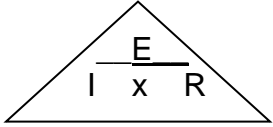


# PARALLEL CIRCUITS (DC)

## OHMS LAW

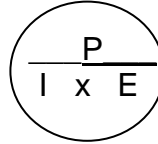


$$E = I \times R$$

$$I = E / R$$

$$R = E / I$$

## POWER LAW



$$P = I \times E$$

$$I = P / E$$

$$E = P / I$$

## Parallel Circuit Laws

Voltage – The voltage drop across each branch of a parallel circuit is the same as the applied voltage.

$$E_1 = E_2 = E_3 = E_4 \text{ (etc.)} = E_T \text{ (total)}$$

Current – The sum of the currents through all of the branches is equal to the total current.

$$I_1 + I_2 + I_3 + I_4 \text{ (etc.)} = I_T \text{ (total)}$$

Resistance – The total resistance is always less than the resistance of the lowest-value resistor, or branch, in the circuit. There are three formulas you can use.

$R_T = R/N$  (when all resistors are of equal value)

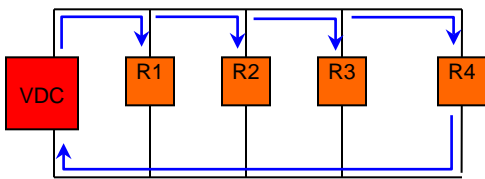
Product over Sum –  $R_T = \frac{R_1 \times R_2}{R_1 + R_2}$  can use this on two branch resistances at a time.

Reciprocal Formula -

$$R_T = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} \text{ (etc.)}}$$

Power – The total power is equal to the sum of the power used across each unit of resistance.

$$P_1 + P_2 + P_3 + P_4 \text{ (etc.)} = P_T \text{ (total)}$$



	R1	R2	R3	R4	Total
E	277 V	277 V	277 V	277 V	277 V
I	.00231 A	.00139 A	.00154 A	.00115 A	.00639 A
R	119913Ω	119281Ω	179870Ω	240870Ω	43349 Ω
P	.640 W	.385 W	.427 W	.318 W	1.770 W

Follow these numbered steps to solve. Colors below coordinate with the EIRP chart above. No shading or colors indicate provided values.

- $I_1 = I_T - (I_2 + I_3 + I_4) = I_1$   
 $.00231 \text{ A} = .00639 - (.00139 \text{ A} + .00154 \text{ A} + .00115 \text{ A})$
- $P_1 / I_1 = E_1$   
 $.640 \text{ W} / .00231 \text{ A} = 277 \text{ V}$
- $E_1 = E_2 = E_3 = E_4 = E_T$   
 $277 \text{ V} = 277 \text{ V} = 277 \text{ V} = 277 \text{ V}$
- $E / I = R$   
 $277 \text{ V} / .00231 \text{ A} = 119913\Omega$   
 $277 \text{ V} / .00139 \text{ A} = 119281\Omega$   
 $277 \text{ V} / .00154 \text{ A} = 179870\Omega$   
 $277 \text{ V} / .00115 \text{ A} = 240870\Omega$   
 $277 \text{ V} / .00639 \text{ A} = 43349 \Omega$
- $E \times I = P$   
 $277 \text{ V} \times .00139 \text{ A} = .385 \text{ W}$   
 $277 \text{ V} \times .00154 \text{ A} = .427 \text{ W}$   
 $277 \text{ V} \times .00115 \text{ A} = .318 \text{ W}$   
 $277 \text{ V} \times .00639 \text{ A} = 1.770 \text{ W}$
- $P_1 + P_2 + P_3 + P_4 = P_T$   
 $.640 \text{ W} + .385 \text{ W} + .427 \text{ W} + .318 \text{ W} = 1.770 \text{ W}$