildford have a very important date on April 9, namely the Annual General Meeting. This is part of the usual routine of meetings on the second and fourth Fridays in each month, at the Stoke Park Model Engineers' building.

Hereford might be a rare county on Top band, but the local lads are nonetheless very active from their home in the Civil Defence Hq., County Control, Gaol Street, Hereford; the booking is for Friday evenings, which seems generally to be a popular choice.

Reading the newsletters that come to this desk each month is always of interest, as much as anything for the odd things which come up for disposal —**Southgate** for instance have an advert for gallon lots of washing-up liquid going cheap—a hint to some marriage-minded bachelor in the group? The Hq. must be one of the easiest to find, for all you have to do is emerge from Arnos Grove tube station on the Piccadilly Line, and cross the road. However, first of all you will have to contact G3XSV for the dates and details—*see* Panel p.115.

At the time of our last contact with them, it was understood that **Surrey** were negotiating for a new place; just what would be done about the existing Hq. in the "Swan and Sugarloaf" seemed a trifle unclear at that time, albeit it has all surely been settled by now. This being the case, one feels the best way of making sure of the routine is to contact the secretary—*see* Panel—before making a visit.

The change of venue has been completed by **Worcester** who now are to be found at the Crown Hotel in Broad Street, on the third Saturday in every month. Incidentally, one notes from their *Newsletter* that there is a vacancy for a resident psychiatrist on the staff for Field Day weekend!

Anyone who lives within striking distance of Flint is welcomed to the **Flint** club. The meetings come up on each Friday, at the Hawarden Castle, Church Street, Flint, and there all sorts of interesting things either being done or in the pipeline.

At **Crawley** it looks like April 28 from where we sit, although it is not possible to tell you just what is organised for the entertainment of the assembled multitude; Trinity Concregational Church Hall is the venue, in the Ifield area of Crawley.

Never a dull moment could well be the motto of the **Crystal Palace** lads; but since they have not long gone past the AGM and held a committee meeting, it is not yet possible for us to tell the arrangements for the third Saturday in April. at Emmanuel Church Hall, Barry Road, London, S.E.22. Start time is. as ever, at 2000.

G3GVU has a fair old task to carry out at the April meeting of the **Kingston** group, with his title given as "Introduction to Integrated Circuits." This one is slated for April 14, starting at 8.0 p.m., at the Penguin Lounge, 37 Brighton Road, Surbiton. There is also a club net on 144·7 MHz on Saturday evenings, starting at 2015.

North Kent have a talk on RTTY down for April 8, and a Junk Sale on April 22. However, we have no note of the place at which they gather, so for this we must refer you to the Panel, for the address of G3WRP.

At **Dorking,** there is a pattern of fortnightly get-

togethers at the "Wheatsheaf," at 8.0 p.m., alternating between the formal meetings—business and/or a talk—and the more informal sessions. April 13 is down for a sale of surplus equipment, and on the 27th the subject is "HF Band Operating."

* * *

The coming of Spring stirs up the blood more than usual in the case of the **Dartford Heath D/F** crowd, who have been impatiently waiting right through the winter for the chance to resume their regular programme of hunts. For the very latest details and news, contact the hon. secretary—*see* Panel.

Fridays at the Aurora Hotel (ex-Naafi Club to us OT's!) is the spot to go for if you are at a loose end in the **Medway** area; the Aurora, of course is in Gillingham.

For **Echelford** the dates are April 12 and 29. The latter should be quite a draw, as George Sweet, G3OZY, will be talking about "Radio Astronomy for Amateurs." The venue for both evenings is the Hall, St. Martins Court, Kingston Crescent, Ashford, Middlesex.

April 21 at the Council Chamber, St. Albans Town Hall, will see the gathering of the **Verulam** chaps, who will be hearing a talk by Brian Armstrong, G3EDD, the subject not known at the time of writing—but it could be VHF.

The **Colchester** group have a booking at the North-East Essex Technical College, Sheepen Road, the normal room being No. 40. For the current list of dates, and all the other information, please refer to G3ZOS, address as Panel, opposite.

Not far away is **Clacton,** where the chaps are in the habit of meeting on the second and fourth Tuesdays, in the Martello Tower, Marine Parade West, Clacton-on-Sea; with an address like that there should be little or no problem for a prospective new member or visitor in finding them!

Back inland now. to **North Bucks,** who cover an area around Bletchley; here we have to confess that we cannot tell you either the dates or venues, for which information you will have to get in touch with G3ZNY—but we can say that this is mainly because of the fact that they had, at the time of their last contact with us, only provisional bookings this far ahead.

Mid-Herts is a new name for the crowd which used to call itself Welwyn, and indicates that they are trying for a rather larger catchment area. They have Hq. at Welwyn Civic Centre, where they can be found on the second Thursday in each month attentively listening to whatever lecture has been arranged. On April 8, it will be Jack Hum, G5UM, on "25 Years of Mid-Herts. Amateur Radio."

* * *

Programme for **Purley** is: April 2, Natter Nite; April 16, Part II of the Spring Sale. All at the Railwaymen's Hall, 58 Whytecliffe Road, Purley, 8.0 p.m.

