# THE PROPAGATOR

THE MONTHLY NEWSLETTER OF THE
WIRELESS INSTITUTE OF AUSTRALIA
ILLAWARRA BRANCH

Published by the Illawarra Branch of
the Wireless Institute of Australia
P.O. Box 110
DAPTO 2530

No. 3/75 March 1975 No. 3/75

PRESIDENT:

Keith Curle VK2ZYI
24 Beach Drive
WOONONA 2517

SECRETARY:

Ian Bowmaker VK2ZJA
15 Akuna Street
KEIRAVILLE 2500

## NOTICE OF ANNUAL GENERAL MEETING

Members are advised that the ANNUAL GENERAL MEETING for 1975 will be held at the Wollongong Town Hall Committee Room on monday, 10th MARCH at 7.30 p.m.

## 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 10th MARCH 1975 7.30 p.m.

THE AGENDER READS AS FOLLOWS

1) Minutes of previous Annual General Meeting
2) Presentation of Office Bearers Reports
3) Election of Office Bearers

4) Apologies and welcome to visitors and new members
5) Minutes of previous General Meeting
6) Correspondence
7) Financial Report
8) General Business
9) Raffle

## FOX EEZY REPORTS.....

HIGHLIGHT of the past month was a visit to the GOSFORD field day, which, despite inclement weather was once again a most enjoyable day. Items of interest were to see Col VK2ZZU tip toeing three the tulips chasing a fox (up to his ankles in mud) Grahame VK2ZZV (Mr America) buying up big in the disposal section, HI.HI.

THERE appears to be quite a bit of interest in CW of late- Don't be surprised to hear Keith VK2ZYI, Geoff VK2ZHU, and Bill VK2ZCO with full calls before too long.

---

WITH the new Wollongong REPEATER frequecy announced (146.25 MHZ in 146.85 MHZ out) now is the time to think about ordering your crystals. WELL?

---

## FOR SALE

WINCH UP TOWER, TILTOVER type. Used to sprout a element Quad. (10-15-20) ANY OFFERS ?

VK2BHL QTHR.

## WANTED

I'm Still chasing EGG INSULATORS- No they are not asbestos coats for googs they are made of ceramic and are urgently required for the completion of my Quad.

VK2BHL.

---

## TREASURERS REPORT

1974

Was a Record year with a turnover of $ 1,880 and an inc. of assets of $273 our total ~~costs~~ Assets are now $ 284. HALL hire for next Year is normally paid before March but has not yet been requested, this will amount ? $33 which should be cosidered as part of this YEARS EXP.

The main reason for this Years Spectactular fin. result has been Bill VK2ZCO 'BILLDIT' which has been a very popular project. The raffles of SurPlus equipment netting an average of $11 per meeting. Many thanks to the ~~donations~~ donators.

CONTI.

of this EQUIPMENT.
AS WELL as transceiver kits, crystal Filters, Resitors, Transistors P.C board have been sold to members. The aim of these sales has been to provide a service for members as well as making a profit of aprox. 10% for the Club on 2 articles sold.

CHARLIE VK2ZEN

---

**Moonbounce Report for February.**

The transmitting and receiving systems were made operational again, with the quarter wave filter in front of the receive preamp.

Checks showed an unexpected very high noise level on receiwe (approx. 20db. above reference 50ohm termination noise.) The noise exhibited no characteristics which would allow identification. It covered the full tuning range of the I.F. channel receiver. It may thereforebe cross-modulation effects from a very strong signal, such as a T.V. vision carrier, on a frequency far removed from 432MHz. The filter was byepassed and the noise lewel dropped!! The filter resonant frequency was then checked as OK.

When the coaxial filter was transfered to the input of the postamp. the noise level dropped to 3db. below 50ohm. termination noise but sun noise is only 12db. above sky noise (down 1½db.)

Further work is required on this problem.

The programmed test by WA6LET, using a 150ft. dia. dish, was carried out on February 22nd. VK2AMW was operated by Charles VK2ZEN, assisted by Roger VK2BRE. Signals were heard from WA6LET from approx. 0800Z. to 0845Z. at strength up to 8db. above noise, but repeated calls from VK2AMW were not acknowledged. As far as is known they did not copy any other signals during the above period.

Work has commenced at the University on the metalwork for the new power amplifier stage for the transmitter.

Lyle VK2ALU.

