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HEADQUARTER STATION - CATTERICK CAMP - GB3RCS/G3CIO

CONTENTS

EDITORIAL

G3FGN

Here it is! The 'Summer' Edition, despite all reports that the word summer has been officially expunged from the English language. We know this to be partly true of certain dictionaries, which have replaced the word with a similar sounding one 'Soonmer'.

This is of Anglo-French derivation, and stems from mon<u>soon</u> and the French '<u>mer</u>', for sea, which gives a fairly aquatic connection, and also produces the following definition:-

"SOONMER" - A period in which solar activity is at a maximum, and during which a phenomena, known as 'Sunshine' is occasionally met. This phenomena produces short duration, square wave, pulses of yellow light, which can cause the eyes to blink.

The unit of measurement of this phenomena is the 'LOASH' which gives the equivalent sun-tan to that produced by 1 cc of sun-tan lotion applied per cm/square of hide. So there!

Now, about this edition, we make no apologies for following on so quickly to our last, because our object is to get up-to-date. Doing so means that we can the more easily meet our Autumn deadline, and so reach our members correspondingly more punctually.

Of course, as we reiterate, we need material, and even if it is a letter suggesting that the Editor boils his head, this can be knocked into shape. (The article that is!)

The first, and most important, article concerns the revision of the secretarial appointments. Without elaborating on the revision, readers will see that the object is to provide the permanent secretariat aimed at under our present rules, to which members can write, regardless of how the changes are being rung by the serving members.

To align ourselves with this policy, therefore, all future correspondence for the field secretary should be directed, as shown on our membership cards, to 8 Signal Regiment. Here, Mr. John Hodgkins, G3EJF, will either deal directly, or will filter the correspondence to the reigning official concerned.

Incidentally, the present editor is being posted to 9M2 land in middle August, so this system will be working very soon.

Next, we again say that we wish to have articles on members, their clubs, and their activities. We start a series of 'Clubs in the Society' not so much to emulate 'The Other Man's Station', as to let society members know the system, frequencies, and power inputs our various member stations use. The object is to encourage inter-club activity.

In addition, where the stations concerned belong to ex-members of the Corps, it is suggested that a brief summary of where and when the op served would not go amiss. Apart from purely swinging the lamp, perhaps old acquaintances will be renewed, and long rags chewed.

It was hoped to include a revised membership list in this edition, but amendments to our last published list are incomplete. In this respect, we are pleased to receive irate letters from members pointing out errors in callsign, spelling of names and so on, because this indicates activity, and keeps us in touch. We would prefer, however, to have notification from individuals as their addresses change. This is particularly so for our service members, who could also assist by giving us their home QTH as an alternative mailing address. So how about this?

This edition sees another article from G3MEF on aerial loading, and also a strong defence of the merits of the G5RV antenna. Tom Wylie had just entered QSO number 580 with W1DD in his log at the time of writing, so one can understand his conviction that the G5RV had something to offer.

'Receiver Topics' is yet another article by G3IBB who is now active in <u>some</u> foreign clime. We wait to hear whether his problems are those of termites in his spreaders, or insufficient de-icer in his radials!

Finally, the Editor thanks 3EJF for the HQ station N.F.D. write up, on which occasion the weather was fine and things went off productively and pleasantly.

73's de G3FGN
DL2QT
GM3FGN
VS1FC, 9M2??

A REVISION OF THE SECRETARIAL APPOINTMENT

The Signal Officer in Chief, Major General F. Swainson, OBE, after an extensive tour of overseas commands, expressed the desire for both a HQ Secretary, and a Field Secretary, to handle the affairs of the Society.

The President has implemented this desire by appointing a secretary at Signals Directorate, and delegating the practical aspects of running the HQ station, and editing 'Mercury', to the field secretary.

It is felt that in this way a reasonably permanent secretariat will be established for handling the many problems of policy and liaison, and at the same time permit the field secretary more time to edit and produce 'Mercury'.

As a guide to members, general terms of reference are shown below, and correspondence should be channelled accordingly.

<u>HQ Secretary</u> Major (TOT) F.A. Davidson,
Signals 2(a)
The War Office,
Whitehall,
<u>LONDON S.W.1.</u>

(a) Liaison with overseas and U.K. commands and units.

(b) Maintenance of current lists of such units and their delegated representatives.

(c) Publicity in its many aspects.

(d) Liaison with Signals 1(c) on equipment for the society.

(e) Administration of the Annual General Meeting.

FIELD Secretary

Capt (TOT) A.C.Earl, G3FGN,
Army Apprentices School.
Harrogate. Yorkshire........until 30 July 63, then.....

Mr. J. Hodgkins, GJEJF,
2 Squadron, 8 Signal Regiment,
Vimy Lines,
Catterick Camp.
Richmond. Yorkshire.

(a) Running and conduct of the HQ Station.

(b) Organising events such as Princess Royal Day, NFD's etc.

(c) Allocation of, and accounting for, equipments issued to affiliated clubs.

(d) Editing and producing 'Mercury'.

(e) Advising on the formation of clubs, and assistance in equipping such clubs.

Changes in these appointments will be notified to all members as and when they occur.

Receiver Topics

by G3IBB

Local Oscillator Tuning.

The local oscillator frequency of a superhet can be arranged to be lower or higher than the signal frequency by a value equal to the IF of the receiver, and in view of the fact that it is easier to obtain better stability with a low frequency oscillator, it may be wondered why the higher choice of frequency is invariably chosen.

