Decibels and Power

Decibels are always a ratio of some quantity, and are often referenced to one particular level
A decibel as a symbol is dB, but if its relative to something a suffix denotes what that is.

Power Levels in the Radio licence are quoted in dBW, which are dB relative to 1 Watt

For Power Ratios relative to 1 Watt .-

*Power, $dBW = 10 \times Log_{10}(Power, Watts)$

*Note Voltage ratios in Amplifiers are $20 \times Log_{10}$

Power, dBW	Absolute Power
0dBW	1 Watt
3dBW	2 Watts
6dBW	4 Watts
9dBW	8 Watts
10dBW	10 Watts
20dBW	100 Watts
26dBW	400 Watts

Note that 3dB is a ratio of 2 1, and 10dB is a ratio of 10 1

Example-1:

Thus 50 Watts (Intermediate Licence) can be derived from -

100 Watts (20dBW) minus 3dB = 17dBW

Example-2:

5 Watts is a half of 10 Watts -

10dBW-3dB=7dBW

OR

It's a tenth of 50 Watts -

17dBW-10dB=7dBW

Antenna Gain should be quoted as dBi (relative to an Ideal Isotropic radiator),
or dBd (relative to a Dipole) As 0dBd=2 15dBi, dBi numbers can 'enhance' gain specs

Decibels

db			
3	2x	= 2x	
6	2 x 2	= 4x	3 + 3
9	2 x 2 x 2	= 8x	3 + 3 + 3
10	10 x	=10x	
13	10 x 2	=20x	10 + 3
14	10 x 10 / 2 / 2	=25x	10 + 10 - 3 - 3
16	10 x 2 x 2	=40x	10 + 3 + 3
17	10 x 10 / 2	=50x	10 + 10 – 3
20	10 x 10	=100x	10 + 10
30	10 x 10 x 10	=1000x	10 + 10 + 10