One would think that by now the main recent activity at **Maidstone YMCA**—painting and decorating in the new second shack—will be completed, and so everyone will be sitting back and to enjoy it. They get together at the "Y" Sportscentre, in Melrose Close every Friday. After kick-off at 1930 clock, the time till 2030 is devoted to the beginners, the main meeting starting at 2030 and continuing till around 2230, clock times.

Weekly, this time on Tuesdays, is also the form at **Chippenham,** where the venue is the Boys' High School, in Hardenhuish Lane, although we cannot at the time of writing give details of the programme for April.

Reading have a place at the "Victory" public-house, and at the last indication the routine was "fortnightly on first and third Tuesdays." However, since an AGM has been taken since last we heard, it is not possible to give current programme details, for which, and directions for finding their Hq., contact the hon. secretary, as Panel.

The first Thursday each month is favoured by the **Cornish** lads and lasses for their "main" meeting, at the SWEB Clubroom, Pool, Camborne. There is also a Newquay group of the club, who have dovetailing arrangements. All the details can be obtained on these and other Cornish activities from G3UCQ —*see* Panel, opposite.

Burraton Toc H Hall, Waraton Road is the home base of the **Saltash** crew, where they meet on the first and third Friday evenings, starting at 1930. They seem to have had a full and interesting programme going, but, sadly, we have no details of the April activities—once again, it is a matter of checking *via* Panel QTH.

It is now just over a year since the formation of the **Minehead** club, who have Hq. at the old Police Station, Dunster, and who get together every Tuesday evening. However, they are firmly convinced that there are some potential new members lurking around who have not seen the light yet; and they want these folk roped in to keep the organisation nice and strong. So—reserve next Tuesday and go take a look at them.

Haverfordwest also use Tuesday evenings for their meetings. These are the Hq. in Rosemary Lane, Haverfordwest, where among other goodies they have an SSB rig on the go under the call GW3XOT, and can help with Morse tuition too, if needed.

Shirehampton group serve a part of Bristol, and get together in Twyford House, Shirehampton, where they can be found any Friday evening. The club runs an R.A.E. course, Morse can be practised by those who aspire to a G3 ticket, there is a Club station available and, of course, the usual sort of programme, with dates devoted to talks, film shows, visits, and whatever.

The other **Bristol** group in residence at 41 Ducie Road, Barton Hill, Bristol, 5, on Tuesdays and Thursdays; to judge by the past, Thursdays are the ones when the talks and similar events take place, while the Tuesdays probably see some good old nattering as well as other activities.

From where we sit, April 2 looks like the evening when the **Bangor, Co. Down** club will be meeting; Silverstream Hall, Belfast Road, is the place to be

heading for, but for the latest details, we have to refer you to the hon. secretary—*see* Panel, below.

Back over the water now, to **Exeter,** where they are settling down into the new Hq. at the Community Centre, 17 St. Davids Hill, and continuing their routine of meetings on the first and third Tuesday in each month, the first mentioned being the main one, the latter the evening for operating the Club station and general gassing.

A rather unusual routine is followed by the **Wessex** crowd; they have their get-togethers on the first Friday and then the Monday seventeen days later. For April, then we find this yields us April 2 and April 19 as the ones to be ringed in red on the calendar. Having sorted out the dates, the place is comparatively easy—the Cricketers Arms Hotel, Windham Road, Bournemouth. For any other points, refer to G8BBN, as Panel, who will be only too pleased to give some later information.

An early start, 7.0 p.m., is made possible for the **Basingstoke** group by having their meetings on Saturday evenings—the first and third to be more precise. Hq. is at Chineham House, Shakespeare Road, Popley, Basingstoke, and for the latest information as to

Names and Addresses of Club Secretaries reporting in this issue:

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BANGOR (North Wales): B. V. Davies, GW8CGP, 17 Erw Faen, Tregarth, Bangor, Caerns.
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BRACKNELL: L. J. Parry, G8AMK, 13 Cannon Hill, Easthampstead, Bracknell (*23704*), Berks.
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CRAWLEY: G. Bowden, G3YVR, 51 Leighlands, Pound Hill (*3253*), Crawley, Sussex.
CRAY VALLEY: P. Vella, G3WVP, 78 Hurst Road, Sidcup.
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MIDLAND: N. Gutteridge, G8BHE, 14 Metchley Drive, Harborne, Birmingham, 17 (*021-622 2323*).
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READING: P. J. Bendall, G3NBU, 89 Hexham Road, Reading.
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SURREY: S. A. Morley, G3FWR, 22 Old Farleigh Road, Selsdon CR2 8PB (*01-657 3258*).
THANET: R. T. Trull, G3RAD, 1 Approach Road, Broadstairs, Kent.
TORBAY: Mrs. G. Western, G3NQD, 11 Truro Avenue, Hele, Torquay.
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WESSEX: G. A. Moore, G8BBN, 15 Stanfield Road, Winton, Bournemouth BH9 2NL.
WEST OF SCOTLAND: K. McDermott, GM3SSB, 22 Fettercairn Avenue, Glasgow W5.
WHITE ROSE: R. Short, G3YEE, 10 Tyersal Grove, Bradford 4, Yorkshire (*664 220*).
WIRRAL: A. Fisher, G3WSD, 34 Glenmore Road, Oxton, Birkenhead, Cheshire (*652 5078*).
WOLVERHAMPTON: J. P. H. Burden, G3UBX, 28 Coalway Road, Wolverhampton WV3 7LX.
WORCESTER: G. Spink, G3WUI, 1 Belvoir Bank, North Malvern, Worcs. (*Malvern 3088*).

the programme, contact G3CBU (Panel).

