THE PROPAGATOR

THE MONTHLY NEWSLETTER OF THE
WIRELESS INSTITUTE OF AUSTRALIA
ILLAWARRA BRANCH

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NOTICE OF GENERAL MEETING

Members are advised that the next GENERAL MEETING of the Illawarra Branch of the W.I.A. will be held at the Wollongong Town Hall Committee Room on Monday, 12th MAY 1975 at 7.30 p.m.

THE AGENDA READS AS FOLLOWS:

1) Apologies and welcome to visitors and new members.
2) Minutes of previous meeting.
3) Correspondence.
4) Financial Report.
5) General Business.
6) Raffle.
7) Lecture.

Two EME tests were programmed for VK2AMW on April 19th. Both were 'CQ periods'. The first test from 1400 to 1500 EAST covered the American 'window', but an intermittent open circuit in a coax. connector prevented transmitter operation. JA1VDV was heard testing on 432.060Mhz after our test period.

Four members were at Dapto during the afternoon.

The second test between 2200 & 2300 EAST covered the 'African and European window'. Although we received good echos, no other signals were heard. VK2BHL and VK2ALU were on site for this test.

The transmitter was then removed for installation of the 'K3RIW' type final amplifier in place of the push-pull P.A.

Although modifications are well under way, we will miss the May EME tests.

The new receiving system input coaxial filter has been made and is being silverplated.

Twenty metre skeds with ZE5JJ continue each Saturday afternoon, during which the latest EME information is discussed.

Lyle VK2ALU.

P.S. Can anyone help me with a suitable vehicle for transport of a light TV tower, in two sections each 20ft. long, about a mile to my place?

DX PANORAMA

BY GERRY VK2APG.

The 20mx band over the last few weeks has shown quite a few interesting stations. The band is still starting to open to South America around 0300 GMT and followed by Europe not much later around 0500. Short path Europe opens around 1100 GMT to Scandinavia and gradually down to southern Europe. The 10 mx band is still opening to the Pacific a nd America around 2300 GMT Still haven't heard much of Jim 2BBG on 20, nor much of Hank 2BHL.

Some interesting stations I have worked on 20 are:-

PY8AGS	0554	Porto Velho	OY3H	1206	Faroe Is.
XB9ABX	1326	Indonesia	XE1PF	0518	Queretaro
JD1ABZ	1137	Minami Toroshima	OZ3WG	1250	Copenhagen
FO8DP	0703	Papeete Tahiti	HL9TO	1052	Korea
YN1PJ	0500	Managua	4X4AS	0624	Televiv
VP5GT	0652	Grand Turks	KP4QA	0702	Puerto Rico
9Y4AVC	0710	Trinadad	FB8XD	0511	Corsica
6P6AH	0447	Barbados	GL3TLT	1255	Bangor
ZF1MA	0428	Cayman Is.	T19FAG	0523	DXpetition Cocos

As announced in the April 75 issue we are requesting renewal of subscriptions for The Propagator for 75 - 76.
Those of you who have been receiving copies of this newsletter as a free service from the Illawarra Branch will receive only ONE issue after this unless we receive your subscription. At the General Meeting held on 14.4.75 it was resolved, because of increased postal rates, to increase the Subscription rate.
The subscription rate is now $2 with concession rate of $1 to apply to Students & Pensioners.
Your subscription should be sent to:

The Secretary,
Illawarra Branch WIA.
P.O. Box 110.
DAPTO. N.S.W. 2530.

Ian 2ZJA.

After some deliberation the Committee have decided not to pursue the store project for the time being. If anything turns up in the meantime we will be happy to investigate it. It was decided however that some of the money in the club funds should be used to purchase bargain priced components for resale to members. This will not only give you the opportunity to get some cheap parts, the small profit the club makes (approx 10%) will help to combat the effect of inflation on our bank balance.
We have at present some 200 trimmers (20p- 200) currently selling at $1 or more by the large volume components shops - our price is 4 for $1. At the time this publication went to press we have also a large volume of Greencaps at very good prices but I can't quote them as details are still sketchy.
Some months ago we received a carton of FT241 crystals from the VK2 Divn. and will be publishing a list of the values soon. Bill 2ZCO has been grinding and etching some samples of these and has evolved a circuit using the reground rocks where the gain is amplified to a volt or more so that these low activity crystals will be useful in all sorts of applications. We will not sell these rocks however until the circuit is published as my guess is that the last lot sold are mostly sitting in odd boxes in radio shacks far and wide, gathering dust.

