SPRAT

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DEVOTED·TO·LOW·POWER·COMMUNICATION

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S.P.R.A.T. - JOURNAL OF THE G-QRP-CLUB. No.18. SPRING 1979.

Rev.G.C.Dobbs (G3RJV) "Willowdene"Central Ave, Stapleford. NOTTINGHAM. NG9 8PU.
Telephone Nottingham (0602) 394790.

Dear Member,

Over a good many years, now, QRP has brought me a lot of pleasure. The most pleasant thing that has happen to me in the hobby for a long time came when the xyl and I visited GM3OXX. Not only did George and his wife give us a fantastic welcome, but I enjoyed 24 hours of QRP!

An array of home built equipment - not a commercial item in sight - that inspired, and dismayed, me at my own efforts. George and I tinkered with equipment and talked QRP until the small hours. Auld Leekie George! Long may you inspire us lesser QRP mortals.

R.S.G.B. HF CONVENTION: Chris, G4BUE and I will be there on Sept 15. We hope to go for a meal after the convention and 'talk QRP'. Will any other members who are going and would like to join us, please let me know, so we can arrange to meet. It could be fun!

Don't forget the QRP Contest and Activity Weekends.

Best 73 and hpe cu qrp — George — G3RJV.

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CONTRIBUTIONS FOR SPRAT ARE ALWAYS WELCOME - SKETCHES AND NOTES TO G3RJV
QRP OPERATING NEWS ITEMS TO G4BUE. AWARDS CLAIMS TO G8PG.

INPUT vs OUTPUT POWER STANDARDS and TECHNIQUES FOR MEASURING RF OUTPUT POWER

Adrian Weiss K8EEG

Techniques of Measuring R.F. Output Power

It is disappointing to me as an individual who has devoted much time to the QRPp cause as Editor and Publisher of The Milliwatt: National Journal of QRPp, QRPp Editor and Columnist for C.Q. Magazine, and contributor to QST, CQ and Ham Radio, to note that, after about 10 years of effort, input power is still the accepted standard of performance in official QRPp organs such as The QRP ARCI I and The G-QRP-C, as well as The DL-AGCW Group, and elsewhere. As W7ZOI pointed out 9 years ago in an early issue of The Milliwatt, the use of input power as a comparative standard of achievement is senseless because it provides no reliable data regarding the factor which actually accomplishes that achievement, namely, the power which is radiated into the propogation path by the overall transmitting system.

For example, consider The QRP ARCI's KM/W, or "1000 miles per watt" award. What achievement is actually indicated by the use of input power as the standard? What validity is there in the implicit comparison of the achievement of two KM/W awards? Suppose that G5BWE's KM/W award specifies that he worked a distance of 800 miles with an input of 300 milliwatts, for a KM/W of 2666 miles per watt. But, G5BWE's single stage crystal oscillator rig exhibits an efficiency of only 18% (typical for this type of circuit) and the actual r.f. power is only 54 milliwatts. If we measure the achievement in terms of output power, his KM/W is 14814 miles per watt. Quite a different story!

Further, what if G4BOX worked the same distance with the same input power, except that his three stage transmitter's final stage exhibits an efficiency of 67% (typical) and produces an r.f. power output of 201 milliwatts. Based upon the input power standard, the two achievements are exactly the same - 2666 KM/W. But, based upon the output power standard, G4BOX's KM/W is only 3980 miles per watt, while G5BWE's is 14814 miles per watt. Now, which figure is more indicative of the achievement which the award is supposed to recognise Clearly, the output power standard provides the actual comparative achievement.

A similar rationale applies to the definition of power multiplier levels in terms of the input standard in various QRPp activities and contests sponsored both by The QRP ARCI, G-QRP-C and DL-AGCW. According to the input standard, G4BOX and G5BWE of the above example are in the same power multiplier class, but the former actually has a 5.7 dB advantage! That is a solid S unit of advantage! In addition to the fact that the input power standard masks a very significant advantage while producing the appearance of equel matching, that the two stations are in the same class is unfair. It is like matching a 155lb fighter against one weighing 220lbs and giving even betting odds.

While I could go on with arguments supported by both theoretical and practical considerations, I think that the above example is so cogent that any rational, objective mind will bow inexorably to the conclusion that the input power standard is untenable in the face of scientific principles and practice. The major reason for rejecting input power is that it exhibits an ambiguous relationship to ouput power and varies in all instances. In fact, there is no way of calculating output power, given input power - it ultimately must be measured empirically. Since it is the output power which performs the "work" of producing a readable signal at a distant point via the propogation path, the output power must be known in order to assess performance and achievement. One primary objective of The Milliwatt was to perform such an assessment and present the results for all the world to see. It became immediately apparent that no such valid assessment was possible if the inpu power standard was used, as is illustrated in the foregoing examples. This is still true. Fortunately, r.f. output power is easily measured using simple instruments.

The Measurement of R.F. Output Power

For the average amateur, the basic approach to the measurement of r.f. output power is to convert that a.c. quantity to a d.c. form, and perform a measurement at d.c. In general, we are speaking of measurements of "average" power rather than "peak" power, although the same techniques apply to the measurement of both. The measurements of average output power from a voice actuated SSB transmitter is beyond the capabilities of those lacking access to a sophisticated laboratory setup. In the following, two instruments and their application are discussed.

R.F. Power Wattmeter

Figure 1 shows the circuit of a simple, easily calibrated, and accurate r.f. output power wattmeter that can be used in conjunction with an external VTVM/FETVM/DVM, or an internal microammeter or milliameter. The theory of circuit operation is quite simple. It is an a.c. peak voltage sensing circuit. When an a.c. or r.f. signal is placed across the load R1, a voltage representing the a.c. peak level is rectified through D1 and charges capacitor C1 to that peak level. That voltage is then measured, and the formula of Figure 2 used to calculate the average power output of the signal source.

Measurement of the peak voltage at C1 can be accomplished by using an external VTVM/FETVM/DVM exhibiting an input impedance of several megohms or higher, or a self-contained micro. or milliameter. A voltmeter cannot be used in conjunction with the circuit due to its low input impedance, which will disturb the impedance relationships in the circuit. Likewise, "cheapie" VOM's are unlikely to provide accurate, dependable readings.

The circuitry for a self-contained meter consists of RFC1, the R2 series dropping resistor, and the meter. The purpose of RFC1 is to isolate the meter from the dummy load at r.f., while R2 is chosen in conjunction with the meter sensitivity to produce a full scale needle deflection at the desired upper watts limit. If an external VTVM/FETVM/DVM is used, measurements should be taken at the meter - R2 end of RFC1, and the dummy load shield from the VTVM/FETVM/DVM. R.f. isolation is essential.

Construction

The major objective of construction is the assembly of a dummy load from composition resistors and its mounting in a shielded enclosure. Figure 3 shows the use of double-clad p.c. stock as the walls of an appropriate enclosure for a unit capable of dissipating 6 watts continuous. Two of the walls are etched for mounting the circuitry. Three 150 ohm, 2w carbon composition resistors are "sandwiched" between the etched walls and soldered in place, and the remaining parts mounts and soldered to their appropriate foils. The remaining walls are soldered into place after the actual resistance of the dummy load is measured as accurately as possible, and calibration is completed. Any appropriate enclosure, such as a minibox, may be used.

Resistor Values

In choosing resistors, our objective is to produce a given dissipation capability with a cumulative resistance of 48-54 ohms when the resistors are paralleled. In the units shown, three 150 ohm, 2w resistors produced a resistance of 51.9 ohms.

Calibration

The advantage of this circuit is that it can be calibrated at d.c. A variable voltage d.c. supply capable of producing 0-36VDC (15w range), 0-33VDC (10w range) or 0-23VDC (5w range) is placed across ground and D1 (disconnected from R1!), and a VTVM/FETVM/DVM used to set the calibrating voltage to be calculated volts vs watts levels derived from the formula. The self-contained meter scale may be re-faced and marked in watts, or the meter readout in ua/ma vs watts referenced in a table. Accuracy of readout can be checked by reversing the process, i.e. attempting to reset calibration voltage levels by readout in watts from the new meter face or table. If an external VTVM/FETVM/DVM is used, insert the peak voltage into the formula, and calculate average power.

Once calibration is perfected, complete the enclosure after resoldering D1 to the dummy load. Measurements are simple. Connect the transmitter to the input of the unit, apply power, and readout watts average power. The unit may be used to calibration an in line wattmeter of the Breune type which has been discussed in the amateur literature (see CQ Magazine Jan. 1974; May 1977 and August 1977).