* * *

On Thursdays **Shefford** can be found gathered in the Church Hall in Ampthill Road, April 1st being down for "short lectures on any subject"; April 15, Field Day planning and surplus sale; April 22, R.A.E. revision; April 29, LF-band aerials and ATU's. When one considers that in the Amateur Radio sense, Shefford is out in the sticks, adjacent to one of the biggest "blank areas" south of the GM border, it is quite astounding how they do it—a weekly programme, year in year out, of a standard that many a metropolitan club would envy. No wonder they can boast an annual dinner attendance of ninety-odd!

Cray Valley really mean business when they talk of publicity. Despite the postal stoppage, they have organised things so they get their letter to the right spot in plenty of time. This sort of enthusiasm pays off in club attendances. On April 1, they have their Annual General Meeting—somebody has a sense of humour!—followed on April 15 by the usual Natter Nite; both are at the Congregational Church Hall, Eltham, S.E.9, the kick-off being at 2000.

Another of the faithful few who contrived to bring us up to date with their doings is **Acton, Brentford and Chiswick.** Here the date is April 25, and the speaker G8DLK, who is to talk about his two-metre tackle and his experiences on the band. This one is at the usual place, the Chiswick Trades and Social Club, 66 High Road, Chiswick, London, W.4.

Solihull have an interesting event for April 20. When the lads attend this one, at the Manor House, High Street, Solihull, they will be treated to a programme of colour slides of members' shacks—one can imagine a few salty wisecracks and a good time being had by all!

Last time out, we mentioned the formation of a group in **Bracknell,** Berkshire. One would imagine that there would be no shortage of takers, with such a lot of electronics interest in the area and the surrounding districts; however, if there remains anyone who has not heard of a Bracknell group yet, it is time he hot-footed it to the nearest telephone and rang G8AMK (Panel) for the latest information.

Wakefield have a film show tee'd up for April 6, while on the 20th they will be airing the club callsign, G3WRS. Both these events, and indeed all home dates, are at the Hq. in Wakefield Youth Centre, Zetland Street, Wakefield.

Torbay seem to have their monthly work-out on the fourth Saturday in each month, at the Hq. in Bath Lane, rear of 94 Belgrave Road, Torquay; but doubtless the hon. sec.—*see* Panel—can confirm the exact date and time, plus the latest details on the "doings."

At **Mansfield** there is no doubt about it at all—the first Friday of each month it is, for a natter-and-a-noggin at the New Inn, Westgate. after the hard work of the Annual General Meeting last month.

The **North Leeds** chaps will by now, be well settled in their new abode, which offers improved aerial facilities, for their Tuesday evening sessions. However, they are not able to advertise their venue, and so it is necessary for anyone wishing to make contact to get in touch with G3MZF for the details, at the address in the Panel.

For those living on the **Wirral** peninsula, the local group has returned to its old Hq. at Harding House, Park Road West, Birkenhead. The dates and details for April are not available at the moment, but we can give the QTH of the secretary in the Panel; he will do the rest.

The Conservative Divisional Office is the home of the **South Manchester** Club, at 449 Palatine Road, Northenden, Manchester 22. Here they can be found on any Friday evening; but if your interests are VHF'ish, then there is in addition a VHF sub-section, which has every Monday evening at the Club Shack, Greeba, Shady Lane, Baguley. To both Friday and Monday sessions, visitors are welcomed.

The **Mid-Cheshire** area is centred on Winsford, where the group have a place in the Winsford Verdin Comprehensive School, Technical Activities Centre, Grange Lane, High Street. Wednesday evenings are set aside for the normal meetings, from 1900 till 2130, and there are extra activities in the way of nets on Top Band and VHF.

Thanks to the strike, we have not been able to get the latest news of the **Hull** doings. Nonetheless, a look at the files suggests that they will be sticking to their basic routine of weekly Friday-evening stints, at 592 Hessle Road, Hull. We could go a little further, and say that for a long time now, we have noticed that there is something brewing in the way of a talk or activity on almost every meeting, and that they will welcome any new member or visitor who comes their way.

Peterborough have a summer Hq. and a winter one; and at this point in time we are not too sure which one they will be patronising in April—which is a good reason for a contact with G3KPO, to find out!

If you have unhappy memories of Service guardrooms, and live in Lincoln, don't let it deter you from going to a **Lincoln** Club meeting—they have never yet lost a member into the cells! Tuesday evenings it is, at No. 2 Guardroom, Sobraon Barracks, Breedon Drive, off Burton Road; and this group, like so many others, make a point of saying how welcome visitors are to them.

A group North of the Border who make similar use of service facilities is the **West of Scotland** crowd; for them it is the Royal Signals building, 21 Jardine Street, Glasgow N.W., on Friday evenings. This venue has the advantage of ample parking facilities, not to mention being convenient for local transport services.

