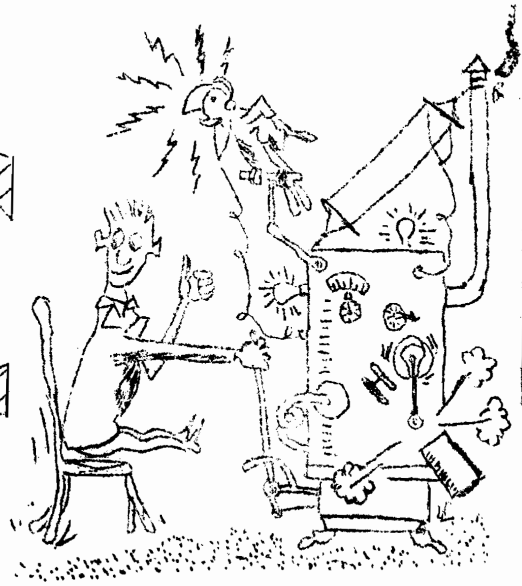
THE BI-TERMINAL MAGAZINE OF THE BRADFORD GRAMMAR SCHOOL AMATEUR RADIO CLUB

THE HAM



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THE BRADFORD GRAMMAR SCHOOL AMATEUR RADIO CLUB,

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BITERMINALLY

EDITORIAL

With the news that the Danish Administration have made a complaint to the General Post Office about QRM on Top Band, I feel that all those of you who are operators, or will be, should take head and be more careful on the air, as we do not want to lose this useful band. The Danish authorities have issued a list of frequencies to be avoided, it is as follows:

Frequency kc/s.	Station or Service.
1806	Lynby Radio
1813	Blavand Radio
1834	Thyboroen Radio
1988	Ships to Skagen Radio.
1995	Ships to Roenne Radio.

The British autorities also state that the following frequencies must be avoided: 1827; 1834; 1841; 1848; 1855; 1856; 1869; 1883; 1911; 1925 kc/s. Also: 1857; 1890; 1930; 1940; 1950; 1953; 1960; 1974; 1995 kc/s.

Apart from avoiding these frequencies (after dark), you should all be especially careful, Hams, and Pirates alike, beacause, as was recently demonstrated when the Radio Services Department of the General Post Office made a complaint about the School signal, we do not pass ignored in official circles.

After the successful trial Direction Finding contest on Baildon Moor we have decided to repeat the performance next term. Further details can be found elsewhere.

As this is our last issue before the City and Guilds Radio Amateurs' Examination, would like to wish all candidates the best of luck. Judging from the preliminary examination results, the fine record we gained under G3KEP will be kept up.

John P. Stott, G3MAB

D.F. COMPETITION

by David Noble, G3MAW

On Saturday, 22nd March, 1958, the first direction-finding competition took place. Despite the rules concerning receivers, there was sufficeint latitude in the rules for the prizes to be won by entrants whose receivers had early ceased functioning, and who had not even heard it ! In short, it was a bit of a farce.......................

It was during one of the marathon QSO's of the Christmas operating season that the idea of a d.f. competition was first thought of, and in the next fortnight that the organising committee had designed a d.f. receiver, constructed a prototype, constructed a low-power transmitter, and made a couple of preliminary excursions over Baildon Moor. The rules of the competition were printed in THE HAM, under the auspices of which the competition was held, as was also the design of the receiver, and certain information on acorn valves. THE HAM had a record sale, and constuction in the club-room reached a level never seen since G3KEP had left.

The next few weeks passed calmly enough. The walks over the moors continued; a suitable site was hit upon; THE HAM published its fourth issue. A little trouble was found in loading the transmitter, but a precaution was taken that, we hoped, would minimise this. And then, complications. The first site was visited, for another test, and, the day being fine and sunny despite some residual snow, the place was thick with strollers, hikers, dogs, and kids. Any chance of hiding it there was out of the question, so another site was found.

Then, more trouble. The transmitter could not be heard ten feet away. So, with the D.F. competition but a fornight distant, we got to work again. The new transmitter consisted of a crystal test oscillator modulated by an audio output unit driven by a 1000 c.p.s. Morse oscillator, with about 19feet of wire. Power was derived from a vibrator pack and 6v. accumulators. One quick rehearsal, and then THE DAY.

At school, the construction of receivers had been in full swing for most of the term. The secretary of the Club and the libtarian had both produced very nice receivers, although Tony had the misfortune to blow both his valves. Andrew constructed his on a very large chassis, on which he also tied his batteries, but rather foolishly placed the valves on the outside, and one got broken. It has been rumoured that this was an 'ACCIDENT ON PURPOSE' to hide the fact the valves used (EF80's) were high-consumption and the batteries could not stand the load. (It should be noted that the proto-type receiver, using low-consumption acorn valves, did not function correctly until the H.T. current was reduced to 5 mA., and that the rated H.T. current of the larger valve is rated at 10 mA each, WITH bias.)

