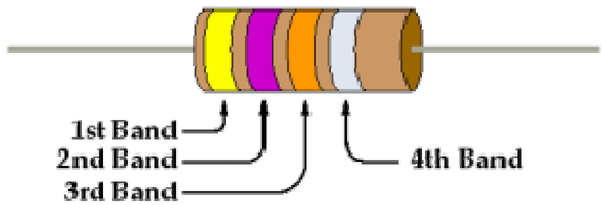
Resistor Color Code

Try our Resistor Calculator eTool



Color	1^{st} Band	2^{nd} Band	3^{rd} Band (Multiplier)	4^{th} Band (Tolerance)
Silver			0.01	None (±20%) Silver (±10%) Gold (±5%)
Gold			0.1	None (±20%) Silver (±10%) Gold (±5%)
Black	0	0	1	None (±20%) Silver (±10%) Gold (±5%)
Brown	1	1	10	None (±20%) Silver (±10%) Gold (±5%)
Red	2	2	100	None (±20%) Silver (±10%) Gold (±5%)
Orange	3	3	1000	None (±20%) Silver (±10%) Gold (±5%)
Yellow	4	4	10000	None (±20%) Silver (±10%) Gold (±5%)
Green	5	5	100000	None (±20%) Silver (±10%) Gold (±5%)
Blue	6	6	1000000	None (±20%) Silver (±10%) Gold (±5%)
Violet	7	7	10000000	None (±20%)

				Silver (±10%) Gold (±5%)
Gray	8	8	100000000	None (±20%) Silver (±10%) Gold (±5%)
White	9	9	1000000000	None (±20%) Silver (±10%) Gold (±5%)

Mnemonic to remember the color order:

- **B**rave **B**oys **R**ace **O**ur **Y**oung **G**irls **B**ut **V**iolet **G**enerally ins

How to decipher the code:

1. Take the first color and find its integer equivalent (e.g., Yellow = 4)
2. Take the second color and find its integer equivalent (e.g., Violet = 7)
3. Take the third color and find its multiplier equivalent (e.g., Orange = 1000)
4. Take the third color and find its tolerance equivalent (e.g., Silver = ±10%)

Putting them all together: 47 * 1000 = 47000 Ω = **47 KΩ ±10%**

http://www.aqeds.com/support/rot/rot_resistor.asp

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http://www.tscm.com/elecform.pdf
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http://www.coasteltools.com/tech_electronic-formulas.htm

Ohm's Law Formulas for D-C Circuits.

$$E = IR = \frac{P}{I} = \sqrt{PR} \qquad P = I^2 R = EI = \frac{E^2}{R}$$

Ohm's Law Formulas for A-C Circuits.

In these formulas θ is the angle of lead or lag between current and voltage and cos θ = P/EI = power factor.

$$E = IZ = \frac{P}{I\cos\Theta} = \sqrt{\frac{PZ}{\cos\Theta}} \qquad P = I^2 Z\cos\Theta = IE\cos\Theta = \frac{E^2\cos\Theta}{Z}$$