The second and fourth Thursdays are the ones for **Lothians,** albeit we cannot give you the venue, for which it is necessary to contact the hon. sec.—*see* Panel, p.115.

Derby seem to have Mondays, Wednesdays, and Fridays booked, the QTH being in the Clubroom at 119 Green Lane, Derby. However, their main interest during April will surely be the Diamond Jubilee Exhibition in the Museum and Art Gallery which is open from April 3 until the 17th. On opening day there is to be a ceremony, the Official Opening.

Last month on p.53 we showed a picture of GB3GYS in action. Here we see members of the West Yorkshire Scout Group, including G3JWN, G3SOP, G3WAH, G8AVL, G8VSO and G8CDG.

which will be carried out by the Mayor, Miss M. E. Grimwood Taylor, who, oddly enough, is a daughter of one of the founders of the group back in 1911, when it was called the Derby Wireless Club. The exhibition will be open from 10.0 a.m. through the day till 6.0 p.m. with Sunday opening from 14.30 till 16.30.

On the third Friday in each month the members of the **Melton Mowbray** mob wend their way to Hq. For all the details of the April activity, we must refer you to the secretary of this small but active and lively society.

The **Cannock Chase** Club is perhaps best-known in its WAB and HAB activities. They hold regular get-togethers, and once in each month organise a talk or films, or whatever. For April, it is hoped to have G3POA (MP4MBJ, VS1IQ), *not* to talk about his DX calls but his other interest, namely sky-diving.

* * *

Oddly enough, **Coventry** come in at this point as a result of a QSO with a station in Jersey, of all places! The reason is simple—fifteen years ago, almost, your conductor first met that operator, and the meeting occurred on a visit to the Coventry Club in their old Hq. which, alas, has long since gone to make way for the reconstruction of the town centre. However, it served as a reminder that the group is still active, indeed more so of late years than ever, and running their weekly Friday-evening session, with a big welcome to visitors. The present club Hq. address is not given in the letter taken from the file, so we must refer you to the Panel.

Redditch next; a place perhaps more thought of in connection with motor-bikes and fishing tackle than radio; but there was a station in Redditch before the War, with a plate like a doctor would have, by the side of the front door of the house, and tuned feeders going up to the aerial—days when an amateur could be proud to let neighbours know his hobby, rather than skulking under the threat of TVI, as so often happens today. One wonders if that station is still active, and a member of the club? The lads have their home at the Old People's Centre, Park Road, Redditch, and can be found there on the second and fourth Thursday in the month.

April 20 is the date for the **Midland** chaps, at the Birmingham and Midland Institute, Margaret Street, Birmingham 3; but we cannot at this time tell you what they have planned for the meeting, although we do know something is being organised.

There is almost every month a whole string of activities for the **Wolverhampton** chaps to take part in; this being the case, it only remains for us to point out that most of them are based on Hq. at Neachells Cottage, Stockwell Road, Tettenhall, and for the rest to suggest you contact the hon. secretary —*see* Panel.

The last news we had of **Leicester** was that they had just elected a new hon. sec. at the AGM, and that he had a mandate to rope in more members to add to the 56 already on the register. This being the case, it is doubly certain he will be glad to hear from you and give you the run-down on April activities, not to mention meeting you at the meetings.

The **Nuneaton** lads reformed their group at the end of last year, and at that time it was intended to assemble on the first Friday of every month at Caldecote Grange, with additional sessions as and when it was thought necessary. The secretary (*see* Panel) will no doubt be pleased to hear from any prospective new members or visitors; incidentally, at the time of their writing the subscription had been set at the surprisingly low level of 25p per annum.

For those interested in RTTY operation, or FAX, membership of **BARTG** is a "must." The newsletter alone is worth its weight in gold to an RTTY man, especially if he has kept his back numbers and uses the articles in it to guide him through the intricacies of setting up a teleprinter. Years ago your scribe, as part of his training. spent a period of time in a teleprinter repair shop, but the setting-up correctly of one of these beasties always eluded him; indeed, it led to hard words in later years with a REME warrant-officer who was a dab-hand at it!

It is always pleasant to be able to record the initiation of a new group; the more so when the

one concerned caters for the younger generation. **Netteswell School** in The Hides, Harlow, now has its own club development, the sparkplug in this case being G8CUA—*see* Panel, who rather amused your conductor by remarking that now he would have to pass his Morse test, as the members wanted to hear him working some DX!

* * *

Not to be confused with Bangor, Northern Ireland, the newly-formed **Bangor** Radio Club is for that area of Wales. They are to meet at the local Technical College, fortnightly on alternate Thursdays, at 7.0 p.m.

The Pudsey & District Radio Club has changed its name to **White Rose** Radio Society. They meet at the White Horse Hotel, Armley Town Street, Leeds, Wednesday evenings at 7.30 p.m. First objectives of the group are to enter as many contests as possible and to organise their third White Rose Mobile Rally, to be on the same lines as the previous two, both highly successful. They also intend holding a monthly Quiz Night, asking local Clubs to join them. White Rose already have a Top Band net on Sunday evenings, 7.30 p.m., and shortly they will be starting a 4-metre net, to drum up more activity on that band.

