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, 9th JUNE 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.

JUNE MEETING. GUEST SPEAKER.

This months meeting will be both interesting and important for all those concerned with Amateur Radio.

Our guest speaker is John Milton, VK2AQM, Wollongong District Radio Inspector, who will be talking on the subject of "Novice Licensing". This subject is of interest to Amateurs and Hobbyists alike, so bring your friends along to hear about our hobby and the way to become involved in it.

A raffle is to be held with a worthwhile and useful prize - so bring your money along. In the future we expect having tools, test equipment etc. as prizes in our raffles - this is to be the first of the upgraded raffles.

There is also an important matter of business to be discussed, so we urge all members to be present.

SUBSCRIPTIONS.

For those of you who have not forwarded your subscription, we must make this your last free issue of The Propagator. Because of increased postal rates and costs we are only able to send The Propagator to fully paid up subscribers.

So, if you have found The Propagator worthwhile reading and would like to continue receiving each issue, send in your subscription immediately.

The 1975 subscription rate is $2, with concession rate of $1 for students and pensioners.

Send to - The Secretary,
Illawarra Branch, W.I.A.,
PO BOX 110, DAPTO. 2530. N.S.W.

STORE.

The Committee has decided, after looking at a number of possible plans, to run the Store direct. We anticipate to be making purchases of selected components and offering these items for sale to readers of The Propagator. The components will be of prime quality and purchases will be made so that we can offer good savings when compared to the usual sourses of component supply.

Elsewhere in this issue may be found details of components currently available.

Conditions of sale must be on the basis of -

CASH WITH ORDER
FIRST IN, FIRST SERVED
WHILE STOCKS LAST

BILL DIT KITSETS.

This the last and final notice for members who require parts to complete their Bill Dit Kitsets.

We must finalise the deal with our supplier by the end of June 1975.

All lists of outstanding parts must be in the hands of Bill VK2ZCO by the end of June otherwise this Branch cannot accept any responsibility for the obtaining of any outstanding components.

FOR SALE

1 only MR6A HIGH BAND F.M UNIT Complete with crystals for CHANNEL 1,4, and B . QQE03/12 FINAL , BLOCK FILTER
Also comes complete with an AC power supply $35
GEOFF CUTHBERT 2ZMU 2NIOKA Av KEIRAVILLE 2500 Ph 289085

1 only MR10C converted for 52.525 but without crystals
Modified to remove handset control unit.
Volume and mute located on main unit $20
GEOFF CUTHBERT 2ZMU 2 NIOKA Av KEIRAVILLE 2500

Moonbounce Report - June.

Construction of the new one kilowatt power amplifier for the transmitter has been completed and it is now being installed in the main transmitter chassis.

Testing should be underway in about a week's time, after the required power supply wiring changes have been made.

Approx. 50 hours concentrated effort has gone into trying to get the transmitter operational again before the June series of EME tests.

A letter has been received from F9FT who wants to arrange special EME tests with VK2AMW.

The weekly 20 metre skeds with ZE5JJ continue to provide a useful interchange of EME information.

It was noticed that an advertisement appeared in March QST for the new ARRL publication -'Specialised Communication Techniques for the Radio Amateur' - and on the front cover of the book is a photograph of the Dapto Moonbounce Installation!! It will only cost you US$3.00 to have a look. Hi!

Lyle - VK2ALU.

DX PANORAMA

Gerry VK2APG

I haven't been very active on the HF bands within the last month so therefor have some information from John VK2BHO to help make up the page. On 20 mx, conditions have been wide open to North America and Canada with quite a few Alaskans were also heard and worked, Openings have been around 0100-0800z to the states and Canada.

John 2BHO reports several openings to VK4 & VK5 on 6 mx.

On Thursday 29-5-75 between 0900-1100z worked 7 VK5's.

On Friday 30-5-75 heard ZL TV and VK5VF beacon.

On Sunday 1-6-75 heard ZL TV and worked VK4ZAN and VK4FH at 0630z.

Also heard VK4RTL Townsville 6mx beacon.

Also here's one for Harry 2BJL, John 2BHO worked W7JLU at 1035z on 3.5 Mhz with 549 reports both ways, on 17-5-75.

That's about it for now. Hope to have more interesting notes next month.