Geoffrey Armitage started his receiver the evening before the contest, and when it did not work (it was not quite finished when the contest had begun) was disqual ified. Most of the other entrants who turned up had creditable, if not working, receivers.

The entrants went up to the top of the moors, to the triangulation station and arrived there a little late. No one, not even P.J.B. with his vaunted receiver, could hear the transmitter, and so they all went off to where a 'leak' had told them it was. This was site No. 1, the quarry on the end of the glen near Eldwick. And there they hunted for a little while, while the transmitter radiated unheard.........

In a little hollow at the other side of the moor, G3KEP and G3MAW were crouching, out of site of the rest of the moor; they had just switched the transmitter on for the 5th time when they heard the voices. They switched off the transmitter, and the voices in volume slightly; these were the competitors !

Ten yards away, Peter Barowitz, the only one left with a working receiver, muttered under his breath as the transmission ceased. Those surrounding him, nearly all the competitors who had not gone back to help John (G3MAB)'s sisters eat up the ice--cream left from dinner, spread and searched. William Kaye was the first to drop in; he was given his winner's slip and told to pretend to go on looking. A minute later we were favoured (?) with a visit from Jeff McManus, and the hunt was up.

All those in the district were called, and a few photographs were taken; then the party returned to John's, where, after stuffing themselves on stew, ice-cream, and drinks, an evening's sitting round the T.V. Rx which John has acquited was had by all who did not drop off to their dancing class.............

AUTOMATIC VOLUME CONTROL

by David Noble, G3MAW

Automatic Volume Control (hereinafter A.V.C.) is a means of controlling the gain of a receiver with the signal level. This means that the effects of fading are minimised and that a strong signal will reduce its own power if it suddenly comes onto the frequency. Readers may have noticed in circuits of communications receivers that the R.F. gain is controlled not by a potential divider type of control as in audio gain controls (Fig. 1a) but by a variable resistor in the cathode (Fig.1b), thus varying the negative voltage with respect to the cathode and hence the gain of the R.F. (or I.F.) stage. A similar method is used to control the gain by a.v.c.; a negative voltage is applied to the grid, and this voltage varies with the signal applied to the last I.F. valve anode.

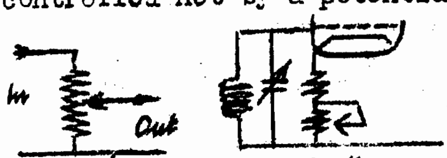


Fig 1a Fig 1b

In normal circumstances, i.e. in broadcast receivers, the a.v.c. is obtained by taking some of the voltage from the I.F. strip, using it to provide a negative voltage of similar amplitude, smoothing out any radio frequency r ipple that might give rise to feedback, and applying it to the control grids of the R.F. and I.F. amplifiers; thus controlling the H.F. gain of the receiver. The circuit is shown in Fig.2.

The principle of the circuit is that the R.F. voltage on the diode anode produces a d.c. current through the diode, which results in the mean voltage at the hot end of the ½ meg. resistor being negative with respect to chassis. This negative voltage is fed through smoothing networks of 0.1 uF condensers and 0.15 Meg. & 1 Meg. resistors, and is then fed to the grids of the R.F. valves.

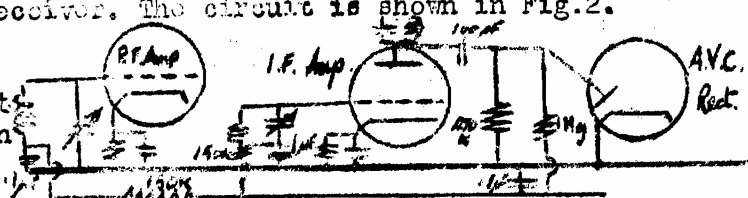


Fig.2 A.V.C.: The derivation of the A.V.C. Voltage & its application to the H.F. amplifying stages.

It should, however, be noted that in a broadcast receiver the diode is usually in the same envelope as the first A.F. stage, and shares the same cathode, which is usually a few volts positive with respect to chassis. The negative voltage, therefore, does not start developing until the signal amplitude is greater than this.

If a B.F.O. is fitted for the reception of c.w. transmissions, then the a.v.c. must be shorted to earth when the b.f.o. is on, otherwise the signal from the b.f.o. will provide such a voltage on the a.v.c. line that the signals will not pass the R.F. and I.F. stages unless it is very strong. This difficulty is sometimes overcome by using a bridge circuit, but this is complicated.