Consider a receiver which covers 500 - 1,500 kc/s having an IF of 450 kc/s. The local oscillator could be arranged to tune 950 - 1,950 kc/s or 50 - 1,050 kc/s.

The resonant frequency of a tuned circuit is given by the well known formula:-

$$f_o = \frac{1}{2\pi\sqrt{LC}}$$

and it is usual to tune over a given range by making the capacitor variable, and using a fixed value of inductance.

Frequency can then be considered to vary as The maximum value of C(C_{max}) will correspond to the lowest frequency, and the minimum value of C(C_{min}) to the highest frequency.

It follows that the ratio of lowest to highest frequency of a tuned circuit will depend on the root of the ratio of maximum to minimum values of capacity. Applied to the RF stages of the receiver in question, we get:-

$$\frac{500}{1,500} = \sqrt{\frac{C_{min}}{C_{max}}}$$

from which it will be seen that the ratio of capacity to cover this range is 9 : 1, i.e. a variable capacitor of 50 - 450 pF.

When the local oscillator is arranged to tune **above** the signal frequency, from 950 - 1,950 kc/s, the ratio of C_{max} to C_{min} will be:-

$$\left(\frac{950}{1,950}\right)^2 = 4{\cdot}2 : 1$$

i.e. a 50 - 210 pF variable capacitor.

If the local oscillator tunes **below** the signal frequency, from 50 - l,050 kc/s, the ratio of C_{max} to C_{min} becomes:-

$$\left(\frac{50}{1,050}\right)^2 = 441 : 1$$

i.e. a 50 - 22,050 pF variable capacitor, which is impracticable.

Over a small tuning range, or at higher frequencies the lower value of local oscillator frequency may be used, but to minimise tracking problems the higher frequency is used in the great majority of HF communication receivers.

Choice of IF

There are two conflicting problems to be considered when selecting the IF of a superhet. They are: "second channel" interference, sometimes called "image", and "adjacent channel" interference.

The first of these, second channel interference, results when the IF is low - an example will serve to illustrate. Suppose a receiver with an IF of 100 kc/s is tuned to frequency of 14 mc/s. The local oscillator frequency would be 14·1 mc/s and the difference frequency selected at the mixer anode and amplified. Consider a strong signal on a frequency of 14·2 mc/s, i.e. 200 kc/s higher than the wanted signal This unwanted signal will be attenuated to some extent by the tuned circuits preceding the mixer grid, i.e. in the RF amplifier(s) but a separation of only 200 kc/s at 14 mc/s and higher will result in a fairly strong signal of 14·2 mc/s arriving at the grid of the mixer, which will heterodyne with the local oscillator to produce a difference frequency of 100 kc/s i.e. the IF. Both wanted and unwanted signals will appear in the output of the receiver.

An IF of say 1·6 mc/s would overcome this form of interference because the image frequency would now be 3·2 mc/s higher than the wanted frequency, and the tuned circuits preceding the mixer are able to discriminate between the two frequencies.

A method of recognising second channel interference is by rocking the receiver tuning each side of the received signal. If the interference is due to second channel a beat note will be heard which changes frequency as the dial is moved. (Similar to the effect you would get with the bfo switched on). A check on the higher frequencies of your receiver may be quite revealing.

The second form of IF interference, adjacent channel, is caused by choosing an IF which is too high, and is due to the resultant poor selectivity of the IF tuned circuits. An unwanted signal say 10 kc/s higher or lower (or both;) than the wanted signal will fall within the pass band of the RF tuned circuits and appear at the mixer grid, resulting in a difference frequency at the mixer anode of IF±10 kc/s which will appear at the output of the receiver if the bandwidth of the IF tuned circuits are unselective. It can be indicated quite easily that a low IF is more selective than a high IF - hence the two conflicting factors in the choice of frequency. A reasonable compromise can be made by using an IF in the region of 465 kc/s, but a more sophisticated method is to use one stage of high IF, say 1·6 mc/s to overcome image problems, and then to change to a very low IF, say 80 kc/s, to obtain good IF selectivity - in other words, the double superhet. The only draw back here is due to the extra noise introduced by having a second mixer stage.

IF Bandwidths

It was stated earlier that it is easily shown that a low IF will give a sharper response than a high IF. Let’s see how.

Fig.1 shows the response curve of a parallel tuned circuit, i.e. how the voltage across the tuned circuit varies as the applied frequency is changed. Maximum voltage will be developed across the circuit at its resonant frequency (f_o) - let's assume this maximum voltage to be 1 volt. There will be a frequency either side of resonance where the voltage will have a value of 0·707 volts i.e. f_1 and f_2.