COMMONWEALTH OF AUSTRALIA

POSTMASTER-GENERAL'S DEPARTMENT

AMATEUR OPERATOR'S CERTIFICATE OF PROFICIENCY

SECTION M (Theory) FEBRUARY, 1972

(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 a circuit diagram of the plate-modulated radio-frequency amplifier and modulator stages of a 150 watt D.C. input amateur band transmitter.

   (b) Describe fully how 100 per cent modulation is obtained.

2. (a) What is meant by the following terms when used in reference to an iron cored transformer :-

   (i) turns ratio, and (ii) impedance ratio.

   (b) List the losses associated with the operation of a power transformer and state how these may be minimised.

   (c) A transformer has a primary winding of 600 turns to which 240 volts A.C. is applied. Neglecting losses, calculate the number of secondary turns required to give a voltage of :-

   (i) 16 volts, and (ii) 6.8 volts

3. (a) Discuss factors you consider desirable in a microphone used in mobile operation.

   (b) With the aid of a sketch describe the construction and theory of operation of a microphone which you consider meets these requirements.

4. (a) Assisted by a circuit diagram describe the operation of a Grid Dip Oscillator or a Transistorised Dip Oscillator.

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

5. (a) With the aid of sketches explain how frequency-modulation differs from amplitude-modulation.

   (b) Describe a detector suitable for resolving the audio component of a frequency modulated signal.

6. Describe an instrument which, when inserted into the transmission line between the transmitter and aerial, will indicate whether the aerial is correctly matched to the impedance of the transmission line and the output stage of the transmitter. A circuit diagram will assist.

7. (a) With the aid of a circuit diagram explain the operation of the radio frequency stages of a receiver suitable for reception of UHF signals in the 420-450 MHz amateur band.

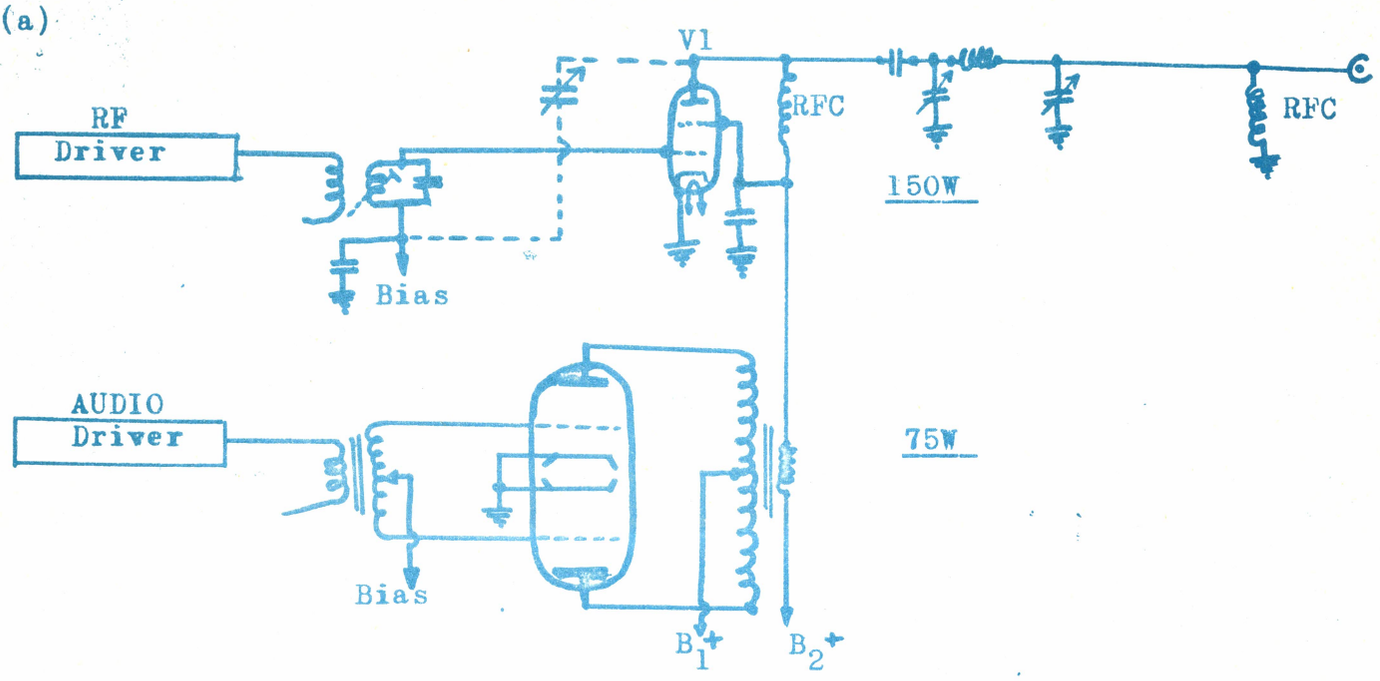
   (b) Indicate and give reasons for any techniques used in the UHF receiver which would not apply to a receiver operating on 7 MHz.