Thanet Radio Society's annual dinner is on April 3, at the San Clu Hotel, Ramsgate, 7.0 for 7.30 p.m., for which tickets can be obtained from G3RAD, *QTHR*. The Club meets every Friday night, 8.0 p.m. at Hilderstone House, St. Peters Road, Broadstairs. A varied programme has been arranged for the summer months, and they will be represented at the Broadstairs Hobbies Exhibition, at the Charles Dickens School in that town, over April 14-17. Their stations will sign G3DNR/A on two metres and GB2BHE on other bands, running SSB.

Down in Cheltenham, **Government Communications** Amateur Radio Club have their Annual Open Night on Friday, April 23, 8.0 p.m. in their canteen at Benhall, Gloucester Road, with an open invitation to all interested in seeing some new equipment, gadgets and ideas about aerial systems, with which goes the opportunity of having a pleasant evening in congenial company. G3PEO, QTH as Panel, will be pleased to give details and directions.

Deadline

It is at the time of writing that, after seven weeks of no post, the resumption of service is announced. What this is going to mean in practice is not yet clear but we hope that it will enable you to get your Club news and reports through, in writing, by **Thursday, April 8**—this would probably mean posting "first class" by not later than the 6th. We would prefer it this way rather than by telephone—though indeed we acknowledge the great efforts made by Club Secretaries in all parts of the country in ringing their reports through during the last couple of months.

The address for all correspondence for "Month With The Clubs" is: Club Secretary, SHORT WAVE MAGAZINE, BUCKINGHAM, to arrive by **April 8, May 7** or **June 4** for the issues immediately following.

COMMUNICATIONS TRIUMPH—APOLLO-14

Apart from the magnificent spectacle provided for TV by the Apollo-14 drama on the Moon, nobody in any way interested in radio communication could fail to have been deeply impressed by the slick efficiency of the radio circuits. Speech quality was noticeably better than on previous space-occasions, with far less "sharsh" (circuit and aerial noise) and the over-hearing was all the time very good. When one realises the radio channels required for an operation of this sort—between Shepard and Mitchell for their own inter-communication, repeated for all to hear (even to the heavy breathing of Mitchell when he was struggling a bit with his "Thumper" experiment); between the astronauts and Mission Control *via* satellite and through different ground stations as the Earth-aspect changed; the circuits for the TV presentation; the direct monitoring of the physiology of the astronauts themselves (heart rate, body temperature, oxygen usage, etc., of vital importance to the medicos responsible for advising the Mission Controller); the radio circuits involved in the Tx/PSU left on the Moon for subsequent seismological and solar wind experiments; and much else besides—to say nothing of Roosa orbiting alone in his "Kittyhawk" waiting for the join-up with "Antares" and, while all eyes were on the Moon-walkers, also in full radio communication with everyone involved.

It is clear beyond all doubt that the Americans have developed and brought to perfection a radio control and communication system of unparalleled operational reliability and technical excellence. In terms of actual frequencies, no announcement of what they were for Apollo-14 has yet been made—but they can be assumed to have been, variously, in the bands 267-273, 401-402, 449·75-450·25, 900-960 MHz, and also in the GHz bands—during the operation the collapsible dish aerial was specifically mentioned as being for the "S-band," which is 2·0-4·0 GHz, or 2000-4000 Mhz.

FOR THE OLD-TIMER RECORD

U.K. amateurs still holding callsigns who were licensed and on the air before the Kaiser's War (meaning pre-1914) include G2DX, G2DY, G2NN, G2XV, G5RQ, G5SH, G6DN and G6MB. In those days, they had three-letter callsigns, always incorporating an X (the X for "experimental") in the sequence, *e.g.*, PZX (who is now G3HT, he having let his licence lapse for 20 years), while G2DX now was TXK in 1912. All these gentlemen, happily still with us, must be 72+ years of age. We offer them our salutations—long may they continue to flourish.

THE OTHER MAN'S STATION G3YZX/G3YZY

THE station depicted here is operated by a father and son combination—Howard and Howard David Brindle of 4 Bowjey Terrace, Newlyn, Penzance, Cornwall. They took the R.A.E. together at St. Ives and the Morse Test at Lands End Radio, GLD, and on December 16 last were allocated the consecutive callsigns G3YZX and G3YZY.

Howard Junior's interest as an SWL was stimulated by Howard Senior who was a Leading Telegraphist in the Royal Navy during World War II. At first an HRO receiver and vertical antenna was used with good results. Eventually the Hammarlund HQ-170 was acquired and has proved to be an excellent receiver. Shortly after getting their licences the station Tx, a *Heathkit* SB-401, was obtained. With this, SSB is mainly used, over all bands 10-80m.

Antennae are the *Mosley* Mustang 3-element Tribander for 10-15-20 metres on the roof of the house, and a trap dipole for 40 and 80 metres. Operating periods are Saturday and Sunday mornings on 10 and 15 metres, these being preferred for DX, and 80 metres in the evenings—prep. permitting, in the case of 16-year-old G3YZY; 20 and 40 metres are also worked but to a lesser extent.