Fig.1

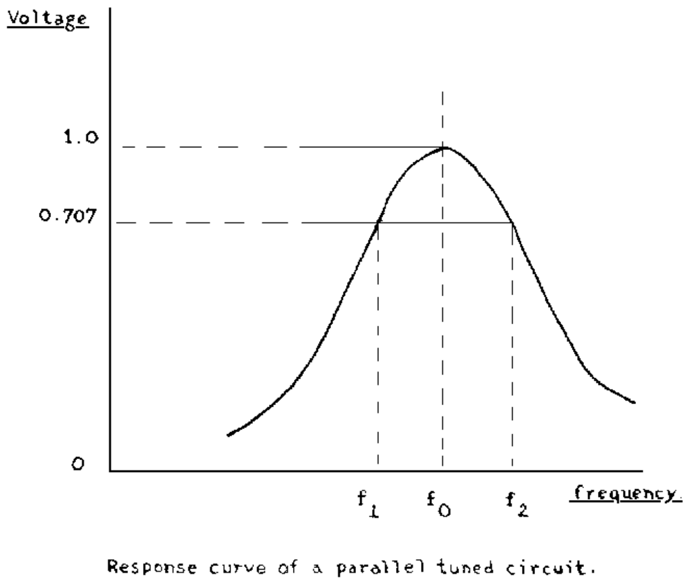


Fig 1

The"Q" of a tuned circuit can be defined in terms of these three frequencies such that:-

$$Q = \frac{f_o}{f_2 - f_1}$$

It so happens that the bandwidth of a tuned circuit lies between the points where the voltage falls to 0·707 of maximum, corresponding to the – 6dB points. The bandwidth of the circuit in Fig.1 is therefore (f_2 - f_1) and thus :-

$$\text{Bandwidth} = \frac{f_o}{Q}$$

This simple result can be applied in principle to the IF selectivity problem by considering two IF frequencies: one of 100 kc/s and one of 1·6 mc/s, both transformers have a Q of 50.

(a) 1·6 mc/s :-

$$\text{Bandwidth} = \frac{1\cdot6}{50} \times 10^6$$

$$= 32 \text{ kc/s}$$

(b) 100 kc/s:-

$$\text{Bandwidth} = \frac{100}{50} \times 10^3$$

$$= 2 \text{ kc/s}$$

The results obviously infer that the lower IF will have the greater selectivity.

Mixer Noise

Conversion Conductance (g_c) of a mixer valve is defined as :-

$$g_c = \frac{\text{the change in anode current at IF}}{\text{the change in grid voltage at signal frequency}}$$

This is similar to the mutual conductance of a normal voltage amplifier, but taking into account that the anode current will contain not only signal frequency., but the other frequency components resulting from mixing. In fact it can be shown that the conversion conductance of a valve used as a mixer is approx. equal to one quarter of the original mutual conductance :- i.e.

$$g_c = \frac{g_m}{4}$$

Noise in a voltage amplifier will vary with g_m. The higher g_m, less noise. Noise in a frequency changer will vary with g_c and the greater g_c again less noise. However, when a frequency changer is used the gain has gone down by a factor of 4, and the noise has increased by a factor of 4. It is apparent that the signal to noise ratio has deteriorated by a factor of 16.

Naturally, if two frequency changers are used, as in the double superhet, the signal to noise ratio will be worse, but this is offset somewhat by the improvement in signal to noise ratio achieved by having a narrower bandwidth.

PIRACY - or The Grand Deception

Piracy, like so many of the finer crafts, is rapidly becoming a dying art. No longer does the super-dx roll in from East Acton, Cheam and all points East, spurring on those certificate hunters to splendid pile-ups and visions of first time DX QSO's.

Instead, we find the system becoming so orthodox, with fully licensed, paid up amateurs happily working away, within frequency limits, within power limits, and generally observing the rules of the game.

Occasionally, bless 'em a slight splutter of resistance flares up, and the odd chap does an hours worth of VOX overs without station identification. Then the relapse occurs, the callsigns are declared, and the net becomes just one more legal setup.

No! what is wanted is the spirit of buccaneering, with commando like raids against the regulations. But, above all, let it be done with subtlety, and without the fatuous S9+20 dbs from XW5, or AC4, which everyone immediately regards as suspect. How the genuine XW5 or AC4 feels about this is debatable, because presumably he must at times put in such a signal.

The first requirement, if the intention is to deceive, naturally, is a catalogue of accents designed to suit the rare DX one intends dispensing. Many accents are relatively easy to produce, such as the "say-koo-venty" applicable to I calls, and some Latin Americans, but a few hours of S.W. listening will give a sound basis for some of the more unusual stations.

Similarly , due regard must be paid to power outputs. One should aim at producing a signal which is watery enough to simulate real long hop dx at the receiver. If ones' area of deception is to cover say, a ten mile radius, then a simple 5 - 10 watt sender is the answer. The "Hoodwink"is such a sender, sold in kit form by Deception Electronics, and having several refinements intended for the discerning pirate. One in particular is the motor driven variac which swings the input from 2 - 10 watts at a rate determined by the front panel control. This is graduated from zero fade to rapid fade, with the maximum being 12 fades per minute. Tests conducted with a monitor receiver 3 miles distant showed a most convincing swing from S9 to S3, which would deceive even the better equipped DX hunter.

Another useful innovation is the switched power supply filter system, which gives controlled degrees of HT filtering. Position one of the switch gives less than 5% D.C. ripple, but this is only intended for emergency operation, when legal communication is required. Subsequent positions give 10%, 20%, 50% and raw A.C. A conversion chart is

For the more aspiring customer, however, Messrs Ambiguity retail a 50 watt sender, the "SuperTT Rate", with low impedance matching to the mains wiring of the shack. This form of "wired-wireless" has produced good results, and this particular sender comes with a test certificate proving U.K. QSO's from 20 different deception QRA's.

Now, to mention the operating procedure! It is the axiom that a 3 minute CQ is well worth while, particularly if made plus or minus 2 kcs. of an established net. The resultant 2 kc. beat note is designed to wear down and shatter most nets, and even if no qso results, a useful 10 dbs of nuisance value is caused. If possible, use a microphone with treble characteristics.