The following is an extract from the Government Weekly Digest. 20.4.75

Amateur radio service licences introduced.
16.4.75 The postmaster general Senator Reg Bishop, announced that arrangements have been made for the introduction of novice amateur radio station licences.
The novice licence is being introduced to enable persons who have not passed the standard amateur examination to engage in radio as a hobby on a restricted basis and gain the knowledge and experiance necessary to qualify for a normal licence. This move by the Government had the wholehearted support of the Wireless Institute of Australia.
To become eligible for such a licence, persons will be required to Qualify for a Novice Amateur Operators Certificate of Proficiency.
The certificate will be issued to any persons regardless of age, who pass a comparatively simple examination in radio theory and regulations and a morse code test at 5 words a minute.
The fee for a novice amateur station licencee had been set at half the normal rate and would be $6 per year. The fee for the examination will be $2.
Novice amateur station licencees will be permitted to operate within the bands 3.525 - 3.575 MHz, 21.125 - 21.200 MHz & 26.960 - 27.230 MHz. All transmitters must be crystal controlled. Powers of up to 10 watts for double sideband and 30 watts for single sideband transmissions will be authorised.
Persons wishing to obtain more information concerning the new novice licence should contact the regulatory & licensing section of the PMG's department in the state in which they live.

Keith 2ZYI.

AUTO MORSE KEY GERRY VK2APG

Here is an automatic key which is very easy and economical to build. It uses a minimum of components and can be built in 2 to 3 hours. I built this unit and have now been using it for some months, making many contacts, CW. Some hints when constructing :-

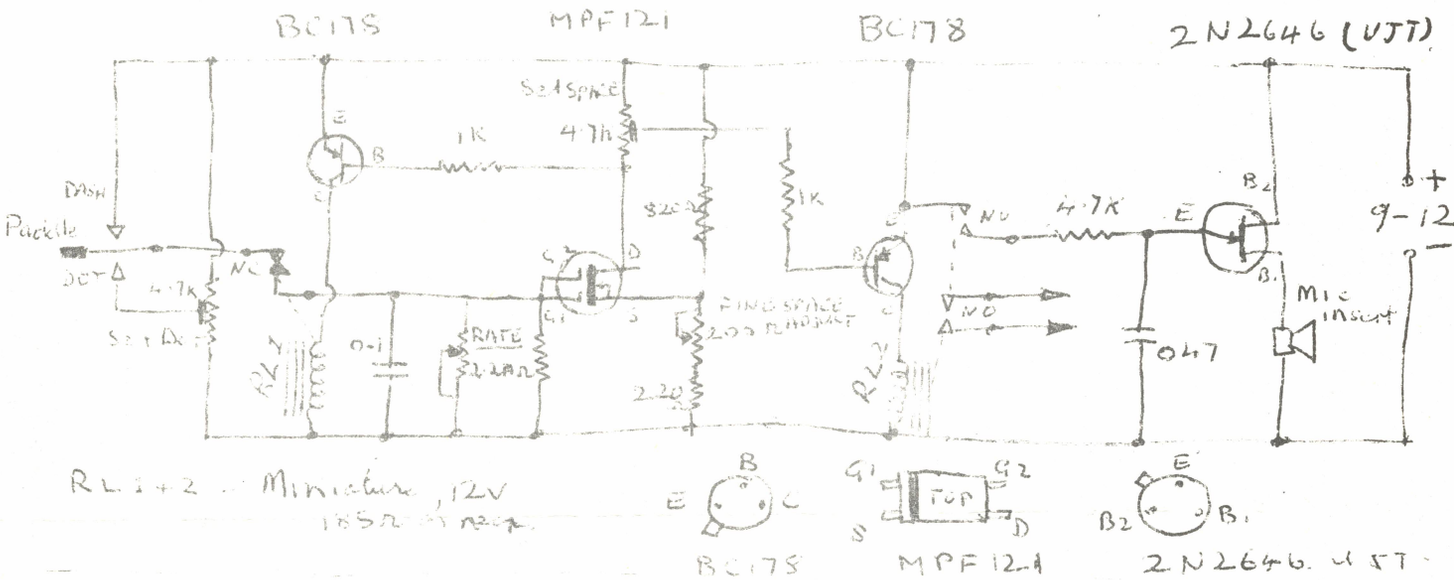
1). Use only metal boxes as plastic onesdo not properly shield RF which has some drastic effect on transistors.

2)."Set Dot" pot and "Set Space" pot are skeleton types and are m mounted on the board (vero board I used)

3). "rate" pot is speed pot and "fine space " pot are both mounted externally for externally for control tosuite individual operators.

The last stage is a side tone oscillator which can be used for practice purposes etc . I have a 3 position switch to switch osgillator off as my HF rig already has a side tone oscillator built in.

Also it may be necessary to double up on relay contacts as there is quite considerable current passing via contacts. If contacts still do not hold current as in early model FT200 etc., it might be advisable to connect a 10 or 15 OHM resistor in series with the contact.



To set this keyer up after completing construction I found that by following the steps below it can be achieved easily.