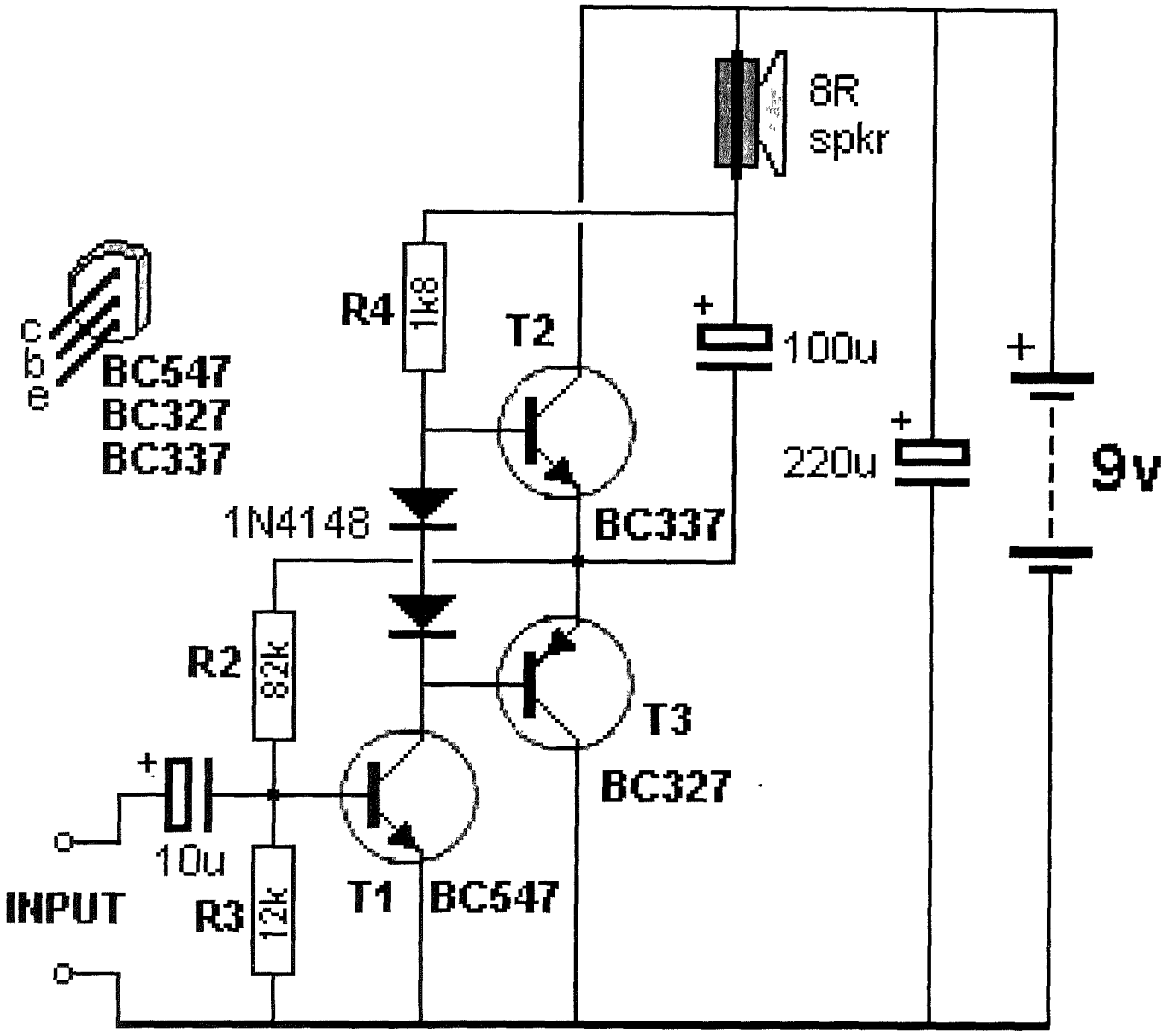
dBW ref to 1W

dBm " to 1mW

dBi perfect isotropic antenna

dBd " to dipole

1 000 000 000 000		10^{12}	tera	T
1 000 000 000		10^{9}	gıga	G
1 000 000		10^{6}	mega	M
1 000		10^{3}	kılo	k
1				
0	001	10^{-3}	mılı	m
0	000 001	10^{-6}	mıcro	u
0	000 000 001	10^{-9}	nano	n
0	000 000 000 001	10^{-12}	pıco	p



Class 'B' push pull o/p stage

Formula sheet

This formula sheet will be provided to candidates in the examination and may be used to answer any question

$R_T = R_1 + R_2 + R_3$

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$

$V = IR$

$V_{out} = V_{in}\frac{R_2}{R_1 + R_2}$

$P = VI = \frac{V^2}{R} = I^2R$

$V_{rms} = \frac{V_{peak}}{\sqrt{2}}$

$\frac{1}{C_T} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3}$

$C_T = C_1 + C_2 + C_3$

$C = \frac{kA}{d}$ where $k = \varepsilon_0\varepsilon_r$

$L_T = L_1 + L_2 + L_3$

$\frac{1}{L_T} = \frac{1}{L_1} + \frac{1}{L_2}$

$X_L = 2\pi fL$

$Z = \sqrt{R^2 + X^2}$

$V_T = \sqrt{V_R{}^2 + V_C{}^2}$ (or $V_L{}^2$)

$X_C = \frac{1}{2\pi fC}$

$f = \frac{1}{2\pi\sqrt{LC}}$

$T = \frac{1}{f}$

$\tau = CR$

$Q = \frac{2\pi fL}{R}$ or $\frac{1}{2\pi fCR}$

$Q = \frac{f_C}{f_U - F_L} = \frac{\text{centre frequency}}{\text{bandwidth}}$

$R_D = \frac{L}{CR}$

$Q = 2\pi fCR_D$

$V_S = V_P\frac{N_s}{N_p}$

$I_P = I_S\frac{N_s}{N_p}$

$Z_P = Z_S\left(\frac{N_p}{N_s}\right)^2$

$\frac{Z_P}{Z_S} = \left(\frac{N_P}{N_S}\right)^2$

$I_C = \beta I_B$

$f_{step} = \frac{f_{crystal}}{A}$

$F_{out} = f_{crystal}\frac{N}{A}$

$c = 3\times10^8$ m/s

$\text{Gain (loss)} = 10\text{Log}_{10}\frac{\text{power out}}{\text{power in}}$ dB

$SWR = \frac{V_{max}}{V_{min}} = \frac{V_f + V_r}{V_f - V_r}$

$v = f\lambda$

$\text{Gain (loss)} = 20\text{Log}_{10}\frac{\text{voltage out}}{\text{voltage in}}$ dB