73's

Gerry 2APG

P.S.

The Mid-Winter VHF contest will be held on the Queen's Birthday weekend on 14,15 & 16th June. There will be many stations operating partable from various mountain tops around the area.There should be plenty of 6 &2 metre contacts to be had, perhaps even an opening or two on 6 interstate like that occurred 2 years ago. So keep this weekend in mind and let's see lots of participation in providing numbers for the stations who are looking for them. Good luck in the contest to all.

THERMOMETERS

FEELING SICK or have you just received your electricity bill? Not to worry, come to the June meeting where each person present will receive a clinical thermometer. Guaranteed new and unused, not even by a typhoid patient. Can even be used to measure maximum temperature in your transmitter as long as it is between 95 and 110°F. By courtesy of one of our non-medical members.

GREENCAPS

Some very cheap Greencap condensers fell off a truck right outside our clubhouse. They will be available at the June meeting. Bring at least $2 with you. Any survivors could be available by mail in July.

TRIMMERS

There are still some very cheap 20-200 pf trimmers for sale. They have ceramic bases and mica insulation and are suitable for R.F. Ideal for your 2 metre 30W power amplifier. About one fifth of retail price at 4 for $1. Can be sent by mail at additional cost of 15c for a jiffy bag and 24c for postage. Maximum order is for 8 trimmers.

NAME .....

ADDRESS .....

.....

The Secretary,
Illawarra Branch, W.I.A.,
P.O. Box No. 110
DAPTO 2530

Please send me ..... 20-200 pf trimmers $

plus p & p $ 0 - 39

$

Cheque/postal note is attached.

NOVICE AMATEUR OPERATOR'S CERTIFICATE OF PROFICIENCY

SAMPLE QUESTIONS FOR THEORY EXAMINATION

Only one of the answers given is deemed correct. The question paper must be handed back to the Examination Officer upon completion of the examination. 50 questions to be attempted in 60 minutes.

1. Which of the following microphones requires a source of direct current in order to operate efficiently:-

   (a) crystal (b) dynamic (c) velocity (ribbon) (d) carbon?

2. One of the electrodes of the triode valve usually operates at a potential which could result in severe electric shock to a person who accidentally made a contact between it and earth. This electrode is:-

   (a) heater (b) cathode (c) grid (d) anode.

3. Indicate which of the following frequencies falls within the VHF (very high frequency) amateur bands:-

   (a) 3.53 MHz (b) 27.12 MHz (c) 146.10 MHz (d) 432.00 MHz.

4. An amateur station operating on a frequency of 21.125 megahertz could also be referred to as operating on:-

   (a) 21,125,000 Hertz (b) 21,125,000 kilohertz (c) 21,125 gigahertz

   (d) 21,125 cycles per second.

5. A half wave dipole antenna is always:-

   (a) supported on two wooden poles (b) fed by a single wire feed line (c) fed at the centre by a two wire feed line (d) fed at each end by a two wire feed line.

6. Which of the following materials would you consider the best conductor of electricity:-

   (a) carbon (b) bakelite (c) silver (d) silicon?

7. When it is required to reduce the mains voltage from 240 volts to 12 volts with a minimum loss, use is usually made of a:-

   (a) power transformer (b) frequency divider (c) current limiting circuit (d) power amplifier.

8. Radiation of harmonies of the operating frequency of an amateur station is undesirable because they may cause:-

   (a) overloading to occur in the antenna coupling circuits;

   (b) harmful interference to other receiving stations;

   (c) severe distortion to the modulation on the operating frequency;

   (d) the operating frequency to vary considerably during modulation.

9. When connected to a direct current reading meter, which of the following components will enable the meter to indicate alternating current:-

   (a) a resistor in series (b) a capacitor in parallel

   (c) a diode in series (c) a thermistor in parallel?

10. Propagation of high frequency radio waves is possible between Australia and Europe due to the presence of the:-

    (a) troposphere (b) atmosphere (c) stratosphere (d) ionosphere.

