THE PROPAGATOR

NO. ~~10~~ 11/76 ~~OCTOBER~~ NOVEMBER 1976 NO. ~~10~~ 11/76

THE MONTHLY NEWSLETTER OF THE
ILLAWARRA AMATEUR RADIO SOCIETY

A Member Club of the Wireless Institute Of Australia

Published by the
Illawarra Amateur Radio Society
P.O. BOX 1838
WOLLONGONG. 2500.

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NOTICE OF MONTHLY MEETING November 1976.

Members are advised that the Monthly Meeting of the Illawarra Amateur Radio Society will be held at the Wollongong Town Hall Meeting Room on Monday, 8th November 1976, at 7.30 p.m.

AGENDA.

1. Apologies and welcome to visitors.
2. Minutes of previous General Meeting.
3. Correspondence.
4. Financial Report.
5. General Business.
6. Raffle. - as usual we will have a worthwhile prize.
7. Talk.

The talk is to be given by Mr. John Milton, the District Radio Inspector. See elsewhere for more details.

CHANGE OF ADDRESS.

Please take note that the postal address for all mail is now -

P.O. BOX 1838, WOLLONGONG. 2500.

W.I.A. NOTES

Compiled by Geoff VK2ZHU

The CB activities are still progressing with the usual articles and protests etc. and it is becoming even more difficult to obtain an unbiased view of what actually the current situation is.

Unfortunately the media are printing misconstrued facts and even the TV showing Dick Smiths CB Radios in which I was unable to pick out any 27MHZ sets from all the other VHF and HF amateur type equipment.

This may produce sensational stories etc. and I feel giving people a possibly false impression that CB licensing is just about in. In the final chapter the decision will be made by people with technical and administration knowledge and I dont feel that they will be influenced by such statements that "amateurs are causing interference on CB emergency channel 9".

In this months mail from NSW WIA I received an interesting copy of an article "A Triple Roadblock for the CB Makers". On reading this I would consider that the Australian Government would be most reluctant to accept CB at least until the USA get their new regulations etc. operating.

If CB is legalised in its present form in Australia then we will become a "dumping ground" for all the soon obsolete CB equipment in USA. If CB is legalised along with the new American standard all the sets in Australia may become obsolete before they are legal.

On the other side I also have the September Newsletter from the "Australian CB Movement" indicating that the Government will recognise CB and that it will shortly be a reality. If anybody wishes to contact this organisation I have their address.

N.B. In the confusion of CB dont forget the threat of WARC79 or we may all be collecting stamps or matchboxes!

NOVEMBER MEETING.

Wollongong District Radio Inspector, Mr. John Milton, VK2AQM, is to be our speaker. Two very topical subjects at the present time are Novice Licensing for Amateur Operators, and "Citizens Band" radio communications. Mr. Milton has indicated that he may concentrate his remarks on these topics, as well as holding discussion on any other matters in connection with Licensing and Regulations governing radio transmission.

A reminder that visitors are welcome to attend the meetings, and this promises to be a good one, as has been the case on previous occasions when Mr. Milton has been guest speaker.

Whilst on the topic of "CB", the item reproduced below just goes to prove that some problems are not new but they just keep cropping up from time to time -

Citizens' Radio

THE bad weather which recently isolated the Mount Buffalo chalet from the rest of the world, illustrates the value of radio communication to the average citizen, when frequencies are made available for private enterprises.

The time is fast approaching when the requirements of such citizens must be given serious consideration by the authorities who control the allocation of frequencies. The use of the ether is something which should be allowed to provide, where appropriate, the same facilities as are now available by means of the ordinary telephone when it is impracticable to use these facilities. There are, at the moment, a large number of private enterprises which can make an excellent case for the employment of radio in their everyday activities.

Application of ultra short waves for radio communication, particularly over comparatively small distances, has thrown a completely new light on the problem of frequency allocations. For instance it is quite practicable to use one set of frequencies here in Sydney without any interference to other services in Melbourne using the same frequencies. An added attraction of these ultra high frequencies is the ease with which they may be used for communication with moving vehicles, as is now the case with such services as the police force and ambulances.