$Z_0{}^2 = Z_{in}\times Z_{out}$

$E = \frac{7\sqrt{erp}}{d}$

$\text{Return Loss} = 10\text{Log}_{10}\frac{\text{Reflected power}}{\text{Incident power}}$

$bw = 2(AF_{max} + \Delta f)$

erp= power × gain (linear)

$\text{Gain} = 10\text{Log}_{10}\frac{\text{power from Yagi}}{\text{power from dipole}}$ dBd

$V_{rms} = \frac{V_{peak}}{\sqrt{2}}$

or $L = \frac{1}{4\pi^2 f^2 C}$ or $C = \frac{1}{4\pi^2 f^2 L}$

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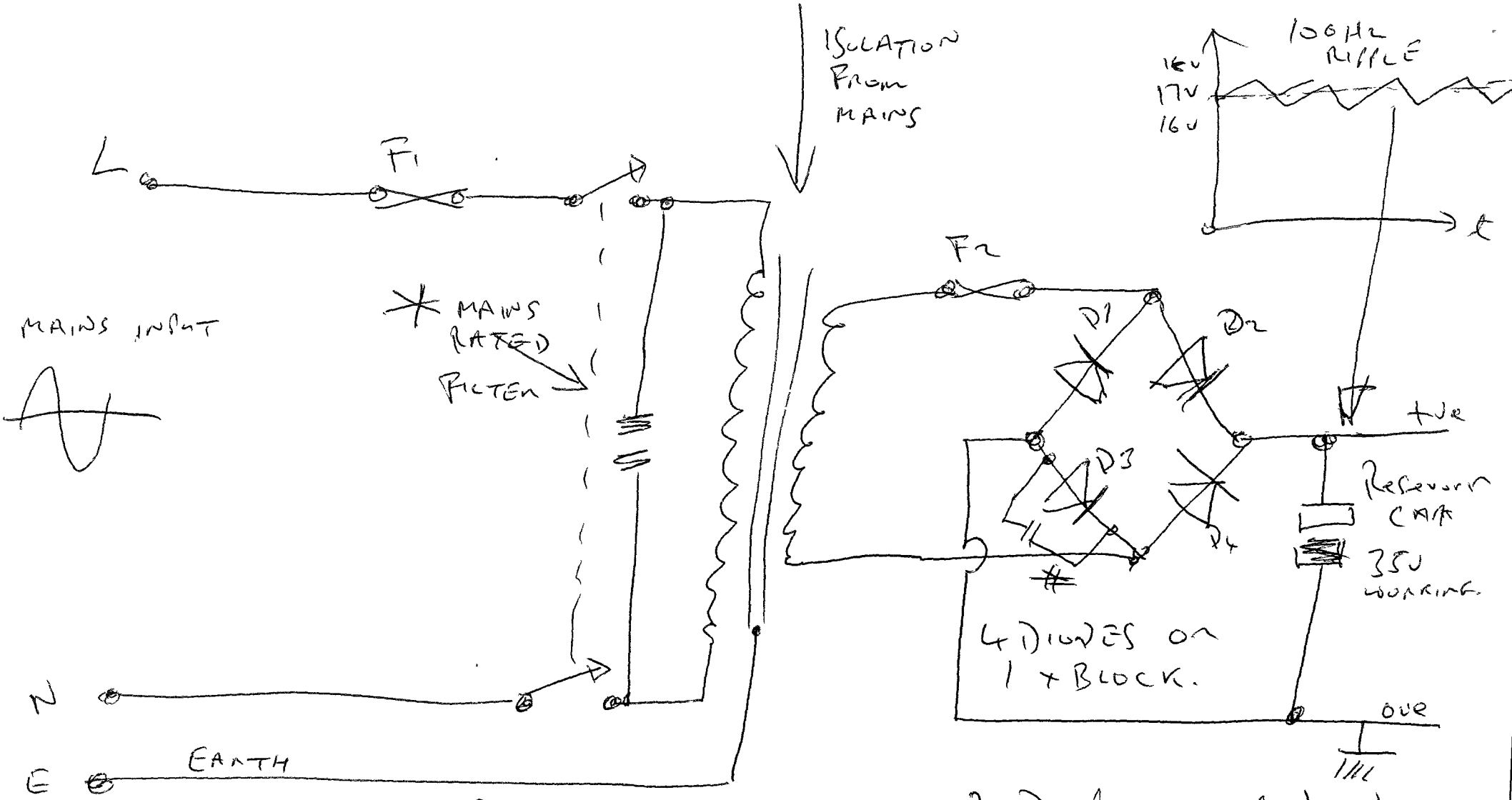