1).Connect OHM meter across keying contacts on R12

2).Adjust "speed or rate" potto a fairly fast speed

3).Hold paddle in "DASH" position and adjust "set space" pot for 75% of full scale deflection.

4).Hold paddle to "DOT" position and adjust #set dot" pot to give 50% full scale deflection. This should just about do it!

For any further details contact me ,either on HF or 146, or at 4/15 GILMORE St WEST WOLLONGONG

PS. I also have a layout for P/C board if anyone is interested.

73'S GD. DX

JERRY VK2APG.

FOX EEZY REPORTS-------

APOLOGIES- In the March Propagator Best wishes were extended to Geoff VK2ZHU and Keith VK2ZYI for their C.W. exam. Unknown to me, John (big bad) WOLFE and Herman Feige also sat for the exam, Istheir any wonder they failed? Without my good wishes they didn't stand a chance. BEST OF LUCK for next time fella's but no excuses!! ED. Despite the good wishes Geoff and Keith also failed!

TALKING of C.W.___ How about the guy with the FT 200 in the mobile making CW QSO'S while cruising along in excess of 100 KPH ? Trevor VK2BTB thinks nothing of it. By the way, if you find your mobile CW note drifts at about 120KPH try getting a wheel balance. HI!

BILL CALVERT VK2ZCO has been reported tobe seen with a new project on the drawing board which could come up soon as a club project. Rumour has it that it is a 200 MHZ frequency counter that will cost around $100. Sounds to good to be true.....

HANK VK2BHL has been working on the solid state Ident for the repeater of late which indicates that things could be on the go again. WE can only HOPE!

YET another local now mobile on 2 Metres FM-- Jim VK2YCH now sporting a multi 7, and already has built up a 25 Watt P.A.

73's de

BARRY VK 2FE

COMMONWEALTH OF AUSTRALIA

POSTMASTER-GENERAL'S DEPARTMENT

AMATEUR OPERATORS' CERTIFICATES OF PROFICIENCY

SECTION M (Theory) AUGUST, 1970.

(Time allowed - 2½ hours)

NOTE:- SEVEN questions only to be attempted. Credit will not be given for more than SEVEN answers. All questions carry equal marks.

1.(a) Draw the circuit diagram of an amateur station transmitter suitable for operation in the 144 - 148 MHz band. Explain briefly the theory of operation of each stage of the transmitter.

(b) Describe how you would tune the above transmitter.

2.(a) With the aid of a circuit diagram describe the operation of a three stage tuned-radio-frequency (T.R.F.) type high-frequency receiver using one stage of radio-frequency amplification, a regenerative detector, and one stage of audio amplification.

(b) Explain why interference could be caused to neighbouring receivers by a receiver comprising only a regenerative detector and audio amplifier stages.

3.(a) Explain the theory of operation of a heterodyne frequency meter suitable for use in an amateur station. A circuit diagram should be shown.

(b) Under what circumstances would you use :-

(1) an absorption wavemeter,

(11) a heterodyne type frequency meter,

(111) lecher wires,

(1v) grid-dip oscillator,

(v) cavity resonator?

4.(a) Aided by a circuit diagram describe the operation of a full-wave high voltage power supply which uses silicon rectifiers.

(b) Discuss any precautions you would observe when using silicon rectifiers :-

(1) singly, and

(11) in series.

5. With the aid of a circuit diagram describe the operation of the "product detector" stage of a receiver built to receive single-sideband suppressed-carrier radiotelephone signals.

6.(a) Aided by a sketch describe a directional aerial suitable for use in the 21 - 21.45 MHz amateur band.

(b) Explain how the directional characteristics of this aerial are produced.

7.(a) With the aid of a sketch describe the construction and explain the theory of operation of a carbon type microphone.

(b) Draw a circuit diagram showing how this type of microphone may be connected to an amplifier.

8.(a) Assisted by a circuit diagram describe the operation of a two stage transistor type audio amplifier.