In the case of the Mt. Buffalo chalet, the advantages of having available radio communication for emergencies are most obvious. Here again because of its elevated situation, UHF transmission would probably be quite practicable with inexpensive and low powered apparatus. The whole matter is an important one, and should be given a high priority.

RADIO AND HOBBIES FOR SEPTEMBER, 1946

Graeme Dowse, VK2AGV, is on the move again ! His work is taking him maritime mobile in the Bass Straight region, and his YL is calling him to Canberra.
Congratulations on your Engagement Graeme, we sincerely hope to see you both settle back in Wollongong - might put an end to these DX-peditions though.

QSL cards available from Geoff VK2ZHU for the following.

AW, DY, ANO, AYF, AMD, ALV, BHO, ABI, FE, BJE, BNG, BJL, MT, BHL, ZYI, ANH, BJF, AIV, OO, FT.

** NOW AVAILABLE IN WOLLONGONG **

Kenwood TS520 H.F. Transceiver 80-10M AC/DC.....$560.00

Kenwood TS820 The ultimate in H.F. Transceivers
Due first week in November.....$800.00

DGI - Digital Display for TS820.....$144.00

Kenwood TS700A full 144-148 MHZ coverage
FM-AM-CW-SSB VFO AC-DC.....$585.00

Sanyo TA-777 27 MHZ 23 ch. Synthesised 5W. AM mobile
attractive unit - extra sensitive.....$159.00

Midland 13-892 27 MHZ 23 ch. SSB-AM
15 watts P.E.P. Ideal for the novice.....$239.00

Hansen FS5 Dual Power and V.S.W.R. Meter
Switchable 50 or 75 ohm scaled 0-10 and 0-100 W.....$ 29.50

RG Coax...(RG58).....per meter.....$ 0.35
Kenwood HC2 Hamclock.....$ 29.50
also 27 MHZ mobile antennae

MACELEC
83 Princes Highway FAIRY MEADOW.
phone 29 1455
or Contact Barry Hartley VK2FE

FOR SALE

FT 101 transceiver. As new. $460.

Telequipment 5" single beam CRO. 5 MHz. $100.

Contact - Barry Hartley, VK2FE.
29 1455, work. 84 2439, home.

BLACK & WHITE
TV SETS

Roger Graham has some B & W TV sets to give away to whoever calls.

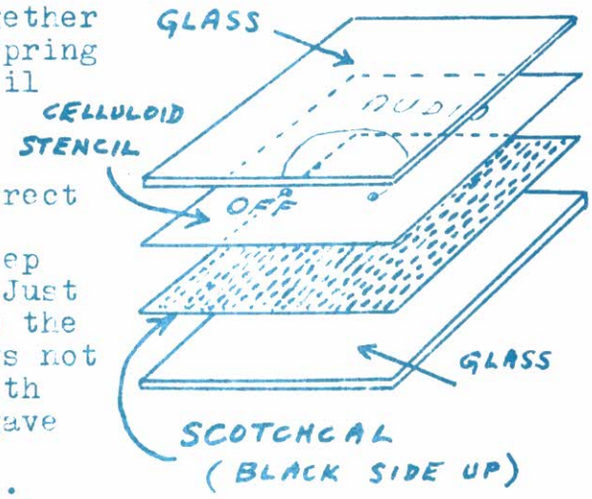
Ring Roger on 34 1431 before the meeting.

"SCOTCHCAL" LABELS.

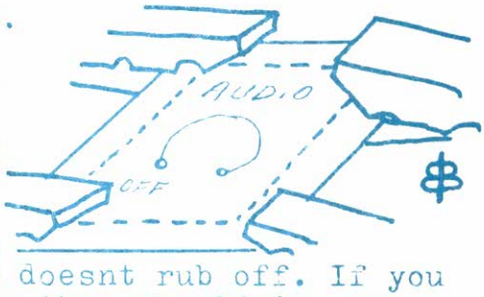
Self-adhesive photosensitive aluminium. Stated shelf life 3 years in un-opened pack. Store in refrigerator to prolong life. Available only in packs of 10 sheets or more, from distributor, at approximate cost of $3 for a sheet 10" x 12".