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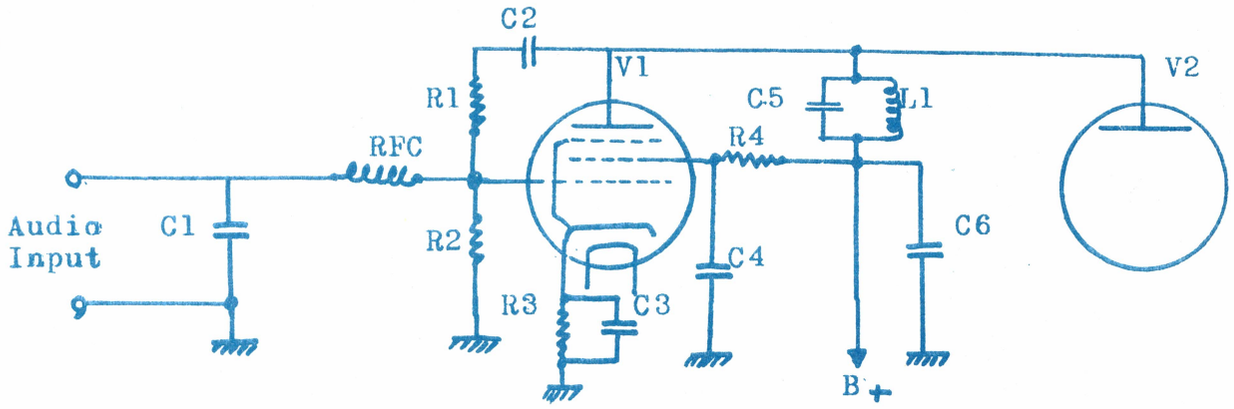
1 (a).



The control grid of V1 is connected across the oscillator tank circuit C5 - L1 through resistor R1 and blocking capacitor C2. Resistance R1 is made large compared to the input capacitance of g1 so the RF current through R1 - C2 will be practically in phase with the RF voltage appearing across C5 - L1. However the voltage across the tube input capacitance will lag the current by 90 degrees. The RF current in the plate circuit of the modulator will be in phase with the grid voltage and is therefore 90 degrees behind the current through the tube input capacitance or 90 degrees behind the RF tank voltage.

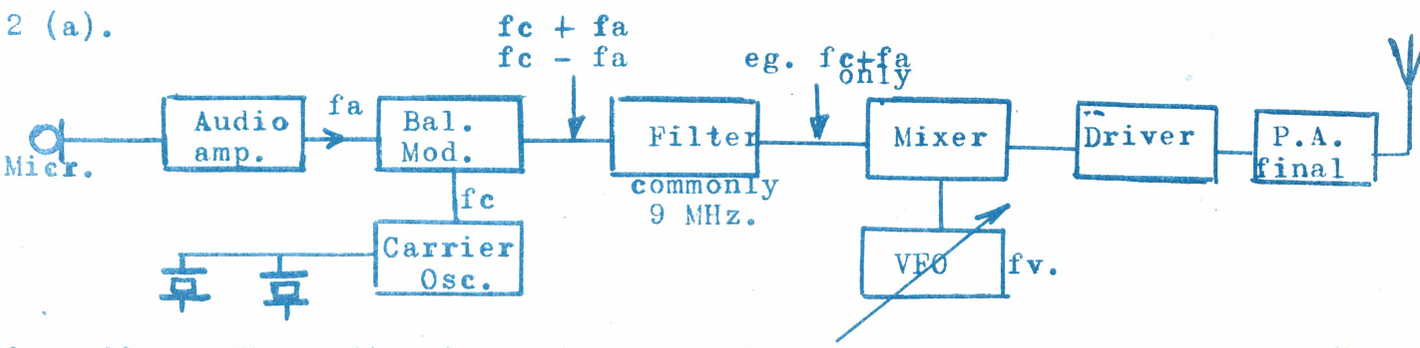
This lagging current is drawn through the oscillator tank, giving the same effect as if an inductance were connected across the tank. The frequency increases in proportion to the amplitude of the lagging plate current of the modulator and vice versa.

The audio voltage, applied to V1 grid via a RF choke varies the transconductance of the tube and thereby the RF plate current.

(b). With FM, the frequency deviation is proportional only to the amplitude of the modulating signal.

With Phase Modulation, the frequency deviation is proportional to the instantaneous amplitude of the modulating system. The speed of the phase shift is directly proportional to the frequency of the modulating frequency.

2 (a).



