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<table>
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<tr>
<th>Item</th>
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<tr>
<td>DL600 800Watt Dummy Load</td>
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<td>JAYBEAM</td>
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<td>TB2 2 Element Tribander</td>
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<td>TB3 3 Element Tribander</td>
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<tr>
<td>Frequency range: 110 to 130MHz (i.e. all NAV/COM channels, 240 to 290MHz of steps)</td>
<td>£254.00</td>
</tr>
<tr>
<td>Sensitivity: Better than 0.75 microvolts</td>
<td>£254.00</td>
</tr>
<tr>
<td>Memory channels: 100 (10 banks of 10 Memories can be scanned automatically or selected manually. Power required: 24V dc: negative earth 240V</td>
<td>£254.00</td>
</tr>
<tr>
<td>Display can be switched off to reduce consumption when operating portable. Size: 160 x 46 x 130mm. Weight: approx. 1kg (including memory back-up batteries).</td>
<td>£254.00</td>
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</tbody>
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**THE THE SHORT WAVE MAGAZINE**

October, 1986
SHORT WAVE MAGAZINE

(Vol. 44, October, 1986)

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Editor: PAUL ESSERY, G3KFE/..3SWM
Advertising: Charles Forsyth

Published at 34 High Street, Welwyn, Herts. AL6 9EQ, on the last Friday of the month, dated the month following.

Telephone: 04-38715206 & 5207

Annual Subscription:
Home: £17.40, 12 issues, post free
Overseas: £17.40 ($25.00 U.S.), post free surface mail

Editorial Address: Short Wave Magazine,
34 High Street, Welwyn, Herts. AL6 9EQ, England.

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Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one side only of A4 sheets. Photographs should be lightly identified in pencil on the back with details on a separate sheet. All drawings and diagrams should also be shown separately, and tables of values prepared in accordance with our normal setting convention — see any issue. Payment is made at a competitive rate for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd., on publication.

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VHF BANDS

NORMAN FITCH, G3FPK

THIS month's reports cover the launch of the latest amateur satellite, the results of the Perseids meteor shower and the last of this summer's Sporadic E openings, plus the usual ingredients.

The Satellite Scene

As reported in our Stop Press item last month, the Japanese amateur satellite JAS-1 was successfully launched on August 12 at 2045.005 UTC from the island of Tanega shima in the extreme south of Japan. The orbit is an almost circular one inclined at 50°, the nodal period being 115.5 minutes and the track separation 29.24° west per orbit. The average altitude is 1,500 kilometres. The analogue, or JA, transponder has been working perfectly since the first orbit and the 145 MHz Rx seems very sensitive. Users have reported excellent results with the 145 MHz Rx seeming very sensitive.

The latest Keplerian Element Set to hand is no. 7 for August 24 and for computer buffs is:-

<table>
<thead>
<tr>
<th>Parameter</th>
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<tr>
<td>REPFP</td>
<td>3157.1339036°</td>
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Note that the above period is the anomalous one, from perigee to perigee and which is slightly more than the 115.5 minutes, which is the interval between successive equatorial crossings as used for prediction calendar purposes; i.e. the nodal period. The orbit is a highly stable one, as can be deduced from the very small decay figure, so accurate predictions for several months ahead can be made with confidence.

The digital transponder, Mode JD, was due to be made available about the middle of November. The four uplink channels for this mode are 145.85, 145.87, 145.89 and 145.91 MHz, the one downlink channel being 435.91 MHz. AX-25 protocol using Manchester coded FM is needed. This means that the modems in TNCs using the Bell 202 AFSK system will have to be bypassed and replaced by another. Jim Miller, G3RUP, has already designed a suitable modem on a PCB measuring 160 x 100mm. and the description is in AMSAT-UK's Oscar News No. 61.

For Mode JA, the uplink band is 146.000 to 145.900 and the inverted downlink band is 435.80 to 435.90 MHz. Note that to get a USB signal back, you need to transmit on LSB. The general band plan is that the bottom one third of the downlink band is CW, the top third SSB and the middle third is mixed mode. Because of the inverting transponder, ground stations will have to transmit CW at the top end and SSB at the bottom. The telemetry beacon is on 435.797 MHz, usually running CW at 20 w.p.m. The Doppler shift on the beacon will be up to ±8 kHz. Transponder signals will have up to 5½ kHz shift, plus or minus, since the up and down shifts are subtractive.

The expected life of this all-Japanese satellite, now known officially as FO-12, is three years. Our congratulations to the JARL and NASA for a successful project which came to fruition very close to the announced date. For a full account of FO-12 see your scribe's article elsewhere in this issue.

Oscar 10 seems to be in serious trouble still and the Mode B transponder has been on continuously. Since there is no telemetry, the condition of the battery system is unknown. Needless to say, it would be sensible not to use it until AMSAT advises to the contrary. But if you do attempt the occasional QSO, please keep your ERP down to the absolute minimum — 100w or less. John Acton, GI1DOX, (CBA) got up early on Aug. 31 and first worked 7PB8CM in Maseru followed at 0600 by PT2WWV in Brasilia, DG5MAA, HB95DY, HB9SJZ, three Is, six Ws in Illinois, Texas, Minnesota and the Carolinas, and finally SV1AB in Athens for his best O-10 DX session so far. Using only 10w to a 5-ele. Yagi on Aug. 29, Colin Morris, GOCUZ, has been working with DL, OA, SM, UA, VE2 and YU. Using RS-5, Colin had SSB contacts with DL and ON. On 2m. he uses 20-40w to a 5-ele. indoor Yagi or 6m. dipole for overhead passes and his 10m. Rx system uses 20m. dipole antenna.

"VHF Bands" deadlines for the next three months:—

November issue — October 8th
December issue—November 5th
January issue — December 3rd

Please be sure to note these dates.

Award News

Congratulations to Suli (Szigy) Julius, YO2IS, who is member number 69 of the 144 MHz QTH Squares Century Club. His certificate was issued on Sept. 2 with stickers up to 300. He is 45 years old and was first licensed as an operator of the YO2KAB Club station in 1959, his own licence coming in 1962. His XYL, Delia, is YO2DM and prefers HF band operation. Szigy’s first VHF activity was in 1964 but he then operated more on the HF bands until 1975, when Delia took over. After that, YO2IS returned to the VHF's via the satellites.

All his equipment is home made, apart from a Yaesu FT-7, and since 1967 he has been a member of W2MEL’s World Institute of Home Brewers, or WHIB. His 2m. stations runs the legal limit of 400w using a single 4CX250-series PA the antenna being a 10-ele. PAOMS Yagi. All modes except E-M-E have been used to work 341 squares, 308 of which are confirmed. The QTH is in the middle of Timisoara (KF17e). Best tropo. DX is OY9JD/P (W76g) at 2,550 kms., best Ar DX is G3NMS (ZL14e) at 1,775 kms. on 25-7-81 but which Bob has not sent the QSL for, so far.

The breakdown of the 308 squares is, CW 244; SSB 61; SSB/CW 2 and one on FM. Propagation types were, Tropo. 77; Es 68; MS 162 and Ar 1. Szigy is also QRV on 70cm. and lately on 23cm. and enters the Squares Table.

Gerald Nenner, DL8FBD, (EK75f) was awarded his "200" sticker for QTHCC certificate no. 39 on Aug. 22 and now has
202 confirmed. His latest 25 were SSB mode 8; CW 17, with three via Ar; 14 by MS; three via Es and five on tropo. His total of squares worked on 2m. up to Aug. 15 was 266.

Two more readers have joined the 144 MHz VHF Century Club. John Wainwright, G6PBW, from Cutthorpe (DYS) was awarded certificate no. 386 on Aug. 15. His amateur radio interest started in 1975, his first RX being a two valve "H.A.C." set. Later sets included a Sony ICF 8900L and Yaesu FRG-7 used with lengths of wire up to 70ft. John sat the R.A.E. in May 1982 and got his licence in Dec. 1983. His station consists of a Yaesu FT-790R and 30w amplifier with a 5-over-5 slot fed Yagi in the loft and a Yaesu FT-290R and 30w amplifier with a 5-over-5 slot fed Yagi in the loft and a 5-ele. Yagi on a mast outside. He is QRV on 70cm. with a Yaesu FT-790R and outside 5-ele. Yagi. He is a keen WAB type and future plans include some 3cm. work and to take the Morse exam.

Member no. 387 is Gordon Allis, G1LRS, from West Ewell (SRY) whose certificate was issued on Sept. 8. He also began as an s.w.r. in the late 1960s, and did some award hunting, antenna experimenting and some home-brewing. In Dec. 1984 he took the R.A.E., passed it, and got his licence the following February. His station consists of a Trio TR-9130 running 25w. The antenna is a QDX Double Quad-Yagi array at 35ft. Gordon has an Edystone EC-10 and a Geloso 209R Rx for HF listening and a Mosley TA-33JR beam at 35ft. He is studying for his Morse exam. helped by a computer and DRAE Morse Tutor. For details of the QTHCC and VHFC send an s.a.e. to the VHFB address.

YO2IS will be a familiar call to VHF DX-ers and satellite users. Szigy lullus is pictured here with his XYL Delia. YO2DM, in his well-equipped shack. Apart from a Yaesu FT-7 which Delia uses, all the gear is home built, including a computer and the antennas. YO2IS is member number 89 of the QTH Squares Century Club with 388 squares confirmed out of 341 worked by all modes except E-M-E.

better coverage. Its reliability has been excellent with only one component failure and a feeder fault at the Stanmore site. Future plans are for a standby repeater station, a new duplexer for single antenna working and a protected mains supply.

The Group has been building a 23cm. FM repeater/beacon, due to become operational from Bushhey Heath this year. The Tx/Rx QRGs are 1,297.0/1,291.0 MHz respectively. The Treasurer is Brian Greenaway, G3THQ, who would like to hear from anyone keen to make a donation so that more projects can be funded and existing ones maintained. No address was given in this document, so he is presumably QTHR.

Beacon Notes
In the above-mentioned Information Sheet it was stated that the SWHUG was responsible for the GB3SWH 3cm. beacon, also located at Bushhey Heath. It is on 10,360 GHz, horizontally polarised with good coverage. The Tx was built by Les Sharrock, G3BLN, and reception reports are welcomed by Trevor Groves, G4KUJ.

Paul Turner, G4IJE, is reported to have built a beacon Tx and sent it to Norway to test. LA6QBA is a regular participant. G4IJE had a few random MS QSOs in the Persides and wants to do it again in the December Geminids.

Receivers
The Southwest Hertfordshire UHF Group has sent an Information Sheet on the 10th anniversary of its 433 MHz repeater GB3HR. It began operation on Aug. 21, 1976 from a site at Bushhey Heath but is now sited near Stanmore, providing...

Paul Turner, G4IJE, (ESX) sent in a comprehensive computer print-out of all 6m. stations/beacons worked or heard, including crossband QSOs, for the months of May through August. The only in-band DX worked in August was to Portugal. On the 6th, at 1852, he worked GJ3YHU who was beaming 230°. ZB2VHF was copied on the 19th at 2030 on S5 and on the 26th at 0930 at S3. On the 27th it was S9 at 0830 but each time there was nothing else heard on 6m. Since Feb. 1, Paul has worked 12 countries and 44 squares but has yet to work CU, GD, OX, VE, or ZB2 since the band was generally released. He mentions random MS activity every Saturday and Sunday morning from 0615 to 0715 local time on 50.350 MHz with LA6QBA a regular participant. G4IJE had a few random MS QSOs in the Persides and wants to do it again in the December Geminids.

John Jennings, G4VOX, (LEC) worked G3KKJ (CBA) on a flat band at 2315 on Aug. 9. Alex was working G4BLX in Brighton so they made it a three-way. Other new stations worked were G4YBB, G3BUT, G3LRS and G3LPM. Mike Johnson, G6AJE, (LEC) is a keen listener on 6m. and makes crossband QSOs too. He writes that there are a lot of unanswered "CQ" calls so suggests those...
G3XEV was personally delivered by GW3MHW. GW3MHW admits to his Tx getting rather G4HWA (NHM) for to the band. On Aug. 15, John worked activity with G4LPD (NOT) a newcomer to the band. On Aug. 11 he got EI2CA/P (UM) and GB2ZR and GB2YS expedition stations. Telephoned his report and worked the (HLD) on the 12th, completed via MS, GW3MHW (PWS) on Aug. 11; GB2YS. Wickford and/or WN square contact Bill and GB2YS. He did complete with bursts from such as GB2ZR, GB4MTR, and GM4UHV. He thinks most of them are more interested in with S9 signals from the east of England. MS experience in the Perseids copying they were amazed at the amount of activity the EI5 WAR NFD station on July 5/6 and operates -/P from a nearby hill using a home QTH is not good for VHF so Bill 5 -ele. ZL-Special antenna and on Sunday borrowed from EI2CA. He made up a operator and came on the band last May Bray, Co. Wickford, and is a keen 4m. ops make it across the Atlantic. Mike has learned that WAIOUB, who has Powys) had a two-way QSO on Aug. 27 there for any Class B stations. He also thinks it unwise to QRT when the Es is over, since conditions were only fair. YO2IS is a very keen 4m. operator and came on the band first time. Charles wrote some JYs on FM and SV5s. The Asian ones are OD, UD6, UG6 and 4X, while IW9AJZ/IH9 was the African connection. In the Aug. 5 Es, he missed out on UL7AAX (LN53PN) but says the YUs worked him. In the early-August Es, YO4AUL (O6E6g) got the first Turkish QSOs on 2m. by contacting TA1E/2 and TA1D near Istanbul. Also heard via Es were SV9ZBR (Creté), SU1ER (Cairo), some JYs on FM and SV5s.

Charles Coughlan, EI5FK, (Cork) sent a long letter detailing activity up to mid-August. He finally worked EA8XS on July 19 at RS51 but later, Salvador was up to S7. At 2,714 kms. it was his best DX. His short -/P operation from UL square, July 12-15 was quite good with about 100 stations worked in 25 squares, most on CW. The station comprised a Standard CS800, BNOS 100w amplifier with preamp. and a G2BCX type antenna at 20ft. The site was 1.600ft. a.s.l. with an excellent take-off in all directions. Beacons GB3VHF, GB3CTC and FX3THF were audible much of the time even though conditions were only fair. Some of the longer DX included G1KDF (YN), G4SWX (AM), GM4CMX (XP), GM0BQM/P (YP) and G0AEI (AL). Charles wrote while on holiday in Crosshaven where the weather, like the Perseids MS shower, was "poor enough".

Many of his skeds failed, but he did complete with DL8HCZ (FN) and possibly SM6KJX (GR).

Szigy lilius, YO21S, reveals a fascinating picture of what can be worked from Romania and he has 53 DXCC countries from Europe, Asia and Africa. The Asian ones are OD, UD6, UG6 and 4X, while IW9AJZ/IH9 was the African connection. In the Aug. 5 Es, he missed out on UL7AAX (LN53PN) but says the YUs worked him. In the early-August Es, YO4AUL (O6E6g) got the first Turkish QSOs on 2m. by contacting TA1E/2 and TA1D near Istanbul. Also heard via Es were SV9ZBR (Creté), SU1ER (Cairo), some JYs on FM and SV5s.