The fitting of a meter to record variations in the strength an incoming signal is a matter which is not really difficult, but which is awkward in one way; this is that a meter is required that reads from Right to Left. The circuit is shown in Fig.3. It is, however, possible to obviate this by use of a bridge circuit, but in most commercial receivers a special meter is used. Alternatively, a normal meter can be used upside down.

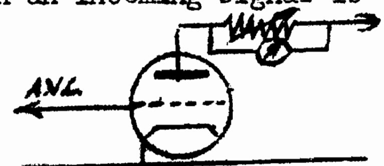


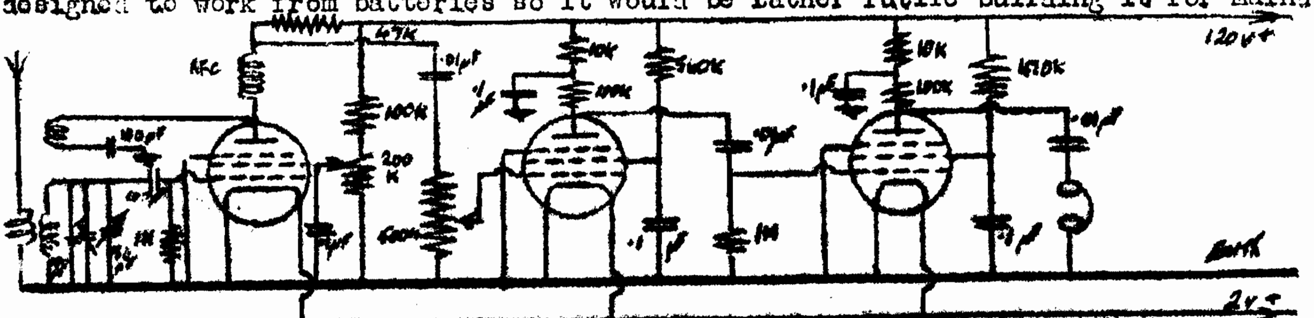
Fig.3

A Low Consumption Battery Receiver
By John P. Stott, G3MAB

The receiver described here wasmade by the writer as the receiver section of a portable transmitter-receiver. It uses three R.F. pentode valves (ARP12) and runs headphones.

The circuit as shown is just a simple 0-V-2 TRF receiver. The values were found by experiment and give the set an extremely low consumption. The writer's set was built into the cabinet of the ex-government 38 set and uses the four foot whip which can be obtained with that set.

The consumption of the set at an H.T. voltage of 120 volts is 2 mA. which means that a normal 14/6 battery will run it for about 1,000 hours. The L.T. can be taken from two 1.5 cells or from a 2 volt accumulator. The consumption is 0.15 amps. The power could be derived from the mains, but the LT would have to be rectified, and as this set is designed to work from batteries so it would be tather futile building it for mains.



On the four foot whip the set can be used for receiving amateur stations up to three miles away. On a longer aerial it would be a good receiver for a short wave listener to start on. By omitting the 100 pF padding condenser the set could be made to receive the Light Programme if you feel so inclined.

The coil used is a Denco range three green coil. By picking the right coil, or using plug-in coils, you could make the receiver cover any or all bands.

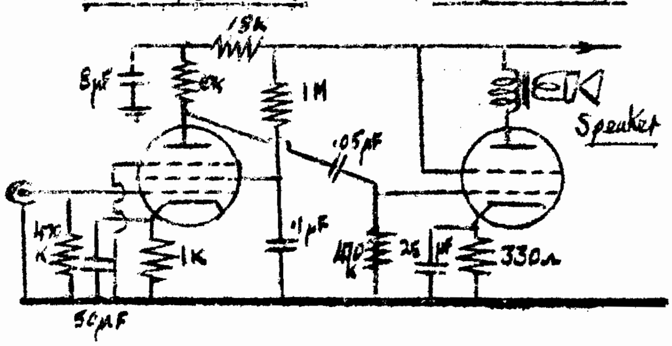

ARP12 base connections

BEGINNERS' SERIES
5 THE OUTPUT STAGE

The set as you have built it now consists of three stages: R.F. Amplifier; Detector; and A.F. Amplifier. There is with that arrangement sufficient amplification to drive a loud speaker, however normal valves, such as those used, cannot handle sufficient power to drive a speaker properly. For that reason there are special valves which can handle sufficient power, although they do not usually give much amplification. They are called output valves.

When such a valve is used the A.F amplifier circuit is modified, as shown. The output valve circuit is shown in the second figure. The output transformer is necessary because the resistance in the anode of the output valve should be high and the resistance of the speaker is low. Approximate values are: Anode resistor 4,000 ohms speaker 5 ohms. High resistance phones could be used in place of the speaker, the transformer being omitted.

A.F. Amplifier   Output Stage



Suitable valves are: 6V6, 6F6, etc. Before connecting such a valve to your power supply, you should check that the current it draws can be drawn from that supply in safety, as the current is rather heavy.