Operation. The audio signal from the microphone is amplified and applied to the balanced modulator. The crystal controlled carrier oscillator generates the carrier (upper or lower) which is also applied to the bal. mod. The Balanced Modulator output does not contain carrier due to the out of phase cancelling action but only puts out the products fc + fa and fc - fa. The filter removes one of these sidebands and passes the other one.

Eg. carrier osc. 8997KHz or 9103 KHz (lower & upper sidebands). - Say 8997 is in use. If audio of 3 KC was applied, the products would be 8997 + 3 = 9000 & 8997 - 3 = 8994. The filter passes 9000 KHz and rejects the 8994.

Assuming the VFO runs from 5 to 5.5MHz the output from the mixer would then run from 9 + (5 to 5.5) or 9 - (5 to 5.5) = 14 to 14.5 or 4 to 3.5 MHz. (20 & 80 m).

Tuned circuits in the driver & final, select the required band, usually switching in different coils.

If operation on the other bands is required, a second mixer and a X-tal controlled heterodyne osc. are required before the driver & final.

COMMONWEALTH OF AUSTRALIA

POSTMASTER-GENERAL'S DEPARTMENT

AMATEUR OPERATORS' CERTIFICATES OF PROFICIENCY

SECTION M (Theory) FEBRUARY, 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) Describe, with the aid of a circuit diagram, the operation of a reactance-tube-modulator used to frequency modulate a transmitter.

(b) Describe the main differences between a transmitter which is "frequency modulated" and one that is "phase modulated".

2. (a) With the aid of a block diagram describe the operation of a single-sideband suppressed-carrier transmitter.

(b) Describe how you would tune a receiver adapted for S.S.B. to correctly resolve an S.S.B. signal.

3. (a) Discuss the limitations of a high-frequency heterodyne type frequency meter when used alone for measuring a frequency which should be in the 7 Mc/s amateur band.

(b) What additional piece of apparatus would be required to ensure that the emission being measured was not actually a harmonic on 14 Mc/s, instead of the required fundamental on 7 Mc/s?

(c) Draw a circuit diagram of the additional piece of apparatus referred to in (b) and explain its theory of operation.

4. With the aid of a circuit diagram explain the operation of a receiver which will give satisfactory reception on 420 Mc/s.

5. (a) Explain the possible causes of interference to television receivers from amateur station transmitters.

(b) Discuss the technical precautions you, as an amateur station licensee would adopt, to avoid transmissions from your amateur station causing interference to television and broadcast receivers.

6. (a) Assisted by a sketch, describe the construction and theory of operation of a crystal type microphone.

(b) Listing component values, show by means of a circuit diagram how this type of microphone is connected to an amplifier.

7. (a) With the aid of a circuit diagram describe the operation of a grid-dip meter.

(b) Give a practical example for the use of such an instrument.

8. (a) What is a folded-dipole aerial? A sketch will assist.

(b) Compare the electrical and directional characteristics of a standard dipole and a folded type aerial.

(c) How can the standing-wave-ratio of a transmission-line be determined?

9. (a) With the aid of a circuit diagram describe the operation of a full-wave H.T. power supply which uses silicon rectifiers.

(b) Discuss any advantages and disadvantages silicon solid-state rectifiers may have when compared with the high-vacuum tube type.

2 (a) contd.

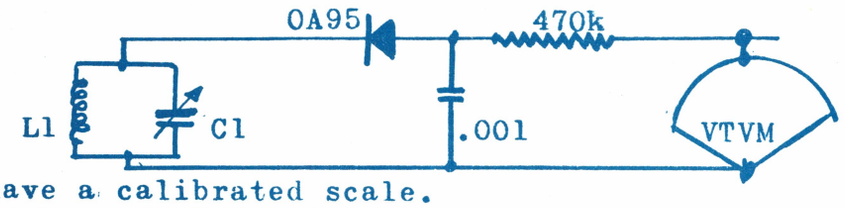
eg. To operate on 7 MHz a 21.5 MHz signal would be required for the heterodyne osc. to produce 21.5 - (14 to 14.5) = 7.5 to 7 MHz. etc.