R.M.S. Voltage R.F. Probe

A second method for measuring r.f. power output is by using a VTVM/FETVM/DVM in conjunction with an r.f. probe, shown in figure 4. In this approach, the r.f. voltage developed across a load of known resistance is measured by means of the probe, and the measured r.m.s. voltage inserted into the formula to calculate average r.f. power.

The probe circuit is wuite simple. C1 is a d.c. blocking capacitor which exhibits a low impedance across the frequency spectrum of signals to be measured. When it is applied to a circuit point, it permits the r.f. signal to pass and the diode D1 then rectifies, or grounds, the positive half-cycles of the r.f. signal. The remaining negative half-cycles are then filtered by the shunt resistor R1-R2 and cable capacitance. The resulting d.c. r.m.s. voltage is then measured. The shunt resistance R1-R2 is selected in conjunction with the VTVM/FETVM/DVM input impedance to produce a ratio of 0.707 between the r.f. voltage at the test point and the d.c. voltage at the probe output. Meter readings are then in r.m.s. Since standard value resistors are not available to provide exact R1-R2 values, two ¼ watt resistors are placed in series to get that exact value.

Construction

Two approaches to construction are possible, both using the p.c. board shown in Figure 5. The ciruitry may be either housed in some metal cylinder, such as a 0.5 inch dia. piece of copper tubing, or, the p.c. unit may be insulated by a generous wrapping of electrical tape, followed by a generous wrapping of aluminium foil which is electrically connected to the coax cable shield braid and the p.c.b. common foil, and completed with another generous wrapping of electrical tape. The "K8EEG World Record R.F. Probe" followed this second approach, and was completed in 24 minutes flat, from entry to the office until first actual r.f. measurement! The unit duplicates the more sophisticated approach unit's performance. The probe tip is soldered directly to the proper p.c. pad and is cut from number 12-16 copper wire. The alligator ground clip must be electrically connected to the housing and cable shield braid.

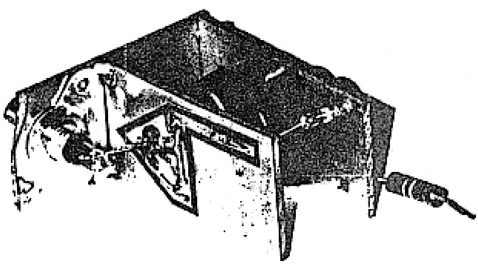
Measurements

The load (dummy load) is measured for its actual impedance, and output from the transmitter is placed across the load. The resulting r.f. voltage developed across the load is then measured with the r.f. probe, and then the dummy load resistance and r.m.s. voltage values inserted into the formula to calculate the average r.f. output power.

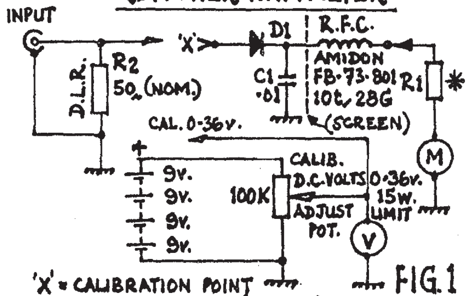
Conclusion

The above instruments will allow amateurs to measure r.f. output power accurately and with a minimum of expenditure and effort. The return will be reliable, and sometimes invaluable data which assesses the performance of a transmitter both in regard to internal performance and performance in a communications situation. I strongly urge all QRPp operators to recognise the senselessness of input power as a standard, accept the scientific cogency of the output power standard, and construct the means whereby r.f. output power can be determined. The description of the above instruments is an encouragement in this direction. As a final note, I would encourage the official QRPp organisations to discard input power as a standard and to redefine their awards/activities according to the output standard. This will be a step forward for our unique branch of an exciting hobby.

WATTMETER/DUMMY LOAD



R.F. POWER WATTMETER



'X' = CALIBRATION POINT
V = EXTERNAL VTVM/FETVM/DVM TO READOUT CALIBRATION VOLTAGE
M = MICRO./MILLIAMETER
* R1 – SEE TEXT

R.F. POWER W'METER – CAL. FORMULÆ

$$\text{Av. } P_{\odot} \text{ WATTS} = \frac{(E \text{ peak D.C.})^2}{2R \text{ (D.L.R.)}}$$

OR

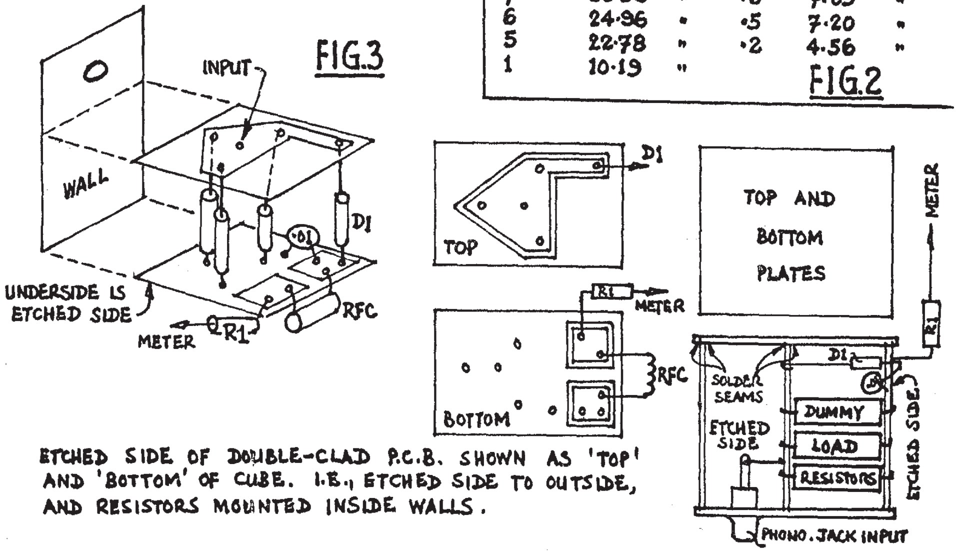
$$E_{DC} \text{ CAL. VOLTS} = \sqrt{\text{Av. } P_{\odot} \text{ W.} \times 2R \text{ (D.L.R.)}}$$

AUTHOR'S CALIBRATION TABLE

(ACTUAL 'R' = 51·9Ω)

$P_{\odot}$	D.C. CAL. VOLTS		$P_{\odot}$	D.C. CAL. VOLTS	
10	32·22	V.D.C.	·9	9·67	V.D.C.
9	30·56	"	·8	9·11	"
8	28·82	"	·7	8·52	"
7	26·96	"	·6	7·89	"
6	24·96	"	·5	7·20	"
5	22·78	"	·2	4·56	"
1	10·19	"			

FIG.2



ETCHED SIDE OF DOUBLE-CLAD P.C.B. SHOWN AS 'TOP' AND 'BOTTOM' OF CUBE. I.E., ETCHED SIDE TO OUTSIDE, AND RESISTORS MOUNTED INSIDE WALLS.

R.M.S. VOLTAGE R.F. PROBE

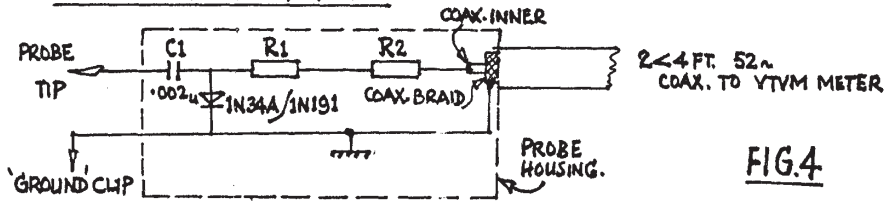
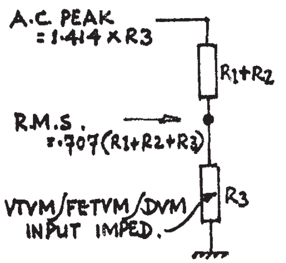


FIG.4

R.F. PROBE (DATA)

SELECTION OF R1 AND R2 TO FORM R.M.S. VOLTAGE-DIVIDER IN CONJUNCTION WITH VTVM/FETVM/DVM INPUT IMPEDANCE.



R3	R1+R2
10MΩ	4.14MΩ
11MΩ	4.57MΩ
20MΩ	8.28MΩ

FOR 10MΩ. R3 = 10MΩ×1.414 = 14.14MΩ

14.14−10 = 4.14MΩ FOR R1+R2

(USE 3.3MΩ + 820K = 4.12MΩ)

R.F. PROBE P.C.B. (USE ALSO FOR 'WORLD RECORD' RF. PROBE).