To Make Professional Labels.

1. Draw stencil of desired label on thin celluloid. Front of shirt box is good. Use Indian Ink and conventional drawing instruments. For lettering use "LETRASET" rub-on lettering, available from GAF, Kenny St., Wollongong. Excellent but expensive. Recently $5.41 per sheet. Of course a photographic process could be used to make the stencil if that is where your skills are.
2. Cut Scotchcal with scissors in ordinary dim light. You can draw guide lines on the white paper backing first if it helps. Try not to bend the corners about .. sticks better later if kept flat.
3. Sandwich Scotchcal and stencil together between 2 pieces of sheet glass. Spring clothes pegs at corners keep stencil in close contact with surface of Scotchcal.



4. Expose for 10 minutes in bright direct sunlight. Best if you keep glass still during the 10 minutes, to keep edges of shadows sharp and clear. Just prop glass up facing directly into the sun and leave it there. Cloudy days not so good. Attempts to make label with prolonged exposure with hazy sun gave very inferior label...fuzzy edges, tendency to misjudge exposure time.
5. Remove Scotchcal from glass sandwich, inside in ordinary dim light once more. Rub surface gently with pad moistened with developing solvent. Just a little on a folded paper tissue is enough for quite a large label. The black coating on the aluminium softens at once and rubs away in the areas that were protected from light. The area exposed to light should be hardened so that it doesnt rub off. If you find that the black areas rub away when they shouldn't, you are rubbing too hard, or you didn't expose it long enough.



6. Let the label dry. Cut holes for knobs etc. Sharp chisel or curved gouge is good for this, with label face up on scrap of chip board. Finally give a thin spray with clear lacquer and allow to dry.
7. When you come to stick the label onto the panel, ge it positioned right first time. Sticks at once, and you can't reposition it.

Editors note - Thanks to Roger Graham VK2AIV for the above.

How about some more of this type of article ?

Scotchcal is available from the Store as SINGLE SHEETS, at a price of $3.50 per sheet of 10" x 12".

Moonbounce Report - October 1976.

No EME test schedule was received for October, possibly delayed in the post.

The eclipse of the sun on 23rd October provided a unique opportunity for VK2AMW to carry out experiments to obtain information on

(i) the diameter of the 'radio' sun at 70cm.
(ii) the proportion of its energy at 70cm. radiated from the corona.
(iii) effects of the eclipse on properties of the ionosphere, specifically related to rotation of polarisation of signals.

Preliminary results of the experiments indicate that

(i) the 'radio' sun at 70cm. is appreciably greater in diameter than the 'Optical' sun
(ii) the corona generates a significant percentage of the r.f. energy emanating from the sun at 70cm.

A chart record and numerical results were obtained and are being evaluated. They may modify our antenna beamwidth pattern, obtained by using the sun as a $\frac{1}{2}$ degree diameter noise source.

The most unusual part of the experiments was in obtaining echoes of our transmitted signal back from the moon when it was directly in front of the sun. Rotation of the polarisation of the reflected signal during its passage through the ionosphere was not significantly affected by the eclipse at this location, possibly due to the effect of the residual solar energy from the 6% of the disc still visible and from the corona.

Club members VK2ZVX, VK2ZHU and VK2AIG assisted VK2ALU during the experiments. Two visitors, including Japanese amateur JA3SVG (MM operator) were also present.

Lyle VK2ALU.