Having made a CQ, contact should be shown to have been established with another DX station. For instance, a VS1 simulated emission should result in a simulation QSO with, say, JA3. The JA3, would be given an S6-S7 report, and all the essential details of the VS1 simulation, in particular the QTH. Remember to allow sufficient time for the fictitious JA3 to say his piece, before coming back with a query on the name or a request for a repeat on his QTH. The ARRL call book is invaluable in this respect for providing genuine names and QTH's. Never under-estimate the opposition. Your potential contact may well be checking on you with his callbook.

Having established and conducted a deception QSO, follow this with a QRZ or two and you are in business.

Two QSO's, or maybe three, should be ample in this phase of the operation before going QRT. Again, be logical, and in the quoted example, for instance, refer to monsoon trouble, lightning storm or similar reasons for terminating the QSO.

Then, QSY at least 15 - 20 Kcs before opening up again with another exotic call sign, and preferably, use a microphone with a base response.

One final warning, though, and that is to remember, each QSO, just whereabouts geographically you are. It is fatal to refer to a glorious sunset when a moments thought would reveal that it was in fact three in the morning at that particular QTH.

There we are! In the piracy business, and confusing all.

For the more unfortunate participants who do get caught at this game, the Loose-wallah Insurance Agency offer a very attractive indemnity policy, full details of which can be had on request.

G3FGN

The G5RV ANTENNA

Tom Wylie wishes to clear up some slight misgivings members may have felt about his article in the last 'Mercury' which dealt with this well known multiband antenna. This quote from G3MEF states his case.

Ed.

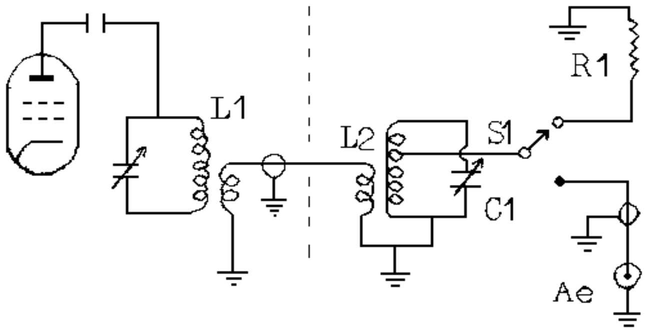
"I do know that conflicting dimensions of the G5RV antenna have been circulated from time to time, and that the use of erroneous dimensions has caused many to abandon the G5RV in disgust, but I wish to state., most emphatically, that the dimensions given in my "Mercury" article are precisely those given me by Louis Varney G5RV, personally; that they are absolutely correct; that they produce absolute unity SWR on all Bands provided for; and that this antenna, and any other properly dimensioned G5RV antenna known to me, gives excellent all-Band performance. The erroneous dimensions may have arisen from dimensions given by Louis Varney, G5RV, for 400/600 ohms open line to replace the 300 ohms twin lead; this dimension being 34 feet for the full G5RV and 17 feet for the half G5RV. Open line has not been tried out here, but has been tried by my co-worker W1DD and found not to be as satisfactory as tubular 300 ohms twin line."

BRAIN TEASER

"Two black boxes are connected together by two single conductors.
Box"A", which has a flex connected to the A.C. mains coming from it, has mounted on its front two toggle switches marked '1' and '2'.
Box "B" has mounted on its front two lamp bulbs labelled '1' and '2'.
Depress switch '1' and bulb '1' lights.
Depress switch '2' and bulb '2' lights.
Depress both switches and both bulbs light.
HOW DOES IT WORK."

A Sin of Omission

The Editor apologises profusely for omitting the A.T.U. diagram for the W.S.36 in last edition of 'Mercury'. This is figure 1 referred to in the text and is published below.



Circuit diagram of the Aerial Tuning Unit suggested by VQ2GF for the Type 36 transmitter. That part of the circuit which is to the right of the dotted line is enclosed in the drawer.

CONSTRUCTION OF THE ATU

L1 - Existing tank coil with pickup link.
L2 - Plug-in coils (Eddystone Cat No.580)

7 & 14 mc - 10 turns 1½in dia 1 in long, tapped 3 turns from 'hot' end, with 2-turn link. 21 & 28 mc - 4 turns 1½in. dia ✋in long tapped 1 turn from 'hot' end, with 1 turn link.

C1 - 100 µµF transmitting type variable condenser.

S1 - SPDT rotary ceramic switch.

R1 - 75 ohm dummy load, rated 50 watts.

LOADING THE SHORT ANTENNA

It is generally recognised that any old piece of wire, of any length and at any height, will radiate if connected to some form of radio frequency generator or transmitter.

It is fairly obvious that unless this piece of wire is of the correct length for the frequency in use, and is properly fed by an efficient feeder, its efficiency as a radiator will be poor and that only a fraction of the power generated by the transmitter will be radiated into space in the form of Hertzian waves.

It is equally obvious that comparatively few amateurs have sufficient lateral space at their disposal to erect even the nominal standard of efficiency, the half wave antenna in free space and not less than a quarter wave above ground, for all the Bands they would like to work. It WOULD be nice to have a 256 foot antenna, 128 feet up in the air, for working the 160 meter Band, but for most of us that is only a dream, and a very hazy one too!