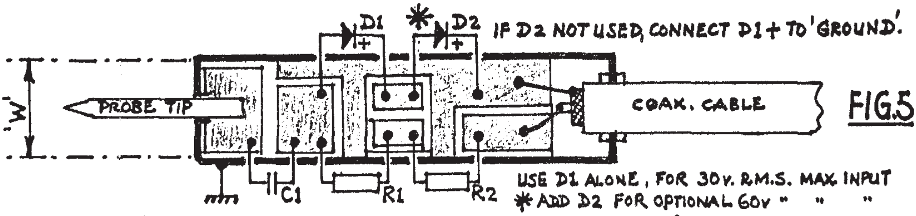
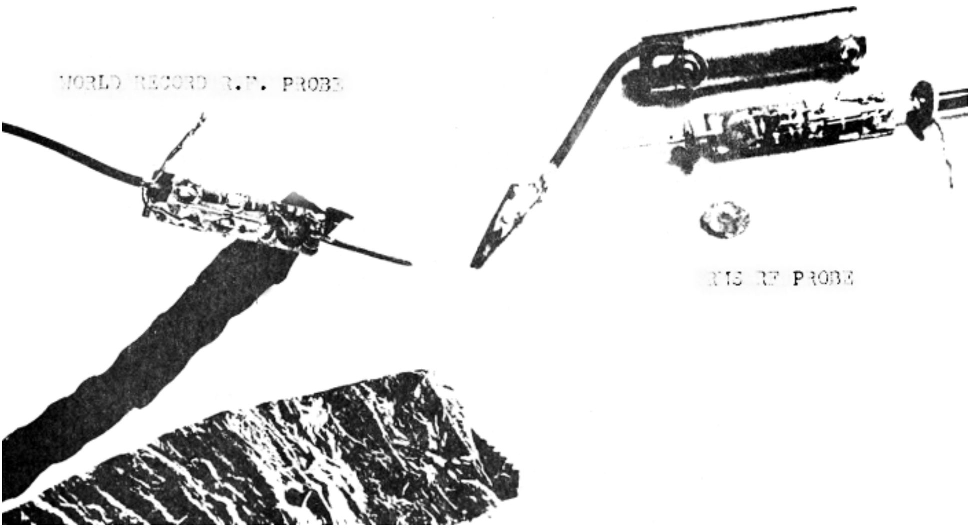


FIG.5

'W' = WIDTH OF P.C.B., TO FIT INSIDE DIAM. OF TUBING/HOUSING
(ISOLATE PROBE TIP FROM HOUSING WHICH IS AT GRD. POTENTIAL)



QRP NEWS

Compiled by G4BUE

PA3ABA - Joop Stakenborg: Joop took part in the new WPX CW Contest and made 238 QSOs, including some new QRP countries in the shape of HS1ABD, KG6SW, KL7HR, VP2KV, HD1A, JA1PIG/PZ, LU8DQ and UJ8JCL. That completes a W.A.C. for Joop when he receives the KG6SW QSL card. The equipment in use is the FT 200 with reduced drive to 5 watts output, but a seperate PA with a maximum of 5 watts is in the planning stages. Joop has now worked 72 countries with QRP and has 54 confirmed.

GM3MXN - Tom Sorbie: Tom uses a HW8 to a W3DZZ dipole at 18 feet, and since September 1978 has worked 51 countries including VK3, JA, OX, YV, HC, PY, KL7, VE4, UAØ, EA8, CN, KV4 on 14/21MHz, and UA9, W1-W4 on 7MHz, and TF, CT, UA9 and YU on 3.5MHz. Tom has worked the U.S.A. on 21MHz with a mobile whip on his car with 1 watt.

GM3OXX - George Burt: George is now the proud possessor of Milliwatt DXCC Trophy No. 2 The trophy stands two feet tall and has taken up a commanding position on top of the family television set. Recently he has worked SV, ZD8 and UJ8 for new countries to bring his total to 109. George also had a dabble in the WPX Contest and worked VK, ZW, KL7, PY and 'loads of Ws'. George had a visit from our Secretary and his XYL, and we are told there was much talk of QRP way into the early hours!

G4FJF - Mike Thacker: Mike is working his way towards his first 25 countries, but is finding the QSL cards difficult to obtain. (I think we all suffer from that problem.) Mike uses a HW8 and the 18 AVT/WB vertical which is mounted on the ground. Mike has worked into Japan a few times with 3 watts on both 14 and 21 MHz, so he shouldn't have much difficulty in obtaining the 25 QSL cards for the QRP Countries Award. On 25.5.79 at 1818z, Mike was working DL7VK, who was QRO, on 21MHz. DL7VK said he had to go QRT as he had a TVI problem, but Mike managed to pursuade him to stay on the air, but just reduce power. This he did, reducing his power to 20 watts, and was amazed to find he was able to continue the QSO with Mike without causing TVI. Thus another amateur is converted to the advantages of QRP.

G4DYF - Brian Castle: Brian was on the bands during the SSB QRP Activity Week-end, but the only other member he worked was OE1SBA, on 14MHz. He had QSOs with some QRO stations in Europe, but no other QRP stations. When he worked OE1SBA, Bruno told him that he had not heard any other QRP stations, so it would appear that there is very little support for a SSB QRP Activity Week-end.

SMØGMG - Lars: Lars was heard on the bands with QRP during the WPX CW Contest. He worked members G4BUE and PA3ABA, and when last heard had a serial number of 383.

G4BUE - Chris Page: Chris was another member who took part in the WPX Contest, He made 418 QSOs and worked KØAX/DU2 for a new QRP Country. Other DX worked during the contest was HD1A, ZW4OD, YX1DIG, HS1ABD, JA1PIG/PZ, KP4ESP, LU8DQ, some JAs and loads of Ws. Members recently worked by Chris include, KØUBA, SMØGMG, PA3ABA, DK6AJ, G3DOP, G2CVA, WB9QPS, G3HQQ, G3WBO, W8JKB, AA9N, G3GWI, G3IGU, G3ILO, G4FJF, GM3MXN and G8DV. Like George Burt, Chris has now received his QRPp DXCC Trophy number 8 from C.Q. Magazine, endorsed 'First Europe'. It stands two feet high and the shack had to be rearranged to accommodate it. The RSGB Low-Power Contest was entered and 67 QSOs made with 1 watt, but generally the amount of activity was disappointing.

G8PG - Gus Taylor: Gus has been modifying his PM3 and HW7 rigs, so air time has been somewhat restricted, but some Ws, a UA9 and a 7X4 were worked on 28MHz with 3 watts. Gus has been awarded the first WAFOC Countries Award endorsed for QRP.

G3DNF - Gordon Bennett: Gordon is another member who took part in the RSGB Low-Power Contest. He made 41 QSOs with 1 watt, and also found activity down on the previous year.

OK1DKW - Petr Doudera: Petr was ill during the early part of the year, but is now fully recovered. He has been experimenting with different antennas for QRP work. Judging by the DX he has been working, his antenna experiments seem to be working very well indeed. His QRP DX work includes QSOs with ZF2CL, HM1DH, FP8EE, KH6IJ, VP2SZ, WA7JRL/SU, and many two way QRP contacts with stations around Europe. Petr is working towards the QRPp DXCC and has 90 countries worked and 65 confirmed.

AA9N - Philip Lazar: Phil uses an Argonaut and has worked 72 countries during the two years that he has been licensed. He is also a member of QRP ARCI in the U.S.A. and operates 100% with QRP.

G3RJV - George Dobbs: George was on the air during the WPX SSB Contest for about one hour and worked all W Call areas, except W6, on 28MHz. Recent DX worked by George on 28MHz includes 5B4EP, EA8QL, VP2EM, FGØDYM/FS7, CT2CH, PY2AAM, A4XGC, JH4GLE, and many W and UA stations.

WA2JOC - Bill Dikerson: Bill is another amateur who operates 100% with QRP. He recently worked 601FG and has now worked 160 countries with 5 watts or less, using either his Argonaut or HW8.

It is hoped that this column will be a regular feature in each issue of Sprat, but it is dependant on you - the members, to let us know what you have been doing on the bands with QRP. It doesn't have to be good DX, anything of interest to other QRP operators is the type of material we are looking for. Please include brief details of equipment used and antennas, and send all your information to Chris Page, G4BUE.

CERTIFICATE NEWS

GEORGE BURT, GM3OXX, IS THE FIRST TO ACHIEVE THE MASTER AWARD!

Hearty congratulations to George Burt on achieving QRP Masters Certificate No1.
.Congratulations also to the following for outstanding results.
QRP Countries Award. 125 G4BUe, 75 OE1SBA, 50 OK1DKW, Basic SM7BNG,SM5ENX.
Worked G QRP C. 60 members GM3OXX.

