

THE WIRELESS INSTITUTE OF AUSTRALIA

TASMANIAN DIVISION

BOX 851J, G.P.O., HOBART.

JULY 1966

MONTHLY BULLETIN

PRICE 5c.

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EDITORIAL

On sitting down to prepare this month's bulletin, I find myself in the same boat as those who tackled this task before me--- nothing to write about. It strikes me as ludicrous, that in a state the size of Tasmania, there should be such complete apathy and lack of co-operation in the compiling of a news sheet, that is after all for the benefit and/or amusement of all of us. The idea of the Bulletin is purely and simply to allow all in VK7 to know what is going on, what meetings and lectures etc. are afoot, yet it is in these things that the apathy is most apparent. And the most ludicrous part of it is that our hobby is radio, communication our business, yet I have only once been contacted with any news whatsoever from the North or North-West Zones.

If, in one state alone, the zones cannot be induced, goaded or bribed into pulling together to make one small effort a success, what hope has the Federal Executive of getting Australia as a whole to back their efforts in the fight for retention of our Amateur Bands.

Anne VK7LY.

MEETINGS FOR JULY.

- JULY 5th... North West Zone meeting, Lakins Hall, Ulverstone, 2000 hrs.
6th... Headquarters General meeting, 147 Liverpool St., Hobart, 2000 hrs.
8th... Northern Zone, Adult Education Rooms, 51 York St., Launceston.
18th... Council Meeting.
20th... V.H.F. Group Meeting, Club Rooms, Hobart. 2000 hrs.

LECTURES.

Headquarters general meeting....A lecture will be given by Ted Beard, the first of two, on Civil Defence.

SUBSCRIPTIONS.

Owing to the soft heartedness of your Treasurer the axe, illustrated in last month's bulletin, has been suspended until the next council meeting. Accounts will be sent to the 41 members outstanding, this being the last correspondence in connection with this matter.

41 members outstanding is approx. 22% of the total membership, a pretty high percentage in anyones language, and a disgrace to VK7.

REMEMBER--- if you haven't paid YOURS, your fellow members are buying this bulletin, and A.R. for you.

NOTICES

As this bulletin is being printed so close to the council meeting, there has been no time to prepare the promised list of Library Books. However, this list will appear in next month's bulletin.

MCW Tapes are now available from this division. If you wish to take advantage of this offer, send in a tape to the Secretary with details of your tape recorder (make, speed, etc.) and the required MCW speeds. Please enclose return postage. Do not forget to clearly state your name and address.

FOR SALE.

By Jim Oliver, VK7JO, 73 Normanstone Rd., Launceston.

- Item 1. 50 watt CW transmitter, Geloso VFO to 6146 final, with power sup.,
in case 18"x 9"x 11", needs only tuning condenser to be on air. \$38
- 2. Modulator for above, with power supply, on chasis 11"x 11". \$30
- 3. Small receiver on chassis 11"x 6 $\frac{1}{2}$ " covers 80 and 40 Metres.
6AN7, 2 x 6BA6 high selectivity I.F., 6BL8 product detector,
6AV6, 6AQ5 to 3" speaker. Provision for "S" meter and band
spreading on 80 and 40 using Jabel double reduction dial.
Less power supply. Will sell for less than cost of parts. \$36

We have been advised that artery forceps can be obtained for 50c each. These are high quality, locking type, ideal for transistor work or fine wiring. Several sizes are available. Contact the Editor, 223 Bathurst St., Hobart.

DX

For the benefit of DX enthusiasts, Poly VK7CK, has given us the following information (per radio).

10 MX. This band has been spasmodically open to the States.

15MX. Regular openings, mostly to the States and Canada, and occasionally to South America have been occurring for four weeks or more between 0900 and 1500 EAST every day. Signals have been quite often up to S9 both ways

20MX. Poly has been working West and North Africa in the late afternoons (1700 to 1800 hrs) regularly. ZB2AK, Gibraltar, has been quite consistently strong. Stations heard and/or worked are as follows. ZD8CD, Ascension Is. ZD7RH, St. Helena, CR6DX, Angola, 9L1HX, Sierra Leone, TU2BD, French Guinea, ZD9VH, FB8YY.

Nearly every day ZS1,5&6 in South Africa are heard. All these have mainly been short path but occasionally long path, so it pays to check both ways

PROJECT AUSTRALIS.

Since publishing details last month, we have been in regular radio contact with the Melbourne University, and the following information has been passed on.

Several changes have been made, mainly due to the fact that a battery of the required capacity was unavailable, and therefore power is at a premium.

Until the battery is exhausted, after 2 to 3 months, there will be a continuous transmission on 144.050. This will carry telemetry information of which there will be seven separate readings. The 50MW transmitter will emit this information with each read-out taking 80 seconds, made up of seven 10 second audio tones and 10 secs. of CW which will be "VK" transmitted with 1 second gaps.