Szigy reckons that the 1986 Es season has been quite capricious, the best opening being on July 8 from 1600 till 1900. It started with UA3, then OH1 to 8, thence SM2, 3, 4, 5 and 0 down to SM6 and LA, taking in squares from YJ in the north to EU and FT in the south. At the end, the Gs and northern Gs came in and he worked G00BQA (YP) and Marion, GIPEN, (CBA) in YO, the first YL operator on VHF Es. YO21S is a very keen MS operator with over 500 QSOs completed, 80 with PAs as he is chasing his PACQ 2m. award. He has never worked GD so would any IOM reader care to try the first YO/GD MS QSO? Also he would appreciate QSLs from G8ECI and GM3ZBE.
He is definitely of the opinion that the 10th, DL4EA/LA (DU) and on Aug. 3. His CW MS successes included occupied with local QSOs. Ken Osborne, night EI activity is still quite high. QRG5 little to report other than that the Monday Sept. 1.

Ian Rose, G1 PDW, (ESX) has EI3VPH/P (W L) on the 30th and again on GIDOX lists GM3IDS (FFE) on July 26, (GNS) on Flatholm Is. From Cumbria, elements.

gales on the 25th YU7MS (KF), F6DMD (BC), HG7PL and new squares worked were LA8OW August Colin had more success on CW MS and he found the Perseids particularly GB2YS on the 15th. His main interest is GB2YS on the 10th. Ian Comes, EI3VPH/P alias G8GXP in UM on the 

Bob Nixon, G1KDF, (LNH) was on Prior to the move, he completed burst, OK2PZW (JN89 = IJ) for a new square on the 9th, HG5AM (UN79) in poor conditions on the 10th, 16DQE (JN63 = GD) on the 11th which took 50 mins at the height of the shower, LA6QBA/P (JP51 = FV) on the 24th, and SM2CEW (KP15CR = L2) on the 26th via sporadic meteors, the QRBl being 1,950 kms. Later that day, through the rain and gales, he worked GM0CLN/A (I088 = YS) on tropo, and who peaked to 77.

June Charles', G4YIR, (ESX) highlight of August was almost working her first Es station, OE3OKS (IH) on the 4th who came back "G4RIR..." before disappearing. John Lemy, G42TR, (ESX) sent a brief resume of the GB4XN expedition in which 44 squares were worked. Best tropo. DX was 780 kms, and seven MS squares came off, including SM2CEW, all using random meteors. He apologises if people thought they were a bit deaf one evening. This was due to the PA relays arcing over and acting like a 20dB attenuator because of the high resistance contacts.

For G6AJE, Aug. 17 produced calm weather so Mike put his mast up to its full height and was delighted when his "CQ" call was answered by G1JKX/P (NLD), then G6DBE/P (YSN). On Aug. 23 he managed GB2FI but could not make it on 70cm. MIke has learned from K3HZO that in the eastern U.S.A. Es propagation is often noticed on their 220 MHz band, a typical opening lasting 20-30 mins. On 2m. such openings last 2-3 hours. Es openings to the south, to the Caribbean, often happen during the hurricane season, lending support to the wind shear theory to explain E-layer ionisation. While Auroras are rarer than in Europe, especially on 70cm. channel 70, MSs are observed. Finally, he understands that a "state-of-the-art" U.S. 2m. contest station would run two kilowatts into eight long Yagis at 6,000ft. a.s.l.

Ela Marty, G6HKM, (ESX) is another whose household has been suffering from the decorating bug, so no additions to the Squares table. However, a "CQ" call on Aug. 9 brought a response from EI3VPH/P in Co. Cork, followed by a call from EI5Fk (VL). On the evening of the 9th she worked GB2YS. John Fitzgerald, G8XTJ, (BKS) was in California the first weekend of August. New 1986 entities later were GB2RKR (MSY) on the 15th and G4KIS/P (LDR) on the 24th. He is busy with this latest "in thing" of collecting islands for the WAB awards programme. John is now Publicity Manager for the WAB and is also on its Committee, so we are promised occasional press releases. In spite of his severe antenna restrictions, he has achieved his "Gold Award" for 1,000 WAB areas.

Keith Bolet, GJ6TM, worked ICB6J (HA) and YU1GT (K8) via Es on July 17, then went on holiday to Spain and Portugal, taking an FT-290R, 100w
amplifier and 5-ele. Yagi. Operating /CT1 from VA square he contacted EA8XS (SO) and EA8BEX (SN) on July 28. On Aug. 6, while mobile in E2 in YD near Santander, he worked SP9DKD and SP9EWO in JK and DK3RV (GI) via ES using a gutter-mounted 3½-wave whip antenna. From home, XD was another new square.

Paul Baker, GW6VZW, (GWT) wrote, “At last a little success to report ...” Aug. 1 brought tropo. QSOs with FC1CBC/P (AJ) and FF1KTX/P (Y1), then on the 3rd, at 1640, a brief Es event produced I9OWA/TV/GY at 1,950 kms., his best DX. Next day he contacted one YU, and two each OE, HG and OK stations the furthest being H8GCE (KG12c) at 0900 for about 20 mins. All-time new squares were HI, II, JH and KG. OE3NFC was 45 dB-over-S9 and the loudest DX Paul has ever heard. In flat tropo. conditions, he has been working assorted islands for the WAB awards.

Reg Woolley, GW8VHI, (GNW) spends a lot of time operating G6RAF but also worked with 32 confirmed. Szigy who has no idea of procedures. Reg Woolley, GW8VHI, (GNW) spends a lot of time operating G6RAF but also worked with 32 confirmed. Szigy who has no idea of procedures.

**Ken Ellis**

Readers will be very familiar with the pains-taking 50 MHz. research and reporting undertaken by Ken Ellis, G5K, for the best part of half a century. At a Council meeting on Aug. 9, the RSGB unanimously elected Ken as a Vice-President of the Society as, to quote from part of the letter to him, “... a small demonstration of Council’s respect and gratitude for the considerable contribution you have made to amateur radio and for your dedicated services to RSGB”. All of us at the Short Wave Magazine say a hearty, “Hear, hear” to that. This move was started by Ken Willis, G8VR, who edits the VHF section in RadCom., and who well recognises the value of G5KW’s work. We understand that G8VR has resigned from the Council of the RSGB, and also handed in his Executive Vice-President’s badge. It is always sad when an active and very useful member of a team takes such a course: may he be trying to tell us something?

**Magazine Contest**

Some time ago, the idea of a Short Wave Magazine sponsored contest was suggested and readers were invited to comment. A number of you have but the majority has not, so far. Who are those who would have no complaint about your views? If you do not favour any contest at all, then please say so. To date your ideas vary a lot; some would prefer a one-off, single band affair, while at the other extreme, some suggest a multiband, cumulative one. G4VOZ made a plea that the scoring be made as simple as John reckons the RSGB system puts people off. Point taken.

**Finale**

That’s it for the month. Now will we have another wonderful tropo. lift to report from mid-October like we experienced last year? Whatever happens, please send all your reports, comments and table claims to the usual address by the date in the box: — “VHF Bands”, SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ. 73 de G3FPK.
A Multi-Memory Keyer
Part 2

the fully-featured design for all occasions!

PAUL WHATTON, G4DCV

Construction

Both the keyer and the memory board are built on double sided PCBs, the component layouts being shown in Fig. 5 and Fig. 6. Track layout for the keyer board is shown in Fig. 7 and Fig. 8 and for the memory board in Fig. 9 and Fig. 10.

Because of the high track density, especially around the memories, a small tip (for example 1mm bit) soldering iron along with 22 swg solder should be used. PCB pins should first be inserted around the edges of the boards where inputs and outputs are required. Build the keyer board first since this will be needed to test the memories. Mount all the lowest profile components first, i.e. the diodes and resistors followed by the capacitors and any transistors, and finally the ICs. All the ICs used are prone to damage by static, so observe normal precautions for handling CMOS. Since connections are required on the top and bottom of both boards normal IC sockets cannot be used. The author prefers to solder in the 4000 CMOS, keeping sockets for the memories. ‘Soldercon’ type sockets can be used since these can be soldered both sides of the boards. If luxury is desired then turned-pin IC sockets, can with care be soldered on both sides. Take great care not to bridge adjacent tracks on the PCBs, and observe the polarity of all diodes, transistors and ICs.

The keyer should be built into a metal box for RF proofing, the choice being up to the constructor. Both PCBs can be stacked as their mounting holes line-up, the memory board should be placed on the top since access to the EPROM socket may be required. (The author keeps a spare EPROM for portable contests and pops it in the night before going out!) Ribbon cable makes the wiring between the board and memory select switches very neat. Suitable sockets should be provided for the paddles and key output, the author using a stereo and mono jack respectively. Board interconnection and switch wiring is shown in Fig. 11.

Power Supply

The keyer requires a stabilised 5V supply and a simple circuit is shown in Fig. 12. This should be rated to allow the EPROM to be used at a later date if not fitted initially. Three-terminal voltage regulators provide a simple solution and a 7805, 5V, 1 amp device is adequate. If the 2532 is used the regulator should be bolted to the case as a heat sink.

Setting-Up and Use

On switch-on, if the memories are in the ‘read’ mode and a RAM is selected, a string of rubbish will be heard from the sidetone oscillator if all is well. This is because the RAMs are full of random data on switch on, and this needs to be cleared before use. The added complexity of an automatic erase circuit was not considered justified as the RAMs can be quickly cleared. For the moment, switch off the memories with S3 the memory/keyer...
switch. Check the operation of the electronic keyer board with the sidetone-oscillator: dots should be produced when the paddle is moved to the right! (The author knows an amateur who was never told this!) Hold down PB1 on the keyer board, this causes the clock to run at maximum speed. VR1 should then be adjusted to the point where the clock still just runs. This button is used to speed up the clock when erasing a memory.

Switch S3 back to memory and the read/write switch to write. Providing the paddles are not touched the 'fast' button allows a memory to be erased in a few seconds, so holding this button down push each of the RAM select buttons in turn, each time waiting for the 'full' LED to indicate the RAM has been erased. Switching back to read should now produce blissful silence from the RAMs. To write in data switch to write, select a RAM and send with the paddles. Once finished switch back to read, press ‘reset’ and the message should be faithfully reproduced. By loading in a string of PARIS the speed control can be calibrated. Check that the single/repeat switch functions correctly.

To simplify the construction of this project the author has made arrangements to supply the CMOS RAM ICs, fibre-glass, roller-tinned and pre-drilled PCBs and the EPROM if required. The prices are: TC5504-AP3 CMOS 4k x 1 RAM, £2.00; Keyer-board PCB, £4.50; Memory-PCB, £4.50; 2532 EPROM custom-programmed, £10.00. Please include 50p post/packing.

All the other components are readily available from the usual mail-order stockists. Existing KM4000 owners may wish to interface the memory-board to their keyer and so this PCB has been made available separately. If the EPROM is required then please type or clearly print the eight messages required on a separate piece of paper with your address. Please ensure that the
Fig. 8. Keyer board underside (full size)

Fig. 9. Memory board component side (full size)

Fig. 10. Memory board underside (full size)
messages are not longer than 29 words, in the case of a repetitive
message, e.g. a MS CQ call it is sufficient to show the message
once, and then put 'to end' after it. The author will then fill up as
much memory as possible with that message. For example:

1. CQG4DCV to end
2. RRRRRRRRG4DCV to end
3. CQ CQ CQ DE G4DCV G4DCV QTH JO01QD JO01QD CQ
   CQ CQ DE G4DCV G4DCV G4DCV AR PSE K etc., etc.

The author's address is: 36 Jubilee Road, Littlebourne,
Canterbury, Kent CT3 1TP.

OVER the last couple of months we have been looking at the
various ways of getting on-board voltage stabilisation and
this has led to several enquiries for information on complete
power supply designs. This is not as easy as it may first appear,
simply because of the various voltage and current requirements
that may be called for to satisfy varying needs. However, there are
some basic guidelines that can be given to enable you to put your
own unit together.

Hit or Miss?
A power supply usually seems to be put together these days by
the simple expedient of buying a few odds and ends at a rally and
fitting them all into a box. This ends up with a working system but
its correctness for the job and its reliability could certainly be
questioned. So what is required? Let us look at the basic design
steps that will result in a well engineered unit at reasonable cost.

Specifications
The first, and known, requirement is obviously the voltage
output you need and for our purposes we shall assume that you
require a standard 12.0 volt supply. The next point to determine is
the current capability that you need and here it is a good plan to go
a little bit on the generous side as the difference in overall cost of
upping the capability by fifty per cent is not likely to be significant
when you take into account the cost of the case, terminals, meters, etc. Let us assume you decide on ten amps for your supply.

**Heavy Metal**

Finding a suitable transformer will probably mean digging around at rallies and junk sales as the cost of a new 150 watt transformer can be a bit nasty. Incidentally 12 volts at 10 amps is only 120 watts so where did that extra 30 watts come from? Do not forget to allow for the voltage drop in the rest of the circuitry, and, taking this into consideration, what we actually need is a transformer that can supply around 16 to 18 volts at full load. This need not be supplied by one winding so do not forget to add together the various secondaries that are on the lump of metal you find.

**Options**

For instance an old valve heater transformer with two secondaries of 6.3 volts and one at 5 volts could have all of them wired in series to provide 17.6 volts, which would be just about right. Another option is to wire suitable voltage secondaries in parallel to give the current rating you require. When doing this wire an AC voltmeter across one secondary and then, while keeping an eye on the meter, connect the other secondary across the first. If you have got it the right way round the voltmeter will stay the same but if you have the windings out of phase the voltage will disappear. The same type of test is done when wiring the windings in series, but in this case the voltage will either add or subtract the voltage of the added winding.

**Booster**

A little bit of voltage boost can be obtained on the older type of transformers which have several mains input voltage taps by taking the usual 240 mains input to the 220 or even in extreme cases the 200 volt input points, hence gaining a 10% or more increase in output voltage, say 1.5 to 2 volts on the secondary. If all else fails then look into the possibility of winding a few extra turns onto the transformer; this is only possible if there is a little space between the windings and the core into which the extra turns can be wound.

**Extra Turns**

Before winding on the extra turns measure the output voltage of the secondary as it stands with no load connected. Next connect a length of wire to one terminal of the secondary and then wind on perhaps ten turns of wire and check to see what the new off-load voltage is. If it is less than the original remove the wire and reverse the direction of the winding. Once you have found out the extra voltage obtained from the ten-turn additional winding it is easy to figure out the number of turns required to get the voltage you need. Wind the new winding on evenly while keeping some tension on the wire and then finish the job with a couple of coats of varnish. Remember that the wire you use must be able to carry the full load current and should be well insulated. As can be seen these measures give quite a lot of scope when looking for a transformer.