NOVICE LICENCE PROPOSAL

So far over 100 letters and cards of support, including 5 UK local radio clubs. What is your local club doing about registering their support???

G2NJ TROPHY, 1979

Will be awarded for the best log of QRP results submitted for the period 1 January to 31 December, 1979. All modes and bands may be used with a maximum input of 5w cw or 3.6 w pep. In making the award the Committee will not be looking purely for strings of DX worked, but also for contacts of outstanding technical/experimental merit. Last time G3NEO used all bands 160m to 70 cm, and his log included outstanding QRP contacts via OSCAR. So, whether you have worked 300 countries with 500 mW or regularly work 300 miles with 5w to a 6 inch nail antenna,send your entry to the Communication Manager by 28 February, 1980,

DIRECT CONVERSION 80m RX - RadCom March '79. Bill, G4CIA, suggests to avoid frustration with this circuit, try making R14=6.8K,Ra=100K, Rb=56K, & Rc=39K,R17 increased to 100K stops IC3 clipping. Tnks Bill!

AGCW WINTER QRP CONTEST - RESULTS

What a fantastic showing by Club members in this contest. The overall winner, five out of the top six positions in Class A (below 3.5 watts input), and three first positions in the band awards, all going to Club members.
Club members appearing in the results for Class A are as follows :-

1.	G4BUE	18423	6.	G3DNF	2221	22.	PAØGG	315
2.	OK1DKW	4656	12.	DK6AJ	990	26.	G4EJN	204
3.	G8PG	3094	14.	G3NEO	767	28.	G4AYS	106
4.	GM3OXX/A	2346	20.	G4GIE	502	34.	PAØYF	38

There was a total of 46 entrants in Class A - congratulations to you all.

Details of the band awards are as follows :-

160m	80m	40m	15m	10m
1. GM3OXX/A	1. OK1DKW	2. DK6AJ	3. GM3OXX/A	1. G4BUE
2. OK1DKW				2. G8PG
3. G3NEO				3. G3DNF

In total the contest attracted 127 entries from 18 countries in 3 continents, so it would appear that the new rules have been a success. The Summer Contest is being held over the week-end 21st/22nd July 1979, and the rules were published on page 11 of the Winter 1978 edition of Sprat.

CQ WW DX CONTESTS

The Contest Committee for the CQ WW DX Contests 1979 have retained the QRP sections introduced last year, in their CW and SSB contests. The contest committee have asked for as many logs as possible to be sent in (regardless of the number of contacts made). In order to show the organisers of the contests that there is a need for the QRP sections, members are urged to send in logs to the address shown below. The results of members will be published in Sprat.

SSB CQ WW DX Contest - 27th/28th October 1979 - Logs deadline 1.12.79
CW CQ WW DX Contest - 24th/25th November 1979 - Logs deadline 15.1.80

Logs should be sent to the following address :- The CQ WW DX Contest Committee, 14 Vanderventer Avenue, Port Washington, New York, 11050, U.S.A., and should be clearly marked that they are intended for the QRP section.

CW QRP ACTIVITY WEEK-ENDS

Members are reminded of the dates for the CW QRP Activity Week-ends :-

23rd/24th June 4th/5th August 6th/7th October

Full details were published on page 8 of the Spring edition of Sprat.

BENELUX QRP GROUP WEEKLY QSO PARTIES

Member Frans Priem, PAØGG, has kindly sent a copy of the newsheet of the above group to Chris Page, G4BUE. Although the newsheet is printed in Dutch, Chris has noted the following times and frequencies when members meet on the air. Frans says that any members of G-QRP-C are welcome to join in.

Saturday mornings at 0930 GMT on 3640 SSB
Sunday mornings at 0900 GMT on 3560, 0930 GMT on 7030 and at 1000 GMT on 14065.

QRP ARCI

Although this club is based in the U.S.A. and defines QRP as being under 100 watts !!, many members use QRP as we know it with less than five watts. Members meet on the first Sunday of each month on the international calling frequencies between 1500 and 0300 GMT.

LOCAL CLUB GROUPS: Scottish members met at a 'MacSprat' meeting at the GM3OXX QTH and included: GM3KHG, GM3RKO, GM4HVM, GM3MKW, GM4HBM, GM4FPR, GM8KMX, SWL Noel, & GM3OXX. Much QRP talking went on during a great evening. Why not try to get your local QRP members to meet one evening?

G-QRP-C SUPPORTS THE CW BAND PLAN

MILLIWATTS FROM AN ARGONAUT - MORE NOTES By Chris Page, G4BUE

Since writing the article, 'Milliwatts from an Argonaut' which appeared in the Spring edition of Sprat, I have continued experimenting with very low power and a summary of my experiments is set out below.

In order to obtain even lower input power levels than the 150mW mentioned in my previous article, I gradually started reducing the collector voltage to the PA transistors, by replacing the standard 12 volt line with batteries, depending on the voltage required. I finally finished up with a 1½ volt dry cell, and by using a voltage divider, reduced this to 1 volt. By driving the PA to 10mA, I had an input power of 10mW. In this manner I worked three W stations (including a W8) during the ARRL CW Contest in March.

I was over the moon at having worked the U.S.A. with an input of 10mW, but got to thinking just how much output power was being obtained in running the Argonaut in this manner. A close friend (who is also a radio amateur) works in a test laboratory and has the use of some very good equipment, including a £30,000 oscilliscope. He agreed to allow me to take the Argonaut and the necessary ancillary equipment into the laboratory, to measure the output of the PA at different input levels, using his expensive oscilliscope. The results absolutely staggered me. With an input of 5 watts, the Argonaut gave just over 2 watts out, which was about right. Then, as the input was reduced, the efficiency of the PA also reduced, until finally at the 10mW input level, I was obtaining an output of 576 Microwatts. I had worked across the Atlantic on 576 Microwatts, and just couldn't believe it (for two reasons). The figures were checked and re-checked and sure enough, 576 Microwatts was the output.

The second reason that I found the 576 Microwatt output figure hard to believe was that it represented an efficiency figure of 4.6%. Obviously by reducing the collector voltage to 1 volt, it was altering the impedance of the PA and making it less efficient. 4.6% was lower than I had expected, and it was as a result of this that I started experimenting with different voltages and current, whilst monitoring the output, to find the most efficient combination of running the PA at different input levels. The results are set out below, and are reproduced in order that other members thinking of using their Argonauts at these levels have some idea where to start.

Input power	Volts	Current
5 watts	10	500mA
3 watts	7.5	400mA
1 watt	4.25	235mA
750mW	3.5	214mA
500mW	3	166mA
350mW	2.75	127mA
250mW	2.25	111mA

Input power	Volts	Current
150mW	2	75mA
100mW	1.6	62.5mA
75mW	1.4	53.5mA
50mW	1.15	43.4mA
30mW	0.75	40mA
15mW	0.65	23mA
10mW	0.5	20mA
5mW	0.4	12.5mA

Since arriving at the above figures, an accurate voltmeter, 25mA meter and variable PSU to the PA board, have been added to the Argonaut. What is interesting is that to obtain the best efficiency of the PA at 5 watts input, it was necessary to reduce the 12 volts on the PA to 10 volts and increase the drive to 500mA.

By using the PA in a more efficient manner, it has been easier to work new countries at the different milliwatt input levels. On the 11th April, I adjusted the PA for an input of 5mW, and called N1YL, who was calling CQ during the YL Contest. She came back and gave me 599 after copying my call sign correctly, and then copied my report to her. Although the 599 contest report does not mean anything, I had worked across the Atlantic with an input of 5mW. I was now begining to wonder if it is going to be possible to obtain a "Million miles per watt" endorsement to the QRP ARCI KM/W Award. It would be fair to say, however, that the output from the Argonaut during the QSO with N1YL at 5mW input was much higher than the 10mW input QSOs during the ARRL Contest when the PA was only operating at 4.6% efficiency By using input power as a standard of measurement for QRP work, the incentive is there to make the PA as efficient as possible.

Recently I have received a very interesting letter from member Brice Anderson, W9PNE, whose article in the Autumn edition of Sprat initially got me interested in milliwatt QRP. He has also tried using the Argonaut with milliwatt input levels, and has come to similar conclusions to me. He has found that by running the PA with 3 volts on the collector and driving it to 83.5mA, he obtains an input of 250mW with an efficiency of around 50%. Brice uses the model 505 Argonaut whereas I use the 509 model, but our figures for an input of 250mW are very similar. With the full break in facility of the Argonaut, there is quite an advantage in using the Argonaut for QRP work as opposed to using an outboard PA.