Those of you who have followed this series should now have a four valve receiver which, given a suitable aerial, will not only be an excellent broadcast receiver but will also be quite passable for communications work.

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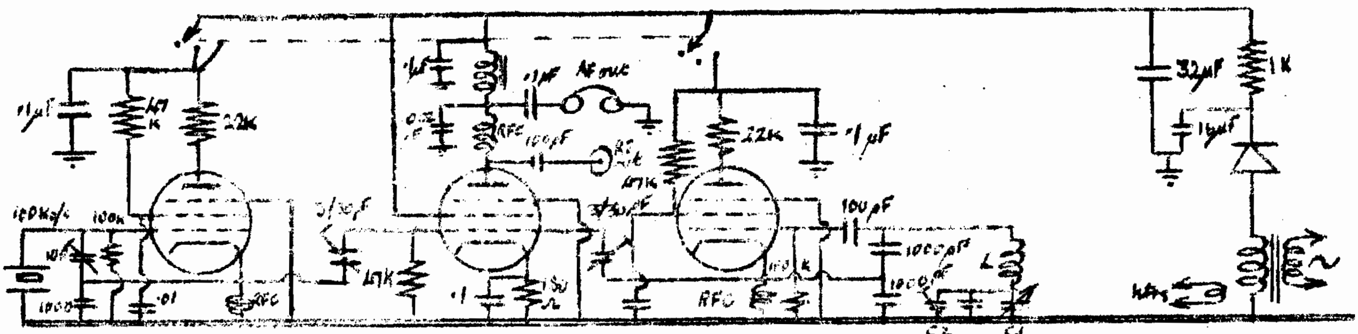
FREQUENCY CONTROL AND MEASUREMENT
Part 2
A Simple heterodyne frequency meter
by David M. Pratt, G3KEP

As it is necessary to measure the frequency of a transmitter to the nearest kilocycle for the purpose of the log, and as it always useful to be able to measure the frequency of an incoming signal, a suitable design for a heterodyne frequency meter is given below. It consists of a 100 Kc/s crystal oscillator, a variable frequency oscillator covering 100 Kc/s which beats with the harmonics from the crystal oscillator, and a combined R.F. mixer and audio amplifier.



The crystal Oscillator stage comprises any R.F. pentode in a pierce oscillator circuit with the output taken from the cathode. The 'top' feedback condenser was, in the writes's case, a variable type so that the crystal can be 'pulled' down to a frequency of exactly 100 kc/s. It should be mentioned here, that all crystals are always a little higher than the marked frequency so as to allow for any stray circuit capacities. In the case of a certified 100 Kc/s crystal, the stray capacity will be stated on the certificate.

The variable oscillator is a Clapp circuit using a similar valve to that of the crystal oscillator. In the proto-type, this oscillator tunes 6.3 to 6.4 Mc/s.; but any convenient 100 kc/s range can be used. A variable condenser is chosen for C1 which tunes about a 110 Kc/s range in a linear manner. The scale is then calibrated from 0 to 100 kc/s leaving a little overlap at each end. C2 is a variable trimmer of about 10 pF taken to the front panel to adjust the 'zero' before taking an accurate measurement.

The outputs from the oscillators are taken via 3-30 pF Phillips trimmers to the control grid of the third R F. pentode which mixes the two oscillators and amplifies the R.F. output. This stage is also an A.F. amplifier to the beat note of the two oscillators so that the instrument can be set up using a pair of headphones. The injection of the oscillators into the output valve is varied for maximum strength of beat note in the 'phones by adjusting the capacity of the two Phillips trimmers.

Any power supply capable of supplying 150-200 volts H.T. and 6.3 volts L.T. can be used. In the proto-type a half-wave metal rectified internal power supply was used, a two-pole, three-way switch being used so that either bother oscillators can be off, the crystal oscillator can be on, or both oscillators can be on.

This instrument is an accurate piece of gear, and should be capable of measuring the frequency to about 100 c.p.s. depending on the type of slow motion drive and dial used.

R.F. CIRCUITRY

by David Noble, G3MAW

This article is intended to follow that of the last issue, on the design of A.F. circuits. In R.F. work, the biasing of the stage, the considerations of screen resistors, etc., are similar, but the coupling and decoupling condensers, chokes, & controlgrid resistors are much smaller, and there arises the important consideration of the tuned circuit - all of which I propose to deal with in this article.

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The most important consideration in r.f. circuits is the tuned circuit. As most of you will know, an inductance (coil) presents an impedance to A.C. current which increases as the frequency increases, called the 'inductive reactance'. Similarly, a condenser presents an impedance which decreases with rise in frequency, called 'capacitive reactance'. It is obvious that, if we connect a condenser and a coil in parallel, there will be a frequency where the two reactances are equal. At this frequency, the combination presents a comparatively high impedance to the incoming signal. If the incoming signal is of this frequency, it will build up as a voltage across the circuit which will appear on the grid and be amplified.