8. (a) Describe a quarter-wave vertical groundplane aerial suitable for use in the 14 MHz amateur band. Show dimensions and approximate feeder line impedance.

   (b) Discuss the advantages and disadvantages of this type of aerial when used for both transmitting and receiving.

9. Calculate :- (i) the frequency at which a capacitor of 3.3 pico-farads (mmf) has a capacitive reactance of 159.2 ohms. (ii) the power dissipated in a resistor of 180 ohms when a potential of 3 volts exists across the resistor.

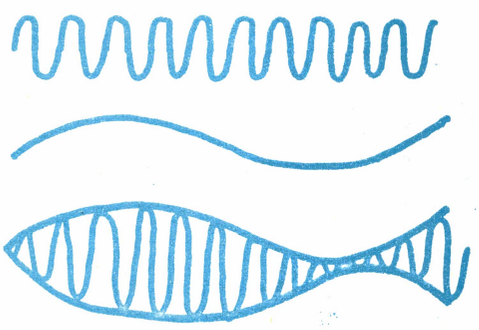
1. (a)




(b). Carrier Only

Modulating Audio

Resulting RF O/Put.

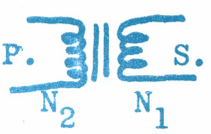


For 100% modulation, the audio voltage swing at the plate of $V_1$ must be from zero to twice the DC plate voltage.

---

2 (a) i Turns ratio is the ratio of number of turns of the secondary winding ($N_1$) over the number of turns of the primary winding ($N_2$).

$$\therefore \text{T.R.} = \frac{N_1}{N_2}$$




ii i.e. The ratio of impedance between the primary & secondary of a transformer & changes with the square of the turns ratio.

$$\therefore Z_{primary} = Z_{secondary} \left(\frac{N_2}{N_1}\right)^2$$

(b). Losses:

i. Coil (wire) resistance.
ii. Hysteresis effect.
iii. Leakage reactance.

To reduce losses:

i. Increase wire size.
ii. Use better iron.
iii. Reduce the leakage inductance.

(c). Nprim 600 turns 240V ac.

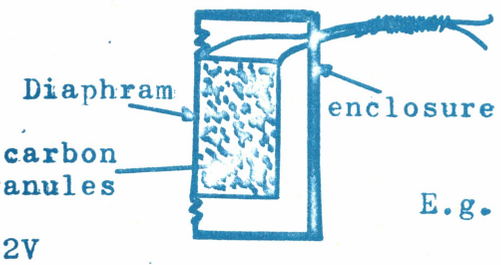
i.e. per turn ..... $\frac{240}{600} = .4V.$

i. To get 16V you need $\frac{16}{.4} = 40$ Turns.

ii. To get 6.8V you need $\frac{6.8}{.4} = 17$ Turns

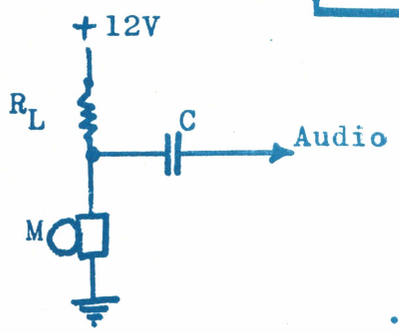
3 (a). i. Shock/drop proof.
ii. High Output voltage.
iii. Uni-directional sensitivity.
iv. Frequency response 200 - 2500 Hz.
v. Suitable for close talking to reduce car noise pickup.

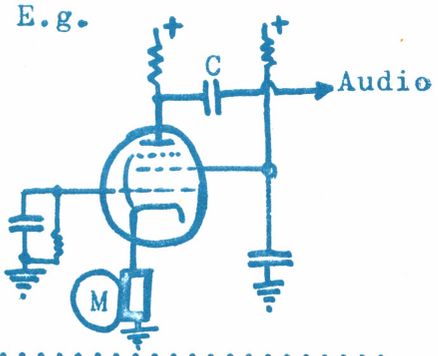
(b). Carbon Mike.




sound waves striking the diaphram cause compression & decompression of the carbon granules resulting in a change of resistance of the elemer This change can be converted to a number of circuits.....