Jamboree of the Air 1976

Station- VK2ALU

Date- Sunday 17/10/76 Operating Period - 0400Z to 0730Z

Stations worked- ZL2AMI -Upper Hutt, New Zealand - Jamboree Station
ZL2AMI -Wellington, New Zealand - Jamboree Station
JAØDWY/P(1)-Urawi, Japan - Non Jamboree Station
ZE5JJ - Salisbury, Rhodesia-Non Jamboree Station
ZE2JE - Salisbury, Rhodesia-Non Jamboree Station

Scout District involved at VK2ALU - Keira District
Groups present during operating period
1st Keiraville Scouts
3rd Wollongong Scouts
Beaton Park Scouts
Gwynnville Guides

EDITORS NOTE.

The above contribution from Lyle, VK2ALU, is the only report so far received following the Jamboree of the Air.

We would like reports from ALL stations which participated, for passing on to the Scouting authorities.
Any personal remarks and observations, eg, interest, behaviour, supervision, etc are welcome, be they good or bad.

HOW TO CHOOSE THE RIGHT BYPASS

In modern electronic circuits the capacitor is used more frequently for the function known as "by-passing" than for any other single application. The selection of a capacitor of the proper type and value for a given job is an important aspect of circuit design. The subject is discussed at some length in this paper prepared by Engineers of the Aerovox Corporation.

CRITICAL performance characteristics as frequency response, phase distortion, circuit stability, and freedom from parasitic oscillations are determined by the bypassing used.

This discussion is intended to provide a review of this subject for the benefit of the amateur, experimenter, acting engineer, or anyone who has been puzzled by the problem of what by-pass to use for a specific purpose.

The factors underlying the choice of capacitors in typical circuits will be pointed up by the use of examples.

"Bypassing" can be defined as providing a short, low impedance path around certain components for electrical currents of some frequencies, while maintaining a high impedance path for other frequencies. The circuit designer is repeatedly confronted with the need of components having this property of passing currents of a desired periodicity while excluding others.

Actually, both inductances and capacitors qualify under this definition because of the frequency discriminating action of these simple filters. An inductance, or "choke," may be considered to be a low frequency bypass element since it presents a low impedance path for DC and low frequencies while presenting a high reactive impedance for high frequencies.

SIMPLE FILTER

The condenser, on the other hand, is a simple high-pass filter, having a high reactance at low frequencies and becoming more nearly a short circuit as frequency is increased.

It is when this latter property is used to provide a "detour" around some part of a circuit that the term bypassing is most commonly employed.

For a capacitor to function as an effective bypass, its impedance must be much lower than the impedance of the circuit element being bypassed.

Of course, the reactive impedance of a capacitor of any value is easily calculated for any given frequency from the basic expression:

$$(1) \qquad X_C = \frac{1}{2\pi f C}$$

Where:

X_C is the capacitive reactance in ohms

f is the frequency in cycles per second

C is the capacitance in farads

Provided that $X_C >> X_L$, X_L = lead reactance.

Needless to say, this relationship is of constant use in designing proper bypass circuit. It shows that the reactance of a given unit decreases with frequency or that, for a given frequency a value of capacity can be chosen to give any desired value of capacitive reactance.

To aid in visualising this function, we have plotted the reactance of a .001 mfd condensed versus frequency in Fig. 1.

The most frequent use of the bypass condenser is illustrated in Fig. 2, where the capacitor is used as a cathode resistor bypass. The necessity for this is obvious when the characteristics of the circuit are considered.

As is well known, any vacuum tube stage which uses cathode bias exhibits strong degeneration if the signal current is allowed to flow through the bias resistor. This is so, as the AC component of the plate current flowing through the bias resistor develops a voltage drop across it during signal peaks which increases the bias applied to the grid of the tube.