The problems of TVI have been partly overcome in that the station can be operated during TV hours on 10, 40 and 80 metres in spite of the QTH being in a terraced row of houses. For this they have to thank the local Post Office engineers, who proved to be most helpful and understanding: they also had lots of help and advice from the Cornish Radio Club and local amateurs.

The QTH is on a hillside and overlooks Newlyn Harbour and St. Michael's Bay, with a good take-off towards the Pacific, Australia, New Zealand and Japan. Much DX is worked in this direction, with regular weekly contacts into JA, the KR6 area (Zone 25), ZL and VK. QSO's have been achieved with most parts of the world. They have difficulty in working Africa because the beam has to be aimed right into the hillside on which the station is situated. Contacts with South America are usually made by long-path and good results have been obtained. So far, some 86 countries have been worked and it is hoped that DXCC will be made soon. G3YZX/G3YZY have many friends in this country and throughout the world.

As both operators are named Howard some confusion is caused, especially when working on the local Cornish net. To avoid this, G3YZX, at his age of 49, has had to adopt the name of "Brin", a nick-name from school and R.N. days. G3YZY obtained his licence when he was 15 years old. He is at present studying Physics, Mathematics and Chemistry at A-Level and has already obtained ten O-Level subjects. His father is in the employ of the Cornwall Education Committee.

We are delighted to be able to give—for the first time in this feature—some details of an active father-and-son station. Good luck to them both!

NEW QTH's

This space is available for the publication of the addresses of all holders of new U.K. callsigns, as issued, or changes of address of transmitters already licensed. All addresses published here are reprinted in the U.K. section of the "RADIO AMATEUR CALL BOOK" in preparation. QTH's are inserted as they are received, up to the limit of the space allowance each month. Please write clearly and address on a separate slip to QTH Section.

EI5CE, P. Timmons, Kilbarry, Wilkinstown, Co. Meath.

EI6CE, P. Cantwell, Trim, Co. Meath.

G3ZAI, D. Jennings (*9J2EJ*), P.O. Box 591, Livingstone, Zambia.

G3ZYO, P. A. Connolly, 47 Norfolk Road, Gravesend, Kent.

G3ZZR, P. J. Revill, 19 Shepherds Walk, Farnborough, Hants. (*Tel. Camberley 26092.*)

G8EGO, R. E. Hall, 41 Ayresome Avenue, Leeds 8, Yorkshire. (*Tel. Leeds 661708.*)

G8EOO, I. B. Jolly, Oakmere, 68 Liverpool Road, Chester.

G8EOY, D. Seabrook, 1 Lewes Close, Pound Hill, Crawley, Sussex.

G8EOZ, K. Waight, 2 The Rise, Pound Hill, Crawley, Sussex.

G8EPI, P. J. Poole, 5 River Drive, Strood, Rochester, Kent.

CHANGE OF ADDRESS

EI3BV, J. F. Shortland, 24 Inchvale Drive, Shamrock Lawn, Douglas, Cork.

G2AFB, B. H. Douthwaite, 12 Kingsway, Petts Wood, Kent.

G2DX, K. Alford, Green's Farmhouse, Cherry Orchard, Shaftesbury, Dorset.

G2FRX, G. Wakeham, Beech Cottage, Foxwell Lane, Newton Abbot, Devon.

G3HVY, R. Murcott, 156 Chase Road, Burntwood, Walsall, Staffs. WS7 ODX.

G3ICG, K. S. P. McFarlane, 14 Willoughby Road, Ipswich, Suffolk. (*Tel. Ipswich 50009.*)

G3JUL, G. C. Voller, 56 Marlborough Road, Ashford, Middlesex.

G3LEQ, G. L. Adams, 2 Ash Grove, Knutsford, Cheshire. (*Tel. Knutsford 4040.*)

G3MBK, D. W. Underdown, c/o Springwood, Morton Road, Horsell, Woking, Surrey.

G3MVI, D. A. Heather, 11 Earls Hill Gardens, Royston, Herts. (*Tel. Royston 41030.*)

GI3NSV, M. C. Donnelly, Tirgarve, Allistragh, Armagh, Co. Armagh.

GI3NZZ, R. J. Copeland, Greystones, Cromlech Park, Kilkeel Co. Down.

GM3PCX, B. J. Dodge, Firthside Lodge, Thurlow Road, Nairn.

G3PXV, R. E. Wiseman, 9 Wheatfields, St. Ives, Hunts.

G3RZC, R. D. Pellett, 29 Jubilee Road, Bexhill-on-Sea, Sussex.

G3SGT, A. P. Teale, 11 Burns Avenue, Mount Pleasant, Southall, Middlesex.

G3UQT, K. A. Draycott, 175 Oliver Road, Kirk Hallam, Ilkeston, Derbyshire.

GI3XDX, G. G. McDowell, Eindhoven, Old Galgorm Road, Ballymena, Co. Antrim. (*Tel. Ballymena 3189.*)

G3YAX, G. Moon, 17 Birch Avenue, Winwick, Warrington, Lancs.

G8ASL, W. E. Bowden, 65 Estover Road, March, Cambs.