Since working N1YL with 5mW input, I have worked a W4 in Virginia, also at 5mW, but I will not count the QSO for award purposes, as I had initially made contact at 5 watts input, and then gradually reduced power. The contact does show, however, the kind of distances that can be covered with very low power.

With a more efficient PA, I am now trying to accomplish even greater distances using milliwatts, but recently the conditions on the HF bands have been against me. During the Winter months I intend trying the LF bands with milliwatts. I would be interested to hear from other members who have been experimenting along the same lines as Brice and myself.

PARTRIDGE TROPHY 1979

A CHANCE FOR ALL TO DO SOMETHING USEFUL!!

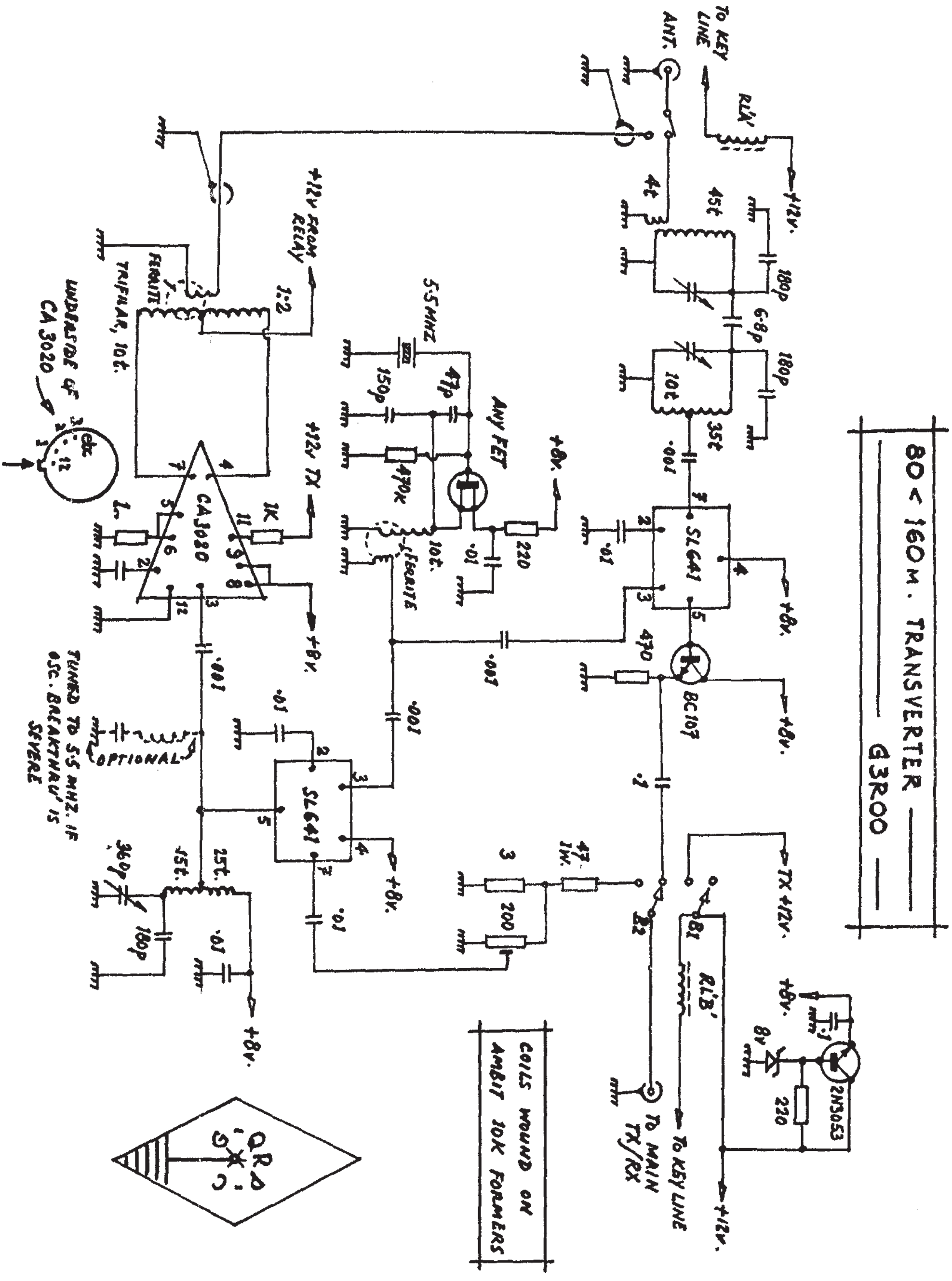
In many parts of the world there is a need for reasonably consistent low power hf radio communication over distances of 300 to 400 miles, often from very difficult sites such as deep valleys, forests and jungles. Typical users are local administrators,public utilities, survey/exploration parties and rescue parties. Such users will often have to carry their equipment with them and set it up each time that they require to communicate. Designs for large aerial arrays suitable for short range hf communication exist, particularly in the tropical broadcasting services, but their complexity and size are such that they can only be installed on large permanent sites by skilled engineers. The requirement for low power transportable work is different, involving light, easily erected aerials that can be put up quickly by two men amongst trees, in a rock strewn valley or in a built up area . Such aerials should be capable of operating over the range 3 to 8 MHz, and be easy to load without the use of complex equipment. They should be capable of providing 300 to 400 mile communication for a good part of each 24 hours when used with transmitters having an input in the order of 10 watts. The mast or masts used may have to be carried on a pack animal, in a Jeep, in a small boat or even on the backs of the operators, so very high masts are not feasible.

We invite you to consider this problem, put up your idea of a suitable aerial, and test it on the 3.5 and 7 MHz amateur bands. Then send us a description and a summary of your test results, which should reach the Communication Manager by 31st January , 1980. The best entry received will be awarded the Partridge Trophy and a Plaque (Trophy to be held for 1 year). Other entries considered to be of high merit will earn Merit Certificates. (Note: The Committee will be basically looking at the design and performance of the aerial: a design for suitable mast(s) may be submitted, but it is not obligatory).

Contestants should note that the Committee reserve the right to assemble the best designs into a technical paper and either print it in SPRAT or submit it to another technical journal for publication. Full credit will be given to those submitting the designs if this is done.

USE YOUR QRP SKILL AND HAVE A GO AT THIS CHALLENGE!

CRYSTAL ETCHING: G2CAS, John Douglas, 15 Pannal Ash Dr. Harrogate. is able to etch crystals. John kindly suggests that he may be able to hold a stock of crystals for members requirements, or etch members own crystals up in frequency. Please send any (not plated or hermatically sealed) crystals, which are of no use to you, but may be useful for other members to john so that he can build up a small stock for club use. A chance to sort out some of those old crystals lying around in the junk box. I also suggest that if you request John to etch a crystal (up in freq.) you donate at least one crystal to the stock.


80 < 160M. TRANSVERTER
G3ROO
ANT.
TO KEY LINE
RLA
+12V FROM RELAY
TRIFILAR, 10t.
FERRITE
UNDERSIDE OF CA 3020
CA3020
+12V TX
5.5 MHZ
ANY FET
FERRITE
SL641
BC107
TUNED TO 5.5 MHZ. IF OSC. BREAKTHRU' IS SEVERE
OPTIONAL
RLB
2N3053
TO MAIN TX/RX
TO KEY LINE
COILS WOUND ON AMBIT 10K FORMERS
QRP

EIGHTY TO ONE-SIXTY TRANSVERTER. Ian Keyser (G3ROO)

Apologies to all those who have been waiting for this article asfter it was announced in a previous SPRAT. A failure produced some instability and due to pressure of work at ROO, I was delayed.