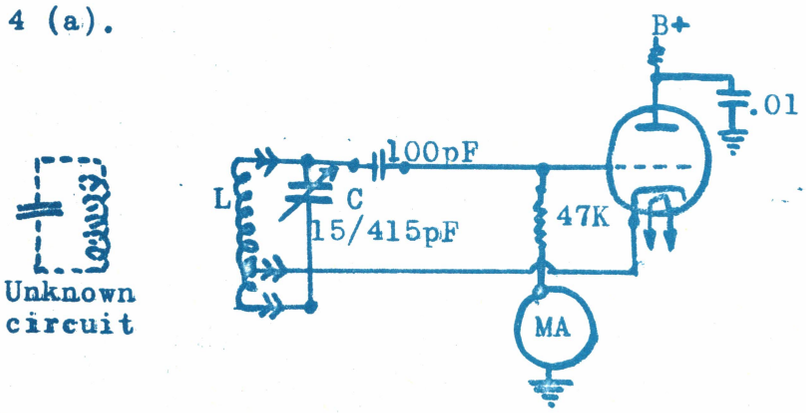
E.g.




.....

4 (a).




Coil L = Plug In.

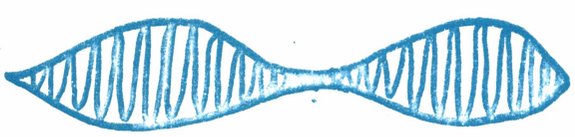
When oscillating the valve draws grid current, which is indicated on the scale of a mA meter.
If the coil L is coupled to an unknown LC circuit and tuned through resonance of that circuit, the unknown circuit absorbs some of the energy. This causes the oscillator feedback to decrea which in turn reduces grid current and the meter "dips", from the graduat scale of C the frequency can then be read off.

(b). When building a receiver or transmitter, it is often necessary to find out if a circuit is on frequency or has enough range of adjustment to put it on frequency. Coupling the GDO coil to the unknown, a quick check can be performed.

.....

5 (a).

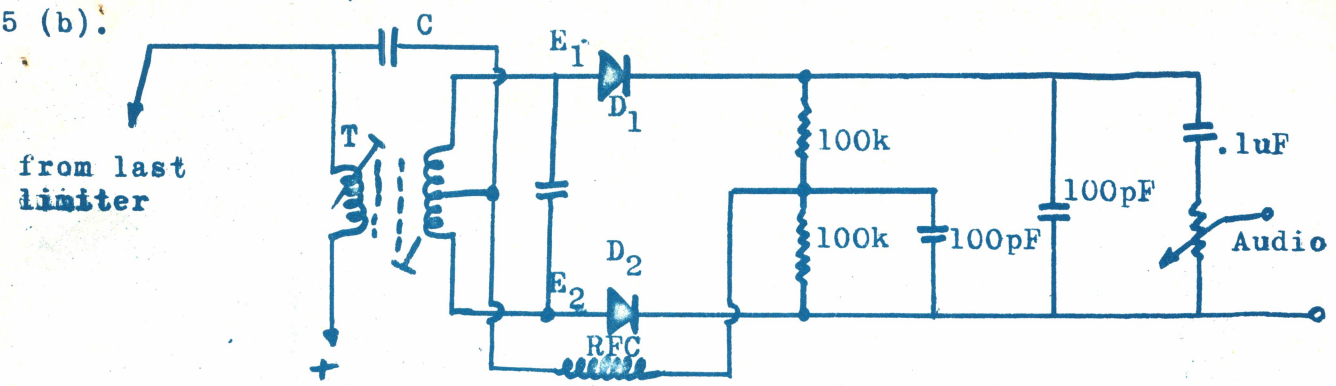
FM.



AM.

F.M. has a constant amplitude and changing frequency.
A.M. has a constant carrier frequency and changing amplitude.