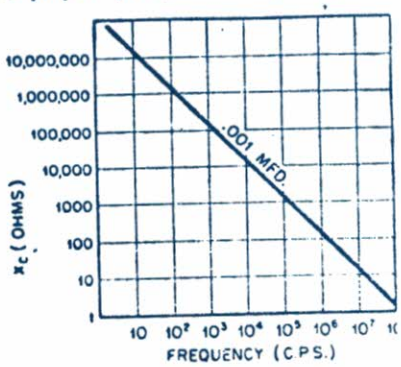
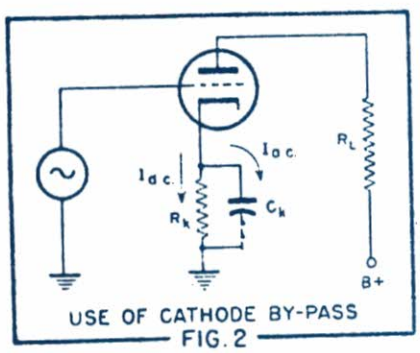


FIG. 1



USE OF CATHODE BY-PASS

FIG. 2

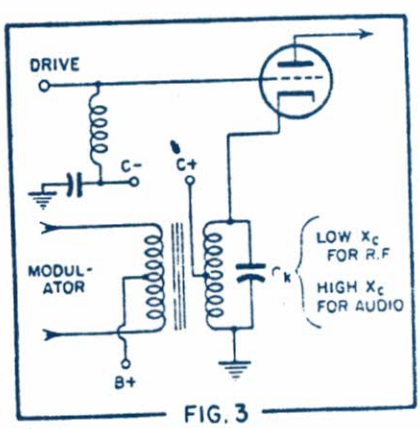
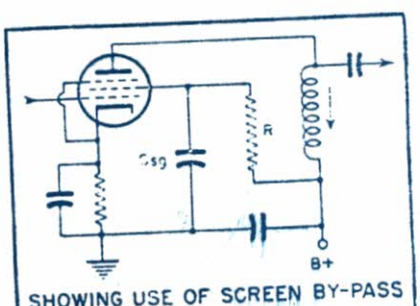


FIG. 3



SHOWING USE OF SCREEN BY-PASS

FIG. 4

DEGENERATION

This has the effect of reducing the signal voltage on the tube grid and thus reducing the stage gain and introducing phase distortion and other undesirable results.

In Fig. 2, this degenerative effect is prevented by shunting the cathode bias resistor with a capacitor which bypasses the AC signal component around it. Let us now consider the requirements placed upon this capacitor.

Assume that the stage depicted in Fig. 2 is an audio amplifier intended to work over the frequency range of 200 to 5000 cps and that the cathode resistor recommended for the tube type used is 300 ohms. A bypass capacitor must be provided across this resistance which will prevent most of the audio frequency plate signal current from flowing through it.

Since the reactive impedance of the condenser becomes lower with increasing frequency, as shown by Eq. 1, one which is satisfactory at the low frequency end of the desired range will do for the entire range.

RULE OF THUMB

Therefore, in the present example, a capacitor which effectively bypasses the 300 ohm cathode resistor at 200 cps should be adequate. Most circuit designers consider a ratio bias resistance to bypass reactance of about 10 to 1 to be a safe rule-of-thumb for most work. With this ratio more than 99 pc of the total AC current flows through the bypass condenser. Ratios up to 20 to 1 may be used in high fidelity amplifier work where space and economical considerations permit, however.

Assuming a bypass ratio of 10 to 1 to be sufficient, a capacitor having a reactance of one-tenth the resistance of the bias resistor at 200 cps is necessary. By rewriting Eq. 1 to solve for a value of capacitance having a reactance of 30 ohms, an answer of 26 microfarads is obtained. Therefore, the nearest standard value of **25 microfarads would be used.**

An electrolytic condenser is usually used in this application since leakage resistance is not important in this case and these units are compact and economical. The capacitor must be rated for a working voltage greater than the maximum bias voltage developed.

OHM'S LAW

This may be obtained from Ohm's Law, using the bias resistance and the maximum DC current which flows through it. For pentodes, this means both the plate and screen current, and for classes of amplification other than Class A requires the maximum-signal current. A voltage rating of 25 or 50 volts is usually sufficient for cathode bypassing.

In the example discussed above, the cathode bypass could have been made large without limit, without detrimental effects on circuit performance.