So, what to do? We have shown in another article that the ½-G5RV antenna, only 51 feet in overall length, can be made to work very effectively on the 10, 15, 20 and 40 metre Bands, and if it is lengthened to 102 feet, with suitable feeder matching modifications, to give a full G5RV antenna, it will also cover the 80 metre Band. But you say you have not sufficient space for 102 feet and that, anyhow, you also want to work on the 160 metre Band, or you may even say that you have not sufficient space to accommodate 51 feet.

Obviously, some means of electrical lengthening the antenna, while keeping it physically short, is required, and the thought of winding the radiating portion of the antenna in the form of a helix often comes to mind; but helices are notoriously poor radiators and, as the radiator in this form loses its characteristics as a "wire in free space", we run into imponderables and incalculables which would have given Einstein a bad headache or a good run for his money, so, when physically shortening the radiator, we must see to it that it has no more self-inductance than a straight wire in space. This makes you feel discouraged and despondent?

Rejoice and be exceeding glad. I bring you glad tidings of great joy, for we can fix things nicely for you by referring to "Aerials for Confined Spaces" by M. J. Heavyside, B.Sc(Hons.), M.Ed., Ph.D (G2QM), in the R.S.G.B. Bulletin for January, 1958, and Mr. Heavyside has kindly allowed the writer to use part of his material in "Mercury". The original Heavyside article described means of increasing the radiating efficiency of antennae, but we will only concern ourselves here with his ingenious method of physically shortening an antenna while retaining the electrical characteristics of the theoretical "wire in free space".

Referring to Figs A & B, we see two circular end-pieces, let us say each 1 foot in diameter, giving a circumference of 37 inches, and spaced about 3 feet apart. Around the circumference of each end-piece, insulated pegs are placed 1 inch apart, and the loading wire is wound around these pegs, shown in the diagram. The dimensions given would allow for a loading coil of 37 wires, each 3 feet long, with 3 feet for end spacing, giving 114 feet in all. The end-piece diameters and drum length can be chosen to suit the circumstances, but it should be noted that the wire must have at least 1 inch spacing between "turns" and it should be the same as that used in the antenna proper; preferably not less than 14ga. H.D.C. It is a very simple matter to calculate the dimensions of the former required for any particular length of loading. The actual construction of the drum is left to the ingenuity of the reader, and there are many possible ways of tackling this, but it must be non-metallic and the insulation must be good. It can be slung from the far ends of the antenna or fixed to end masts if these are used. The framework of the drums used here consisted of wooden dowels and end-pieces, boiled in paraffin wax; the construction being "open".

This form of loading can be used at both ends of a G5RV, a □-G5RV or a half-wave dipole, where the lateral space available is insufficient to accommodate the usual length of straight wire and, of course, the whole antenna should be as high as circumstances permit; up to the theoretical quarter wavelength up.

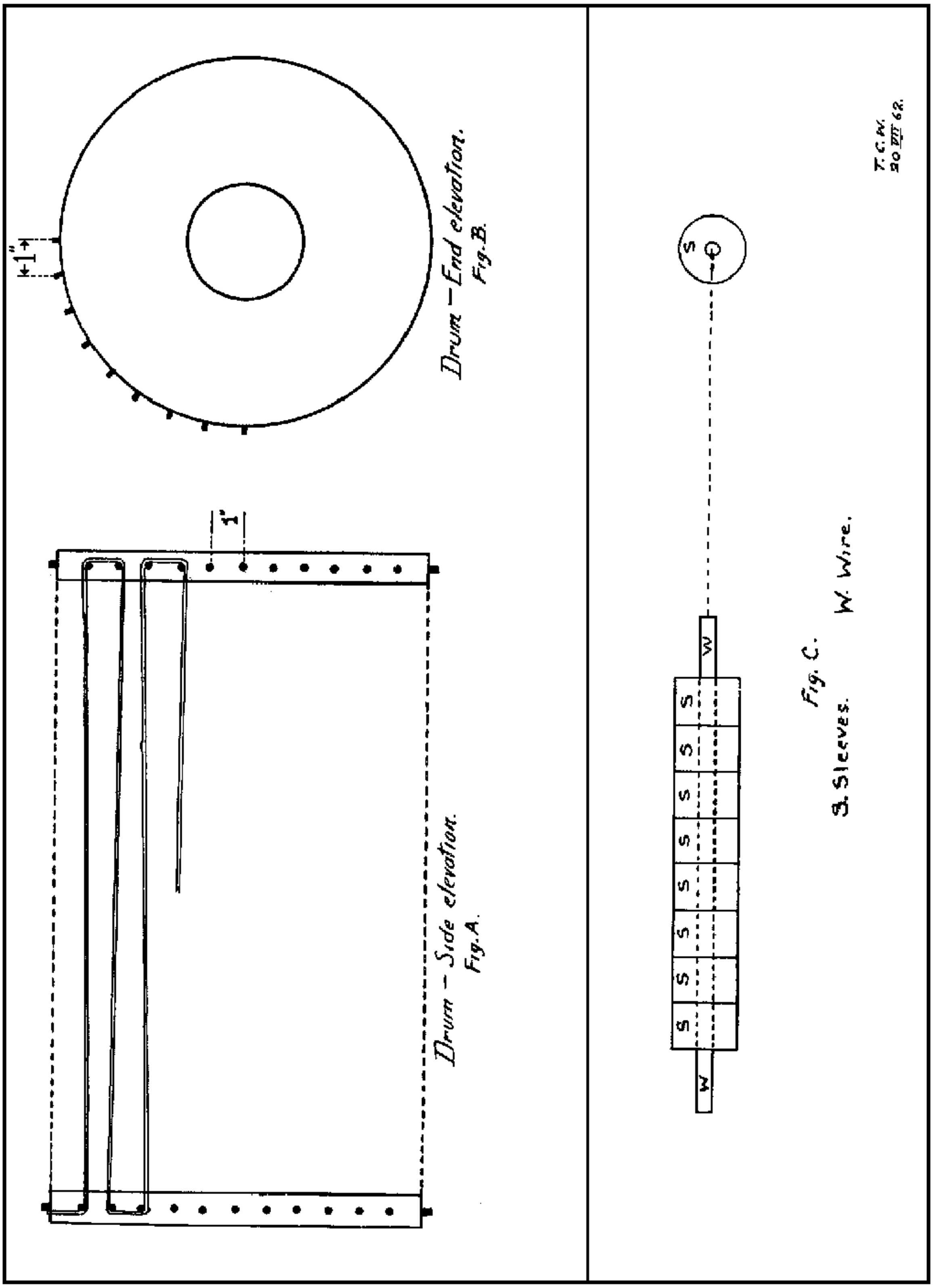
For a practical example of the application of this system, let us say that the lateral space available is 40 feet, and that we wish to put up a half-wave dipole, with 80 ohm centre feeder, to operate on 3535 Kc/s. The length of a half-wave in space, allowing for "end effect" is:-