Figure 1 shows the usual circuit for an r.f. amplifier stage, with values given. L2/C1 is the tuned circuit determining the frequency of the incoming signals. L1 is the coupling to the next stage, various ways of arranging which are shown in figs 1b-c. Fig.1d should be of interest to those who acquired a coil for the d.f. contest with only two windings, as it saves an r.f. choke and a condenser over the more usual circuit of Fig.1c. Fig.1a shows how an r.f. gain control is fitted.

The usual type of t.r.f. detector is shown in fig.2. The basic principle is that the incoming r.f. signals vary in amplitude at the frequency of the superimposed speech, and on applying the r.f. to a diode the resulting d.c. output varies in amplitude as the speech, i.e. we have an audio signal with a d.c. component. The detector does not work on quite this principle, however; but it is simple enough to puzzle out its working remembering what happends when the grid goes positive. The reaction is a form of positive feedback; when the control is advanced too far the receiver oscillates on the frequency to which it is tuned, which produces a beat note with stations which are being received. It also improves the selectivity of the receiver.

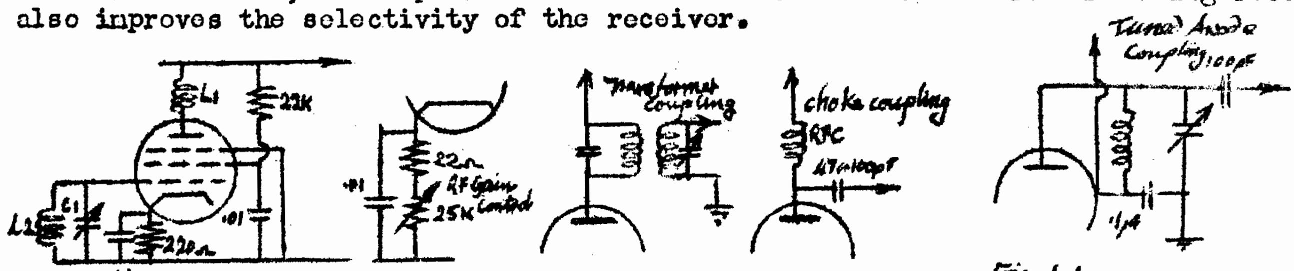

Fig 1 ~ R.F. Amplifier stage   Fig 1a   Fig 1b.   Fig 1c   Fig. 1d.

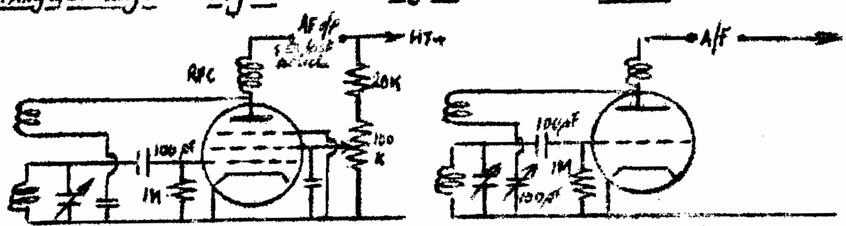

Fig 2. TRF detector   with triode valve

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CURRENT NEWS by A.M.P.

Due to various circumstances I was unable to write the current news for the last issue, and so I now thank my stand-in D.M.P.

Firstly, I must mention the D.F. competition. News of this is given elsewhere, but a few comments here will not be out of place. The contest did not quite proceed in the orthodox planned manner, but I think it is true to say that this first contest was in the nature of an experiment, and that everybody, both organisers and competitors alike, have learned from their mistakes. Two surprising fact emerge. To begin with, the transmitter was not heard by anybody until they entered the quarter mile radius. G3LZW and SWL McManus tracked it down to within a few yards, but it was finally found by SWL Kaye who accidentally fell into the crater in which the transmitter itself and its two operators were concealed. N.B.:- Information as to the whereabouts of the transmitter revealed by Charley Knowles both before and after the contest was entirely unfounded and only served to illustrate his preference for either golf or beer, both of which are to be found in the golf-house.

At the Bradford Society, a display of member's test gear was held, and also arrangements were made for Field Day in June, and also the Harewood House Mobile Rally in April upon which there will be a report in the next issue. At last year's Field Day, G3KEP/P was the representative station, set up in St. Bede's playing fields and operating on 160, 80 and 10 metres. Operators, all by regulation members of the R.S.G.B., were G3BKE, G3INW, G3KEP, G3KEZ, and others. This year the station will again be run in the playing field of St. Bede's Grammar School.