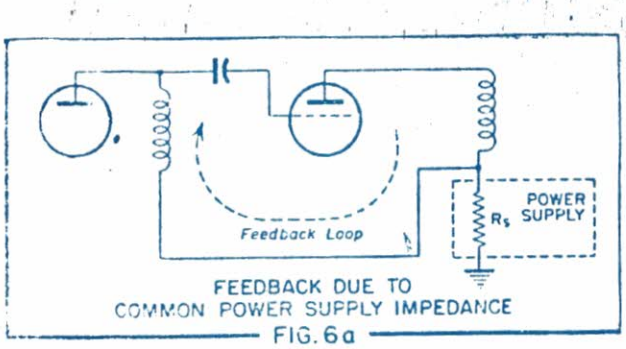
Circuits exist, however, in which there is an upper limit to the capacitance which can be used to bypass an impedance in the cathode circuit. As an example, consider the cathode-modulated Class C r.f. amplifier shown in Fig. 3. Here the condenser is required to bypass r.f. around the modulated transformer.

Otherwise regeneration may result from feedback into the grid bias circuit. However, if the cathode bypass is made too large, the modulation frequencies will be shunted to ground. A value of capacitance must be chosen which has very low reactance at the carrier frequency, but a high one at the highest modulation frequency.

RF REACTANCE

Fortunately, this is easily done in this case because of the wide difference in the frequencies involved; a .02 microfarad condenser has a reactance of about 8.0 ohms at an r.f. frequency of 10 Mc, but almost 2000 ohms impedance at 5000 cps. A good mica or ceramic condenser of low inductance would be used in this application.

Of course, not all cathode bias resistors must be bypassed. In many high fidelity audio amplifiers and television i.f. amplifiers controlled



FEEDBACK DUE TO
COMMON POWER SUPPLY IMPEDANCE
FIG. 6a

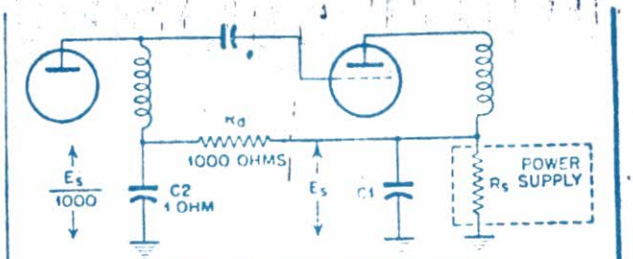


PLATE LEAD DECOUPLING FILTER
FIG. 6b

[illegible] negative feedback are [illegible] to improve the overall [illegible]. In such cases, the [illegible] is compensated by add[illegible] stages.

[illegible] bypassing is also omitted [illegible] push-pull amplifiers, [illegible] the AC signal components of [illegible] flowing in the resistor [illegible] out of phase and cancel out.

The screen element of tetrode and pentode electron tubes must be effectively bypassed to ground for all signal voltages present. This is

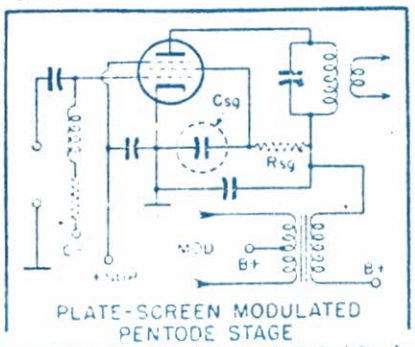


PLATE-SCREEN MODULATED
PENTODE STAGE
SCREEN BY-PASSED FOR R.F (Csg)
FIG. 5

necessary to prevent degeneration of a type very similar to that discussed above.

For example, consider the television IF amplifier stage shown in Fig. 4. Here the screen voltage is derived from the plate supply through a dropping resistor. If the AC signal component is allowed to pass through the screen dropping resistor, the gain of the stage will be reduced.

SCREEN BYPASS

For this reason, a bypass condenser is used to ground the screen for signal voltage without interfering with the application of the DC screen voltage. If the screen bypassing is imperfect at any frequency, the response of the amplifier will fall off there or it may oscillate.