**Rectifier Diodes**

These diodes come in many shapes and forms from the single diode typified by the 1N4000 family of devices through the heavy duty stud mounted types, which are available in both positive and negative stud types — so be careful when mounting them, and onto the “four in a package” surface mounting bridge rectifier types. The peak inverse voltage rating of the diodes is something to be considered and in this connection one important point to bear in mind when choosing your rectifier unit is whether it will be used in a full wave or a bridge configuration. If they are in the bridge circuit then the diodes need to be able to stand only 1.5 times the r.m.s. input voltage but in the full wave system they have to stand three times the r.m.s. input voltage. The reason for this is that the diode “sees” the peak input voltage plus the off load charge on the reservoir capacitor which will be equal to the peak input voltage. In the bridge rectifier there are always two diodes conducting at any one time so each diode sees only half of this combined voltage. Once again it is sensible to use diodes which will stand well over the expected voltage simply because transient spikes on the mains input can cause much higher voltages to be present than one may imagine.

**Testing**

One frequently sees bargain bags of unmarked rectifier diodes at the rallies and these can provide an excellent source of supply . . . if you know what you are doing! Unless you are sure that you can sort them out then do not take any chances but go for a marked, known device. The additional cost is usually not great and remember that a blown diode can cause a catastrophic failure of the attached equipment unless suitable precautions have been built-in to guard against over-voltage. Diodes can be easily tested for polarity with the usual type of ohmeter. Simply connect the leads from the meter to the diode and note the reading; now reverse the connections and check the reading again. In one direction you should have a very high reading and in the other direction a low one which will at least show that the diode is a working one. The polarity is indicated by the negative lead from the meter which will, in the low ohm reading direction, be connected to the anode of the diode whilst the positive lead is, of course, connected to the cathode. This apparent reversal of the expected result is due to the fact that when measuring resistance the negative lead of the usual analog type of meter is connected to the positive pole of the meter’s inbuilt battery.

**The Capacitors**

The reservoir capacitor is usually chosen on the basis of fitting the largest value that can be found at the rally but, as with so many points of supply design, there is more to it than that. First of all we need to get some idea of the minimum amount of capacity that is required and then resist the temptation to use significantly more. The reason for this is that when you first switch on there is a tremendous surge of current into what is, effectively, a short circuit caused by the discharged capacitor and the resulting high mains current will probably keep blowing your fuses for you unless you fit a “soft start up” system.

**How much?**

In the usual electronically stabilised type of power supply a good rule of thumb is to use somewhere around 2000µF for every ampere capability of the supply, so for a 10 amp unit something in the region of 22000µF would be about right. If you use anything much less than this then the voltage across the capacitor will sag to less than the minimum required to operate the regulator correctly during the non-conductive part of the diode cycle and ripple will appear on the output voltage.

**Ripple Current**

Remember that there is a very high AC current flowing through the rectifier circuit and that this current has to flow through the reservoir capacitor. This component must be able to handle an AC or ripple current at least equal to the full current capability of the power supply. Sometimes this rating is marked on the capacitor, but if it is not then look for the type with screw terminals and, most likely, fluted sides to the can. The reason for these heavy terminals is to carry the heavy ripple current and this will also give you a clue to as to the sort of wire which is required to make the connections to the capacitor: none of this “heavy copper leads on all the obvious current carrying leads and then a bit of hook up wire to connect the electrolytic!”

Next month we look at heatsinking, stabiliser circuits and ways of providing over-current and over-voltage protection.
Oscar – 12
an all-Japanese satellite
NORMAN FITCH, G3FPK

History
SINCE the first OSCAR — Orbiting Satellite Carrying Amateur Radio — was launched on December 12, 1971, a total of fourteen, long life, amateur-built spacecraft has been successfully placed into orbit around the Earth. These were Oscars 6 to 11 and the Soviet RS-1 to 8; Oscars 1 to 5 were short-lived satellites. The western ones have been designed and constructed by AMSAT teams in various countries, including the U.S.A., the U.K., Germany, Australia and Japan, and launched from sites in the U.S.A. and French Guiana.

Japan’s involvement with the amateur space programme dates back to 1976 when its JAMSAT group developed and built the Mode J transponder for O-8 which was launched on March 5, 1978. Such was the success of this module that the Japanese considered the idea of building a complete satellite, initially identified as JAS-1. JAS-1 was promoted by the Japanese Amateur Relay League (JARL) as a joint venture with the NASA space agency. The NEC organisation built items including the space frame and power supplies and the JAMSAT project team designed and constructed the transponders, telemetry, command and housekeeping computer, and the ground support systems.

Mission Objectives
The objects of the mission were:
(i) to provide reliable worldwide amateur radio communication,
(ii) to enable radio amateurs to study command and tracking techniques,
(iii) to offer a “proving ground” in space for amateur-built transponders and sub-systems,
(iv) to provide an opportunity for the NASA to carry out a multi-payload launch by the new H-1 launch vehicle.

Description
The spacecraft is a 26-facet polyhedron measuring 400 by 400 by 470 millimetres and weighing 50 kilogrammes; 25 faces are covered with a total of 979 solar cells which were designed to generate about eight watts of power. The eleven nickel-cadmium battery cells have a capacity of 6AH and supply 14 volts average to generate about eight watts of power. The eleven nickel-cadmium battery cells have a capacity of 6AH and supply 14 volts average to generate about eight watts of power.

The Launch
The launch of the two-stage NASDA vehicle H-1 was identified as Test Flight 1. The three payloads were JAS-1, an Experimental Geodetic Payload — EGP, and a Magnetic Bearing Flywheel — MBFW. The launch site was on the island of Tanega shima in the extreme south of the country, latitude 30°.23'.45"N, longitude 130°.58'.22"E. “Blast-off” was on August 12, 1986 at 2045 and half-second UTC. At 2147 UTC, when the vehicle was over Chile in South America, JAS-1 was successfully separated from the second stage of the H-1 and the 70cm beacon was automatically activated. At this point, once the satellite was on its own, it became OSCAR-12, now known as FO-12 after its subsequent christening as “FUJI”. At 2205, the first telemetry signals were received by the University of Surrey’s UoSAT Command Station and as the spacecraft came over Europe, the JA transponder was on and stations were using it. The JARL Tracking and Command Room in Tokyo had to wait till 2239 for its telemetry reception, which lasted twelve minutes.

The Orbit
FO-12 was placed in a near circular, direct orbit inclined at 50° to the equator. The period between successive equatorial crossings is 115½ minutes and the average altitude is 1,500 kilometres. Thus, FO-12 passes over all the area of the globe between latitudes 50°N and 50°S and should be “seen” by observers up to 86°N and down to 86°S. For British Isles observers, the satellite will travel right overhead along the English Channel when it crosses the equator in the west. For those with polar projection maps, the range “circle” will be very slightly larger than that of the old O-7, by the thickness of a pencil line. Up to seven orbits per day are in range, the majority between 20 and 24 minutes duration.

Satellite orbits are defined by a set of Keplerian Elements and the latest ones available at the time of writing were Set No. 7 for August 24. They were provided by AMSAT-UK’s “Hot News” service and are reproduced in Table 1. They are essential data for those using computer programs for orbital predictions. However, all that is required to establish details of the period, track separation, altitude, relative velocity, Doppler shift and semi-major axis is the mean motion, orbit inclination and eccentricity.

In the case of near circular orbits, little error is introduced by ignoring the eccentricity, though. A direct orbit is one inclined between 0° and 90° and is so called because the satellite rotates in the same direction as the Earth. Those inclined at 90° to 180° are called retrograde, since the satellite then rotates in the opposite direction to the Earth’s rotation. For further reading about satellite orbits, see Ref. 1.

When will FO-12 be in range?
To enable a fairly accurate prediction to be made for the aquisition period of any orbit, Figure 1 has been prepared. This diagram is for the London area. (See Appendix 1.) To use it you need to know when one orbit in the day crosses the equator and at which longitude west of the Greenwich meridian this occurs. (Note that in amateur satellite work, longitudes are always measured west from Greenwich, so are in the range 0° through 360°; e.g. although Stockholm is in usual parlance at longitude 18° east, in satellite context it is 360° - 18° = 342° west.) This EQX/°W information is published by AMSAT-UK and should be available on the RSGB’s Prestel service.

An example will illustrate the use of Figure 1. Let us take an orbit which crosses the equator at 1200 at 60°W. Looking up the

<table>
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<tr>
<th>Satellite</th>
<th>FO-12</th>
</tr>
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<tbody>
<tr>
<td>Epoch</td>
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<td>Inclination</td>
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<td>RAAN</td>
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<td>Argument of Perigee</td>
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<td>Mean Motion</td>
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<td>Semi-major axis</td>
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<tr>
<td>Anomalistic period</td>
<td>115.719504 minutes</td>
</tr>
<tr>
<td>Apogee</td>
<td>1508.751 kms.</td>
</tr>
<tr>
<td>Perigee</td>
<td>1491.469 kms.</td>
</tr>
<tr>
<td>Reference perigee</td>
<td>3157.13390363</td>
</tr>
</tbody>
</table>

Table 1. Keplerian Element Set No. 7 for FO-12.
“60” line, the AOS curve crosses the minutes-after-EQX line at about 12, so the satellite will be in range at 1212. The TNA curve is reached at about 12, so the satellite will be in range at 1212. The 243° figure is the azimuth or true beam heading. The TNA curve is reached at about 124 at a beam heading of 167° when the elevation would be about 70°, and the satellite will go out of range when the LOS curve is reached at 1236, by which time the azimuth will be 78°. To track FO-12, the antenna will always have to be rotated periodically anticlockwise, e.g. from west, via south, to east. Once you know the EQX/°W for an orbit, others can be calculated by adding 1h.55m.40s. to the time and 29.24° to the longitude west per orbit. For the author’s QTH orbits between 178°, through 90° to 347° are in normal range.

What does FO-12 do?

The spacecraft carries two Mode J transponders which require a 145 MHz uplink signal and which transmit into the 435 MHz band. The reason for this way round is that the 435 MHz band is very much quieter than is 145 MHz, so there is a better chance to hear weak signals. The first transponder is referred to as JA, meaning Japanese Analogue, and is a linear one. The downlink passband is 435.80 to 435.90 MHz and its transmitter has an output power up to two watts p.e.p. The uplink passband is 146.00 to 145.90 MHz and it is an inverting transponder. This means that a lower sideband signal transmitted on 145.90 MHz will be translated into an upper sideband one on 435.90 MHz, plus or minus Doppler shift. — see Appendix 2.

The second transponder is called JD, meaning Japanese Digital, with one only downlink frequency, 435.91 MHz. To access this, you have to operate on one of four uplink frequencies; 145.85, 145.87, 145.89 and 145.91 MHz, using Manchester coded FM. The JD Tx runs one watt and this is not a “digipeater” operating in real time, but a storage-and-forward device. It is very aptly described as an electronic mail box enabling suitably equipped packet radio stations to send messages to it for subsequent retrieval by other radio amateurs, anywhere in the world. Simple commands will enable users to upload, read, list and erase messages. This system has been very successfully demonstrated by the University of Surrey’s UoSAT-2 or UO-11, since early this year, in its DCE or Digital Communications Experiment. A problem with this system is that there will probably be several stations, who cannot hear each other, operating simultaneously on one channel, so the uplink will be subject to packet collisions. This scheme is known as “Pure Aloha” and to maximise efficiency four uplink to one downlink channel were adopted.

All amateur satellites incorporate one or more beacon channels which carry important telemetry messages and news items. FO-12 has one beacon on 435.797 MHz which runs 100 milliwatts. Normally it sends telemetry in CW at 20 w.p.m. but it can be switched to PSK or phase-shift keying.

Ground Station Requirements

Mode JA only requires a Tx for SSB and/or CW modes for 2m. and a decent 435 MHz Rx. Anyone who operated O-8 on Mode J in the past will have the capability to use FO-12. JAMSA T suggest a maximum of 100 watts EIRP should be quite sufficient at extreme range, e.g. a 10w Tx with a 10 dBi gain antenna system. The 70cm. Rx should have a low noise figure and a 15 dBi gain antenna is recommended. The 2m. antenna need only be a linear one, such as an ordinary Yagi, since the Rx antenna on the spacecraft is a monopole. Your 70cm. antenna should ideally be a crossed, or X-Y, Yagi so that left-hand or right-hand circular polarisation can be selected.

To use Mode JD, you will need a 10w FM Tx and the same 70cm. Rx and antenna as for Mode JA, any AX-25 protocol Terminal Node Controller — TNC — (2), a terminal device and a Modem (3) between the Rx/Tx and the TNC. Since the uplink is exclusively “OR-ed” with its clock, i.e. Manchester coding, standard TNCs incorporating a Bell 202 AFSK modem cannot be used. They would have to be bypassed and an external modem substituted. The terminal would consist of a keyboard for inputting data and a TV screen and/or printer for receiving data. An RS-232 connection is needed for the TNC. Many home computers, with suitable software, would make ideal terminals of course.

The Telemetry

The Mode JA telemetry has 12 analogue channels and 33 system status flags and can be sent without the aid of the spacecraft’s computer. The Mode JD TLM has 29 analogue channels and 33 system status flags and this software driven TLM can include short messages. It can be transmitted on either the JD downlink or on the JA beacon frequency, 435.797 MHz. The analogue TLM consists of five rows of four, three digit numbers preceded by “HI HI”. The first four numbers start with 1, the
MSIs are used but no ROM is provided. Instead a simple area. The spacecraft has five hardware HDLC controllers, four available for message storage. The memory unit is divided into protected by an error detection and correction circuit. The system in Integrated Housekeeping Unit, IHU. 48 NMOS 256K microprocessor with a 1.6 MHz clock and which also functions as hardware bootstrap circuit is used to increase system reliability.

In FO-12 a simple bar magnet system is used, two in its Z-axis. This is unsatisfactory for a communications satellite will tumble about. This is unsatisfactory for a communications

next four with 2, and so on. The first three rows can be decoded by the formulae in Table 2. As examples:— (i) if channel 2C was 234, then N would be 34. The decoded parameter would be 51 x (34 - 15.8) = 928, which would be the output power of the JA Tx in milliwatts; (ii) if channel 3C was 343, then N would be 43. In this case, the decode would give 1.39 x (68.9 - 43) = 36, being the baseplate temperature in degrees Celsius.

Using FO-12

No doubt most operators will use this new satellite for the usual kind of real-time SSB or CW QSOs. However the range is limited. For example, someone in London would have just about two minutes to contact a station in Miami in the U.S.A. during the most favourable passes, whereas the electronic mailbox facility offered by Mode JD makes it possible to communicate with others virtually anywhere in the world. These would not be real-time QSOs since you would transmit your packet message to FO-12, which would then store it. Your correspondent in, say, Melbourne or Hawaii would be able to retrieve it when the satellite was conveniently in view some hours, or even days, later.

Successful real-time operation requires a degree of skill, coordination and nimbleness. You need one hand to operate the Morse key or microphone, another to tune the Rx to cope with the Doppler shift, another to operate the azimuth control and a fourth to operate the elevation control of the antenna system. In most passes, the antennas will have to be rotated through 150° or more in azimuth. Anyone near the 50°N latitude parallel would have a hectic couple of minutes when the spacecraft came in from the west, passed overhead, then whizzed off to the east. For someone further north, say in Aberdeen, the maximum elevation would be a more manageable maximum of about 58°. There is scope here for a genius to develop a system whereby the computer’s ability to derive the AZ/EL figures every couple of minutes could be used to automatically control antenna aiming as per (ii) of the Mission Objectives section.