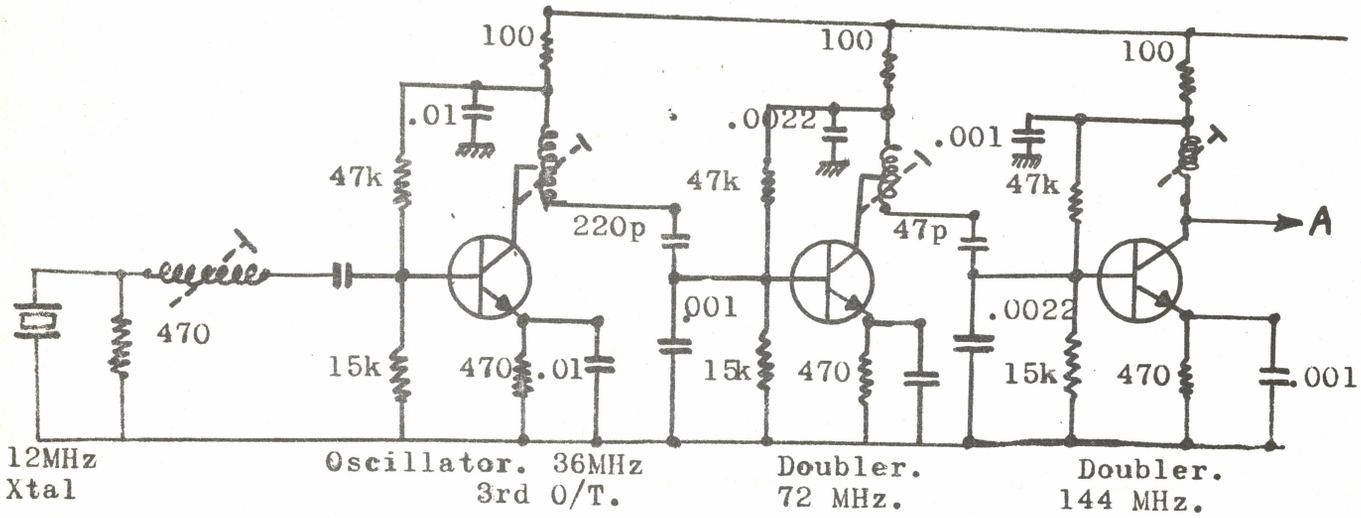
(b) Compare the characteristics of Field Effect Transistors with the normal PNP type in relation to use in radio frequency amplifier stages.

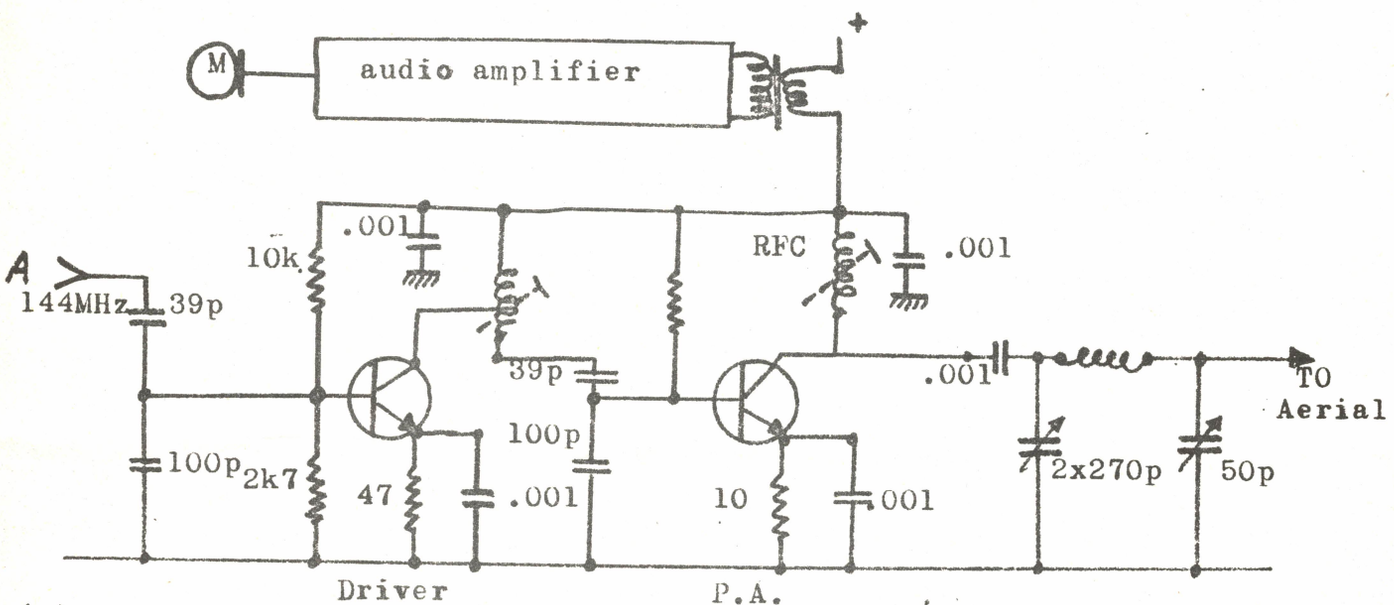
9. Three capacitors of capacitance 5, 8 and 10 microfarads are connected in series with a 400 volt D.C. supply.

Calculate :- (1) the total capacitance of the combination,

(11) the voltage drop across each capacitor. (Show working).

1 (a).