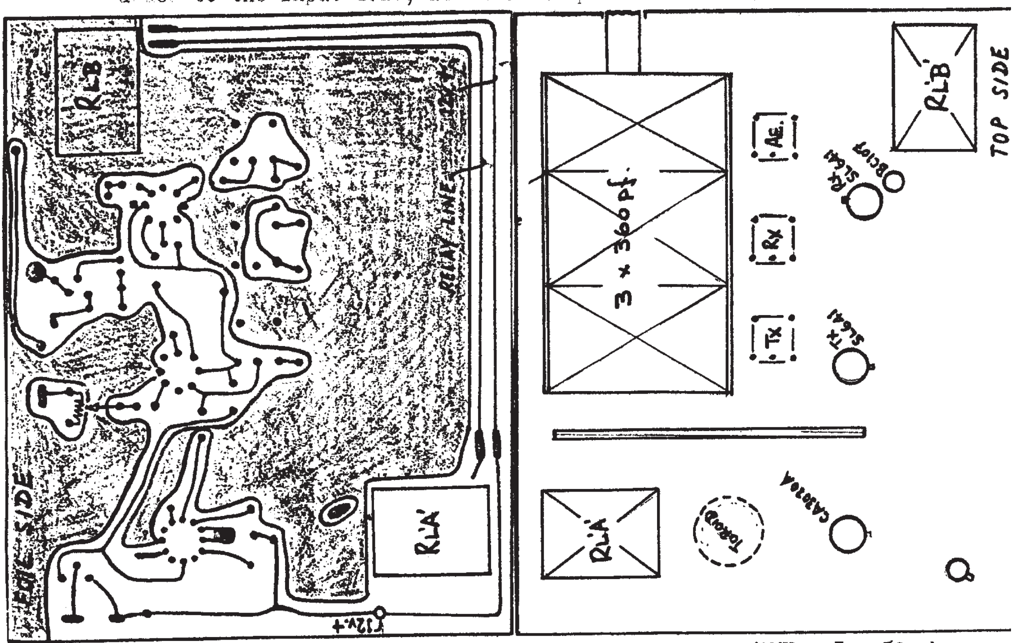
DESCRIPTION:

The Top band signals are preselected by two tuned circuits with loose top coupling and fed to an SL641 and mixed with a 5.5MHz oscillator signal from a FET crystal oscillator. The mixer output is fed to a BC107 emitter follower thence to the main station RX via a change over relay.

The transmit side is just as simple. The TX signal is fed via the changeover relay to an attenuator. The preset output is taken to an SL641 where it is tuned by a single tuned circuit on Top Band. (If any 5.5MHz breakthrough is experienced a series tuned trap may be added at this point) The output from the mixer goes to a CA3020A. One watt on 160m, at 50 ohms is available via the changeover relay.

POINTS TO NOTE:

a) On SSB the input must be set so as not to overdrive the mixer (abt 2w
b) On SSB the sideband is inverted.
c) There is no protection, so the main TX must not insert RF into the unit without the changeover relays operating.
d) The output must be tuned and match to a 50 ohm load.
e) Should instability occur in the CA3020A P.A. a ferrite bead may be added to the input lead, as close as possible to the I.C.



ADVERT: QRP SWR METER. Osker Model 55-51. Frq 1.9-150MHz. Imp 52 ohms, 2xso239 sockets.Full scale power 5w, 14MHz to 100w, 1-9MHz. £5 inc post. or swap multimeter. G3FCK. QTHR.

ADVERT: Ten Tec PM2 CW QRP transceiver 80/40m xtal or VFO, direct con. RX working order. £20. G3VKM. Tel St Benets, Norfolk (069-262) 268.

WANTED: 14MHz CW BAND XTALS except 1400. G3DOP,7 Tregellas Rd. Mullion. Cornwall.

HELP: G4EUW has trouble with stability with his Vanguard (in 10w mode) drift perhaps cause by heating of VFO cap. Any experts please help!

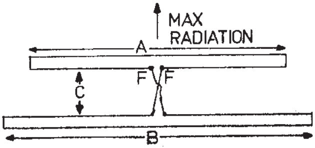


FIG.1.

Lesser Known Aerials III

by A.D.Taylor G8PG

THE ZL SPECIAL

Very popular in the 1950s, the ZL Special (Fig 1) is not so often heard of these days. It is a 2-element beam using a radiator and reflector driven 135 degrees out of phase. Gains as high as 7 dB are claimed for the array, but 5 dB is probably a more realistic figure.Both the radiator and director take the form of folded dipoles, so a good bandwidth is obtained. Table 1 shows dimensional details for 14, 21 and 28 MHz versions in which the radiator, director and phasing line are made from 300 ohm ribbon feeder (wire elements with 2 inch spacing would probably work just as well with these dimensions). Note that the phasing line, C, is transposed. The antenna can be fed with 75 ohm twin feeder at points F F, or if a balun transformer is connected at these points 75 ohm co-axial feeder can be used. Note that the feeder is attached at the director end of the phasing line. As this is a driven array, it is much more suitable for indoor use than a parasitic array. During the early 1950s an indoor 14 MHz version was erected, pointing roughly at Trinidad in the West Indies. Used with 50W of cw it proved a winner - almost all the West Indies and Central America were vorked, plus all US call areas , much of Canada and some South American countries. Recently a 28 MHz version, firing roughly at Moscow, has been in use. This is also extremely good, average signal reports from the East being 2 S-points up on those previously obtained when using vertical and long wire aerials.

TABLE 1

	14	21	28	MHz
A	31 ft 4 in.	20 ft 10 in.	15 ft 7 in.	
B	33 ft	22 ft	16 ft 5 in.	
C	8 ft 8 in.	6 ft 3 in.	4 ft 3 in.	

(For A, B, C see Fig 1)

THE "EBOR" 3.5 MHZ TRANSCEIVER

G3GWI

This 3.5 MHZ rig illustrates how various circuits from SPRAT data sheets and other radio journals can be combined to produce a rig tailored to personal needs. The vfo (Fig 1) uses the very stable Seiler oscillator. Switchable RIT is provided. The bandspread circuit requires about 15 p swing to cover the cw portion of 3.5,and 25 p to cover the whole band. The RX front end (Fig 3) was originally described in Radio Communication. The 200 ohm input potentiometer controls the RX gain. The af amplifier (Fig 4) provides low noise and good gain while requiring few components. The TX (Fig 2) employs a 2N3353 driving a pair of parallel connected BFY51 transistors. They must be fitted with push-on heat sinks. (An attempt to use 2N3353 in the pa produced TVI !) The pa 12V line is keyed via a keying transistor (Fig 2A) which can also be used to key the supply to a sidetone oscillator (not shown). The transmitter output is tuned with the aid of an LED indicator (Fig 5). The twisted wire coupling capacitor should be adjusted unitl the LED provides an adequate indication at full rf output. The power unit (Fig 6) provides 12V for the TX/RX: the additional 5V output is used to power an el bug.The physical construction is shown in Figs. 7 and 8. All sub-units are mounted at rightangles to the front panel, with the vfo housed in a diecast box. Where necesary screens are placed between sub-units. Send/receive switching uses a double-pole switch to change over the antenna, switch the 12V supply from the RX to the TX, and switch the RIT from R to T (Fig 1).(An additional switch connected across the R and T contacts in Fig 1 would allow the RIT to be switched to the T position when on receive, thus allowing accurate netting. Ed.)

'EBOR' Transceiver

Norman Spivey G3GWI

SEILER OSCILLATOR

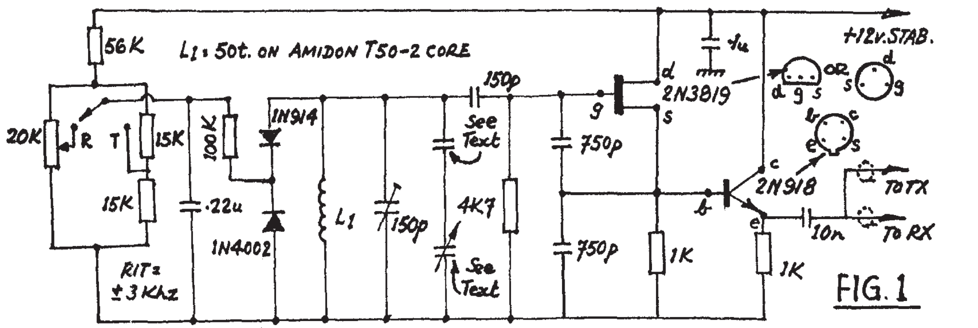


FIG. 1

TRANSMITTER

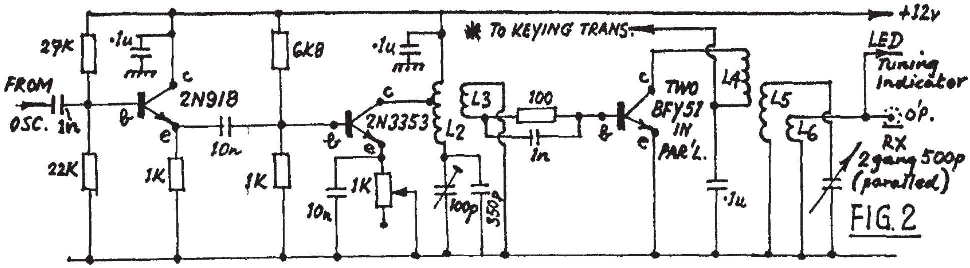


FIG. 2

L2 : 30t, T50-2 CORE, TAPPED 9t FROM COLD END —— L3 : 4t.

—— L4 : 25t, T50-2 CORE —— L5 = 6t —— L6 = 6t.