More Spacecraft Details

Unless some measures are taken to control it, an orbiting object will tumble about. This is unsatisfactory for a communications satellite so some method of attitude control is always incorporated. In FO-12 a simple bar magnet system is used, two in its Z-axis.

The digital transponder is controlled by a screened NSC-800 microprocessor with a 1.6 MHz clock and which also functions as in Integrated Housekeeping Unit, IHU. 48 NMOS 256K DRAMS are used to provide 1.5 Megabytes of memory, entirely protected by an error detection and correction circuit. The system program occupies 32 kilobytes, the rest of the memory being available for message storage. The memory unit is divided into four 256-k-byte cards any one of which can be assigned as a system area. The spacecraft has five hardware HDLC controllers, four for the uplink channels and one for the downlink one. 140 CMOS MSIs are used but no ROM is provided. Instead a simple hardware bootstrap circuit is used to increase system reliability.

First Results

Up to the time of writing, FO-12’s JA Rx has proved to be very sensitive such that NK6K has reported satisfactory results using only one watt to a KLM Yagi antenna. Initially the downlink signals were subject to very deep fading due to the random spinning of the satellite. By the time this is published, this tumbling should have been very much reduced and dampened out by the passive stabilisation system. In the long term the tumble rate should phase lock with the orbital period. The JD system was undergoing evaluation and the aim was to inaugurate it to all by about mid-November.

Alligators

No satellite article would be complete without mentioning the need to use the lowest Tx power commensurate with getting reliable access to the transponder. All past and present satellites have, and do, suffer from the “Alligator Brigade”, so called because they are all mouth and no ears, and who insist on running high power to a group of long Yagis more suitable for an E-M-E station. Of course, they will always gain access but in so doing, their big signals will so desensitise the transponder’s Rx through its AGC action that those operators sticking to the recommendations will never get a look-in. The “no ears” refers to these selfish operators who probably have very inefficient receiving systems; an ancient corroded antenna, old and lossy feeder probably full of moisture, and a multimode transceiver with an Rx noise figure of 8 dB.

The Mirrorball

Finally, a mention of the EGP experiment launched with JAS-1. This is a totally passive sphere, 2.15 metres diameter, made from fibre-reinforced composite resin material. The surface is covered with laser retro-reflectors and plane mirrors and the Mirrorball weighs 685 kilogrammes. It is specifically designed to be ranged by the most accurate of all “radars”, laser light, so perhaps we should call these “ladars”, i.e. Laser Direction And Range? It should be visible up to magnitude 1 from 15 minutes after sunset till perhaps local midnight, and from about four hours before dawn till about 15 minutes before dawn.

References


2. Terminal Node Controller topics were covered in the “Data Comms” feature by Ian Wade, G3NRW, published in Radio Communication (RSGB) March and April, 1986.

3. For details of TNCs and Modems send a large s.a.e. to The Secretary, AMSAT-UK, 94 Herongate Road, London, E12 5EQ.

Appendix 1

Figure 1 was prepared for the author’s QTH in London. For someone living in SW Wales, when FO-12 crosses the equator at about 90°W, AOS and LOS would be about 1½ minutes earlier. The longitude of Milford Haven, for example, is 5°W. Since the “sausage” shaped graph remains the same, it is only necessary to renumber the Degrees Long. West axis by adding your own “sausage” shaped graph remains the same, it is only necessary to renumber the Degrees Long. West axis by adding your own...
Appendix 2

The Doppler shift depends on several factors. These are:

(i) the satellite velocity, which is calculated from the gravitational mass of the Earth and the distance of the satellite from the centre of the earth,
(ii) the inclination of the orbit,
(iii) the latitude of the observer,
(iv) the slant height of the satellite from the observer.

To take an example. Consider an observer at latitude 52° and FO-12 satellite just coming over the horizon at a range of 4,610 kms. The actual satellite velocity is 7.118 kms./sec. but allowing for the rotation of the Earth, which in this case is in the same direction as the motion of the spacecraft, the relative velocity at latitude 52° is 5.627 kms./sec. Now if the ground station transmits on exactly 145.95000 MHz, the satellite’s Rx will receive the signal on 145.952737 MHz, a Doppler shift of 2.737 kHz. The transponder’s translation frequency is 581.8000 MHz, so it would relay this signal at 581.800000 – 145.952737 = 435.847263 MHz.

On the return journey at this higher frequency, the Doppler shift will be more, 8.173 kHz in fact. Thus the ground station will receive a signal on 435.847263 + 0.008173 = 435.855436 MHz. Therefore, the two Doppler shifts are subtractive and the maximum shift is ±5.436 kHz. The ±8 kHz shift referred to by some users applies to the beacon signal. For a comprehensive discussion of Doppler effect see the RSGB’s VHF/UHF Manual, 4th edition, pages 10.2 and 10.3.

SWITCHABLE LOWPAS FILTER UNIT

DURING the course of a year I do quite a few club talks. I enjoy meeting club members and enjoy even more talking about amateur radio construction. A few weeks ago I was talking to one of the clubs in a pleasant part of Lancashire . . . and there are plenty of those. One of the club members commented upon my use of low pass filters at the end of QRP transmitter designs and suggested that I might like to do an article about a switchable low pass filter unit. His idea was that such a unit could be built for a range of amateur bands and be placed in front of an ATU or a 5052 antenna. Then simple little transmitters could be used, with a 50Ω output impedance directly into the unit without the need to build separate low pass filtering in each transmitter. Had I got such a design?

Well — I almost had what he required because sometime ago I built up the HF Linear PA kit supplied by Cirkit Holdings (Stock Item: 41-00903). This is a broadband Class-A power amplifier capable of 15W output for 1.0mW input over the range 1.6 to 30 MHz. I intended to use it as a testbed amplifier for homebuilt projects and to that end I built a switchable series of low pass filters for its output. The designs for these filters could easily be used to provide a convenient switchable low pass filter unit. In fact the little PA kit with the switchable filters would be a useful unit for any radio amateur because with a small signal source it will make a clean and useful CW transmitter for any chosen band or bands.

7-Element Low Pass Filters

Readers who have followed my articles in recent years (there must be some) will have noticed that I use design material supplied by Edward Wetherhold, W3NQN, for my low pass filters. This follows what I believe to be a definitive series of articles by W3NQN on low pass filters in Short Wave Magazine (“Low Pass Filters for Attenuating RF Amplifier Harmonics”, Parts I & II,
The *Cirkit* HF linear amplifier housed in the case

*photos: Jo-Anna*

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**S.W.M. Dec. 1983/Jan. 1984**. These articles discussed the use of 7-element Chebyshev capacitive, 50Ω, input/output filters. The article described the design and performance characteristics of such filters, comparing them with other low pass filter designs. The theory and mathematics may have put some readers off the articles. That is a shame because they concluded with a set of data for designing a very useful set of filters. W3NQN worked on the basis of using standard values of capacitance in his filter data, a very useful starting point because many filter designs contain non-standard values of capacitance which have to be cobbled together using combinations of preferred values.

The latter part of the two articles describes how to design effective low pass filters for amateur band use, using standard capacitance values, for powers of up to 200 watts. Not only is an extensive computer readout provided for a range of useful frequencies but the information is given to calculate simply the number of turns required on a selected range of toroidal cores. The cores can be chosen according to the frequency range and power handling capacities of the required filter. There is even a chart to show what gauge of wire is ideal for a particular winding. The only mathematics involved is one simple calculation which requires a square root function on a pocket calculator. In short, this little series of articles represents a complete guide to making low pass filters for amateur band use. I use the data all the time and these filters have become my standard range of low pass filters for RF attenuation in transmitters.
Practical Filter Designs

The circuit of the standard 7-element low pass filter is shown in Fig. 1. The design uses seven components as the name suggests. In some amateur radio designs 5-element low pass filters have been commonly used but for the marginal extra cost of one more inductor and capacitor, the results are worth the minor addition. Beneath the circuit is a chart showing a series of filter designs worked out from the W3NQN data. These are the designs I used in my switchable bank of low pass filters mentioned above. The top portion of the chart shows designs for six bands (3.5, 7.0, 10.1, 14.0, 21.0 and 28.0 MHz). This is because I used a readily available, and cheap, 2-pole, 6-way wafer switch for the filters. I built filters for the six bands I most commonly use. Below is the data for the three other HF amateur bands should these be required. If the constructor wishes to build a switchable low pass filter unit for all ten bands in the list there are suitable switches. I would suggest the Toko 'F' series push-button switches sold by Cirkit Holdings. A 2-pole switch module would be required for each band with the associated hardware to make up a bank of push-button switches. That would make a smart unit — I might try it myself, someday!

The information given in the chart is for a series of filters capable of handling 10 watts of RF. Notice that the small T37 cores have been used for every band except 1.8 MHz. It is surprising how much power these little cores can handle in low pass filter applications; in fact, the design for 28 MHz is good to 200 watts and the 14 MHz and over designs can handle 100 watts. The 10-watt level is all that I ever require but should beefier filters be wanted, the reader can refer back to the W3NQN articles. Along with all the other information, he supplies a chart of the power handling capabilities of toroidal cores.

The toroidal cores used in these designs are easily obtainable in the U.K. (see footnote). They are iron powder cores not ferrite core. Most of the surplus cores seen for sale at radio rallies are ferrite so sadly this is one case where the proper items have to be bought. The T37/T44/T50/T68 and T80 range are manufactured by Micrometals Inc. in the U.S.A. and are often sold under the 'Amidon' name. The T-designation is the size of the core; the T50 types have an outside diameter of 0.5", the T37 is 0.37" and so on. The final number in the coding refers to the iron dust mix of the core: T50-6 is "6 mix" and T37-2 is "2 mix" for examples. The mixtures are used at various frequencies. For the HF bands, the rough rule of thumb is to use the 6-mix at above 7 MHz and the 2-mix below 7 MHz.

The choice of capacitors is also important. Good quality frequency stable types must be used. I tend to use the common polystrene capacitors; do not confuse these with the polyester types. The voltage rating of the polystrene capacitors is suitable for my applications. The more expensive silver mica types can also be used. Do not use the cheap and common miniature ceramic plate capacitors.

Building the Unit

Fig. 2 shows the circuit for a switchable low pass filter unit based upon a 2-pole, 6-way wafer switch. The switch simply selects a filter by placing the input and output points across it. When built the unit should be housed in a screened box or metal case with a proper input and output socket to match to station standard. I use the cheap phono sockets. It is also useful to have screened leads between the sockets and the switch banks and filters.

Fig. 3 shows the technique I used to mount the bank of filters. I used a piece of printed circuit board blank cut with grooves into a matrix of 5mm square pads. These pads form the solder points for the connections; C1, L2, C3, L4, C5, L6 and C7 are mounted in line as shown using the square pads. The ground connection pads are joined together by a blob of solder which bridges adjacent pads. These solder bridges are placed on the corner where four pads meet, as shown, to allow a spare line of bridged pads to be a ground screen between each set of filters. The layout is compact but not difficult if a little care is taken. The individual constructor could choose whatever method suits, perhaps Veroboard or an etched circuit board. If Veroboard is used I recommend bridging unused tracks and bits of tracks to form a ground mat for screening.

The photograph shows my switch unit — it is nothing like the description above! It was for placing inside the linear amplifier case and was compact with smaller spacing on the matrix board. That was fiddly but others might like to try a more compact approach.

There we have it — a switchable low pass filter unit to order. After having described it I might now build one . . . or at least another one that is not dedicated to a single purpose.

SOURCES:

Toroid Cores: TMP ELECTRONICS, Unit 17, Pinfold Workshops, Pinfold Lane, Buckley, Clwyd CH7 3PL. (0244) 549563. (Or Cirkit.)

Switches: CIRKIT HOLDINGS, Park Lane, Broxbourne, Herts. (0992) 444111.
**OBLAST CORNER**

NIGEL CAWTHORNE, G3TXF

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**Oblast Survey**

The results of the ‘rarest’ oblast survey shows that UA8T (174), UA8V (175), UA9G (141), UA0H (106), UH-W (45), UI-D (173), UI-U (55), UI-V (181), UL-K (24) and UL-Y (176) are the ten most wanted oblasts. The ‘top three’ most wanted appear to be UA8V (175), UI-V (181) and UH-W (45). Everybody, it seems, needs these. Paul, G4PWA, is the only one lucky enough to have found an UA8T (174).

Thanks to all those whose sent in lists of their ‘wanted’ oblasts.

**Expeditions**

RSGB’s DXNS reports that UZ9OWB/RD will be QRV from UD-K (003) from 21 September onwards (QSL via UA9OJ). RA6AR and others were scheduled to be on from the much sought-after UF-0 (015) from 13-21 September, with QSLs to RA6AR.

DXNS also reported UA1OHL as being a new station on Franz Josef Land. RZ1OWA and UV100 appear still to be very active from FJL.

**Iceflows**

An item in ‘Airport International’ reports that a new research station and airfield are being built on a remote iceflow in the Arctic region.

Apparently the previous floating ice airfield serving North Pole 28 drifting research station was split apart by a severe cyclone. A landing strip has been cleared and permanent prefabricated buildings are currently being installed. Amateur radio activity has started keeping an SWL log. Thanks to all those whose sent in lists of their ‘wanted’ oblasts.

**Mailbag Notes**

Several readers have noted that their 1986 scores are already ahead of their 1985 figures.

Paul, G4PWA, who heads the All-Time worked list, reports UZ0JWA (112) and UA00DW (111) as two recent new ones. Paul also notes QSOs with UA9AN/UI (047), UAOZAA (100), UI8LF (48), UI8YAD (030) and UM9MWA/UP8 (177). This last station was an expedition which was also active as UM9MWA/US8Q (033) in mid-July.

Paul, who keeps separate CW and SSB oblast worked lists comments that some oblasts seem to be rarer on one mode than the other, but he adds that “on CW, unlike SSB, I find I can work nearly everything I can hear. On CW, skill in tracking down the oblasts is more important than having a good signal”.

John, G4WSX, confirms that EK9AD is in UA9C (154). John also reports contacting Boris, UM9MWA, operating both /U8P and /U8Q for two new ones.

Steve, GW4BKG, asks if anyone has any info on QSL routings for EM3A and EM0C, both worked several years ago. The oblasts for these are likely to be UA3A (170) and UC2C (099) respectively.

Alex, G4UNH, reports UA0ZDD (128) as a gotaway during the IARU HF Championship Contest in July.

Richard, G4ZFE, found that both the IARU and the WAECW contests produced some new oblasts. Recent contacts include the extremely rare 106 oblasts: UA0HAU as well as ULSGW (190), RJ8J (040) and UM8NAC (094). Richard queries the 4J4F worked during the IARU contest. This one was just a plain UA4F (148) in disguise!
not known how the ratings in the USSR ‘top-ten’ are worked out, but international contesting probably figures somewhere in the calculations.

The winning SWL in the same 1985 championship was UA9-145-197.