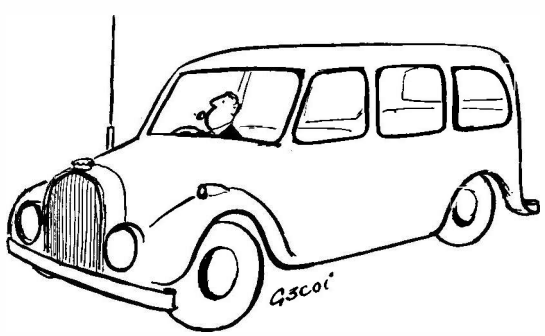
G8EAY, A. P. Foss, 73 Coolgardie Avenue, Chigwell, Essex.

THE "NEW QTH" PAGE

Though we have had no mail intake for the best part of two months, it has been possible to show a full page of "New QTH's" in the last two issues, with the balance outstanding this month. This is because we always have a large carry-over for the "New QTH" page, particularly of changes of address. We print in "New QTH's" only those callsign/addresses that have as yet not appeared in any *Call Book*. All those notified to us (and we accept only written requests to publish) are forwarded to Chicago for subsequent appearance in the *International Radio Amateur Call Book*, the world directory listing the callsign, name and address of every known radio amateur. If you wish to be included, let us have your details—on a separate slip, *please*—as soon as possible (so that they can be sent on to the *Call Book* publishers without delay). After a hiatus of two months, there must be a great many waiting in the postal pipeline.

BOOK TOKENS NOT ACCEPTABLE

Would those concerned please note that, with regret, we are unable to accept book tokens, against orders for either books or subscriptions or any other payment purpose.



" . . . Mod's OK but your tappets need adjusting . . . "

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TRADE

QSL CARDS. Two-colour, attractive design, variable features, from £3.15 per 1,000 (inclusive). Send foolscap s.a.e. for samples.—ARA Press, 46 Moat Avenue, Green Lane, Coventry.

TEST-DRIVE a Trio: Transceivers and receivers on demonstration. Licensed operators may try a transmitter by previous arrangement. (Bring your licence with you.)—**Holdings, Photo-Audio Centre, 39-41 Mincing Lane, Blackburn, BB2-2AF, Lancs. (Tel. 59595/6. Closed all day Thursday.)**

QSL Cards for Tx and SWL. Send s.a.e. for samples stating which type required.—**Beaumont, G5YV, 8 Ashfield Avenue, Morley, Leeds. LS27-0QD.**

SEE The Trio TS-510 and other Amateur Equipment at the **York Photo-Audio Centre, Fossgate, York.** Tel. 56176, or evenings 25798. **Cameras and Equipment in Part Exchange.** H.P. terms available. Also **Wanted:** Good commercial equipment for cash or in exchange for Cameras and Projectors.

MAY Issue: Appears April 30. Single-copy orders 25p, post free, to reach us by Wednesday, April 28, for posting on April 29.—Circulation Dept., Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

QSL Cards and Log Books, GPO approved, cheapest and best. Prompt delivery. — Samples from **Atkinson Bros., Printers, Looe, Cornwall.**

QSL CARDS designed by specialists. Send s.a.e. for samples and prices.—New Forest Printing Co. Ltd., 31 Palfrey Place, London, S.W.8.

SYNCHRONOUS Vibrators, 12v. 7-pin, brand new, £50 per 1,000.—**Ring 061-236 4276 (Manchester).**

STAY AT The Cornwall Ham-Radio Holiday Centre. Self-catering furnished accommodation. Six-element beam; 65ft. tower; 90 awards.—Full details from Bernard Broughton, G3XBR, St. Tudy, Bodmin, Cornwall.

READERS ADVERTISEMENTS

2½p per word, minimum charge 50p, payable with order. Add 25% for Bold Face (Heavy Type). Please write clearly, using full punctuation and recognised abbreviations. No responsibility accepted for transcription errors. Box Numbers 12½p extra. Replies to Box Numbers should be addressed to The Short Wave Magazine, 55 Victoria Street, London, S.W.1.

READERS

WANTED: Redifon R.145 Rx, as described June, 1960, "Short Wave Magazine". Also HF/DF type radiogoniometer (as used R.A.F. D/F stations). There must be some of these still about! Please quote details, with price expected.—Box No. 4932, Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1.

WANTED: Morse Keys (Tappers), civil and military types, for collection. Specimens such as the A.M. B1, Marconi, Admiralty and foreign types are required.—Shedd, 20 Heathgate, London, N.W.11.

FOR SALE: Eddystone 830/7. Under year old; plinth speaker; instruction book, £235 o.n.o. Shure Sonodyne dynamic microphone; good; new appearance; £1.40. Prefer collection London area.—Box No. 4998, Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1.

MAY Issue SHORT WAVE MAGAZINE will appear on Friday, April 30. Single copies at 25p post free can be supplied to orders reaching us by Wednesday 28th, for despatch on Thursday 29th, the day before publication. Orders with remittance to: Circulation Dept., Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1.

WE HAVE TO APOLOGISE once again to Readers who follow this section and Advertisers who wish to use this space that our Small Advertisements are so short this month. At the moment of writing, we have had no mail intake since January 18—which means that a large number of Small Advs. must be held up in the postal pipe-line. They will be published at the first opportunity. In the meantime, if you have a notice of your own in prospect, send it in, with remittance, as soon as you possibly can to ensure its earliest appearance. We are continuing to do our best to get back to normality!—Small Advertisement Dept., Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1.