The seven telemetry channels are Battery Voltage, Battery Drain, Two Horizon Sensors, Magnetic Attitude Sense Coil, Battery Temperature and Inside Skin Temp.

A rotating and tiltable antenna is desirable for tracking and telemetry decoding charts and orbit predictions will be made available.

There will be a beacon on 29.450 mcs and to conserve the batteries, this will be switched on by stations in W, ZL, and VK for about 5 of the 15 daily orbits. It will be commanded by a single channel receiver in the satellite, the command sequence and frequency being classified information. This beacon, while on, will transmit a continuous carrier for 70 seconds and the "VK" gated in from the 144mcs transmitter for 10 seconds. This beacon has a great deal of importance, and due to high power its operation will have to be closely controlled so that as much information can be gained as possible before the batteries give out. If operations are successful the command information will probably be released a few weeks after launch, so that amateurs will be able to try their hand at switching the beacon on and off.

If time and manpower permit, there may be another balloon flight early in July to test the command system. The flight model will be completed by August, and forwarded to the Salisbury Weapons Research Establishment in South Australia for final testing, from where, it will go to the USA for launch some time between December 1966 and January 1967.

The fellows in the Hobart area are really in trouble now. The two big noises on the Eastern Shore have built themselves VFOs. Congrats Barry and Dave. Both sigs sound pretty stable and you will now be able to put them to good use, as there should be a little DX around, about now. I heard somewhere on the grape-vine that the VK4s have been working JA. Usually about a fortnight either side of the shortest day we get a little DX in VK7, sometimes at good strength. Another very big noise on the 6 MX band now is ZPT, who has burnt out receiver front ends over a 3 mile radius by just increasing his HT a little, and adding a crystal mic. to the rig. A really nice sig. now Phil. We have two new licencees in our midst now, one with and one without a call sign. Harvey, VK7ZHF is one, and has been on the air since about one minute after receiving his call. Congrats Harvey. ZHF is active on the net freq. mobile, & around 145 mcs at home. Believe he will soon have 6 MX gear at home also. The other gentleman is David Johnson, who, as mentioned earlier, has no call sign as yet. Hope it won't be too long Dave, and in the meantime, guess you will be building up some gear. Would like to know what has become of Richard, 7ZRR. I believe you were on at one stage Rich. so how about firing up again. If you are having trouble working out of your location, let the broadcast officer, or one of the boys know, and we shall look for you after the broadcast one Sunday. Once you have made a few contacts and the fellas know you're about, many more will follow.

Mike, VK7ZMC, has not been over-active lately, as he is studying for exams, but as a break from study, he has managed to rebuild a receiver he recently acquired.

At least three and maybe a few more I have not heard of, will be sitting for the next CW exam, but we feel sure they will not desert the VHF bands.

At our last meeting we visited the meteorology section of the DCA at Llanherne Aerodrome, and followed a weather balloon, from take-off till bursting point. For many it was the first sight of radar and proved to be very interesting. We now have a greater insight into the peculiar noises we hear on 144 periodically, the harmonic of the 72 mcs balloon Sond transmitter, from which temperature and humidity data is derived. A few facts gleaned during the evening may be of interest to those who could not attend.

The balloon consists of a hydrogen filled envelope, roughly the shape of an inverted pear, made from a plastic type material. The balloon would be about 8 to 10 feet high and 6 feet in diameter at take-off. Below this is strung a small parachute and below this again, a radar reflector, a tin foil covered cardboard device, followed by the Sond itself, a transistorised transmitter in a cardboard box 6"x 6"x 8".

Tone pulses are transmitted which are recorded on a pen-recorder, to give, after suitable conversion tables are applied, temp. to within 1 degree accuracy. The Radar gives height, direction and distance, from which can be derived the speed of drift and therefore wind velocity. The particular launch we witnessed flew for about one hour and burst at a height of approx 60,000 feet, landing in the sea off Marion Bay. Each balloon costs about \$30 but few are recovered as the prevailing winds blow them in an easterly direction out to sea. The day time flights use a larger balloon, and reach about 100,000 feet in height.

73s till next month,

Mike, VK7ZAV.

KIRCHOFF, THEVENIN, AND NORTON

-- by R. L. Gunther (VK7RG)

In order to have the material available in reference form, I shall here summarise the Network Laws proposed by these three worthy gentlemen:

Kirchoff's Laws

1) If a bunch of wires meet at one point, the sum of currents flowing to that point equals the sum of currents flowing away from it. If the currents flowing to the point are considered positive, and those flowing away are considered negative, then in Fig. 1 it is evident that $I_1 + I_2 - I_3 - I_4 - I_5 = 0$.