‘Creative Logging’

In the same issue of Radio on a less happy note, there is an item headed ‘falsifiers punished’. The item notes that two stations (UA6HPP and RA6HE) were closed down for three months and 304

THE SHORT WAVE MAGAZINE

October, 1986

November 9th (0000-2400z) also generates plenty of activity.

The dates for this year’s events are: October 25-26 (SSB) and November 29-30 (CW).

The world’s two largest international DX contests, the CQ WW Contests, are held annually on the last full week-ends of October (SSB) and November (CW). Both contests run for 48 hours from 0000z on the Saturday to 2400z on the Sunday.

The high level of activity in these contests makes it easy for the newer HF operator to work a number of new countries. From the USSR there will likely be a number of special contest calls in the near future.

The CQ WW Contest exchange is an RST signal report (usually abbreviated to 599 on CW and 59 on SSB) followed by the CQ Zone number. The world is divided into 40 CQ Zones; the U.K. is in CQ Zone 14. USSR stations are in CQ Zones 16, 17, 18, 19, 21 and 23 (UA0Y Obl 159 only).

‘Creative Logging’

In the same issue of Radio on a less happy note, there is an item headed ‘falsifiers punished’. The item notes that two stations (UA6HPP and RA6HE) were closed down for three months and were prohibited from participating in further contests until November 9th, usually attracts a fair amount of USSR participation. Similarly the all-band OK DX Contest on November 9th (0000-2400z) also generates plenty of activity.

The ‘once-in-every-three years’ Yuri Gagarin Cup contest is scheduled for April 19-20, 1987. More details later.

Table Entries


Many thanks to Tom K1KI (USSR Tidbits), IARU/ARRL, Dex W4KM and RSGB/DX News Sheet for items extracted.

Good hunting es DSW!
Practical, Simple Sideband
Part 5

in this special series, these two
very well-known designers and constructors
get together to unravel its mysteries

REV. G. C. DOBBS, G3RJV and IAN KEYSER, G3ROO

The Completed MLX Transceiver — by G3RJV

"A fool takes no pleasure in understanding,
but only in expressing his opinion".

Proverbs 18:2

I have heard a lot of radio amateurs expressing their opinions
on the merits, or lack of merit, of commercial SSB equipment,
especially on 80 metres. From the conversations, few seem to have
much real idea of what goes on inside their boxes. This series of
articles has been designed to give a little of that understanding by
the easiest method: building some SSB equipment.

In Parts 3 and 4 of this series (Short Wave Magazine,
Aug./Sept. 1986) I described the use of a little SSB transceiver
board by Mizuho, called the MLX Board. This board with a few
external circuits can be used to build a simple SSB transceiver for
the amateur bands. These parts described one simple method of
getting this board to receive SSB signals on an amateur band. This
article goes on to suggest circuits to complete the amateur bands
transceiver. In suggesting these circuits I am merely showing some
suggested circuits which I have used to produce a simple sideband
transceiver. Individual constructors may like to copy the circuits
exactly or, more likely, they may like to use some of the ideas and
improve upon them or substitute circuitry of their own. Playing
around with the MLX Board provides an excellent introduction to
the understanding of SSB communication. These circuits are also
offered in their own right to be used by constructors who may not
have an MLX Board. They may not be sophisticated, in fact they
are purposely simple, but they do offer a route into homebuilt
single-sideband amateur radio communication.

Originally I used the MLX Board for a simple 80-metre
transceiver which I then converted for use on 160 metres. In fact
although I began on 80 metres, I always intended the transceiver
to be a single-bandner on 160 metres so the circuitry was such that
either band could easily be attained. As with the description of
the receiving circuits, what follows here offers alternatives for either
band. If other bands are required or more than one band, the
band option information offered by G3ROO in Part 2 of this
series (Short Wave Magazine, July 1986) could be used.

The Transmit Mixer

In the receiver mixer I opted for a simple and inexpensive input
mixer stage formed by three FET transistors. One was used as an
RF stage feeding the source of the other two which performed the
input mixing. That little circuit was so successful that I decided to
repeat it for the transmit mixer. The MLX Board does not contain
input and output mixers, it deals with the signal at 9 MHz and
hence requires the received signals to be converted to a 9 MHz
signal before it can be amplified and processed. Likewise on
transmit, the signal is generated at 9 MHz and an external mixer
must be added, with an appropriate VFO, to convert the SSB
signal to the required band before amplification and
transmission. A common mixer could have been used but this idea
was rejected: it would have to be a bidirectional mixer, therefore
passive (unless anyone knows of a good, simple active
bidirectional mixer?) with inherent signal loss. The input and out
put ports on the board are also separate so even with a common
mixer, this would have to be switched between transmit and
receive. The little FET mixer is so simple and cheap that building
another one for the transmit mixing function seems to make
sense.

The circuit for the transmit mixer is shown in Fig. 1. The circuit
uses just the two FET transistors which perform the mixing
operation. The VFO signal is fed onto the gates of the two
Fig. 1  SIMPLE SIDEBAND - TRANSMIT MIXER

Fig. 2  Transmit Mixer layout

PCB underside

Fig. 3  SIMPLE SIDEBAND PA

Table of Values

Fig. 1
R1, R2 = 1M
R3, R4 = 10R
R5 = 15K
R6 = 100R
RV1 = 500R min. preset
C1, C2 = 0.01µF
C3 = 0.1µF

Fig. 3
C10 = 1500pF, polystyrene or s/mica
C11 = 3300pF, poly. or s/m
C12 = 1500pF, poly. or s/m
RFCl = 100µH Siemens B78108,
Cirkit no. 35-71104
RFC2 = see Fig. 3
L1 = see Fig. 3 (ferrite beads FX1115
or similar)
C13, C16 = 470pF, poly., or s/m
C14, C15 = 1200pF, poly., or s/m
L4 = 25t, 28swg, T37-2 core
L5 = 27t, 28swg, T37-2 core

Note: the above values of L2, L3 and C10, C11, C12 are for 160m. See below for 80m.
L1, L2, L3 = 26t, 24swg, on T30-2 core
C8, C9, C10, C11, C12 are for 160m.
C10, C11, C12 are for 160m. See below for 80m.
L4, L6 = 25t, 28swg, T37-2 core
L5 = 27t, 28swg, T37-2 core

* Add 150pF across CT1 for 160m.
Transmit mixer board

Transistors by a small transformer, T1, which is wound on two ferrite beads in the identical manner to the receive mixer. The 9 MHz SSB signal from the MLX Board is fed directly to the sources of the transistors; the sources of TR1 and TR2 are returned to ground through the source follower resistance in the output stage of the MLX Board. The output across the drain leads of TR1 and TR2 is tuned by a bifilar wound coil L1, and CT1 to the required band.

L1 is a compromise value of inductance which can be tuned for either 80 or 160 metres depending upon the total value of capacitance at CT1. The values given in Fig. 1 will tune the 80-metre band. A damping resistance, R5, is added across the tuned circuit to aid broadband tuning. For 160 metres additional capacitance is added. 150pF should be enough to cover 160 metres, across CT1. However even with the damping effect of R5, the adjustment of CT1 was not found to be broad enough across the whole 1.8 – 2.0 MHz range of 160 metres. This is fine if operation of the transceiver is to be restricted to a portion of the band but I hoped to cover the whole of 160 metres without resorting to readjustment of CT1. So in the final arrangement I used for 160 metres I added a 100pF air-spaced variable capacitor across CT1 plus a further 68pF fixed capacitor. The variable capacitor became a front panel peaking control for transmitted signals. My original transceiver had taken the microphone gain control onto the front panel. This is a control that rarely, if ever, requires adjustment, so I reinstated the preset microphone gain control (VR3) on the MLX Board and used this front panel space for the peaking control. Details of replacing the VR3 preset were given in Part 3 of this series.

The layout of the transmit mixer board is shown in Fig. 2. As the photograph shows my prototype board was built up on perfboard, so this could be used in place of an etched printed circuit board. When winding T1 and L1 follow the instructions given for T1 on the receive mixer board (Fig. 8 in Part 4 of this series) and although the number of turns differs, the winding of L1 is done in the same way as L3 in the receive mixer.

It is now possible to listen for the SSB signal on the chosen band. Connect up the screened leads from the outputs of the VFO and the MLX Board and apply power to the transmit mixer board. Connect the output from the transmit mixer board to the antenna input of a receiver on the required band via a capacitor of a few picofarads. The signal can be initially indentified by putting...
the MLX Board into CW mode; that is by shorting the press-to-talk (PTT) point (Pin 20) to ground and then keying 12 volts onto Pin 16. The 12 volts at Pin 16 unbalances the sideband mixer IC (ICI) and produces a carrier. Swing the VFO and/or the receiver tuning to find that carrier signal.

An actual SSB signal can now be attempted by connecting a microphone. I used a reject CB microphone, probably around 500 ohms dynamic, with the microphone gain control turned up high. If the microphone does to provide enough audio for adequate modulation, reduce the value of the microphone gain control, say to about 4.7K ohms. Putting the PTT (pin 20) to ground and speaking into the microphone should produce a SSB signal on the monitoring receiver. If there is a lot of residual carrier present speaking into the microphone should produce an SSB signal on the prototype made little difference. In fact it could be reduced by about 4.7K ohms. Putting the PTT (pin 20) to ground and having cramped space for FB 1.

The PA should be biased to have a standing current of about 200mA using the bias preset control, VR2. Before switching on the supply, set VR2 to the ground end; then measure the current passed by TR2 and TR3 and adjust accordingly. On peaks of transmission the reading should go to over 700mA. The PA can be used to reduce it. The preset balance control on the mixer board (yet another VR1) is really a "belt and braces job" and in the prototype made little difference. In fact it could be replaced by two 270-ohm fixed resistors.

Exciting stuff — you have produced a single sideband signal!

The Power Amplifier

The next requirement is to amplify the SSB signal to a level suitable for transmission. Perhaps the simplest way to do this is to use the PA Module supplied in kit form by Cirkit Holdings. This module is described by G3ROO in Parts 1 and 2 of this series. It certainly represents a simple and effective way of producing a signal up to 10 watts p.e.p. I have used the module with the MLX Board and the results were good. All that I used was the basic PA Module with a lowpass filter on the end of it. For those who do not want to fall back on the use of a kit but build all the associated boards, I offer a simple Power Amplifier circuit.

The circuit is shown in Fig. 3. It is far from original! Versions of this circuit have been used by G3MJW and G4DMH in Sprat, the journal of the G-QRP Club. The circuit makes use of two VMOS transistors working in parallel driven by a simple BC109 driver transistor. VR1 is an input potential divider which functions as a form of drive control. The standing current in the PA devices is controlled by a bias control preset resistor, VR2; this derives a stabilised voltage from ZD1. The VN66AF transistors have separate series limiting resistors on their gate leads. The common output lead is provided by a small transformer, T1, wound on ferrite beads; this matches in the impedance into the lowpass filter network: C10, L1, C11, L2, C12.

The PA is built using the 'island' method of circuit board construction. Islands or copper pads are etched or cut into a piece of printed circuit board blank. I cut the tracks using a 3/16" woodturner’s gouge: a very useful instrument for making such boards. It would be possible to use a lino cutting tool or to etch the board in the usual manner. All the components are mounted onto the copper side of the board so no holes are required in the board. The components are soldered from island to island, the surplus copper around the island pads forming a ground mat for screening and the convenient placing of ground connections in the circuit. It does not look much when its finished but it does work. It was to have been my prototype for a better board to follow but it worked as it was, so . . .

The two VMOS devices are mounted piggyback and their heatsink fins fit either side of an aluminium heat sink with side fins. The heatsink tabs are isolated from the heatsink with mica washers and bolted through the heatsink with a nylon 6BA bolt. In the completed transceiver the PA board is attached to the back of the transceiver case on 6BA standoffs. The board is mounted 'upsidedown' with the heatsink below the board. I did not attach the heatsink to the case as the leads from the VMOS transistors seemed adequate to hold the weight of the heatsink. The other obvious 'crudity' is that the supply line comes to a flying lead from the decoupling capacitor, C7, and thence via the ferrite bead RF traps, FB1 and FB2. I found this easier than using another pad and having cramped space for FB1.

The PA should be biased to have a standing current of about 200mA using the bias preset control, VR2. Before switching on the supply, set VR2 to the ground end; then measure the current passed by TR2 and TR3 and adjust accordingly. On peaks of transmission the reading should go to over 700mA. The PA can now be tested into a dummy load using either a wattmeter or an

Table of Values

| R1   | 1K     |
| R2   | 2K2    |
| C1, C5 | 0.01µF |
| C2   | 4µF, tant. |
| C3, C4 | 0.1µF |
| D1, D2 | 1N914 |

D3 = 1N4001
TR1, TR2 = 2N2904, or similar pnp silicon transistor
RLY = 12v relay with double-pole changeover contacts

C1 = 47µF poly., see text
RV1 = 10K linear pot.
RV2 = 100K preset
D1, D2, D3 = 1N914
FB1, FB2 = FX1115.
SWR meter with a suitable non-inductive 50-ohms load. This little PA will require the drive control VR1 set quite high to give an adequate output. (I managed to get mine to peak to 5 or 6 watts on the wattmeter.) Monitor the signal into the dummy load with the station receiver. It is worth playing around with the drive and bias controls to obtain an acceptable sounding signal. The lowpass filter is built up on a separate small board, shown in Fig. 5. The values on the circuit in Fig. 3 are for 160 metres but values for 80 metres are also given.

The main units for the transceiver are now completed, all that remains is to arrange the changeover circuits from transmit to receive. I had my first QSO with the MLX Board and the associated boards strewn across the bench. It was a pleasant 80-metre SSB contact with an old friend Dennis Hoult, G400. I was pleased with the 5/6 to 7 report between Rochdale and Spalding (Gosberton Risegate to be precise... ah, the magic of those Lincolnshire place names!).

The Changeover Circuit

The transceiver requires a means of changing the antenna input from receive in to transmit out. The voltage changeovers for the various circuit sections in either mode are controlled on the MLX board by Q10 and Q11. I also wanted to have access to a 12 volt keyed supply so that the CW facility provided on the MLX Board at pin 16 could be used. If CW is not contemplated with the transceiver the whole matter is simpler so I will describe the SSB changeover first.

The press-to-talk (PTT) switch on the microphone has to short pin 20 on the MLX Board to ground to effect changeover of the voltages to the required circuits. The circuit in Fig. 6 shows the complete changeover system for SSB and CW. In the SSB mode the PTT switch simply places 12 volts across the changeover relay. This operates a double-pole changeover set of contacts, half of which effect the antenna changeover from input to output. The spare set of contacts are used to switch Pin 20 on the MLX Board to ground. Nice and simple: the antenna has been changed over and the board voltages are switched to the correct state.