OFFERING: **Circuit Diagram** and notes for R.1475. 75p (15s.) and large s.a.e.—Cresswell, G8DAN, 61 West Street, Tavistock, Devon.

FOR SALE: Codar CR-70A general-coverage receiver, with internal PSU, in good working order, £13.—Pringle, 38 Priory Road, Littlemore, Oxford.

SELLING: National HRO, metered PSU, three band-spread and five GC coil packs, spare valves, manual and headphones, in excellent condition, £22. HRO rebuild, with miniature valves, S-meter, PSU, one coil pack, very stable receiver, spare tuning condenser, filter unit, IF coils, etc., offers? Buyer collects.—Cobb, 14 Dale Road, Swanley, Kent.

FOR SALE: JR-310, with extra filter crystal, excellent receiver, perfect condition, seen Edinburgh, offers nearest £60.—Box No. 4999, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

FILTER Crystals, FT-241, 470 kHz range, further small quantity available, still 25p each but 'phone for frequencies. Various panel meters, new and otherwise, all very cheap.—Dobie, 01-397 5552 (Chessington), or Office 01-636 3676, extn. 309.

SALE Heathkit Mohican Rx, portable, amateur and medium bands, BFO, bandspread etc., £25.—Whitworth, 94 Pine Hill, Epsom, Surrey. (Tel: 26016.)

SELLING: Marconi RF power meter, £5; Crystal Millivoltmeter, £5; 10·7 MHz wobbulator, £8; decade resistance box, £1; 250-500 MHz Marconi frequency meter, £5.—Mendez, 1 Talbot Avenue, London, N.2.

SELLING: KW-2000, complete with AC/DC PSU's, Shure microphone and vehicle mountings, price £145. Will deliver to 100 miles otherwise carriage extra.—Brett, G3HBE, QTHR, Tel. 021-373 3026 (Birmingham).

FOR SALE: AR88D receiver with manual and S meter, good working order, £25. K.W. Vanguard transmitter, coverage 10 to 160m., good working order, £30 or near offer. R.1475 Rx, suitable spares, £5. B.40 receiver, modified to miniature valves, good working order, £20. Airmec Osc. Type 213 with crystal oven and 100 kHz crystal, £5. Redifon two-tone keyer-converter Type GK.189, £7. Manuals for Type 62 Set, 50p each. Eagle SWR Bridge Type K.110, £5. Class-D Wavemeter No. 2 as new, with handbook and spares, £8. Jap bug key, £2. Lots of other items for callers.—Inns, G3XGS, 37 The Warren, Chartridge, Chesham (6921), Bucks.

TRIO 9R-59D, £22. Headphones, modern low-impedance, £1·75. Low-fi tape recorder, faulty record circuit, BSR deck OK, £2·25. Eddystone 898 dial (unmarked), £3. KW LP filter, for London, 75-ohm, £2·50. Nuvistors, 6CW4, with new bases, three for £1·25.—Dobie, 01-397 5552 (Chessington), or Office 01-636 3676, extn. 309.

SALE: Trio JR-310, absolutely as new, with headphones and ATU, fine Sideband receiver, price £57.50. Reason for sale, QTH.—Thorpe, Flat 1a, Cecil Court, Valley Drive, Harrogate, Yorkshire.

FOR SALE: Trio JR-599, boxed and with manual, custom-S de luxe model, coverage 2m. to 160m., bargain at £150.—Box No. 5000, Short Wave Magazine, Ltd., 55 Victoria Street, London, S.W.1.

SPRAGUE 2N 3321. 900 Mc/s. PNP unmarked Transistors, 7½p (1/6) each, 7 for **30p** (6/-), **40p** (8/-) per doz.
BRANDED RADAR. Wideband Amplifiers. 10–60 Mc/s. with circuit details. Price **20p** (4/-) each.
SURPLUS unmarked operational Amplifiers, **15p** (3/-) each, **£1·50** (30/-) per doz.
MULLARD Transistors, BF 197 or BF 196 at **25p** (5/-) each.
AC128–AC127 matched pairs, **30p** (6/-) per pair.
MULLARD Diodes BA 144 at **10p** (2/-), BA 154 at **10p** (2/-), OA 91 at **5p** (1/-).
MULLARD Variable Capacitance Diodes BA102 at **22½p** each (4/6).
BY 128 Silicon Diodes, 1000PIV 750mA, **15p** (3/-) each, **£1·50** (30/-) per doz.
PLESSEY MADT SA52 PNP Transistors **10p** (2/-) each, **90p** (18/-) per doz.
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Printed by The Courier Printing Co. Ltd., Tunbridge Wells for the Proprietors and Publishers, The Short Wave Magazine Ltd., 55 Victoria Street, London, S.W.1. The *Short Wave Magazine* is obtainable abroad through the following: Continental Publishers & Distributors, Ltd. William Dawson & Son Ltd.; AUSTRALIA AND NEW ZEALAND — Gordon & Gotch, Ltd.; AMERICA—International News Company, 131 Varick Street, NEW YORK. Registered for transmission to Canada by Magazine Post. *April, 1971.*