$$\text{Length (feet)} = \frac{468}{\text{Freq. (Mc/s)}} \text{ or, in our hypothetical case, } \frac{468000}{3535} = 132 \text{ feet. } 4\tfrac{1}{2} \text{ inches}$$

so we require slightly over 66 feet in each of the two "legs" of the antenna. As we have only 20 feet of available space for each "leg", we must run about 17 feet of straight wire from the centre of the antenna and wind the remaining 49 feet on the drum, as described. (This allows for 3 feet drum space). Always run as much "straight" wire as possible, and remember that the straight and wound wire should be the same; preferably not less than 14ga.H.D.C.

For indoor use, the loading wire may be more conveniently wound on a flat, square frame, which will appear much the same as Fig. A. The ones used here were made of hardboard, with wooden pegs. The frames may be hung from the walls, as long as they are at least 1 inch from these.

This loading system has been used experimentally at G3MEF, and results have never been inferior to those obtained with "straight" wire, even when the proportion of wound to straight wire has been quite high.


Drum – Side elevation.
Fig. A.
Drum – End elevation.
Fig. B.
1"
Fig. C.
S. Sleeves.
W. Wire.
T.C.W.
20 VIII 62.

G2QM reports using a 15 foot antenna indoors, in a house in Bradford, Yorkshire, working Top Band; the antenna being loaded with wire wound on a square frame hanging on a nail on the attic wall; working many U.K. stations, F8RJ in Paris, and having had a letter of complaint from the G.P.O. for causing interference to traffic at Blaavand, Denmark: all this with an input of 8 Watts to the P.A.!

Magnetic Loading

This is also described by Heavyside, in the article already mentioned, and has recently been described by several other writers in current literature.

The principle is to increase the inductance of a wire, used as an antenna, by increasing the permeability of the surrounding medium. This is done by sleeve-loading the wire with a material of high magnetic permeability, but with high electrical resistance to reduce losses, as shown in Fig C., sleeves having OD of 9·5mm., and ID of 3mm., on 24ga. wire. Ferroxcube B2, with permeability of about 250 is a material of choice for the sleeves.

Avoiding mathematics, let it suffice to say that, with suitable magnetic loading, the length of a half-wave antenna is reduced to about □ of the length of an unloaded one, which in the case of 1·9Mc/s. would reduce the approximately 246 feet to approximately 23 feet. Quite a little space saver!

However, loading by this method can be overdone, and a point is reached where the advantages of reduced length are outweighed by the losses involved. To the writers knowledge, no empirical data is available on this point, so successful use of the method must rest on good old "cut and try".

MATCHING

It had not been intended to cover this subject in the present article, but it is of such importance to the efficient operation of ANY antenna system that it has been considered advisable to give it some attention.

The current practice is to use a pi-network in the transmitter P.A./output circuit, and the usual such network may provide a good match from about 40 to 100 ohms, if properly designed, constructed and used. It is also quite possible to construct an efficient pi-network to provide a match from 30 to 800 ohms or so, but this involves the use of large variable inductors, large variable capacitors and large banks of high quality fixed capacitors, so it is seldom used. On the other hand, amateurs are in the habit of using various types of antenna, with feed points running from about 40 ohms to almost infinite impedance, so the best solution would appear to be to hold the transmitter output impedance at from 50 to 80 ohms and to use an economical wide-range coupler, or impedance-matching device, between the transmitter output and the antenna feed point.

The most versatile and economical matching device, for use between the transmitter output and the antenna feeder, is based on the multiband tuner; a most interesting and versatile circuit, first developed commercially by the National Company, U.S.A. as a tuner for various transmitter circuits but, for some unknown reason, always neglected and now almost forgotten except in the form of a matching network; now generally known as a "Z-Match".