For CW operation two extra facilities are required: a 12 volt keyed line to supply pin 16 and an antenna changeover action which is time delayed enough to hold in on transmit at normal keying speeds but falls out when keying ceases. The circuit in Fig. 6 is one I have used before in Short Wave Magazine and represents a neat way of performing these functions. When the key is depressed both TR1 and TR2 conduct; TR1 actuates the changeover relay. The capacitor C2 also becomes charged so when the key is released the switch off of TR1 and the relay depend upon the discharge rate of C2. The given value for C2 is about right for holding in the relay during normal keying speeds with release after keying ceases but it can be adjusted to taste. TR2 produces the required 12 volts keyed to drive pin 16 on the MLX Board which gives a CW output by unbalancing the mixer. The layout for the changeover/keying circuit board is shown in Fig. 7. The relay used is a 12 volt double-pole changeover type. These are usually cheaply available at radio rallies. These relays vary in physical size and layout of contacts, so on the layout drawing I have shown a blank where the contacts should be present. Either the contacts may be connected via PCB tracks or the blank cut out as a hole through which all the contacts go and then direct connections made to the tags on the base of the relay.

Having said all this, CW operation is not so straightforward on the MLX Board. The BFO is set to receive SSB signals and is therefore really too far from the frequency of the carrier to be effective on CW reception. That is if the other station is to be monitored at the comfortable listening pitch of around 800Hz. The crudest way around this to work out, perhaps in a test QSO,
what the other station will sound like when your transmission is netted with his signal and use that pitch as the guide to further CW QSOs. It will not be a comfortable pitch so if many CW QSOs are thought likely on the transceiver another method must be adopted.

There are three suitable approaches; I will suggest them all and leave the individual constructor to choose. The first is to alter the frequency of the BFO. This can be done using the BFO offset facility on pin 22. This approach is only possible if that facility has not already been tied up in reversing the sideband of the BFO by offsetting the original crystal as described in Part 3 of this series. If instead of that the 8998.5 kHz crystal has been replaced by a 9001.5 kHz crystal then all is well. In the CW mode, on receive, 12 volts can be applied to pin 22 and CVT2 adjusted to give a suitable BFO offset to monitor a netted CW station at a comfortable tone. This can be done with a frequency meter but I really do suggest that a test QSO with a tame local amateur is probably the best method.

The next alternative to add an RIT (Receiver Incremental Tuning) control to the transceiver. This is a method of offsetting the frequency of the VFO on receive. Such a facility is not a bad addition even if the transceiver is only to be used on the SSB mode. A suggested RIT circuit appears in Fig. 8. This is a direct lift of the RIT circuit from my TX80 Transmitter in Short Wave Magazine, April/May 1986. A fuller explanation if its function can be found in those articles. The circuit is divided into two sections: the Offset Circuit and the Offset Control Circuit. The offset circuit is added to the VFO, inside the VFO box as close to the tuned circuits as possible. The control circuit is built up behind the front panel RIT control, RV1.

The value for C1 may require some adjustment for the best results. The two supplies for the control circuit come from any of the 12 volt supply points on the MLX Board brought into operation for transmit and receive functions. The preset control, RV2, is set at about the centre of the wiper swing and controls the offset on transmit, the offset on receive is a front panel control provided by RV1. Adjustment of the position of RV2 may be required to give the most useful frequency swing of RV1 around the centre of its travel to allow adjustment either side of the frequency on transmit. Set the system up so that RV1 is midpoint to be netted to the transmit frequency. So on receive in the SSB mode, stations should be tuned with RV1 set midway. A marker point on the front panel is useful. In the CW mode experiment with RV1 to see where it must be set to give a good netting onto other station at a comfortable listening pitch on receive. Another mark can be made on the front panel to indicate this point; this is where the control is set to receive signals so the transmitter is netted onto the other station. A more sophisticated approach would be to have a third voltage source switched in on CW mode only to allow RV1 to be at the same setting for SSB and CW operation. I leave such refinements for the reader to sort out.

The third method is to derive another signal for the carrier on CW. This entails building an outboard oscillator board using a 9 MHz crystal, which can be keyed. Instead of using the MLX Board as the carrier source on CW, this new signal would be keyed into the transmit mixer. Its crystal frequency could be adjusted with a series trimmer to produce a signal in the appropriate place for the existing BFO to have the required amount of offset. This is the reverse approach to offsetting the BFO to suit the carrier. I have not tried this but I know those who have used the system with success.

Whatever system is adopted it can be seen that providing the CW facility is not as easy as it may first appear.

The Completed Transceiver

My complete transceiver was built in an aluminium box 6" wide x 8" deep x 4" high supplied by Minford Engineering. The various circuit boards fit easily into this space with adequate room for front panel controls. The transceiver needs a nominal 13.8 volts DC supply and an antenna termination of 50 ohms.

The circuits shown and discussed in Parts 3, 4 and 5 of this series suggest how an existing SSB transceiver board on 9 MHz can be used with a few uncomplicated extra circuits to make up a simple sideband transceiver. You may think my additional circuits crude and want to try your own, you may not have an MLX Board, or you may not wish to build up any of the suggested circuits, but what these articles do show is that homebuilt SSB equipment is well within the range and capabilities of the average constructor. My completed transceiver is simple and inexpensive and gets good comments for its signal on the band and even better comments when the other station knows that it is homebuilt.

Sources:

Cirkit Holdings PLC, Park Lane, Broxbourne, Herts. EN10 7NQ. Tel: (0992) 444111. for VMOS transistors and other components.
Minford Engineering, Sun Street, Ffestiniog, Gwynedd. Tel: (076-676) 2572. For equipment cases. (The case I used does not seem to be in their current list but was supplied by Minford's, try a phone call.)

Next month, G3ROO returns for Part 6.
COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

Once again we have to report that this will be very short, thanks this time to localised industrial action within the mail system. Carrier pigeons must be more reliable.

However, be that as it may, a couple of letters that arrived at the last moment, and so were delivered separately, managed to reach your scriber, and of course we have the usual inputs from other sources such as W1WY, DXNS, and our own cullings.

The Bands

During the last week the weather has improved, and so my aerials for the LF bands have received their autumn attention. As a result of this, the local eighty-metre net has become totally inaudible under the sideband splash from some chap discussing the gory details of his operation. On the other hand, when I compared a Mercator and a Great Circle map before going up aloft to deal with the HF part of the aerial farm, at least part of the reason for recent problems came to light; the aerial has now been swayed round by some thirty degrees and is 'doing its thing' much more effectively. The moral to this little tale is: when putting up aerials, use a Great Circle map to define the true direction and then, when you are using the compass, make the correct allowances for variation and deviation, and then double check as well. Most of us can find the Pole Star on a clear night, and as that points to True North it can be a valuable cross-check — which is not to suggest mast-climbing on dark nights! But it does certainly indicate that 'conditions' get better when the aerial is somewhere near right.

For example, I have already indicated Eighty bulging with signals as this is written and the same goes for Twenty, particularly at the CW end. Of course, things are also at their best near the equinoxes in March and September, as we all know. So — lively's the word, even in the absence of the sunspots.

Ten Metres

The increased level of activity on this band, to keep out the CB intruders, has of itself been of benefit to our knowledge of propagation on the band. For example, it is now well proven that at sunspot minima there are intercontinental openings to be expected on the band during the summer months, mainly in the north-south direction to Africa and S. America, but also on occasion to the Caribbean and North America. For instance we have the report from G3N0F (Yeovil) who worked CE3GWO, GM3PHD/M on Benbecula, T77C, UP2BAY and 6W1CK, plus lots of the Europeans.

The letter from BRS-88639, Angela Sition of Stevenage, mentions a hearing in July of WB2HJE, working an IK2 at 2100z on 21st, with other East Coast stations just audible and all after the same IK2; Angela has an HR-10B and quite limited aerial facilities. Notice the time: at 2100z one would have expected the band to have been well dead if the 'normal' rules of ten-metre propagation applied, even if there was enough sunspot activity to make that possible. As with so many things, the more we learn about propagation the more we realise how little we know! It is noted that Angela is in for the December RAEX and taking Morse form G4ISO, so we must hope she passes and gets on the air soon.

Fifteen

Here we have only one report that escaped the disruption — thank heavens Don, G3N0F, nearly missed the deadline! Don found the band patchy, with lots of Sporadic-E about; around noon zulu a few openings to Indonesia, and in the evenings around 2100z South America occasionally. He made SSB contact with C31LDL, CE4FXV, EJ4ALE (Bobin), HC1OT, HK6ID, J87D, JA4CYG, KP4BZ, KM5X, PJ2MN, PP2ZD, VP2MU, VS6CT/KP2, WB0NAA/YNI, YB0EZF, YC4GAP, YC0DAJ, YC0DLG, YC0GTP, YC0LWA, YM3KA(TA3B), 9J2RSZ, 9L1AR, and 9Y4RJS. Clearly, even at sunspot minimum, there is some DX about.

Events

From NQ4I, by way of G3N0F, a letter that indicates Rick is going to do the CQ WW SSB Contest in October from Guyana, using his contest call 8R1Z. For a few days before the contest 8R1Z will be on, mainly on Eighty, plus Top Band. The Mosley Classic 33 will be atop the Hotel Pagusas, at 185 feet, with the 7MHz dipole on another corner at 190 feet, and a couple of slopers for Top Band and Eighty will run down from the hotel roof towards the sea, one for EU and one for Stateside. Rick says he will go on to Top Band at 0200z, 0300z and so on to 0700z for the first ten minutes of each hour, transmitting on 1827 and listening on 1849 kHz. QSLs for a ZL, mostly 9Y, T77C, 8R1Z, YM3KA(TA3B), UP2BAY and 6W1CK, direct or through the Bureau. Thanks to G3N0F for passing this news on, but we must say that we think that

NQ4I is doing the game a disservice as far as Top Band goes. After all, the rules are clear enough, even if the Contest Committee haven't used them. To actually announce beforehand that you are going to operate in the DX Window is tantamount to saying to hell with the rules. That remains true whether you agree with the Window concept on Top Band or not.

That Rockall trip planned for mid-August: the cancellation announcement, which wiped out a year's work, was left till the very last moment, but they are back in the hunt with a new, 1987 target. However, one can't help wondering why; after all, ARRL's Don Search is on record as saying it couldn't qualify as a DXCC 'counter' under Rule 2(b). And one can hardly think of it as a holiday resort!

During this month, ZL1AMO will be on Christmas Island; at the time of writing it is not confirmed but this is one DX-peditioner who is not in the business of busted flushes!

On the other hand, it does seem likely that the recent mutterings on the subject of a ZA expedition by some OKs was a manifestation of Walter Mitty... our own view on ZA is just that any you may come across will be pirates; but on the off-chance that they might be for real, work 'em, and hope.

“CDXX” deadlines for the next three months:

November issue — October 8th
December issue — November 5th
January issue — December 3rd

Please be sure to note these dates

The XU1JS signal is said to be on almost daily, usually around 0900-1000z, using battery power to a dipole, deep in jungle, and restricted by a lack of light at times when they might have more chance of being heard in this country; and G4DYO added a note to this entry that it might be worth a comb-out on Twenty long-path for them.

The Operation Raleigh, GB0SWR, team have carried on their merry way, although the Fiji stop seems to have been somewhat comic in the matter of licences; they ended up operating from 30DZM, and at the time of writing the story was that they should make the next stop at Cairns in VK, with no more Pacific Islands en route.
John Layton was to leave the expedition and return to this country from Fiji, and we have no current word of who will replace him.

Early in August a station signing ETUS appeared, asking for QSLS via KJ0M. In the present known circumstances of that part of Africa that sounds as likely as a flying penguin; and indeed all has been silent about this one ever since.

ISWL

We very sad indeed to hear that after a long period of difficulty the President and the council members of ISWL felt they could no longer carry on, the more so as there were serious financial problems. So, ISWL dies, after forty years, unless some enterprising people are game to try and get it back on its feet. However this could be quite costly, as to circulate the members individually with no hope of getting one's expenses back would be a serious pain in anyone's wallet.

Twenty

As we have already indicated, the band seems livelier than we have heard it for a while.

G3NOF notes, however, that this was another month with no signs of VK and ZL on the morning long-path opening times, and there were only a few Pacific stations. Around 1100z the short path showed IOSNT/ZB2, IF9/IT9JKY, IKICIX/ID8 HZ1FM, GM6UW/P on Treshnish, HBO/G4GIR, FG5CB/FS (St. Barthelemy), FM5BX, FW6NDX/P all CP5HK, CU3AU, DU9RG, DX9C AP2SQ, BY4AOM, C3OBB/P, contacts with A22TJ, A4XKC, A92C, the time too.

Also some short-skip stuff about most of collapse quickly after 2300z. There was while the East Coast Americans were about 1800z, mostly north of the Equator, signals faded down and peaked again openings to VK, YB, JA, VU and SE Asia; and there were only a few Pacific stations.

Other Points

We hear that the Chinese 'pirate BY calls' list which was being circulated recently included such as BY5HN and BY5SN, and John Allaway, in his feature in RadCom points out how nearly 'B' and '6' are related; we must admit to being a trifle surprised the CRSA folk didn't spot this for themselves. However it is also being whispered that the Chinese are seriously considering licencing individual stations and also foreigners. And, to revert to G3FKM's column, we notice BY5QH among the new members of RSGB.

West Yorks Scouts

We have a letter from the West Yorkshire Scout Radio Group in which we see with some sadness that they have, thanks to changes in regulations at the licensing authority, lost their GB3RSS, a call they have had continuously for 28 years. They are now using GB2RSS, and hope to make that call as well known as the old one was, world-wide — and all we can say is we hope they do just that.

W1WY

Frank's ever-useful galleys of his Contest Calendar shows the usual rush in October. The major ones seem to be the VK/ZL/Oceania Contest, CW October 11/12, and SSB the previous week. The October 11/12 slot is also down for the RSGB 21/28 MHz shindig on SSB, and on 18th there is the RSGB 21 MHz CW, coinciding with the QRP ARCI contest weekend. October 25/26 is down for the CQ WW DX Phone Contest as well as being the start of the Caymans Pirate Week; this is not a contest but an 'activity' generator, with some special prefixes.

JOTA

Once again it is time for the annual JOTA activity, and this year it takes place over the October 18/19 weekend. Again not a contest, but rather an activity for the Scouts, as anyone who has ever participated will know.

Close Down

If the missing letters turn up we'll have a bonzer pile next month, always assuming we actually get the usual letters as well; for these the deadlines are as shown in the 'box', and should be addressed, as ever, to your conductor, "CDXN". SHORT WAVE MAGAZINE, 34 High Street, WELWYN, Herts. AL6 9EQ.
Program Construction

Enter the listing as given; 128k owners must place the machine in 48k mode first. Use of embedded control-codes has been avoided since certain of them cannot be used on the 128k. Pay careful attention to the machine code sections; a checksum has been incorporated. So you can enter embedded space characters carefully, note that the listing is based on a 60-character line format. See the manual p 131

Save the program regularly. Tape or microdrive may be used. Note the use of graphics in 2260, 2280 and 2290. Use the graphic character "hash symbol" available on symbol-shift/3 keys.

Program Construction

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Pay special care to the function definitions at the start of the program since proper operation can only be obtained if they are correct. Note that, in the listing, the "pound sign" should be entered as a "hash symbol" available on symbol-shift/3 keys.

Note the use of graphics in 2260, 2280 and 2290. Use the graphic character "hash symbol" available on symbol-shift/3 keys.