(b). To tune the receiver, firstly find the position that gives you the highest S - meter reading to put the signal in the centre of the filter pass band. Tune up the RF circuits to obtain the highest S - meter reading. Back off RF gain if required to avoid overloading on very strong signals. Then adjust the BFO for the best audio quality or switch to the correct sideband.

3 (a). With a heterodyne frequency meter it is not possible to determine the exact signal because of the harmonics. Assume a 100kc standard and harmonic generator was used, the frequency in the 40m band could be 7.1 - 7.2 - 7.3 - 7.4 MHz etc.

(b). An absorbtion wavemeter is required, properly calibrated to find the approximate frequency, after which the heterodyne frequency meter plus a calibrated interpolation F. meter could be used, to obtain the exact frequency.

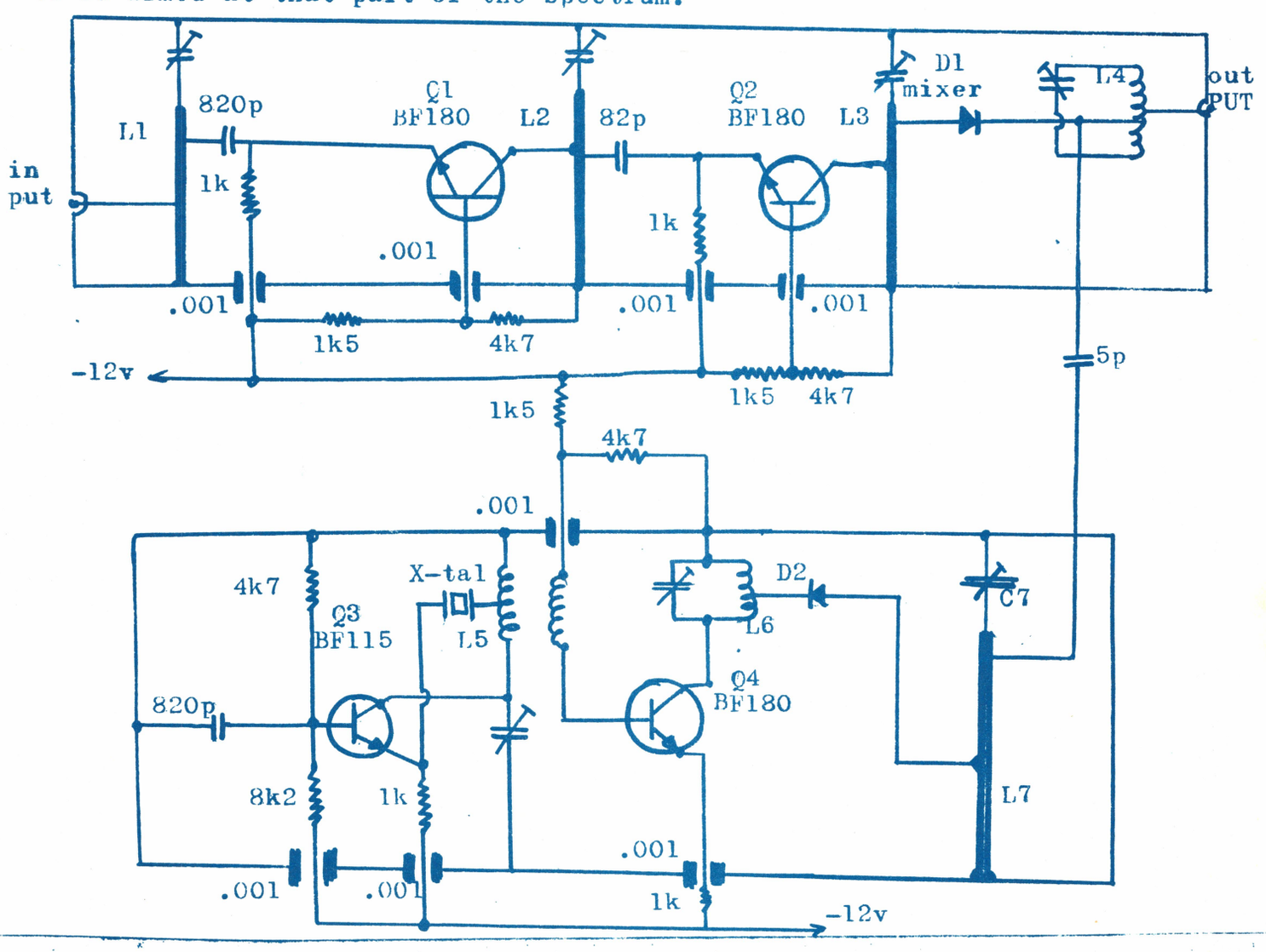
(c).