The "Z-Match", in addition to its extreme versatility in range of match, has many other advantages over any other type of matching network or so-called antenna tuner. It requires no split-stator condensers, no plug in inductors, no variable conductors, no special care of construction, and may be used with balanced or unbalanced feed lines or to feed a straight wire against earth or counterpoise.

Fig. D shows the circuit diagram of the multiband matching device, or Z-Match, designed for operation from 3·5 to 30 Mc/s. C1 & C2 are each 300 pf. variables, with 0·045 inch plate spacing. They are placed in tandem, with their shafts coupled, and rotated by a single knob with suitable dial. They are mounted directly on the chassis.

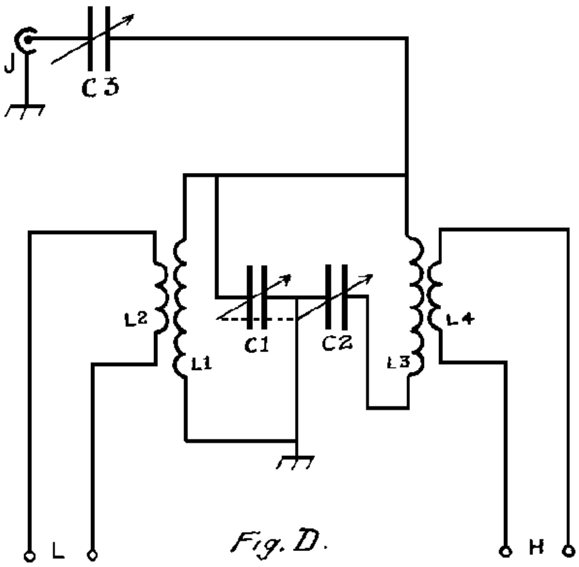


Fig. D.

C3 is a 300 pf. variable, mounted on insulating stand-offs and rotated by an insulating coupling, by means of a knob with a suitable dial.

L1 is 3·2 h; 11 turns, 14 ga. tinned copper, 2 inch diameter, 2¾inches long.

L2 is 2·1 h; 6 turns, 14 ga. tinned copper, 2½inch diameter, 1½inches long, mounted concentric with and at the centre of L1.

L3 is 1·1 h; 5½turns, 14 ga. tinned copper, 2 inch diameter, 1¼inches long.

L4 is 1·6 h; 5 turns, 14 ga. tinned copper, 2½inch diameter, 1¼inches long, mounted concentric with and at the centre of L3.

The coils are usually mounted one behind the other, on the centre line of the chassis, with their axis at right angles to each other; with C3 to one side of the coils and C1 and C2, one behind the other, to the other side of the coils.

J is an ordinary co-axial socket. Terminals L provide the low frequency output, and terminals H the high frequency output. Generally, terminals L will be found best for 3·5 and 7 Mc/s., and terminals H best for 14 to 30 Mc/s., but this may not always be the case, so, if a good match is not obtained with one pair of terminals the other pair may be used. It should be noted that none of the output terminals is earthed, and this is so that they may feed balanced lines properly. If the device is used to feed co-axial cable or a single wire against earth, the earth wire may be connected externally to one terminal of the pair of terminals in use, but in the case of co-axial cable best results may be obtained with or without an earth connection, so both ways should be tried. If desired, terminals L & H may be replaced by a single pair of terminals, selection of output being made by means of a wide-spaced, ceramic insulated D.P.D.T. switch.

Proper adjustment of the device can only be made by use of some form of standing wave ratio indicator, such as the well known “Monimatch".
With the s.w.r. indicator connected in the co-axial line running from the transmitter output to the input co-axial socket J of the matching device, connect the antenna feed line to terminals L or H, ass the case may be; set the s.w.r. indicator for reflected voltage and adjust C1-C2 and C3 to obtain a Zero indication on the s.w.r. indicator meter. There may be interaction between controls at some points, but a few trials should discover a good null point. If a good null cannot be obtained, try connecting the antenna feed line to the other pair of output terminals.

When the null has been obtained, the s.w.r. indicator should be switched to show "forward" voltage, and the transmitter tuned to give maximum output, as shown by the s.w.r. indicator meter.

AFTER THE MATCHING DEVICE HAS BEEN ADJUSTED FOR MINIMUM REFLECTED VOLTAGE, OUTPUT ADJUSTMENTS SHOULD BE MADE ONLY AT THE TRANSMITTER NOT AT THE MATCHING DEVICES.

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CLUBS IN THE SOCIETY

G3HKR

As a first time effort at presenting club stations within the society, the club we show in this edition is that of the Army Apprentices School at Harrogate.

First licensed as G3HKR in 1953, it has like many clubs, had varied periods of activity and interest, very much dependant upon who happened to have a 'ticket' at the time.

A study of the well thumbed log-book shows that in the early days of '53, most of the club's activity was on 80 metres C.W. using a 'QRP' WS.53 and its associated R-l07. Naturally, using the maximum permitted input, and on that particular band, quite a lot of QSO's took place. Almost all, however, were 'G' contacts, and studying the elapsed time per QSO, it is obvious that the accent was mainly on rag chews, rather than on DX chasing. Certainly, few contacts were buttoned up in less than half an hour, which is a change from the present vogue of R.S.T., WX and 73's. Again, as an indication of activity, over 100 QSO's are recorded for the first 11 weeks, which bearing in mind that the club was meeting only once weekly, shows that the license holder was a fairly avid ham.