Modification is being made to the modulation system employed in the QRO rig at G3MHB. It is hoped that the rebuilt equipment will function efficiently, to the safety of all members, and to the good name of G3MHB on both the British and DX bands. A converter for the present station receiver is being aligned so that we can cover the 10, 15 and 20 metre Amateur Bands, something never before attempted at B.G.S.

Several continental 'fish-fone' stations have been complaining about interference from British amateurs. Though gratifying to know that our signals are being propagated so well, it is dosterfying, for it might mean complete closure of Top Band. A recent R.S.G.B Bulletin gives full details of British and Continental fish-fone and distress frequencies, and allowing 8 kc/s for the side-bands of fone stations, and 1 kc/s clearance on each side of CW frequencies to calculate the exact position of clear spots on the band. Allowance must be made for the terrific spreading of Loran, whose fundamental frequency is 1950 kc/s.

Material for the next issue's Current News should be addressed to me a month before the end of the Whitsuntide holidays. All items of news suitable for inclusion will be considered. Here is the space where you DX-chasers, both licensed and unlicensed can advertise their sessions worked or heard.

We want more AMPS for the CURRENT NEWS. A.M.P.

A SIMPLE C.R.O.

by Andrew M. Pomfret, G3LZZ

One of the most useful measuring and testing instruments for any experimentalist is the Cathode Ray Oscilloscope. The one described here not designed for any particular tube, and the E.H.T. used must agree with the maker's specifications.

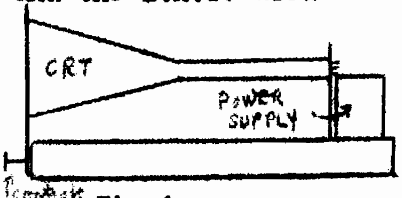
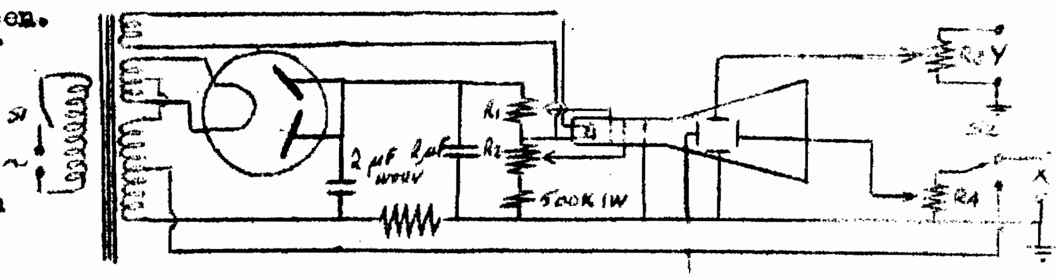


Fig. 1

The diagram shows the arrangement of the chassis in relation to the tube and and the power supply. A metal screen shields the latter and acts as a support for the neck of the tube - which in the original circuit was a Hivac 3" CRT using 400volts HT. It has two LT windings; one for the rectifier, an 83, U50, or a 5Z4, and the other for the CRT.

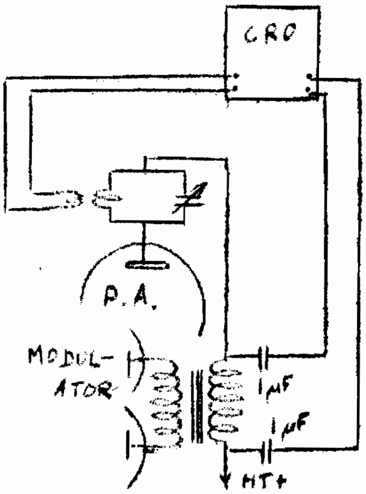
When no inputs are being applied to the X and Y plates, S2 should be switched in to the center-tap of the HT winding to avoid ruining the fluorescent screen.



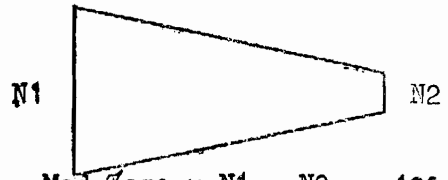
A method of connecting to produce an indication of modulation for example is shown below. Under normal grid or plate modulation conditions, the the familiar trapezium will be formed.

R1 - brilliancy control - 10K
R2 - focussing - 250K
R3 - Y amplitude - 1M
R4 - X amplitude - 1M

The modulation percentage can be found from the diagram below.



The writer will be glad to supply details of other patterns that may be obtained under unsuitable modulation conditions, but these are rather difficult to point and have there fore been omitted. Suffice it is to say that such a system will detect absence of modulation, under-modulation, over-modulation, overload, mismatch, and other faults.