Save the program regularly. Tape or microdrive may be used. Note the use of graphics in 2260, 2280 and 2290. Use the graphic character "hash symbol" available on symbol-shift/3 keys.

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1080 PRINT "The program may be left running for long periods of time due to improved conditions."
1100 PRINT INVERSE 11; BRIGHT 11; "PRESS KEY FOR MORE INFORMATION";
1120 PAUSE 0
1130 CLS 1: PRINT "TAB 3":
1140 PRINT "TAB 0": INVERSE 1; BRIGHT 1; "INSTRUCTIONS"
1150 PRINT "TAB 0": REVERSE 1; "RECEIVER/PROGRAM SETUP"
1160 PRINT "TAB 0": Connect Spectrum EAR to receiver with squelch off. Then raise squelch level when the channel is clear to received signals are received in SSB mode."
1190 PRINT "WINDOW:" INVERSE 1; BRIGHT 1; "TIME WINDOW (Minute)
1210 LET W1=WINDOW*60: REM WINDOW IN SECONDS
1180 LET WINDOW=VAL WS
1200 PRINT "The program may be left running for long periods of time due to improved conditions."
1210 PRINT INVERSE 11; BRIGHT 11; "FINISHED ANY KEY": PAUSE 0
1220 LET WINDOW=5
1230 PRINT "Spectrum EAR will detect all 200 channels in time with audio."
1240 PRINT "TA TO NEW TIMESCALE"
1250 PRINT "TAB 0": INVERSE 1; BRIGHT 11; "INSTRUCTIONS"
1260 PRINT "TAB 0": RECEIVER/PROGRAM SETUP"
1270 PRINT "TAB 0": Connect Spectrum EAR to receiver with squelch off. Then raise squelch level when the channel is clear to received signals are received in SSB mode."
1280 PRINT "WINDOW:" INVERSE 1; BRIGHT 1; "TIME WINDOW (Minute)
1290 PRINT "TA TO NEW TIMESCALE"
1300 RANDOMIZE USR ON
1310 IF CODE INKEYS<13 THEN GO TO 1310
1320 LET WIN=1220: LET WS=0: REM WINDOW GO TO 1540
1330 DIM W(2,21): CLS 1: PRINT TAB 3:
1340 PRINT "TA TO NEW TIMESCALE"
1350 PRINT "TAB 0": INVERSE 1; BRIGHT 11; "INSTRUCTIONS"
1360 PRINT "TAB 0": RECEIVER/PROGRAM SETUP"
1370 PRINT "TAB 0": Connect Spectrum EAR to receiver with squelch off. Then raise squelch level when the channel is clear to received signals are received in SSB mode."
1380 PRINT "WINDOW:" INVERSE 1; BRIGHT 1; "TIME WINDOW (Minute)
1390 PRINT "TA TO NEW TIMESCALE"
1400 RANDOMIZE USR ON
1410 IF CODE INKEYS<13 THEN GO TO 1310
1420 LET WIN=1220: LET WS=0: REM WINDOW GO TO 1540
1430 DIM W(2,21): CLS 1: PRINT TAB 3:
1440 PRINT "TA TO NEW TIMESCALE"
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1460 PRINT "TAB 0": RECEIVER/PROGRAM SETUP"
1470 PRINT "TAB 0": Connect Spectrum EAR to receiver with squelch off. Then raise squelch level when the channel is clear to received signals are received in SSB mode."
1480 PRINT "WINDOW:" INVERSE 1; BRIGHT 1; "TIME WINDOW (Minute)
1490 PRINT "TA TO NEW TIMESCALE"
1500 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1510 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1520 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1530 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1540 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1550 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1560 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1570 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1580 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1590 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
1600 PRINT "TABLES 1": INVERSE 11; BRIGHT 11; "START TIME(HHMM)
**Running the System**

The program first identifies the ULA resident in the micro so that it can adjust operation for the different ways in which they handle data on the EAR socket. The machine code is loaded followed by the instruction screens, each of which is viewed in turn and explains the set-up process.

Connect a suitable lead from receiver 'phone or extension speaker socket to the EAR socket on the micro. The set-up screen instructs accordingly and, after suitable adjustment of the volume control, a signal should cause the bar in the top left-hand corner of the screen to flash.

Use an FM channel; more accurate results are obtained when FM is received than SSB since the continuous heterodyne keeps the machine-code triggered "on".

The suggested time-window is 3 to 5 minutes which produces 15 to 20 samples per hour. When these results have been studied, and replayed if necessary, they may be aggregated into 15 minute or hour periods. Short periods of high activity, especially on a repeater, will show up as well as average activity over longer periods.

A machine-generated example may be used to illustrate the displays and to practice aggregation of data into longer time-spans. No audio connection is required here.

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**CLUBS ROUNDUP**

By "Club Secretary"

Perhaps the time has come to re-state that we will take an entry for this column for up to three months in advance, provided we have a name and address of club secretary and of course the other details. So many changes of Hq. and Hon. Sec. occur that we always reckon that we need an update after three months. The system we use at the office makes sure that if you miss the deadline, the material is not thrown away but put into the pile for the following month's piece. After all, your new club members are our future readers - we have an interest in keeping "Clubs" up to date and accurate!

**The Mail**

Fridays at 35 Thistle Lane from 7.30 p.m. is the form for the Aberdeen crowd; October 3 is a junk sale, and on 10th they have their 40th Anniversary cheese and wine party. October 17 is a demonstration of amateur radio microwave by GM4ZUK and GM3GQH, and on 24th they have various members' recollections of 40 years in the hobby. Finally, on October 31, they have a 40 Years Hallow'een Night — free fun and food for family and friends! Details from the Hon. Sec. — see Panel.

From GM to GW, and Abergavenny & Nevill Hall where on October 16 they have G4ASR talking about meteor scatter. They meet on Thursday evenings in the room above Male Ward 2 at Pen-y-Fal Hospital, Abergavenny. This club, be it noted, is a registered centre for the December RAE and early applications should go to the Hon. Sec. — see Panel.

October 21 is the date for Acton, Brentford & Chiswick group, at Chiswick Town Hall, Chiswick High Road, London, for an evening on members' holiday activities.

Now to BARTG, the club for the RTTY and data communication buffs. Membership enquiries to GW6MOJ/GW6MOK, Pat and John Beedie, Ffynnonlas, Salem, Llandeilo, Wales SA19 7NP, and other enquiries to the Hon. Sec. at the address in the Panel.

Barry College of Further Education members number over 70 and they foregather on Thursday evenings at the College Annexe at Weycock Cross, Barry — this is the bit of the college with the HF and VHF towers and beams.

It's the AGM on October 6 for Basingstoke at Forest Ridge Community Centre, Sycamore Way, Winklebury; they also have the odd informal or VHF Foxhunt, the details of which are settled at the last minute and so need to be obtained from the Hon. Sec. — see Panel.

Now to Biggin Hill; this means Downe Village Hall, next to the "George and Dragon", High Street, Downe, Kent, on October 21 for an antenna demonstration. Note that the meetings now start at 7.30 p.m. for the benefit of the younger members.

**Bishops Stortford** are at the British Legion in Windhill on the third Monday in each month, and informally every Thursday evening at the "Nag's Head" on the A120 Dunmow Road out of the town. More details from the Hon. Sec. — see Panel.

For **Borders** the first and third Friday of every month are taken...
at the Tweed View Hotel in Berwick-on-Tweed — details from the Hon. Sec., see Panel.

Borehamwood and Elstree are based at the Organ Hall Community Centre, Bairstowe Close, Borehamwood, on the second Monday of each month; for October G3JPJ will give a demonstration of QRP.

For Braintree the first and third Monday are booked at the Braintree Community Centre, Victoria Street, by the bus park. On the other Mondays they have a club net on 144 MHz channel S15.

Stapenhill Institute is home to the Burton-upon-Trent club, every Wednesday evening. There is also a Morse class starting in September on Monday evenings at the same place. In addition they are deeply into both Top Band and VHF D/F contests, and on October 22 they welcome G3BA for his talk “Clandestine Radio”.

The Tuesday meetings of the Bury club are at the Mosses Centre, Cecil Street, Bury, and we note that on October 14 they have a construction contest.

Bredhurst meets on October 2 for an inter-club quiz, October 16 and October 30 when they have a QRP and homebrew components contest; Parkwood Community Centre, Parkwood Green, Deanwood Drive, Gillingham, Kent, is the place and every Thursday the night — the dates not noted above are for informals.

Now Central Lancashire where we have to refer you to the Hon. Sec. for details — they seem to have had a hang-up! See the Panel for his name and address.

October 7 is the AGM, and November 4 a junk sale, for Chelmsford at Marconi College, Arbour Lane, Chelmsford.

Now to Cheltenham where they have a natter night on October 3, and a joint meeting with other local clubs on October 17 at which G3EE will talk about and show his collection of war-time equipment. The venue, as usual, is Stanton Room, Charlton Kings Library, Cheltenham.

Bury Farm, Pednor Road, Chesham, is the home of the Chesham group, and they are to be found there every Wednesday evening.

Turning to Cheshunt now, we find them at Church Room, Church Lane, Wormley, every Wednesday evening. Much time and effort has been put in to the club Hq. of late, and things seem to be going very well for this large and active club.

Colchester has its AGM on October 2, and a talk on spy sets by G3EUR on October 16. On October 30, G4TZM talks about making aerials for VHF and UHF.

At the time their newsletter was being printed the Cornish club was startled to realise that nothing was finalised for the October meeting! Doubtless this will have been resolved in time for the first Thursday of the month, at the Church Hall, Treleigh, on the old Redruth Bypass; and on November 6 they have a junk sale.

Turning to Coventry we find them at Baden-Powell House, 121 St. Nicholas Street, Radford, Coventry, every Friday evening. October 3 is the AGM and on 10th and 24th they are on-the-air. October 17 is a DIY forum, and there is a (members only) visit on 22nd. Finally, October 31 is the construction contest.

Main meetings at Crawley are now at the Leisure Centre; October 22 is down for G4EFO to demonstrate Microwave Modules gear. Informals for this club are at members’ homes and details can be obtained from the Hon. Sec. — see Panel. Notice that on November 12 the junk sale will be at TS Cossack, London Road, Crawley.

The Crystal Palace crowd continues to have its dates in the All Saints Parish Rooms, Beulah Hill, London SE19 (opposite the 18 New Cross Road, SE19) — or 18 October is a junk sale.

On second and fourth Wednesdays the Chiltern gang head for the Sir William Ramsey School, Science Block, Rose Avenue, Hazlemere, near High Wycombe. October 22 is set aside for a talk on 10-metre conversions.

The Dartford Heath D/F Club programme shows their home events to be the pre-hunt meet at the “Horse and Groom” pub, Leyton Cross, on October 14, and the hunt itself on October 19. The pre-hunt meet is the one at which the details are handed out, so that’s the one to attend. Other details from the Hon. Sec. — see Panel.

The meetings of the Denby Dale club are held at the Pie Hall; October 1 is the AGM, but it seems they have meetings every Wednesday evening.

That is certainly the case for Derby, where they have the top floor at 119 Green Lane for their Hq. October 1 is a junk sale, and October 8 a talk on meters by G3SZJ. On 15th G4UUQ will give an illustrated talk on New Zealand, and October 22 is still to be settled as we write. October 29 is a recap, by G5LP, of their adventures on the Lundy Island DX-pedition.

The Dover club is properly called SE Kent YMCA, and this lets it be known that they are at Dover YMCA, Godwynhurst, Leybourne Road, Dover, where they forgo their Wednesdays. October 1, 15 and 29 are the natter nights, and October 8 a talk on Fire Service communications; October 22 is a Top Band D/F event.

Eastbourne are at Archery Youth Centre, Seaside, Eastbourne, on Sunday evenings at 7.30 for an RAE and Morse class. More details of the club from the Hon. Sec. at the address in the Panel.

On October 9, G4HFL talks to Edgware about sytony, and on 23rd at the informal G3MNO will talk about the club’s history. The venue is Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware.

Deadlines for “Clubs” for the next three months—

November issue — September 25th
December issue — October 30th
January issue — November 27th
February issue — December 29th

Please be sure to note these dates!

Falkirk have the first and third Wednesdays of each month booked at the Grange Centre, Brightons, near Falkirk. Further details from the Hon. Sec. — see Panel.

At Fareham we believe, although they don’t say so, that the group has its base at Portchester Community Centre; there are the natter nights on October 1, 15 and 29, and talks on the other two dates. October 8 is down for G4CJO on Packet Radio, while the subject and speaker for October 22 were still unsettled when they wrote.

For Felixstowe the Hq. is “The Feathers” in Walton High Street, Felixstowe, and they like to acknowledge the landlord’s help in this respect. October 6 is a social and on 16th they visit the East Anglian Daily Times. On October 20, G4SYG of BT will talk about testing and trouble-shooting.

On October 7 the Fylde group has the G6CJ tape and slide talk on aeros, and on 21st it is informal and Morse all evening. Both are at the Kite Club at Blackpool Airport, where they have a combined sub, giving access to the club at all times.

October 30 is provisionally a natter night for the Glossop crew, at the “Nag’s Head”, starting at around 8 p.m.

The G-QRP Club has to be the one for anyone who is interested in low-power operating, or simple gear and aeros, or indeed almost any form of home-brew. Get the details from the Hon. Sec. — see Panel.

We are a bit low on current information from Harrow but they seem to be still at the Harrow Arts Centre, in High Road, Harrow Weald; usually in the Roxeth Room, and from around 8 p.m.

Now Hastings where they have the main meeting at West Hill Community Centre, on the third Wednesday of the month. However, there is also an informal every Friday at their room in Ashdown Farm Community Association in Downey Close.
October 3 at Hereford is G3PGQ’s talk and demonstration on antenna radiation patterns, and on October 17 there is an informal session. The venue for both is the County Council, Civil Defence Hq., Gaol Street, Hereford.

The “Forresters Arms”, Kingsland Road, is home to the Holyhead group; they are booked in on alternate Sunday evenings, and you can get the details from the Hon. Sec. - see Panel.

Ipswich has the big thick newsletter called QUA, which marks roughly the mid-point in the exercise of writing this piece. From it we learn that the “Rose & Crown”, 77 Norwich Road, Ipswich is their base. Nominally they have the second and last Wednesday, but there are usually members there on the other Wednesdays too.

Looking through the IRTS newsletter this time we note that they are the national society in Eire and have the details of the local clubs around the country; and we see a very good article on...
lightning, plus a reference to EI2W — for so long active and leading the way on VHF.

Up to Ulster, and Lough Erne where they forager at the Railway Hotel, Enniskillen. As they have only just had the AGM, we guess they are busy putting the programme together as we write.

Back to England and Loughton. October 10 is informal, and on 24th they have a D/F hunt on VHF; start at 7.45 p.m. from Loughton Hall, where they have Hq. This is in Rectory Lane, Loughton, Essex.

At Maidstone the Hq. is at the YMCA Sportscentre, Melrose Close, Cripple Street, Maidstone. October 3 is the Mobile Rally briefing, and on 10th they have a natter night, repeated on 24th. October 17 is a junk sale, and October 30 a talk on the construction of a valve 100-watt amplifier for 29 MHz.