C1 to have a calibrated scale.
L1 could be made "plug in" to cover different bands.

Coupling L1 to the circuit in question, it will absorb some of the RF which is then rectified and stored in the .001 capacitor. Using a VTVM to avoid loading the circuit, a good indication can be obtained of what the frequency is.

4. For stability reasons, the usual arrangement for reception on UHF frequencies is a converter, followed by a standard HF communications receiver. Only the converter is shown here as the accent of the question seems to be aimed at that part of the spectrum.



4. contd.

e.g. X - tal frequency 13.9 MHz operating 5th overtone produces 67.7 MHz at the tuned circuit in the collector of Q3. Tripling by Q4 results in 202MHz being available in the tuned circuit in the collector of Q4.

Diode D2 produces harmonics and in this circuit for example doubles to 404 MHz tuned by L7 C7 and then injected into the diode mixer D1. Mixing takes place of the amplified signal (via Q1 & Q2) in the diode mixer due to non linear action. If the input was e.g. 432 MHz, the output would be 432 - 404 = 28 MHz, suitable for a standard HF communications receiver. Troughline circuits are used at UHF frequencies as shown in the diagram.

5 (a). Starting at the TV receiver aerial and working our way down, interference can be caused as follows:

i. Corroded joints in the TV aerial can by induced RF voltage produce harmonics (due to rectification) which fall in the TV band.

ii. Dissimilar metals in the guy wires can produce the same effect as (i).

iii. Long down leads, particularly the open type can act as a good aerial and pick up a lot of RF producing:

iv. RF overloading of the tuner and....

v. Cross Modulation.

vi. Unshielded cabinets can allow RF to be picked up in IF & Audio stages.

vii. Power leads and long speaker leads again can allow RF to be picked up and rectified in the sensitive stages.

As far as the Amateur transmitter/aerial system is concerned, the following items can also cause interference.

viii. Harmonic radiation.

ix. Corroded joints in the hardware for the aerial.

x. Spurious radiations etc.

(b) i. To check - use a GDO near the output stage as an absorbtion wavemeter and check for harmonics.

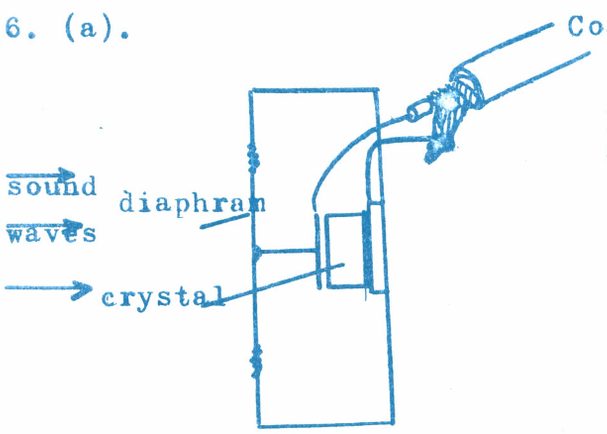
ii. Using a general coverage receiver, check right through the spectrum, if any spurious or harmonic appears in the output, while feeding say into a dummy load.

iii. For SSB, a CRO (2 trace pattern) can reveal many things about the linearity of the transmissions.

iv. If a spectrum analyser is available a sweep will soon show any unusual outputs.