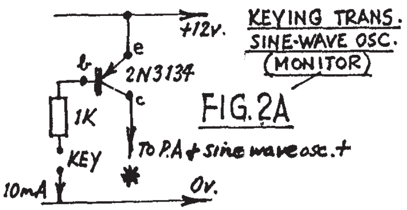


FIG. 2A

DIRECT-CONVERSION RX (FRONT END)

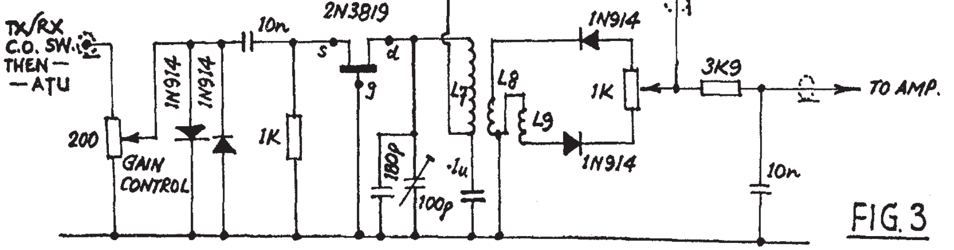


FIG. 3

L7 = 40t on Amidon T50-2 core — L8 and L9 are bifiliar-wound, 6t links spread around the complete core.

AUDIO STAGES

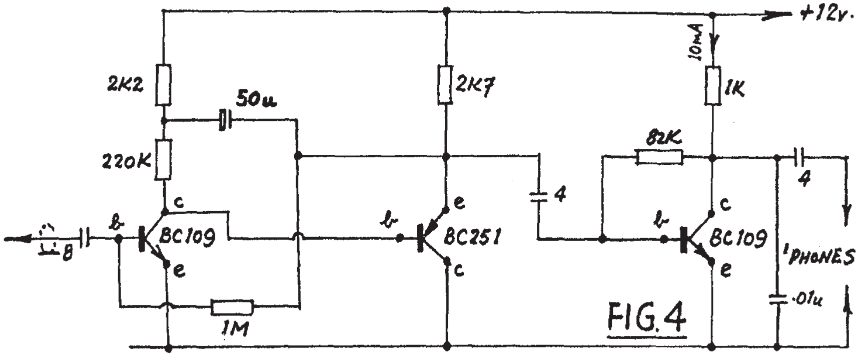


FIG.4

SIMPLE TX-TUNING DEVICE

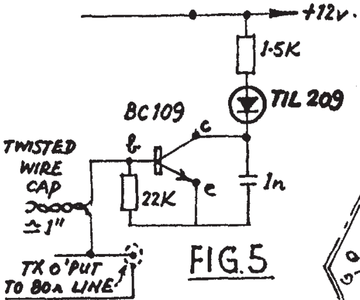


FIG.5

POWER SUPPLY

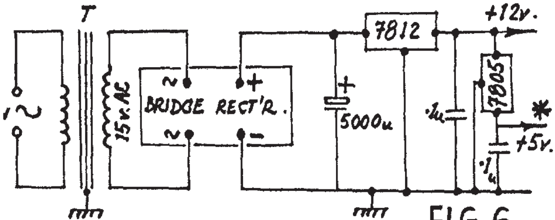


FIG.6

*For keyer and ancillary equipt. only

G3GWI | NORMAN SPIVEY G-QRP-C.

LAYOUT

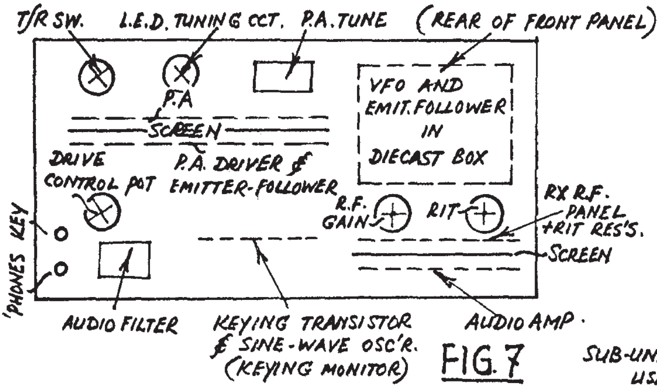


FIG.7

DETAIL OF ALI. SCREEN

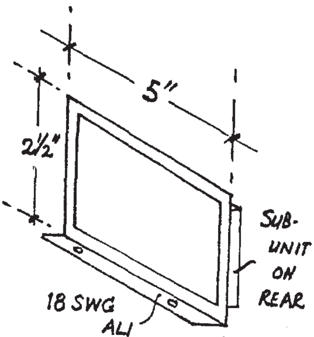


FIG.8

SUB-UNIT ON MATRIX BOARD, USING VERO PINS

NOTE – THERE ARE TWO SUB-UNITS. (1) HAS P.A. ON ONE SIDE, AND DRIVER PLUS EMITTER-FOLLOWER ON THE OTHER SIDE. (2) HAS RX R.F. AMP., DETECTOR AND SOME OF RIT. CCT. ON ONE SIDE, A.F. AMP. ON THE OTHER SIDE.

PARLEZ-VOUS? By 'Mac' McNiell G3FCK

Apropos the article by Angus Duncanovitch (!) in a recent issue of SPRAT, the following is offered to cw operators who would like to "parlez-vous". As with most foreign QSOs , standard contractions , Q singals and common English amateur phrases can be mixed with the "pidgin" French. The most common words and phrases are shown below, and a typical G/F QSO is used to illustrate their use. (Words normally abbreviated are shown in brackets.)

ENG	FR	ENG	FR	ENG	FR
I	Je	With	Avec	But	Mais
My	Mon	Good	Bon,bonne	Again	Encore
You	Vous	bad	Mal,mauvais	soon	Bientot
Your	Votre	East	L'est	This	Ce
We	Nous	West	L'ouest	Please	Silvous plait(SVP)
Am	Sois	North	Nord	Thanks	Merci (MCI)
Dear	Cher	South	Sud	Copy	La copie
Friend	Ami	Near	Pres de	Some of	De,du
And	Et	Name	Nom	Very	Tres
The	Le,la	Also	Aussi	Weather	Le WX
Is	Est	Here	Ici	Windy	du vent
For	Pour(PR)	About	Environs	Cloudy	Nuages
Good day	Bon fin de jour	Good evening	Bonsoir(BSR)	Happy	Heaureux(HRX)
Warm	Chaud	Fine day	Belle jour	Sunny	Soleil
Much,many	Beaucoup (BCP)	Day	Jour	Night	Nuit,soir
Good luck	Bonne chance	I hope	J'espere	CU AGN	Retrouver
Good morning	Bonjour(BJR)	Cold	Froid		

Typical QSO:
CQ de F6 K. F6 de G3 K. G3 de F6= R BJR CHER AMI, HRX DE QSO = RST 579 AVEC QRM=QTH EST PRES DE PARIS ET MON NOM EST FRANCOIS= HW? KN. F6 de G3 = R FB CHER AMI FRANCOIS ET MCI PR LE RPRT= UR RST 589 AVEC BCP QRM= MON QTH EST 10 KM SUD DE LONDRES ET JE M'APELLE JACK= LE WX CHAUD ET LA TEMP 22 C= RIG 10W ANT DIPOLE= OK? KN. G3 de F6= R FB CHER AMI JACK ET MCI PR INFO= ICI LE WX FAIT MAL,NUAGES ET FROID ,LA TEMP ENVIRONS 15 C= MCI BCP PR LE BON FRANCAIS= J'ESPERE JE VOUS RETROUVER , BONNE CHANCE= 73 ET BON DX= BONNE FIN DE JOUR JACK ET MCI= HW? KN. F6 de G3 = R MCI CHER FRANCOIS = HRX DE VOUS QSO ET AUSSI J'ESPERE CU AGN SN= 73 ET BONNE CHANCE/DX SK.
G3 de F6 = R MCVI PR CE BON QSO = BON DX ET 73 SK.

A better understanding may be gained by monitoring inter-F QSOs. Detailed knowledge of a foreign language is unnecessary, as the Writer often swops phrases with German ops, despite having no basic training in that language. perhaps our"D"experts will let us have the next instalment of this interesting aspect of amateur radio contact.

((!) ?? Angus Duncanovitch = Angus , son of Duncan, and if he is not that somebody hasn't half been fooling him for all these years! Ed.)

REQUEST: G4GOF, Berghiem,Battery Hill,Fairlight Cove,Hastings. requires any surplus back issues of SPRAT (he'll be lucky!) Full postage costs will be met.

PORTABLE WORKING: G3FCK requests that any member who has built a copy of the G Whip or Hustler Whip for /p working, might like to offer any details for publication in SPRAT.