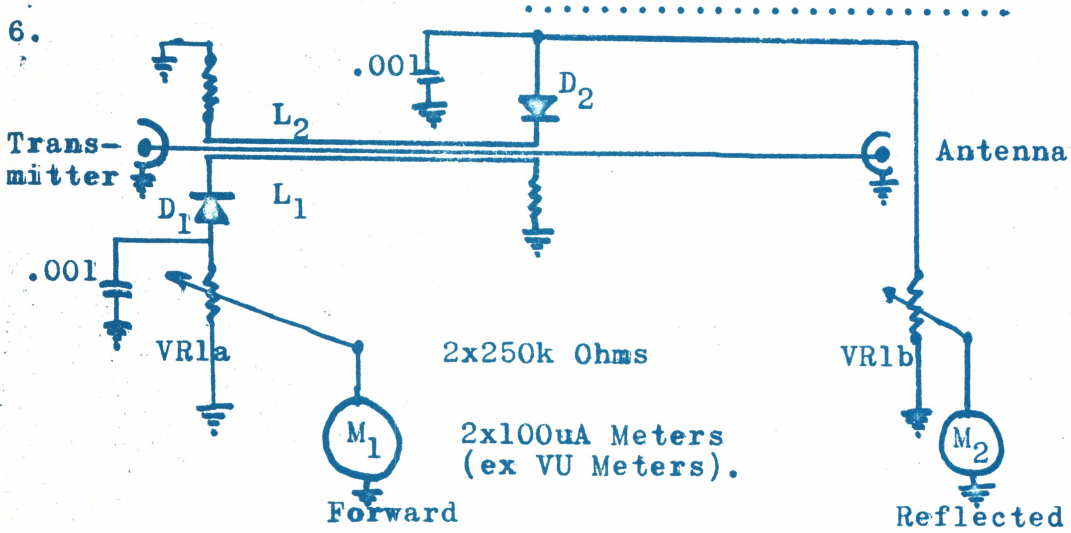
5 (b).




FM is converted to AM in transformer T. $V_{sec}$ = 90° out of phase with the primary current. Primary voltage is added..... at centre tap..... to secondary via C & combines so that the voltages on each side of the centre tap, lead and lag an equal amount. After rectification they are equal voltages but opposite polarity, hence cancel out. When frequency changes, instantaneously $E_1$ decreases while $E_2$ increases & vice versa, producing a change in voltage (amplitude) & audio.

.....

6.




SWR Meter.

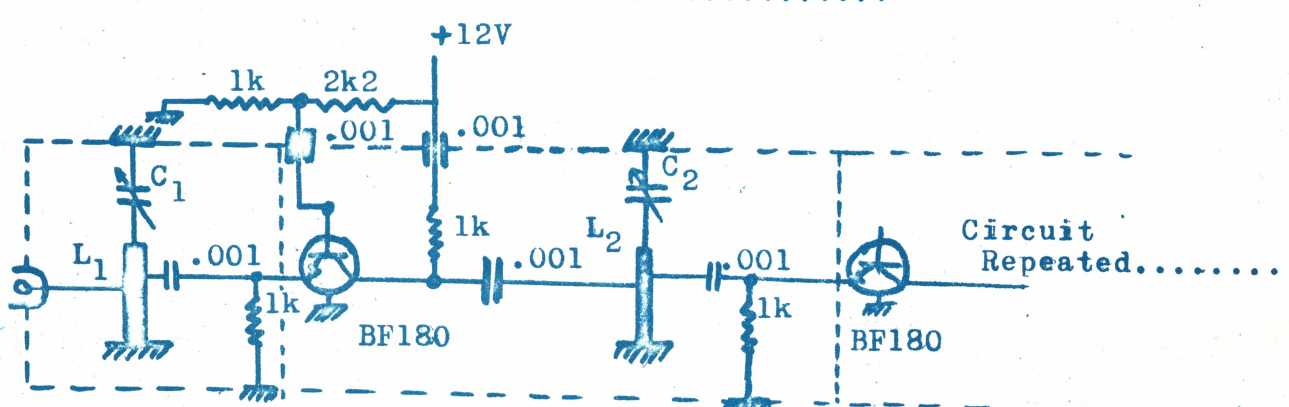
RF currents flowing from Tx to Antenna induce proportional voltages in pickup lines $L_1$ & $L_2$. After rectification by $D_1$ & $D_2$ these voltages can be read on the meters $M_1$ & $M_2$. If VR is adjusted to give a full scale reading on $M_1$, the VSWR can be calculated as follows: Say $M_2$ indicates ½ scale, or 50uA, the VSWR is then--

$$\text{SWR} \quad \frac{\text{FSD}}{100+50} = \frac{150}{50} = 3:1$$

Instead of two meters you often find one meter with a changeover switch.