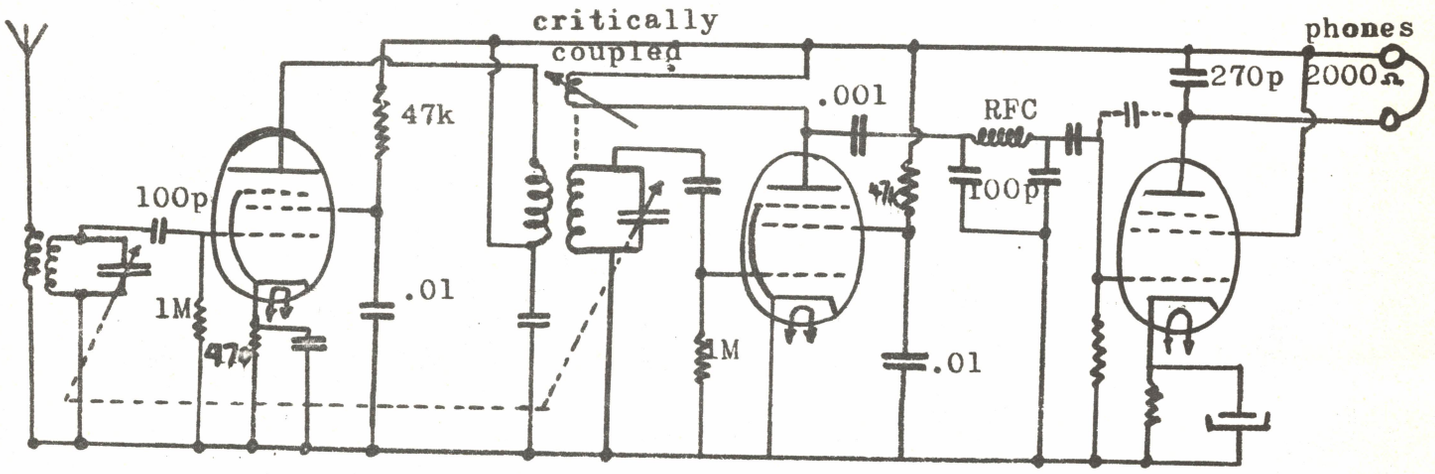
(i) Series crystal oscillator on 3rd Overtone.
(ii) Doublers to 144MHz.
(iii) Driver & P.A. both AM modulated.

(b). TUNING.

Tune each coil for max. negative voltage on base of next transistor, or maximum voltage drop across 100 Ohm supply resistor.

Use SWR meter or RF ammeter in Aerial line to tune for max. RF consistent with current drawn through P.A.

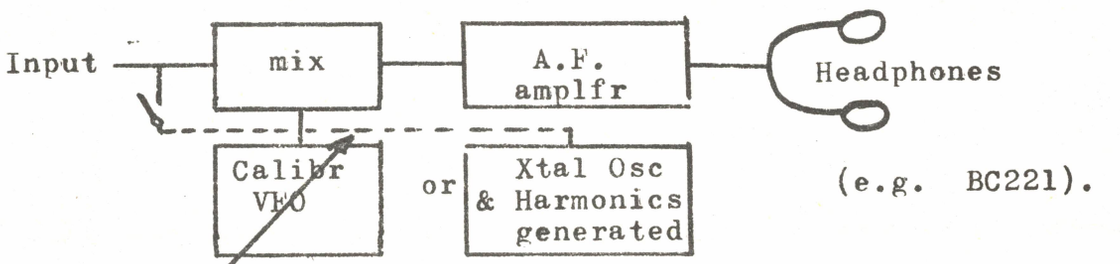
2 (a).



(i) RF Amplifier amplified at signal frequency.
(ii). Regen. Detector produces audio at the plate due to non linear action.
(iii). Pie filter (RFC + 2x100p) blocks RF. passes audio to amplifier.

(b). Without RF amplifier an overcoupled detector would radiate RF from the antenna.

3 (a).



(e.g. BC221).

i. The incoming signal is mixed with the known signal from the calibr. VFO.
ii. When zero beat occurs, the unknown frequency equals the known frequency from the VFO. (calibrated dial readout).
iii. For calibration purposes a xtal oscillator is often included.
iv. One pitfall is that if the frequency to be measured contains harmonics the harmonic instead of the fundamental frequency could be measured. In such a case, a GDO or a calibrated absorbtion wavemeter should be used first to find the fundamental frequency.

(b). i. An absorbtion wavemeter can be used to roughly determine output frequencyof an oscillator, transmitter etc. It can also be used to locate spurious oscillations in various stages of a receiver or transmitter.

ii. A heterodyne type frequency meter can be used to measure a frequency accurately subject to the conditions under (i).