C.C.W.: G3ROO is toying with the idea and would be pleased to hear from other members with an similar interest.

NEW MEMBERS SINCE SPRING ISSUE.

521		Frank E. Wilson, 15 Byrd Walk, BALDOCK, Herts.SG7 6LN	Const.CW.
522	GW8PBO	Robert S.Keyes, 10 Hazel Walk, Home Farm Est.Caerleon,Gwent.	Const. QRP.
523	G4GOF	Jesse H.Luxton, Bergheim, Battery Hill, Fairlight Cove, Hastings, TN35 4AP.	Gen.HF.QRP.
524	GW4EYG	"Garreg Wen" LLanfyrnach, Dyfed. SA35 OBA.	Const.CW.
525	DK9FN	Siegfried Hari, Spessartstrasse 80, D-6453 Seligenstadt	QRP.
526		Dave Yeoman, 24 Oakleigh Dr., Orton Longuevill, Peterborough, PE2 OBD.	HF.QRP.
527	K8EEG/ WØRSP	Adrian Weiss, 83 Suburban Estates, Vermillion, SD 57069, U.S.A. (Hon. Member. Writer Cq QRP Column)	
528	G3FUH	Maurice M.Taylor, 4 Eastgate Close, Herne Bay, Kent.CT6 7ER.	CW.HF
529	G8PUD	John Williams, 16 Station Rd., Braintree, Essex.CM76QJ	HF.QRP
530	PA3AJU	Gerrit D.Visser, Beek 20, 1862 HD Bergen NH, Netherlands	QRP.H.Brew
531		T.D.Hackney, 3a Clumber Crescent South, The Park, Nottingham.	QRP
532	SMØGMG	Lars Mohlin, Gransbacksv. 15, S-170 10 EKERO	QRP
533	G3KNJ	Reg.J.Wyatt, 8 Millbrook Rd., Bushey, Herts. WD2 2BU	QRP
534	RS41218	J.Adrian Oates, 3 Canadian Ave., Chester, CH2 3HE	Gen.H.Brew
535	G4HLP	Mike Haywood, 25 Wentworth Dr., Bromborough, Wirral, Merseyside, L63 OHZ.	Const.HF
536	WA4BTL	Bill Granstaff, Old Eddyville Rd., Princeton, Ky. 42445	DX.
537	G3PKQ	Rod Homes, 92 Dunedin Rd. Leyton, London, E10 5NJ.	
538	G4DKS	Ian H.Ford, The Spinney, Havel Ave., Redland, Bristol,Bs6 6UD.	H.Brew
539	G4GIU	Mike Koblic, 4 Gainsborough Gdns., Bath, BA14AJ.	CW.
540	G4EYA	Chris Evans, 19 Orchard Way, Shirley, Croydon, Surrey,CRO 7NP	
541	G3ZGN	P.Swarbrick, 1 Hill View, Charminster, Dorchester, Dorset.	
542	G3AMO	W.G.John Houghton, Sandhill Farm, Newtown Rd., Sherfield English, Romsey, Hants. SO5 OJY.	CW.QRP H.Brew.
543	BRS41791	Martin R. Holli, 991 Lower Hanham Rd., Hanham, Bristol.	QRP
544	G4HSG	Jock H.Simpson, 37 Princes Close, North Weald, Epping. Essex. CM16 6EW.	QRP
545	G3MQQ	C.Reed, 12 Knowle Lane, Wookey, Wells, Somerset, BA5 1LB	CW.H.Brew.
546	G3ZLA	George Scopes Hall, 17 High Street, Needham Market, Ipswich, Suffolk, IP6 8AL.	AM CW.
547	VE5JQ	Dr.John Dudley, 217 Albert Ave., Saskatoon, Saskatchewan, Canada.	QRP
548	KA8BUE	Thomas C.Warren, P.O.Box 1ØØ7, Frankfort, Mich., 49635,U.S.A.	
549	G3GBD	Sidney R. Hancock, 53, Friary Grange Park, Winterbourne, Bristol BS17 INA.	CW.QRP
550	G4HSO	Peter A.E.Baker, c/o Cable & Wireless Ltd., (F1 Staff) Mercury House, Manama, State of Bahrain.	CW.H.Brew
551	G3ZWH	Doug Hill, 16 Hollow Lane, Snodland, Kent.	
552	G4IEE	Edward L.Stephens, 44 Royal Berkshire Court, Green Close, Didcot, Oxon. OX11 8TF.	HW8
553	G8OHD	Charles Riley, 8 Lambourne Gdns., Woodthdrpe, Notts.NG5 4PA.	QRP.H.B.
554	G4DTE	Albert R.Johnston, 1 Wheatlands Rd., Harrogate, HG28BB. North Yorkshire.	Gen.
555	G2CGL	Eric C.Grafton, 12 Dalesway, Kirkella, Nr.Hull, HU10 7NE.	CW.

556 H.Gray, 119 Cooks Lane, Marston Green, Birmingham,B37 6NU QRP.Gen.

557 G4HYY T.D.Jackson, Castle Lodge West, Halifax Rd., Todmorden, West Yorks. 0114 55Q. C.W.H.Brew

558 G4EHT William Watson, 85 Ferndale Rd., Lichfield Staffs.WS 13 7DL.C.W.H/b.

559 G3TKU Roy Griffiths, 13 South Crofts, Nantwich Cheshire.CW5 5SG.CW. H.Brew

560 G4DMB W.E.Green, 6 Hocman Rd., Aylesham, Norfolk.

561 Peter John Brent, 15 Cromhall Cl., Fareham, Hants PO14 3BJ.H.Brew

562 G3NHC Charlie Trinick, 10 Senhouse Street, Maryport, Cumbria. CA15 6AB. CW.

563 G4GBE Ronald Blacker, 23 Leasowe Rd., Rubery, Birmingham, B45 9TB.

564 Charles Augarde, 18 Carlton Rd., Oxford, Oxton. OX2 7SA Gen.

565 G3YOV T.J.Gammage, 23 Artizan Rd., Northampton, NN1 4HU. HF

566 G3NRO Peter Gill-Purdon, 83 Muswell Court, Saltshouse Road, Hull, HU8 ORD. CW.Const.

567 RS41108 David Johnston Petty, Primrose Cottage, Elm Corner, Ockham, Surrey, GU23 6PX. Gen.

568 W6YVK "ev" E.D.Willis, 2848 Bryant St., Palo Alto, California, U.S.A. QRP DX

569 G8NLQ Ernest Humpoletz, 92 Sandown Rd., Havel Gr., Stockport, SK7 4RT.

570 ONSLJ Jose Lesuisse,, 3 rue de la Passerelle, B4900 Angleur, Liege, Belgium.

571 DF5KD Volker Wegener, Birkenweg 20, 5090 Leverkusen 31, W. Germany.

572 R.E.Daly, 12 Stoney Lane, Newbury, Berkshire, RG13 2NH. Gen.Const.

NEW QTHs:

052 G4BXL "Jean Villa"SHop Lane,Goulceby,Louth.Lincs.LN11 9UW.

059 G4DEP Snowdrop Cottage,Wagg Drove,Huish-Episcopi,Langport.Somerset.TA10 9[illegible]

070 G8AAL 13 Ironside Cl.Bewdley.Worcs. DY12 2HX.

091 W9SCH Nichols and Mechanic St. Albany.Wisconsin.53502.U.S.A.

141 G4DDX 35 High St. Stevenage. Herts.

152 G3WOV 21 Upnor Cl.Perham Down,Tidworth.Hants.sp11 9LJ.

199 G4ELZ 56 Bushmead Ave,Kingskerswell,Newton Abbot.Devon.TQ12 5EP.

247 G4BJZ 111 Dovehouse Lane,Solihull.West Midlands.B91 2EQ.

331 G3YJM 85 Revidge Rd. Blackburn.Lancs

335 G4GJY 14 Lindsey Cres.Kenilworth.Warwickshire.

401 WD4FZU 10810 Riderwood Drive,Houston.Texas.77099.U.S.A.

512 PAØYF Akkerwinde-15,2703 GN - Alphen a/d Ryn. Netherlands

NEW CALLSIGNS:

411 G8PWJ is NOW G4HZC. 421 SWL Rudd is NOW G4HWF. 509 SWL Milne NOW F6FZL.
May the club extend best wishes to our three new calls above.

361 WB7QWA is NOW AA7O (and I bet he feels better for it on the key!)

WRONG LISTINGS: G3VKM is not G3UKM G4ENW is not G4EHW

RESIGNATIONS: 045 G3ZNK, 322 G4FNL,