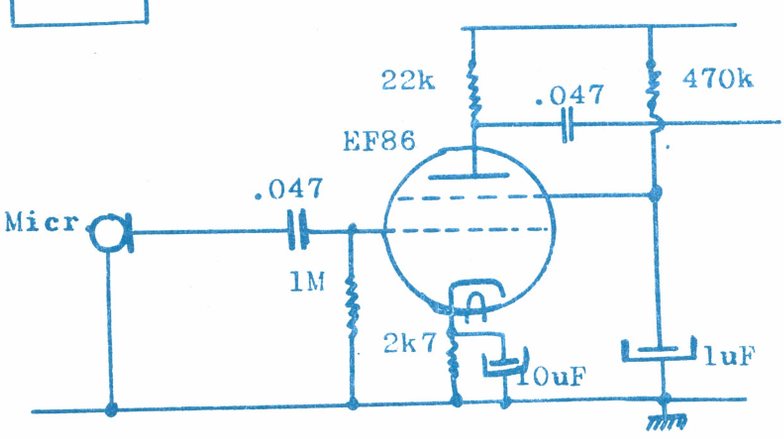
v. Other precautions: preferrably use coax to feed the antenna, bypass power leads to prevent RF from going both up the line, use shielded cabinets to contain the RF etc.

6. (a).

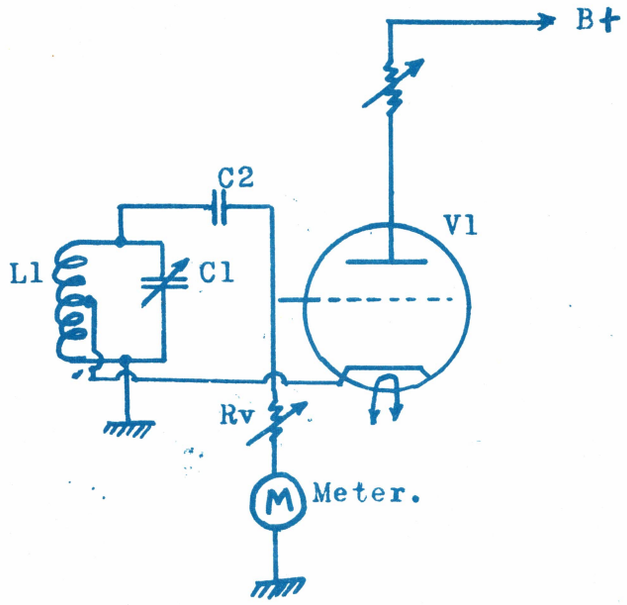


Sound waves striking the diaphram cause the crystal to be compressed & decompressed. Due to the Piezo - effect an ac voltage appears across the surfaces of the crystal.

(b).

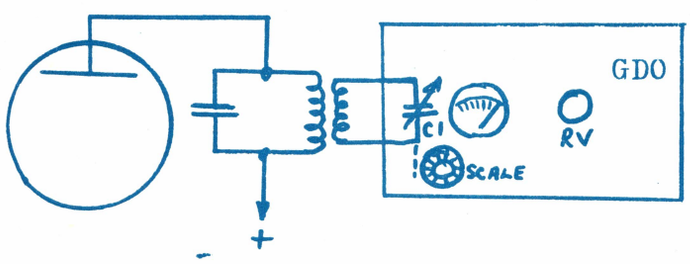


7. (a).



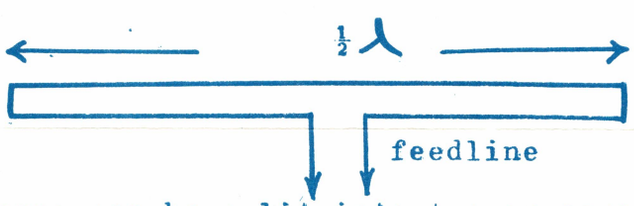
Valve V1 operates as an electron coupled oscillator. As such, it draws a certain amount of grid current, indicated on meter M. When L1 is coupled to another tuned circuit of the same frequency, that circuit will absorb some of the energy from the oscillation.
Oscillation will be reduced, hence grid current will be reduced & the meter "dips".
If C1 is calibrated, the frequency of the unknown circuit can then be determined from the scale.

(b).



Adjust Rv to give full scale deflection on the meter.
Turning C1 through the range will show a dip.
The frequency can then be read off the scale.

8. (a).