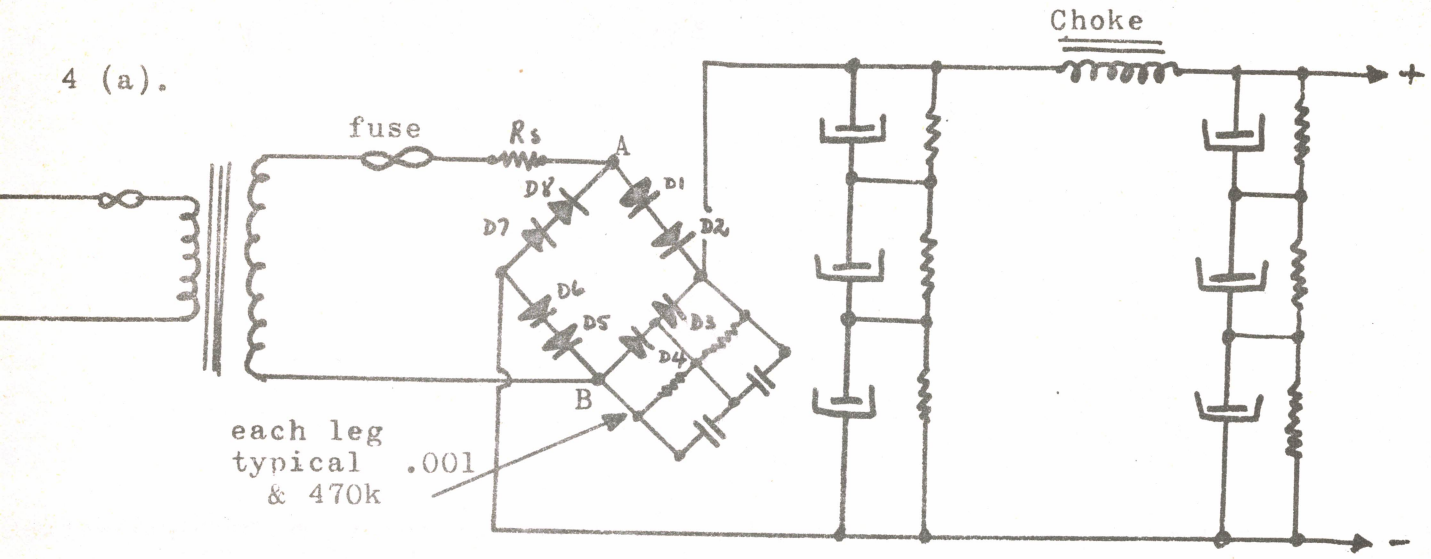
iii. Lecher wires are used to measure frequency at VHF & UHF frequencies using an RF probe, the points of minimum rf(standing wave) can be detected. By measuring the distance between these points the frequency can be calculated using the formula $\frac{\lambda}{2}$ meters $= \frac{300}{f_{MHz}}$ eg.

If the measured distance is 1 metre, the frequency is $\frac{300}{2x1} = 150$ MHz.

iv. A GDO can be used to determine resonant frequencies of LC circuits, aerials, RF Chokes (ends shorted) etc.

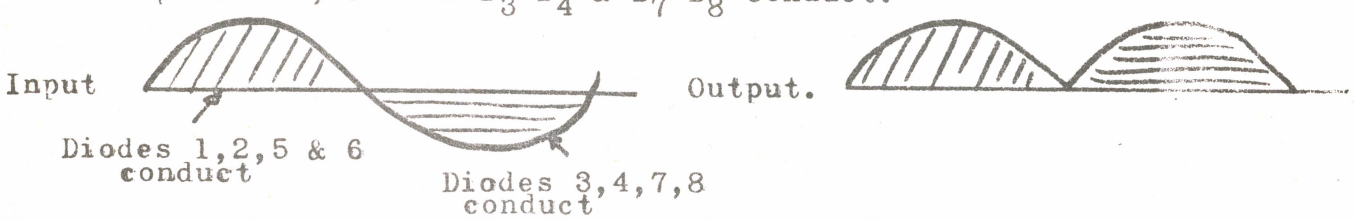
v. Cavity resonators can be used for UHF/SHF work when ordinary LC circuits suffer from side effects like skin effect etc. Cavity resonators can be built as rectangular boxes, cylinders or spheres. Q's of 1000 are readily obtainable. Waveguides are used to transfer energy in or out of the resonators.

4 (a).



During that half cycle when point A is positive in respect to point B, current will flow through diodes D_1 D_2 & D_5 D_6 .

When B is positive, Diodes D_3 D_4 & D_7 D_8 conduct.



Rs = Surge limiting resistor. When first switched on, the storage capacitors are empty and represent virtually a short circuit. If the transformer secondary winding has sufficient resistance, an external surge limiting resistor may not be required.

π Filter. Its function is to smooth the pulsating DC.

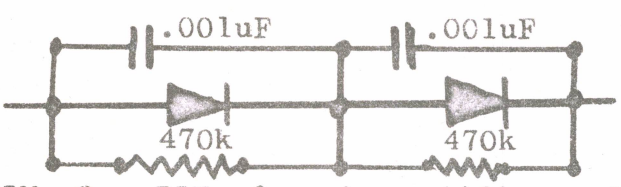
Ripple is dependant on load, size of capacitors, resistance and inductance of choke.