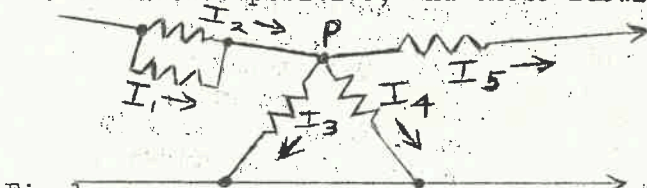


Fig. 1 necessary for the working of Kirchoff's Second Law, the most familiar one, thus:

2) The sum of all potentials in a closed system is zero, including voltage sources. The most useful way to use this idea is to assign arbitrary current loops to a network, and then add them up in consistent fashion. Consider the example shown in Fig. 2. This could be

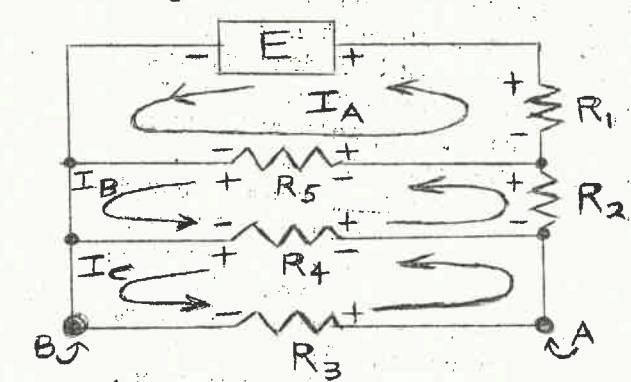


Fig. 2

As it stands, this can be useful in unravelling various problems such as the distribution of currents in a cube, each of whose legs consists of a resistance, as shown in the Lecture of a few months ago. But it is also basically

solved by simple voltage divider relationships, but will serve as a useful illustration for the method which can be applied to considerably more complicated systems. E is the source of potential, with internal resistance R_1 , and we can assume arbitrary current loops, I_a , I_b , and I_c , which for simplicity (heh!) we can assume here to be electron flow. Then the voltage drop across each resistor is of negative sign where the electrons enter, and positive sign where they leave. Now imagine that we know all resistance values, and want to know the actual

current flowing through R_3 . As you can see, each loop has been assumed to go anti-clockwise (it is necessary only to be consistent). If the arrow enters the resistor at the negative end, the voltage is taken as negative, and conversely. Then, as $E = IR$, and the sum of all voltages in any one loop is zero,

$$+E -I_a R_5 +I_b R_5 -I_a R_1 = 0$$

$$-I_b R_5 +I_a R_5 -I_b R_4 +I_c R_4 -I_b R_2 = 0$$

$$-I_c R_4 +I_b R_4 -I_c R_3 = 0$$

Or:

$I_a(-R_5-R_1)$	$+I_b(R_5)$	$+I_c(0)$	$= -E$
$I_a(R_5)$	$+I_b(-R_5-R_4-R_2)$	$+I_c(R_4)$	$= 0$
$I_a(0)$	$+I_b(R_4)$	$+I_c(-R_4-R_3)$	$= 0$

We can solve these three 'simultaneous' equations in three unknowns, by the usual algebraic methods of substitution or cancelling, but it is considerably easier to use the method of determinants. For this purpose it is necessary to set up a 'matrix,' and that is simply a fancy name for 'pattern.' The preliminary work for this has, however, already been when the equations were rearranged, as above right, so that all coefficients of the individual currents fell in columns. Now for the next step, since it is tedious always to write 'R' in front of every value indicating a resistance, we can simply take the number associated with it. Thus, instead of 'R3' we can simply write '3', but bearing firmly in mind that this '3' is not a number, but an algebraic quantity; if it is less confusing, you could use 'A', 'B', 'C', etc, but I think that adds just one more complexity. We want to solve for I_c (going through R_3), and in this instance it is $I_c = P/Q$, where

$$P = \begin{vmatrix} -5-1 & 5 & -E \\ 5 & -5-4-2 & 0 \\ 0 & 4 & 0 \end{vmatrix} \quad Q = \begin{vmatrix} -5-1 & 5 & 0 \\ 5 & -5-4-2 & 4 \\ 0 & 4 & -4-3 \end{vmatrix}$$

Note that '-5-1' is not a process of subtraction or addition, but of multiplication, and is equivalent to '(-R5)(-R1)'. Notice that P consists of three columns which are repeated again to the right, similarly for Q . In P , the first two

columns are simply the values of the resistances multiplying each current, and the third column is the one at the right hand side of the equal sign. This is a general thing: The column to the right of the equal sign is always substituted for the coefficients of the unknown current in the equation-matrix (the one between horizontal lines, above). Otherwise the coefficients of the currents in the equation-matrix are reproduced as-is in the determinant-matrix (the one between vertical lines). Now in Q , the determinant is identical to the equation, where all coefficients to the left hand side of the equal sign are reproduced exactly in the determinant. The quantity Q , therefore, remains the same, whatever values of P are obtained when solving for the various currents.... To solve the determinants (one at a time, of course), you draw a pencil line diagonally through three values, and multiply them together. For example the first diagonal is: $(-5-1)(-5-4-2)(0)$, which being translated back to resistances would be $(P.T.O.)$ ----