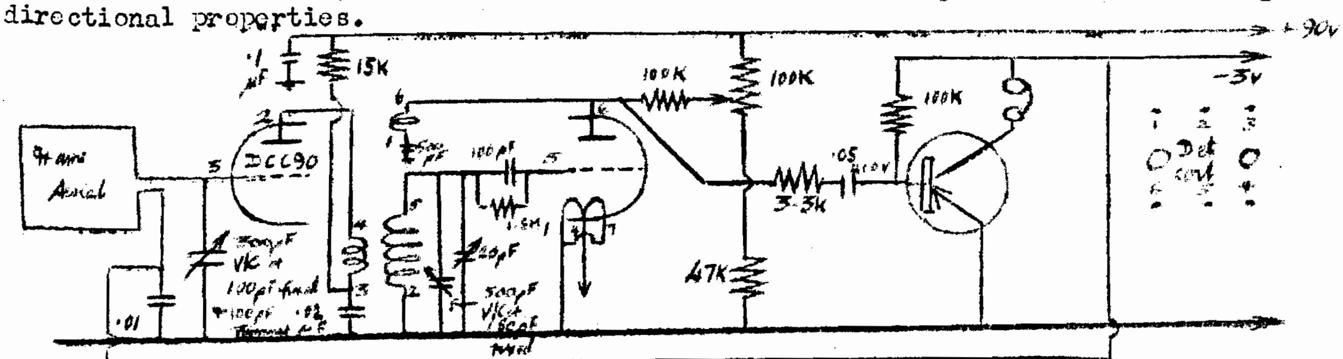
$$\text{Mod \%age} = \frac{N1 - N2}{N1 + N2} \times 100.$$

A SENSITIVE D.F. RECEIVER

by Peter J. Barowitz, G3LZW.

Most people found, I think, that on the last D.F. competition day they could not hear the D.F. transmitter - those who had completed their sets, that is. It is evident therefore that a more sensitive receiver will be required for the next contest and this article as a supplement to the usual transistor article is just to show how a transistor can be used to increase the gain of the basic receiver.

The D.F. receiver used by myself which could detect the transmission at a reasonable distance is shown here, but without the ferrite rod as this proved rather lacking in directional properties.



The numbers given on the coil connections refer to the D.F. coil which was supplied to most contestants while the numbers against the valve electrodes refer to base pins of the DCC90. The method of connecting the earthy side of the frame aerial to the -3v socket on the battery supply is tp put negative bias on the grid of the R.F. stage and replace the 1K and .002 in the cathode of a 955 valve when this is used. Otherwise the circuit is much the same as that suggested in the Ham and my version is only given here for those who wish to copy it exactly. The important part is the transistor which could normally be coupled to the detector with a transformer but to save money and space the combination of 3.3K and .05 uF was chosen. The .05 uF must be a low-leakage type and the value of the 3.3K is very critical. If this latter is reduced in value it will probably render the reaction of the detector inoperative. If made larger, much of the gain of the transistor will be lost in it. The 500 pF reaction condenser was found necessary using a triode detector as was the [illegible] method of connecting the reaction potentiometer to give anode reaction. The 10K in the anode ensures that the minimum load on the valve anode is about 4K (3.3 K plus reactance of .05 uF and base impedance of transistor).

I will probably use transistors throughout next time and an additional audio stage may also prove necessary but this circuit will give better results than most people have so far obtained. The series of transistor articles should help members to work out their own circuits for further improvements. Anyway here's wishing you good D.F.!

THE NEXT D.F. COMPETITION WILL BE HELD ON SATURDAY, 24th JULY

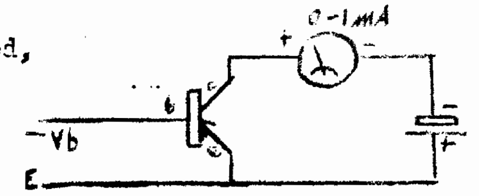
THE USE OF TRANSISTORS

by Pëtor J. Barowitz, G3LZW

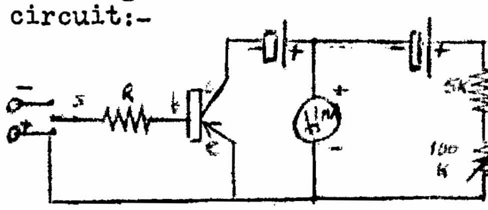
Part 2 - D.C. Amplification.

Although the article of the D.F. receiver in this issue is rather a jump ahead in transistor theory, we will continue to cover the ground as planned.