It is common practice to make the screen bypass reactance small compared with the cathode-to-screen impedance. This is obtained by dividing the screen voltage by the screen current.

Mica or ceramic condensers are used in values ranging from 100 micromicrofarads to 0.1 microfarads for radio frequencies, while high quality paper units and electrolytics are used for audio screen bypassing. As in cathode resistor bypassing, certain circuits require screen bypassing sufficiently heavy to ground the screen for RF but not for audio frequencies.

A typical example of such selective by-passing would be the plate and screen modulated Class C amplifier shown in Fig. 5. In this circuit the screen voltage must vary with the modulation and so should not be by-passed for audio frequencies. A .002 microfarad condenser is sufficient in most cases and does not result in a loss of "highs."

As in the cathode and screen circuits discussed above, any impedance in the plate circuit of a vacuum tube stage which is common to another stage, or another part of the same stage, can cause feedback and instability if not properly bypassed.

COMMON IMPEDANCE

The reasons for this are obvious from Fig. 6a. Here the plate voltage for two stages of an IF amplifier are taken from the same power supply and no decoupling is employed. The internal impedance of the power supply is represented by Rs.

Since the plate signal current is allowed to flow through Rs, a voltage drop is developed across it which is introduced into the plate circuit of the preceding stage via the plate lead. This signal voltage is then fed to the grid circuit of the second stage with the result that oscillation will occur if the stage gain is high enough.

Instability due to plate circuit feedback is prevented by the use of decoupling filters consisting of series isolating resistors and bypass condensers shown in Fig. 6b. Such decoupling networks are most easily understood if thought of as voltage dividers at the feedback signal frequency.

For example, in Fig. 6b assume that the internal impedance of the power supply (Rs) is imperfectly bypassed by C1 at the signal frequency. A small signal voltage (Es) is therefore developed across the power supply impedance and travels down the plate lead to the preceding stage.

The function of the decoupling filter Rd and C2 is to greatly attenuate this signal since they divide it in the ratio of their impedances. Thus, if the reactive impedance of C2 is only 1 ohm and the resistance of Rd is 1000 ohms, the feed-back signal is divided by that ratio so that only 1/1000th of the voltage developed across the power supply impedance is applied to the preceding stage.

Of course, the DC plate voltage is unaffected except for a small IR drop across Rd. In cases where this drop couldn't be tolerated, an inductance could be used in place of Rd. Several such RC or LC decoupling filters are sometimes used in series in cases where feedback is particularly troublesome.

SINGLE EARTHS

Bypass wiring in some circuitry, including high gain amplifiers and VHF circuits, must be done with extreme care to avoid common impedances which introduce feedback. The safest rule for by-passing multi-stage amplifiers is to ground all by-passes associated with the output of one stage and the input of the next stage to a single ground point, as in Fig. 7.

In applications where very effective bypassing at a single frequency is required, some designers have resorted to the use of series resonant by-passing. By this method, the capacitance of the condenser is resonanted with the inductance of its wire leads to obtain the theoretically zero impedance of a series resonant LC circuit.

The self inductance of certain types of windings can be used and capacitors made which will have self resonant characteristics at any frequency. Such capacitors have been used in I.F. by-pass circuits of AM receivers to trap I.F. voltages.

The self-resonance of the capacitor may be found by connecting the ends of the leads together and measuring the frequency at which this L-C combination produces a response on a grid-dip meter or other absorption indicating device.