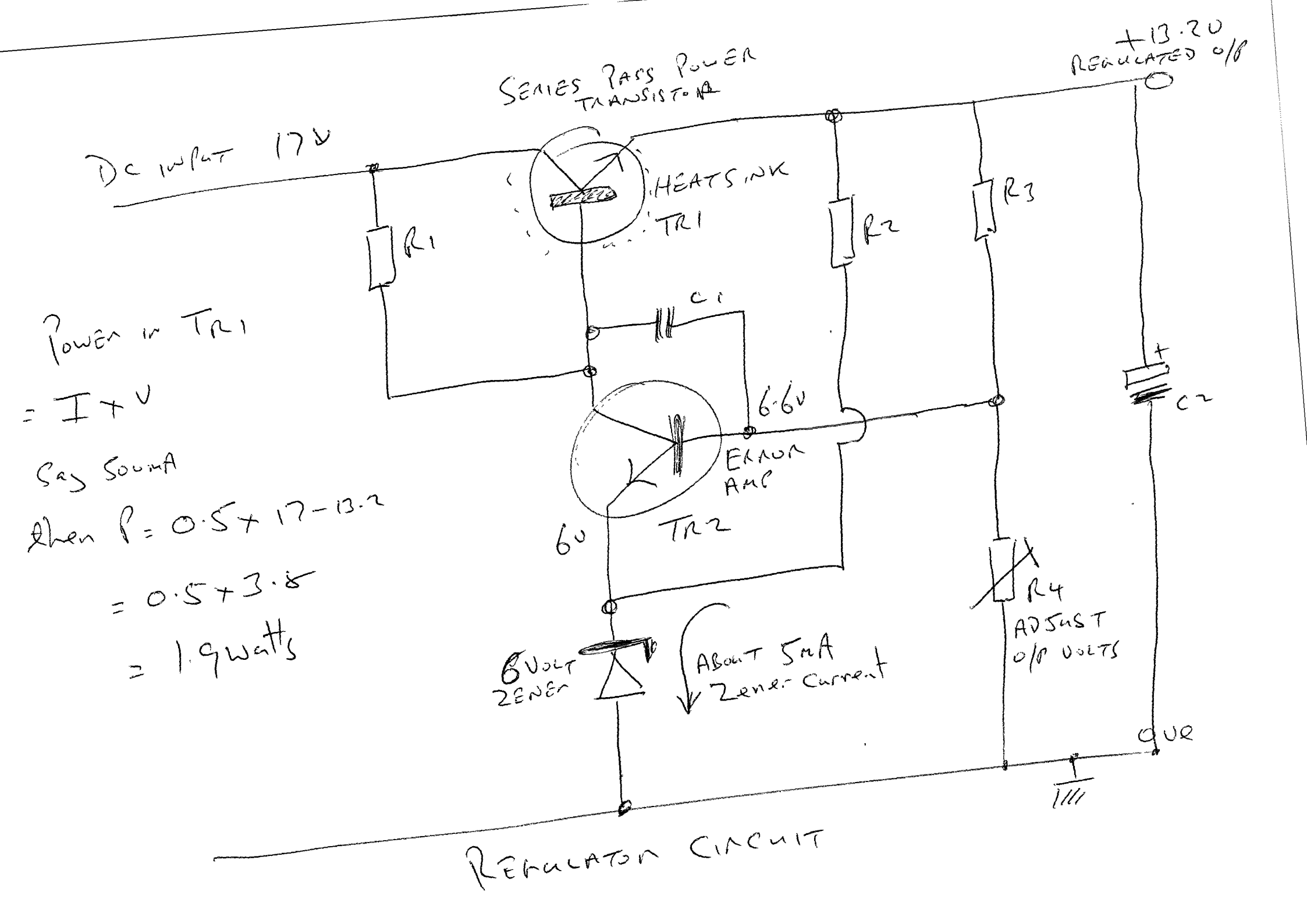

Power in TR1

= I x V

Say 500mA

then P = 0.5 x 17 - 13.2

= 0.5 x 3.8

= 1.9 watts