(b).

i. Silicon Rectifier singly.

Make sure the rating of the rectifier is sufficient for the particular application. ie. PIV (peak Inverse Voltage). Rule of thumb: PIV should be at least 3 x RMS Voltage (actual 2.8) surge rating to be adequate for switch on, if not include surge limit resistor.

ii. Silicon rectifiers in series.

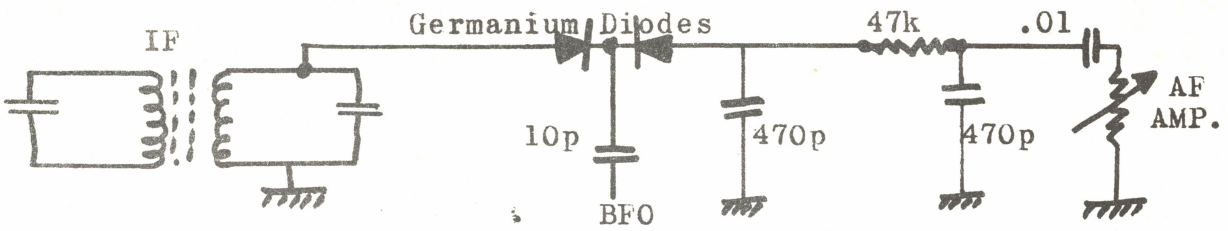


Total PIV = 2 x PIV of each rectifier multiplied by .8 de-rating for safety factor. eg. 2 x 800 = 1600 x .8 = 1280 V Peak inverse.

The resistors are included to ensure that the diodes share an equal part of the DC inverse voltage.

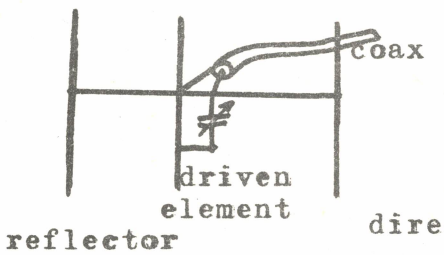
The capacitors are included to ensure that the diodes share an equal part of the AC & spike voltages.

5.



Due to non linear action of the diodes mixing takes place resulting in the product IF + BFO and IF - BFO frequencies. Say a 3KHz signal was used to modulate the SSB exciter and upper sideband was used. The IF/BFO would be say 455KC therefore the incoming IF signal would be 458KHz. The mix products are then (i) 458 + 455 = 913KHz & 458 - 455 = 3KHz. The 47k resistor and 470pF capacitors form a low pass pie - section filter which blocks the 913 KHz but passes the audio at 3KHz.

6. (a).



Driven element.

Elect Length = $\frac{1}{2}\lambda$

$= \frac{1}{2} \times \frac{300}{f} = \frac{150}{f}$

$= \frac{150}{21} \approx 7.15$ m.

Mechanical length = .95 x 7.15 $\approx$ 6.8 m.

Reflector add + 5% = 34cm → total 7.14 m.
Director - 5% = 34cm → " 6.46 m.
Spacing .2λ = 1.36 m.

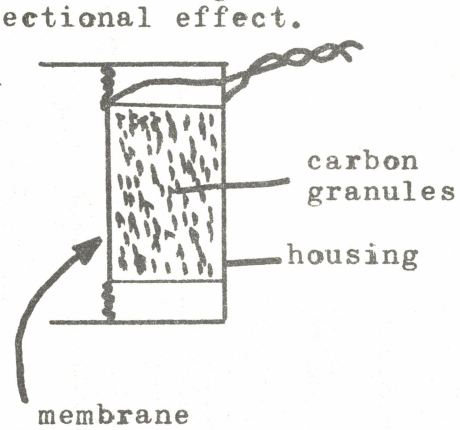
(b).

The director, being shorter than the driven element, has a leading phase angle (capacitive) and re - radiates the signal reinforcing the signal at the driven element.

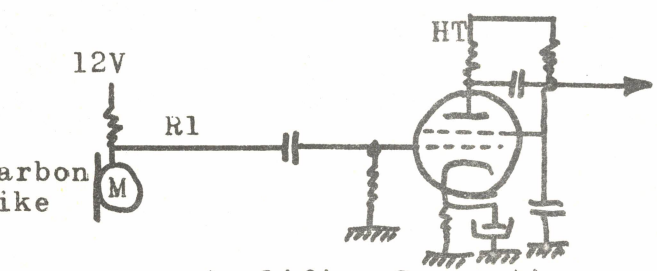
The reflector, being longer than the driven element has a lagging phase angle and also reinforces the signal at the driven element.

Therefore, signals arriving from the director end of the aerial will be much stronger than those arriving from the reflector end, hence the directional effect.

7. (a).