The use of a transistor as a D.C. amplifier will be shown here and readers are reminded that reference to the previous article will be useful. The basic circuit shown there can be modified to use a meter thus:-



In this circuit when the base is left unconnected, a small current will flow through the meter; when the base is earthed this will be reduced but not stopped; when a negative voltage is applied to the base the current will increase greatly, giving a large deflection on the meter (the meter may be any M.C. type up to 5 mA F.S.D. but the more sensitive it is the more sensitive the final arrangement will be). Thus we have a much more sensitive meter. This is almost all there is to it but compensation for the standing current should be made with allowance for temp change causing change in the circuit:-



The extra 1.5 volt cell and 100 K preset pot. causes a current in the opposite direction to flow in the meter and its reading can be adjusted to zero with the preset. The 5K protects the meter from the full 1.5 volts. It will be found to alter the preset under different temp. conditions and the transistor will be found to 'warm up' when used and the zero of the meter will need readjusting. 'R' represents the usual attenuator to give the required voltage reading and may be replaced by a whole set of resistors and shunts with their switches to give different readings as required in the usual way. A spring loaded microswitch protects the transistor against inadvertant overload and also shorts the input for getting the zero as open circuit conditions give higher standing collector current. The values for R are calculated just as for a normal meter but F.S.D. current is taken as the F.S.D. of meter ÷ current gain of transistor and input resistance has to be found experimentally. The current gain (α') may be found by measuring collector current for a known base current (= $\frac{\text{voltage applied}}{\text{series resistor}}$ e.g. 100 uA) and α' then = $\frac{\text{Collector Current}}{\text{Base Current producing it}}$.

It varies in practice between 10 and 80, a typical value being 30. The transistor circuit and shunts etc may be built into a separate unit to increase the sensitivity of an existing meter or built into a box complete with meter, the attenuators and shunts must of course, be designed to suit the ranges of reading required. As a final point it should be noted that the system can be used for A.C. voltages it a meter rectifier (bridge) is used in the basic circuit (after attenuator or shunt). Although not highly accurate, the circuit shown gives relatively accurate readings of voltages both very low and very high which would normally be affected by the loading incurred when a meter alone is used, an S-meter running from an AVC line being a good example.

Assistance in design and construction of such a unit will readily be given by the writer on request.

DATES TO REMEMBER

26th April.. ..	This "HAM" Published
29th	Single Sideband lecture - Bradford A.R. Society
4th May	Top Band Contest 7 -9 p.m. (Rules last issue)
9th	Radio Amateurs' Examination
10 -11th	Boy Scout Jamboree on-the-Air.
13th	Field Day Arrangements - Bradford A.R. Society
14th	Next HAM deadline.
24th May - 2nd June	Whitsuntide Holidays
7th June	HAM Published
3rd	Experimental Colour Television - Bradford A.R. Society
7-8th June ..	National Field Day - St. Bede's G.S. Playing Field.

AN EXPLANATION OF BROADCAST INTERFERENCE

Set out below is a list of formulae which should help sufferers from B.C.I. to find their cause. For clarity in the formulae,

QRM = the frequency on which the unexpected reception occurs.
QRG = the frequency on which the amateur station is transmitting.
and IF = the intermediate frequency of the receiver.

The figures in brackets are the calculated ranges on the broadcast bands for the 160 metre band assuming the receiver intermediate frequency to be 465 kc/s.

i)	QRG	=	2QRM ...	...	...	(300-333m.)
ii)	QRG	=	QRM plus 2IF	...	...	(280-345m.)
iii)	QRG	=	2QRM plus 3IF	...	...	(993-1441m.)
iv)	QRG	=	2QRM plus IF	...	...	(391-449m.)
v)	QRG	=	QRM plus 1$\frac{1}{2}$IF	...	...	(233-272m.)
vi)	QRG	=	QRM plus $\frac{1}{2}$IF	...	...	(170-191m.)

In the next issue, a wave-trap design for B.C.I. reduction, and a High-Pass filter for T.V.I. reduction will be described.

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G3MHB OPERATORS

The following members of B.G.S. Amateur Radio Club are official operators of the the School transmitting station: G3LQJ; G3LXF; G3LZW; G3LZZ; G3MAB; G3MAL; G3MAW; & G3MFJ.

Operators who have not yet paid their share of the licence fee which is due on 13th January, 1959 should note that they will be required to pay 4s.6d. before that date.

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RADIO AMATEURS' EXAMINATION

The management staff of "The Ham" wish to convey their best wishes to all members of the B.G.S. Amateur Radio Club who are offering the radio amateurs' examination in May. Last year, the results were available in the middle of August, but we are informed, this year, that the City and Guilds of London Institute have an additional examiner for this examination, and it is expected that the results will be out much earlier.

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LATE NEWS

"The Ham" is printed and published for the members of the Bradford Grammar School Amateur Radio Club on the Saturday following the beginning of each half-term by David M. Pratt, G3KEP, 27 Woodlands Grove, Cottingley, Bingley, Yorkshire.