In October '54, the first voice QSO was recorded in the log, and thereafter, a frenzy of calls. Now the DX really started rolling in, with exotic calls like DL's , ON's, F's and even PA0's being logged. Just shows what an uncomplicated 150 watts in A3 can do!

However, the interest prevailed spasmodically until 1956 when the complete absence of a license holder necessarily meant the end of transmissions. Even so, at this time, over 500 QSO's had taken place and a fair array of QSL's were held, including VU's, LU's VK's, VS's.

For two years silence predominated until in '58 a WS.36 and an HRO were produced and activity again started, necessarily on 10 and 20 metres, by virtue of the equipment. With the advent of the one eyed monster, goggle box, idiots lantern, or what have you, it was soon obvious that certain amount of TVI was being caused so this restricted activity quite a lot. In fact, out of viewing hours operation, seldom coincided with club operating hours, so the log began to look a bit despondent.

At least until December 1960, when those in high places agreed to the Radio Club having a grant from the Hobbies Fund to cover the purchase of a kit. The kit was chosen, and within the month, one of the members had all the pieces accounted for, power applied, and the Heathkit; DX-100-U radiating. The thin end of the wedge having been applied, the next successful bid was for a KW Geloso converter which, with the HRO, soon provided a station capable of bigger things. Using this rig produced another 30 countries and 20 zones, which with due regard to the single evening meeting weekly, was promising.

In the summer of '61, the suffix /M was acquired and interest was fostered in Mobile Rally programmes. Visits to the Harewood House, South Shields and Lincoln rallies were made and again in '62, when Bridlington was included. The best dx contact while mobile was with GM3GUJ, one of the most northerly of amateurs.

In October '62 the club were extremely fortified to receive a Lord Nuffield Trust Grant, and this meant vast improvements in both equipment and consequent results. A KW Viceroy SSB transmitter, HQ 170 receiver and Mosley TA 33 beam aerial supplemented club holdings and it wasn't long before the DX really became a workable proposition. Among these were KG4's, VP7's. ZS1's, ZD6's, HK1's, VS9's, and many others all of which raised club interest in the apprentices.

Interest is maintained by this DX working, although not at the expense of UK rag-chews, to which the club subscribes fully. Recently one club member took part in a QSO with his father stationed at El Adem, while another was able to participate similarly in a home-town QSO. All good fun.

Among those whose efforts keep the club active are society members G3DPS (No. 90) G3FMW (No.131) G3DBU (No. 130) and O i/c G3FGN (No. 68).

Club activity is usually confined to Wednesday evenings from 1800Z - 2100Z and other specific occasions such as field days. In fact, points are being worked out at present for the clubs own field day outing when for 24 hours, three apprentice members logged as many stations as possible. This it is hoped, will be a regular feature.

Finally, any other society station wishing skeds with G3HKR on voice, CW or SSB 80 -10 metres inclusive on Wednesday evenings, are asked to drop a line to the Officer I/C Amateur Radio Club, Army Apprentices School, Harrogate, Yorkshire.

G3CIO/P NATIONAL FIELD DAY - JUNE '63

by G3EJF

The weekend of June 8/9th 1963 saw a group of members of Royal Signals Amateur Radio Society drawn from 8th Signal Regiment and School of Signals representing the Corps in the National Field Day organised by the Radio Society of Great Britain.

A portable station using a KW Vanguard on low power and a Racal RA 17 was set up in a tent on a hilltop on the edge of the Feldom training area. Dipoles were erected for 80 and 20 metres and an end fed long wire for Top Band.

Good conditions on 20 metres gave G3CIO/P a brisk start to the contest with several European portables and 5B4OS/P near Famagusta contributing over 100 points in the first 3 hours. By the time the night shift took over a QSY to Top Band had taken place and a spell of really foul conditions about midnight slowed the scoring rate temporarily. Despite the altitude, 1250ft asl, the night was quite warm and the thick sweaters and gum boots that the pessimists had brought were not required.

A change to 80 metres was made early on Sunday morning, and with only short excursions to 160 and 20 metres later in the day, the remainder of the contest was spent steadily working through the UK portable stations on this band.

The afternoon was brightened by the unknown operator of a Northern Ireland station who after the customary six figure serial number sent "Certa Cito gud luck Jimmy".

The last of the"5 pointer's" on 80 metres, GI3RNY/P, was worked with minutes to spare just before 1800 hrs BST making a total of 185 stations worked for a score of 571 points. Not a winning score but not too bad for a first attempt. There were no serious equipment failures, even the home made foot controlled send/receive switch stood up to the pressure of sundry sized boots, and the weather man favoured us with brilliant sunshine by day and a full moon at night.

Involved in this busman's holiday were operators L/Cp1 J. Brown-Greaves G3NOL, Sig P. Scottern G3RFI, Civilian Instructor J.E. Hodgkins G3EJF and Civilian Instructor's XYL G3JZF. Staff Sgt Derek Pocock (ex ZC4CP) was chief log clerk and NCO i/c liquid refreshment, assisted in both activities by Sgt Ian Morris. WO.II Terry Richardson was awarded the society's Cordon Bleu for his "Curry a la Radio Relay", bangers and beans and other delicacies and was assisted in his A & Q activities by Sig F. Guppy.

As the gear was being unloaded back at the Catterick clubroom someone was heard to say "next year we must do so and so", proof indeed that a good time was had by all.

The same group of members are now hoping to take part in other portable contests later this summer.