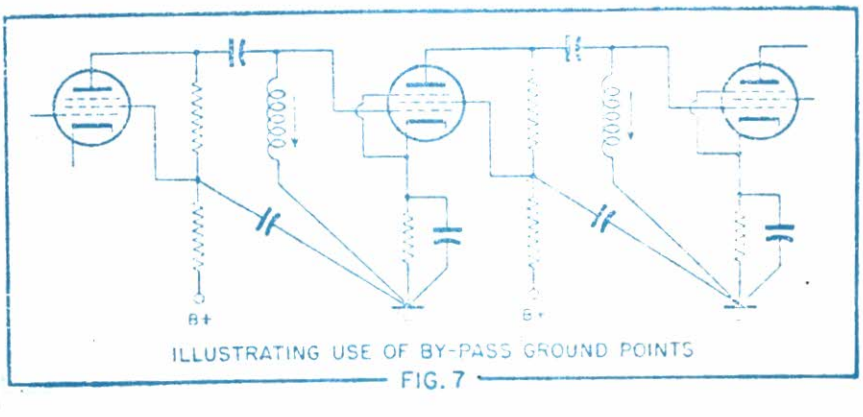
SELF-RESONANCE

The exact length of the wire lead to be used in the circuit must be used in this measurement for precise results. This is illustrated by the fact that the resonant frequency of a tubular .01-mfd unit having leads of 20 guage wire ½-inch long is about 11 mc. However, if the leads are trimmed to 1 3-inch, the self-resonance is raised to about 40 m.c.

For capacitor types which do not have flexible lead wires, the terminals may be connected by a wire of known or calculated inductance and then correcting for this added inductance to find the true resonance.

Dual bypassing is frequently used where effective bypassing must be provided over a wide band of frequencies. A small, low inductance unit for r.f. is connected in parallel with a large condenser of poorer quality for audio frequencies.

The high capacitance unit, if used alone, would contain too much residual inductance to be effective for r.f. and economy prevents the use of a mica or other high quality condenser of sufficient capacity to by-pass all frequencies.



ILLUSTRATING USE OF BY-PASS GROUND POINTS
FIG. 7

COMPONENTS FOR SALE.

SCOTCHCAL.

Photosensitive panel material for making professional looking front panels to pretty up your gear. See article elsewhere in this issue.

Sheet size 10" x 12" . . $3-50.

BOOKS.

Basic Electronics. A very useful book, especially for beginners. Published by Electronics Australia. $3.00

Projects and Circuits. Over thirty Electronics Australia projects combined into a book of 112 pages. $1,50

Westlakes Novice Licence Manual. A very good and inexpensive book. Sample Novice Exam paper available free. $2.50

GENERAL.

Pair meter leads with alligator clips	50c
Vernier dials 35mm. 4 turns knob for ½ turn dial	$1.50
DPDT slide switches	25c
4 pin plug and socket - pair	15c
Alligator clips - large, insulated. Red or Black.	20c
Ground Plane Antenna Base.	$1.00
Edge connectors.	$1.00
Tag strips.	10c

CONDENSERS.

.0068 mf feed through capacitors.	10c
Ceramic trimmer, mica insulation.	30c
Small solder type feed through capacitors.	5c
Wire wrap type trimmers.	10c
Ceramic bolt-down trimmers.	10c

A special purchase of 25V Electrolytics.

4.7 uF	6c
100 uF	12c
220 uF	15c
470 uF	20c
1000 uF	25c

Greencaps. 100V.

.0047, .01, .002 8c

NEOSID.

Formers	8c
Balun formers - small	12c
large	15c
Cans - single	10c
double	12c
Slugs - F 16,	7c

METERS.

S Meter. 400uA 1 3/8" x 5/8"	$2.50
Level Meter. dual 200 uA meters, illuminated.	$3.00
0 - 1 mA Meter. 50mm square.	$4.00
0 - 1 mA Meter. 75mm x 50mm.	$5.00

RESISTORS.

Bag of 160 ½ watt resistors. $4.00
10 each of values 10, 47, 68, 100, 220, 470, 680, 1K, 2.2K, 4.7K, 6.8K, 10K, 22K, 47K, 68K, and 100K.

The I.A.R.S. Store is stocked with selected purchases of good quality components. Asmall profit is marked up on these items yet prices are quite good. The profit goes towards expanding the range of items kept in stock.

Bring your money on meeting nights and keep stocked up with those often needed components.

THE PROPAGATOR.

Newsletter of the Illawarra
Amateur Radio Society.

I.A.R.S.
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