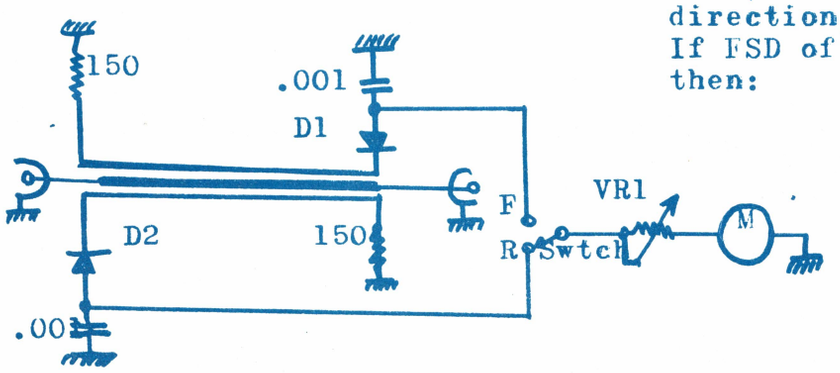
A halfwave antenna can be split into two or more parallel conductors in order to match various feed line impedances.
The step up ratio depends on various factors viz.

i. Number of conductors.
ii. Diameter of conductors.
iii. Spacing of conductors.

A folded dipole as shown with equal diameter wires has an input impedance of nearly 300 Ohms.

(b). Electrically the main difference compared to a standard dipole is the input impedance. Directionally, the radiation pattern is similar to a standard dipole.

(c). With the aid of an SWR meter.



Set VR1 to give full scale deflection with the switch in the forward direction, then switch to reverse.
If FSD of the meter is say 10volt then:

$$\text{SWR} \quad \frac{10 + R}{10 - R}$$

e.g. for 5 volts reverse (½ scale)

$$\text{the SWR} = \frac{10 + 5}{10 - 5} = \frac{15}{5} = 3:1$$

9. (a).

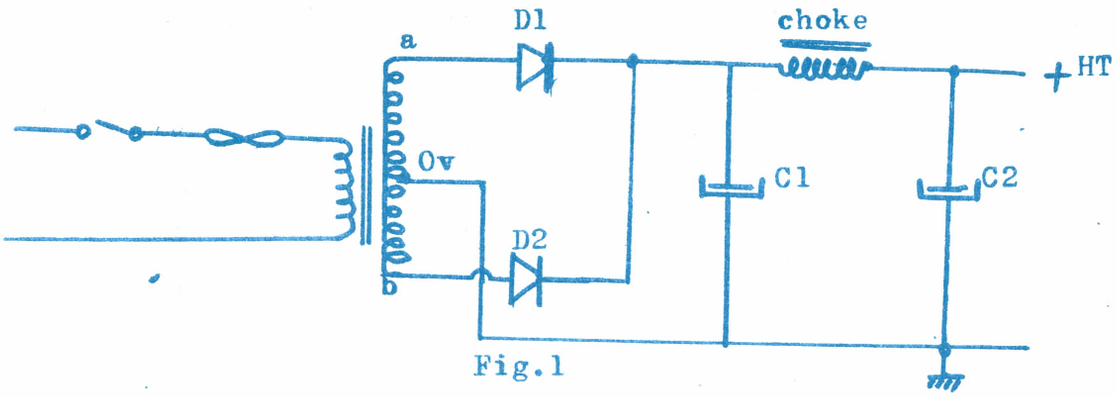


Fig.1

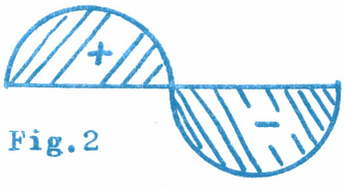


Fig.2

During that half of the cycle that point a is positive in respect to Ov, diode D1 conducts and charges up C1 & C2.
During the other half of the cycle when point a is negative, diode D1 is reversed biased and cannot conduct.
But point b is then positive with respect to Ov and therefore diode D2 will conduct. The combined output from D1 & D2 therefore looks like Fig.3
The Capacitors C1 & C2 together with the choke form a pie filter to smooth the DC. Ripple will depend on e.g. load, resistance, inductance, capacitor values etc.

(b). Advantages:
Power available immediately.
No power required for heaters.
Very little heat to dissipate.
Low forward voltage drop.

Fig.3

Disadvantages:
Switch on surge current is high. (therefore surge limiting resistors must be included unless the transformer secondary has enough resistance).
If used with valves as load, capacitors charge up to peak value until the valves warm up and start drawing current.

SUBSCRIPTION FOR THE "PROPAGATOR"

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I wish to receive the PROPAGATOR. I enclose a donation of $2 to cover cost and postage.

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