We don’t have any detail of the current Maltby activity, so we must refer you to the Hon. Sec., G3ZHI, at the address in the Panel.

Twice monthly in the Tam o’ Shanter Inn, the Maxwelltown crowd heads for the club meetings; October 15 is the AGM date. In addition, most weekends see members at the club site on Solway Firth, but it is suggested you contact the Hon. Sec. about this activity.

Midland now, and this means Henstead House, Henstake Street, Birmingham, where on October 18 they have a home-brew contest.

October for the Nene Valley crowd means October 1 for a talk on the Aylesbury Vale repeater by G8BQH, and on 8th a talk by Dr. Graham of the CEGB on nuclear power. October 15 is an informal, and on October 22 they have Mrs. Cox of the Public Record Office talking about Domesday Book. October 29 is another informal, and all are at the ‘Prince of Wales’ pub, Well Street, Finedon.

The North Cheshire Radio Club seems to have its base at Morley Green Social Club, Wilmslow, Cheshire; for the rest we must refer you to the Hon. Sec. — see Panel.

Every Thursday evening the Nottingham radio amateurs head for Sherwood Community Centre, Woodthorpe House, Mansfield Road, Sherwood, Nottingham. For October they have their activity nights on 2nd, 16th and 30th; October 9 is a 23cm. lightning, plus a reference to EI2W — for so long active and leading the way on VHF.

The Torbay routine has changed a little, as they now alternate the title of G4SSN’s talk on 22nd. Meetings at the Magnet Inn.

The WACRAL members are practising Christian radio amateurs or SWLs, of any denomination. Details from the Hon. Sec. — see Panel.

If you have a Sinclair computer you should be a member of SARUG; every newsletter issue contains interesting programme material for the various computers, plus notes on commercial software and much more. Details from the Hon. Sec. — see Panel.

RAOTA is the club for the old-timers; that means those who can show 25 years or more in Amateur Radio. Get the details from the Hon. Sec. — see Panel.

If you know of a potential or actual radio amateur or SWL who is disabled or blind, you should rope them into RAIBC as the club specially for them. And of course, you could join yourself as a supporter or representative. Get the details from the Hon. Sec. — see Panel.

The Solihull members nowadays get together at the Shirley Centre, 274 Stratford Road, Shirley, Solihull; October 16 is the AGM. New members are welcome and Morse classes are run.

For South Bristol you should find Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol; October 1 is a demo by G4WUB and G0EZE on modem use, and on 8th there is a session on packet radio. October 15 sees the final preparations for the Bristol Rally, and the Rally itself is on 19th. October 22 is a debriefing and activity night, and on 29th there is a lecture which was still to be finalised when they wrote. Usually they are in rooms 2, 3 or 4, but as rebuilding goes on this may change.

Southdown meets on the first Monday of each month at Chaslesly Home, Southcliffe, Eastbourne, plus, on Tuesdays and Fridays, Wealden District Council Offices, Vicarage Field, Bexhill.

Holy Trinity Church Hall is host to Southgate club these days; October 9 is a talk on DBS and ATV, and the informal is on October 23. The venue, by the way, is in Green Lanes, Winchmore Hill, London.

Every Tuesday evening Stafford members are to be found at the Coach and Horses Motel, Weston, Stafford. October is down for G6YHQ to talk on ceramics.

October 8 at Stockport is a talk by G8OMH on logic circuitry, and 15th is an informal natter in the bar. “Shocks and Socks!” is the title of G4SSN’s talk on 22nd. Meetings at the Magnet Inn.

Stourbridge means the Robin Woods Centre, School Street, on first and third Mondays; detail not completed at the time they wrote.

Surrey has first and third Mondays at TS Terra Nova, 34 The Waldrons, South Croydon.

If you want to locate the Sutton & Cheam crowd, you must find Downs Lawn Tennis Club, Holland Avenue, Cheam. The first Monday of each month is an informal in the bar, and the third Monday is the formal. October 17 is a junk sale.

Next Telford which means Dawley Bank Community Centre, Bank Road, Dawley, Telford, Shropshire, every Wednesday.

For Thames Valley the form is to meet on the first Tuesday of each month, at Thames Ditton Library, Watts Road, Thames Ditton. For October, there is the judging of entries for the QRP project.

October 6 for Todmorden is a surplus equipment sale, and on 20th a talk by Mr. Simpson of Ant Products. Both are at the Queen Hotel, Todmorden, starting at 8 p.m.

The Torbay routine has changed a little, as they now alternate between Thursdays and Fridays for the weekly meetings at ECC Social Club, Ringslade Road, Highweek, Newton Abbot, Devon. However, the main meeting on the last Saturday remains unchanged.

On to the Vale of Evesham and the “Round of Gras” at Badsey, near Evesham, on the first Thursday of the month. Should you miss, then look for “The Anchor” at Fladbury on the third Thursday.

The Verulam Hq. is at the R.A.F.A., New Kent Road, St. Albans, on the second and fourth Tuesday of each month. For details, contact the Hon. Sec. — see Panel.

The WACRAL members are practising Christian radio amateurs or SWLs, of any denomination. Details from the Hon. Sec. — see Panel.

The new Wakefield newsletter is reduced in size and a little hard to read, but we gather they are still at the Community Centre, Prospect Road, Ossett. October 7 is entitled ‘Getting Through after Getting Through’ and on 14th they have a competition on the air. October 21 is the home-construction display, and on 28th there is a bonfire party.

An open forum is down for October 7 at Warrington, and on 14th they have G3OOG to talk about spectrum analysis. October 21 is the talk on VHF NFD and other contests, by G4HGI, and October 28 was still not finalised when they wrote. Grappenhall Community Centre, Grappenhall, is the Hq.

October 6 is down for G3FRX to talk about RSGB to Welwyn/Hatfield at the Scout Hq. in Knightsfield, Welwyn Garden City. The same venue on October 20 sees a film and video show.
New Club

This is at Wigan and is to be found on Wednesdays at St. Judes Club; the programme was being built up as this piece is written. More details from the Hon. Sec. — see Panel.

Wimbledon has been reporting in ever since the writer took on this column a couple of decades ago; nowadays they are based on St. Andrews Church Hall, Herbert Road, Wimbledon, where they have the AGM on October 10 and a surplus sale on October 31.

Yet another AGM is at Wolverhampton on October 7, at Wolverhampton Electricity Sports and Social Club, St. Mark Road, Chapel Ash. October 14 is a talk on 'skin effect', and on 21st G8VXY talks and demonstrates RTTY. A D/F hunt on 144 MHz starts from Tettenhall Rock at 11.00 on 26th, and the month ends on 28th with a night-on-the-air.

These days the Worcester activities are concentrated on the Oddfellows Hall, New Street, Worcester. October 6 is club publicity night, and October 20 an informal.

A change of home for Workshop which is now to be found on Tuesdays at the Woodhouse Inn, Woodend, Rhodesia, Workshop.

Worthing now, and here the venue is Lancing Parish Hall, where they meet every Wednesday. This Hq. is in South Street, Lancing, Sussex; October 1 is a ragchew, October 8 the AGM, October 15 another ragchew, and on 22nd they have a talk on SS/TV.

Yeovil has a briefing for GB4OYC on October 9, and G3MYM answering questions on propagation on 16th. He also has 23rd, for a talk on the W8JK aerial, and the natter night is on 30th. G3MYM is back in the chair on November 6 for 'Great Circle Calculations'. The club Hq. is at the Recreation Centre, Chilton Grove, Yeovil.

Every Friday the York crowd is to be found at the United Services Club, 61 Micklegate, York, starting at 7.30 p.m. Visitors are always welcome here.

To meet the 308 crowd, you look for the Coach House, Church Hill Road, Surbiton (no, it's not a pub!). On October 7 there is all the ado of an AGM, and on 28th there is a club junk sale.

Finished

The bottom of the pile aired for another month! Deadlines are in the ‘box’, and meantime please check your club’s details are right. Copy, to arrive by the deadlines, should be addressed to Club Secretary, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. Cuagn.

Rally

November 1, North Devon Radio Rally, Bradworthy Memorial Hall (near Holsworthy), 10.30 a.m. to 5 p.m., bring-and-buy, etc., talk-in on 2m. (S22). Details from G8MXI, QTHR.

Special Event Stations

BBC Radio Newcastle will be holding a public Open Day on October 12 at their new studios at Fenham near the city centre, and Tyne-side A.R.S. will operate GB2FBC from the Newsroom.

The Eighth Army Veterans Association El Alamein Reunion will be held at the Winter Gardens, Blackpool, on October 24-26, and application has been made for GB8AER for contacts on 2m. FM (especially with R.S.A.R.S. members). G2DHV/P and G3JFE/P will also be operating.

Ipswich Radio Club will be operating GB2IRC at the Suffolk Scouts Corroboree 1986, Eurosports Centre, Shotley, during the period October 31 to November 1. Details from G4IFF, QTHR.

R.A.E. Courses

The following information was received too late for inclusion in the main listing in last month’s issue (places may be still available): Knottingley: Knottingley High School, West Yorks., tutor A. E. Ashby G3HCW (QTHR).

Loughborough: Loughborough Technical College, Radmoor, Loughborough, Leics. LE11 3BT (0509-215831), Tuesdays 6-7 p.m. (Morse) and 7-9 p.m. (Theory), tutor Terry Kirk, G3OMK.

College Quest for 100-year-old Former Student

The London Electronics College, which celebrates its 80th anniversary this year, intends to mark the event by setting out on an international quest to find its oldest former student. The College, formerly known as the British School of Telegraphy, was founded in 1906, trained early marine radio officers using the original Marconi wireless telegraph, some 300 of its students being at sea in 1912. Harold Bride, wireless operator on the SS Titanic at the time of the tragic iceberg disaster, and Thomas Cottam on the SS Carpathia, the first ship to acknowledge radio distress messages which saved so many lives, were both trained at the college.

Nowadays, the college specializes in professional electronics technician education, having ceased radio officer training in 1980. The nautical connection was maintained to the end, as the college was among the sponsors of the Trans-globe Polar Expedition led by Sir Ranulph T-W Fiennes under the patronage of H.R.H. The Prince of Wales, during 1979-82. Lady Virginia Fiennes, the expedition’s radio operator, trained at the college during one of the last marine courses.

Since its foundation the college reckons it must have trained some 5,000 students, many of whom will still be scattered over the remote parts of the world, both on land and at sea. In honour of the college’s 80th birthday, a general signal ‘QSO’ is being sent out to all former students asking them to get in touch again. It’s just possible that some of those original 1906 MARCONI wireless telegraph operators will respond to the call. Present-day staff and students will be delighted to welcome such visitors on a tour of inspection — just to see how much electronics has changed in the era of microcomputers and new technology.

Contact Mr. M. D. Spalding, Senior Lecturer, London Electronics College, 20 Penywern Road, London SW5 9SU (01-373 8721).

New Morse Journal

Since 1983, two Dutch radio amateurs, Rinus Hellemans, PA0BFN, and Dick Kraayveld, PA3ALM, have published a quarterly journal, Morsum Magnificat, for Morse enthusiasts. Contributions have been written by amateur and professional Morse telegraphers, young and old, from around the world, but as the journal appears in Dutch, its circulation has been very limited.

In 1985, an experimental, one-off, English version was published to ‘test the ground’ for a wider audience. Now, Tony Smith, G4FAI, has joined the editorial team as English Language editor, and a new English version of Morsum Magnificat will shortly be available by post, worldwide. Its aim is to publish material about Morse, past and present, not normally found to any extent in popular magazines today, and will include history, illustrations, anecdotes and adventures in both wire and wireless telegraphy.

At last, CW addicts can have their fill of Morse matters, can make their own contributions, or have their say, sure of the attention of a specialized and receptive readership.

U.K. subscription for one year (four issues) is £6, postpaid, from G4FAI, 1 Tash Place, London N11 1PA, cheques payable to 'Morsum Magnificat'. For further information, including overseas rates, send an s.a.e., or ring 01-368 4588.
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Work ...................................................... £5.40
The Radio and Electronic Engineer’s Pocket Book... £5.90

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34 HIGH STREET, WELWYN,
HERTS. AL6 9EQ

("SITUATIONS' AND "TRADE")

Copy must be received by Friday, October 17th to be sure of inclusion in the November issue.

A Guide to HF Amateur Radio Equipment. Lists all rigs available since 1965 with details of facilities, sources for modifications, tests, with new and used prices, illustrated, £2.50 including postage. — S. Foster, 91 Copthorne Road, Leatherhead, Surrey KT22 7EF.

Wanted: EE8 American field telephones, any condition, any quantity.— Ring 01-743 0899, 9-5 p.m. Monday-Friday.

November issue: due to appear on Friday, October 31st. Single copies at £1.70 post paid will be sent by first-class mail for orders received by Wednesday, October 29th, as available.— Circulation Dept., Short Wave Magazine, 34 High Street, Welwyn, Herts. AL6 9EQ.

Amidon toroidal cores, ferrite rings and beads. Send s.a.e. for data and prices. Business hours: 10-5 p.m. Tues., Wed., Fri.; 10-4 p.m. Sat. — SMC (TMP Electronics), Unit 27, Pinfold Workshops, Pinfold Lane, Buckley, Chwyd CH7 3PL.

Service Manuals: most makes, models, amateur, test, televisions, vintage etc., s.a.e. with enquiries please;— Mauritron (SWL), 8 Cherrytree Road, Chinnor, Oxon. OX9 4QY.

FREE READERS’ ADS

see Information Panel on page 323

Wanted: Stolle 2010 rotator control box (or willing to purchase complete motor and control box), or possibly updated version provided it is of the ‘feed through’ type for 1½” o.d. tubing. Details and price please. — Evans, 120 Loughton Way, Buckhurst Hill, Essex IG9 6AR.

For Sale: Yaesu FRG-7700 Rx with Yaesu FRT-7700 ATU and Yaesu FRV-7700 converter, Discone VHF Rx antenna, SWL books and manuals, all very good condition, £250 or near offer (buyer collects). — Howes, 149 Warren Wood Road, Rochester, Kent ME1 2XG. (Tel: 0634-404096).

For Sale: Yaesu FRG-7 communications receiver, no mods., recently realigned, complete with manual, box, two books and aerial wire, £115 or very near offer. — Le-Brun, 22 Russet Road, Cheltenham, Glos. GL51 7LW. (Tel: 0242-571279).

Selling: Hameg HM203-4 dual-trace oscilloscope, 20 MHz, good condition, little used, with manual and one switchable probe, £200. Also Leader LAG-27 audio signal generator, sine, square, good condition, £75. — Ring Halfacre, 01-6541882 (Croydon).

Sale: FT-620B 6m. Tx/Rx, £250 or near offer. Microwave Modules 6m. converter with 10m. IF, as new, £25. FT-75 with VFO, but Rx duff, £40. Taylor 45C valve tester, £25. Would accept exchanges for the above, e.g. TS-700 or SSB/CW 70cm. rig, 4m transverter. — Ring GW4HBK, 0495-228316.

TRADE
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