Kirchoff et al (continued)--

$(-R5)(-R1)(-R5)(-R4)(-R2)(0)$; remembering that negative multiplied by negative is positive, and negative multiplied by positive is negative. And that zero multiplying anything is still zero. In this instance, because of the last-mentioned fact, the quantity is zero.... Now, then, you go on to the second diagonal, add it to the first, add the third diagonal, subtract the fourth diagonal which now goes in the opposite direction, subtract the fifth diagonal, and subtract the sixth. This can be made much clearer by doing it: $P = (-5-1)(-5-4-2)(0) + (5)(0)(0) + (-E)(5)(4) - (-5-1)(0)(4) - (5)(5)(0) - (-E)(-5-4-2)(0)$, and this reduces down to $P = (-E)(R5)(R4)$. Similar operation on Q yields $Q = (R5R1)(-R5R4R2)(R4R3) - (R5R1)(R4)(R4) - (R5)(R5)(R4R3)$. The actual numerical values for P and Q are found by substituting in the proper ohmic values for R, doing the necessary arithmetic, and substituting back into the original, $I_c = P/Q$. This takes a lot of words, but it takes less time to do, if you are careful. It is a very powerful, though tedious method for solving a wide variety of impossible problems! Conventionally it is useful for solving the bridge configuration. The relationship for the balanced bridge is classical, but when you want to know the voltage or current distribution in an unbalanced bridge (the condition where it is doing work), the more rigorous Kirchoff method (or Thevenin or Norton) must be used.

If inductances or capacitances are involved, $E_L = L(di/dt)$ or $E_C = (1/C) \int I(t)dt$. A good reference for refreshing yourself on calculus is "An Outline of the Calculus," by C.O. Oakley, in the 'College Outline Series,' or similar. If you haven't had any Calculus, not to worry, just plug in values and measure until they work! I daresay that this applies for all the rest of us too, but it can be nice to have these more elegant methods available if absolutely necessary. My occasion for refreshing myself with them became unfortunately necessary a few months ago when I was volunteered into it... hi.

Two cautions in the use of Kirchoff: 1) At least one of the loops must pass through each voltage source. 2) To use the method of determinants easily, the voltage sources or zeros ought to appear on the right-hand side of the equal sign, as above. In general, for a network of n points, there will be (n-1) simultaneous equations to solve. This method is applicable, of course, only when the values of resistance or reactance are not dependent on the instantaneous values of current or voltage in the circuit. Thus, no varistors, thermistors, semiconductors, or varicaps can be treated by the simple method.

Thevenin's Theorem

Why this should merely be a 'theorem', since it can be easier than the 'law', I don't know. Rigorously it is-- The current in any terminating impedance connected to any network is the same as if the impedance were connected to a generator whose voltage is the open circuit voltage of the network, and whose internal impedance is the impedance looking back from the terminating impedance, with all generators replaced by impedances equal to the internal impedance of these generators! Oh how those Engineers love the sound of words. It is appreciably simpler than that in practice. Consider the Points, A and B in Fig. 2. It turns out that the whole circuit can be simplified to result in the configuration of Fig. 3. The current through R3 can now be found by the simplest application of Ohm's Law, $I = E_{AB}/R$. E_{AB} is the equivalent voltage of the new circuit, the voltage which will appear across points AB if R5 is removed, and RAB is the resistance



across points AB if R5 is removed, and the voltage source, E (the original one) is shorted... But remember that E is the ideal source, and has an internal resistance, R1, which must be taken into account if appreciable. Now this method will reduce the circuit to a set of voltage dividers, in the case of Fig. 2, the voltages and resistance of which can be solved in elementary fashion. Thus, $I_3 = E_{AB}/(R_{AB} + R_3)$. The method will work as well for solving the current in any other resistance of Fig. 2, if that resistance is assumed to be the 'terminating impedance,' and 'A' and 'B' chosen either side of it. If Thevenin's Theorem were applied to the symmetrical network of a bridge (remembering that internal resistance, R1), the bridge will simplify more easily if all voltages and resistances are referred with respect to an arbitrary common line (e.g., one side of the voltage source).

Norton's Theorem

Much like Thevenin, but using an equivalent current instead of voltage. Next time.

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Response to the offer of wholesale prices for the Techpress Publications was disappointingly small, so they will not be sent-for...) --RLG