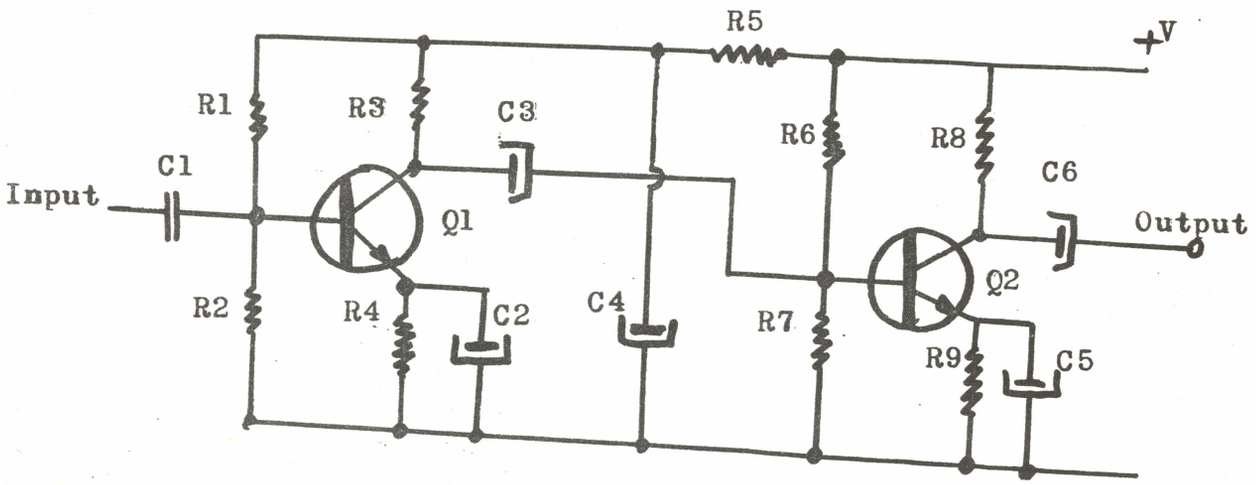
Speech moves the membrane, compressing & de-compressing the carbon granules. The resistance will vary with sound pressure and frequency.



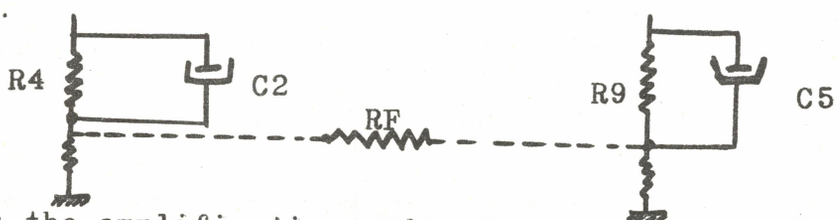
Amplifier Connection

Variations in resistance cause the current through the mike & R1 to vary Hence the voltage drop across M varies This audio voltage can be applied to the grid and amplified normally. Alternatively, the grid can be grounded and the mike connected between cathode and ground.

8. (a).



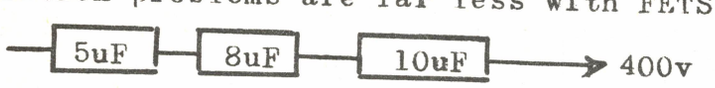
The input is AC coupled to the base of transistor Q1 via C1. C1 should have a large enough value to present a low reactance at the lowest frequency to be amplified.
R1 & R2 set the operating point of the transistor.(Bias resistors) Base voltage of silicon NPN transistors must be approx. .6 to .7 V above the emitter voltage.
Emitter resistor R4 is bypassed by C2 which should have a low reactance at the lowest frequency to be amplified.
R5 & C4 form a decoupling network to prevent voltage variations in the supply line,(caused by Q2)from effecting Q1.
C3's function is similar to C1's etc.
Second stage negative feedback can be applied as follows:



This linearises the amplification and reduces the distortion.
Input impedance of this type of amplifier circuit is usually a couple of hundred ohms. Output around a couple of thousand ohms.

8. (b). FETS.
Fets have a high input impedance and medium to high output impedance. For RF amplifiers low noise types are available eg. TIS88 which give a much improved noise figure over valves or PNP bipolar transistors. Cross modulation problems are far less with FETS than bipolar types.

9.



(i). $\frac{1}{Ct} = \frac{1}{5} + \frac{1}{8} + \frac{1}{10}$

$= \frac{8 + 5 + 4}{40} = \frac{17}{40}$

$Ct = \frac{40}{17} = 2.3529411764uF$

(ii) $Vc_5 = \frac{2.35294}{5} \times 400 = 188.23529V$

$Vc_8 = \frac{2.35294}{8} \times 400 = 117.6470588V$

$Vc_{10} = \frac{2.35294}{10} \times 400 = 94.11764704V$