.....

7. (a).




Stripline 432Mhz RF Amp. $L_1$ resonates within $C_1$ in its cavity on 432 MHz. ditto for $L_2$ & $C_2$. Input circuit is tapped to give correct input impedance as is .001 pF tap to feed transistor. This particular circuit is referred to as grounded base.

7 (b). i. Tuned Circuits - at UHF, stripline techniques are commonly used. at 7 MHz, wound coils are used.

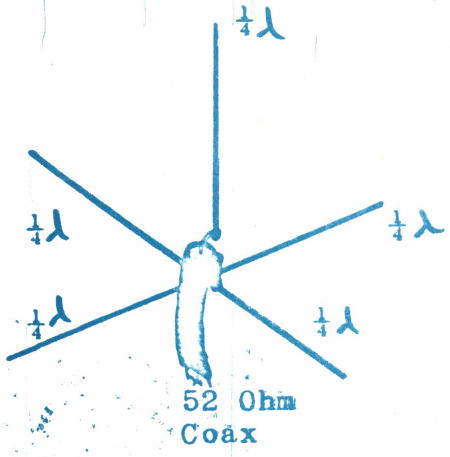
ii. At UHF, x- tal controlled converters are used ahead of a communication receiver.

iii. At UHF narrow band techniques (eg. 100 Cps) are used in, for example moon bounce.

iv. At UHF the noise figure of the RF amplifier limits the performance - on 7 MHz external noise does.

.....

8 (a).

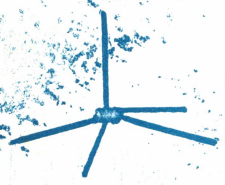



$$\lambda = \frac{300}{14} = 21.4\text{m}$$

$$\tfrac{1}{4}\lambda = 5.36\text{m} \ (\approx 16'\ 4")$$

Using 4 radials the feed point impedence is approx. 52 Ohms. The radiator must be insulated from ground unless a gamma match is employed.

By lowering (drooping) of the radials, the feedpoint impedance can be raised to say 75 Ohms. The radiator is often made of self supporting aluminium tube.



Radials drooped.

8 (b). Omnidirectional pattern of radiator can be an advantage when putting out a CQ call, but a disadvantage when you cannot "null out" the QRM.
On Tx, the low angle of radiation is an advantage, as is the vertical polarisation when living near sources of horizontally polarised electrical noise on receive.

.....

9 (a). $X_c = \frac{1}{2\pi fC}$ $\therefore$ $159.2 = \frac{1}{2\pi f\ 3.3 \times 10^{-12}}$

$$f = \frac{10^{12}}{159.2 \times 2 \times \pi \times 3.3} \approx 300\text{MHz}.$$

(b). $W = \frac{E^2}{R} = \frac{3^2}{180} = \frac{9}{180} = \frac{1}{20} = .05$ Watts.

# ELECTRONICS

Build your own ELECTRONIC COMPUTER, or ELECTRONIC MUSIC SYNTHESISER, or operate your own AMATEUR RADIO STATION.

Study electronics and build practical projects for the Higher School Certificate.

The Board of Senior School Studies has approved our course at the WOLLONGONG TECHNICAL COLLEGE as a 2 UNIT course for both 5th and 6th Forms.

This course is intended to provide a broad theoretical and practical introduction to electronic circuits — useful for students interested in electronics as a hobby or as a career.

This Year (5th Form)

- Learn the fundamentals of electronic devices and circuits,
- Acquire practical skills in electronic construction techniques,
- Build interesting electronic projects;

and Next Year (6th Form)

- Discuss the social impact and consequences of electronic devices,
- Develop your interest and knowledge in AMATEUR RADIO, COMPUTERS OR ELECTRONIC MUSIC,
- Complete more practical projects.

High School students in 5th Form may take this course for the H.S.C. Other interested people could also attend the class.

CLASS:
MONDAY $6^{00}$–$8^{30}$ pm
Room 2–16 (SCIENCE BLOCK)
WOLLONGONG TECHNICAL COLLEGE.

ENQUIRIES:
BRUCE CARROLL (VK2ZZIC)
School of General Studies
(Phone: 29961 1–Ext 271)

This chart was reproduced from Practical Electronics by photographing and reducing. If you would like a larger copy on a better paper, let me know and I'll see if I can get them done at a reasonable price. I'd like to thank Practical Electronics for letting me reproduce it without their consent.

VK2ZYI.