Resistors in Series

$R_{total} = R_1 + R_2 + R_3 + \ldots$

Two Resistors in Parallel

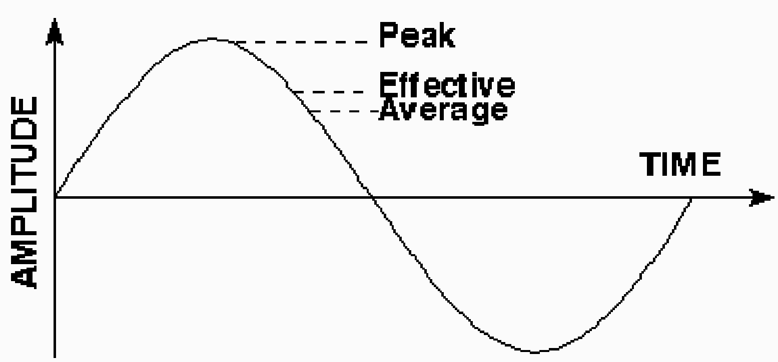
$$R_t = \frac{R_1 R_2}{R_1 + R_2}$$

Resistors in Parallel, General Formula

$$R_{total} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots}$$

Sinusoidal Voltages and Currents

Effective value	=	0.707 x peak value
[Also known as Root-Mean Square (RMS) value]		
Half Cycle Average value	=	0.637 x peak value
Peak value	=	1.414 x effective value
Effective value	=	1.11 x average value



Resonant Frequency Formulas:

*Where in the second formula f is in kHz and L and C are in micro units.

$$f = \frac{1}{2\pi\sqrt{LC}} \quad or \quad f = \frac{159.2*}{\sqrt{LC}}$$

$$L = \frac{1}{4\pi^2 f^2 C} \quad or \quad L = \frac{25,330*}{f^2 C}$$

$$C = \frac{1}{4\pi^2 f^2 L} \quad or \quad C = \frac{25,330*}{f^2 L}$$

Conductance

$$G = \frac{1}{R} \quad (for\ D\text{-}C\ circuits) \qquad G = \frac{R}{R^2 + X^2} \quad (for\ A\text{-}C\ circuits)$$

Reactance Formulas

$$X_C = \frac{1}{2\pi f C} \qquad C = \frac{1}{2\pi f X_C} \qquad X_L = 2\pi f L \qquad L = \frac{X_L}{2\pi f}$$

Impedance Formulas

For series circuits

$$Z = \sqrt{R^2 + (X_L - X_C)^2}$$

For R and X in parallel

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

Q or Figure of Merit

$$Q = \frac{X_L}{R} \quad or \quad \frac{X_C}{R}$$

Power Factor

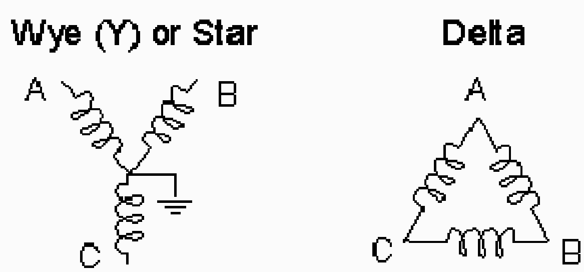
pf = cos θ, where θ is the angle of lead or lag

Note: Active power is the "resistive" power
and equals the equivalent heating effect on water.

$$pf = \frac{\text{Active power (in watts)}}{\text{Apparent power (in volt-amps)}} = \frac{P}{EI} \qquad pf = \frac{R}{Z}$$

Three-phase AC Configurations (120 deg phase difference between each voltage)

If the connection to a three phase AC configuration is miswired, switching any two of the phases will put it back in the proper sequence. Electric power for ships commonly uses the delta configuration, while commercial electronic and aircraft applications commonly use the wye configuration.



Voltage/Current Phase Rule of Thumb: Remember "ELI the ICE man"

ELI: Voltage (E) comes before (leads) current (I) in an inductor (L)

ICE: Current (I) comes before (leads) Voltage (E) in a capacitor (C)

Color Code for Resistors

First and second band: (and third band # of zeros if not gold/silver)				Third band Multiplier		Fourth band Tolerance	
0	0 BLACK	5	5 GREEN	0.1	GOLD	5%	GOLD
1	1 BROWN	6	6 BLUE	0.01	SILVER	10%	SILVER
2	2 RED	7	7 VIOLET			20%	NO COLOR
3	3 ORANGE	8	8 GRAY				
4	4 YELLOW	9	9 WHITE				
The third color band indicates number of zeros to be added after figures given by first two color bands. But if third color band is gold, multiply by 0.1 and if silver multiply by 0.01. Do not confuse with fourth color-band that indicates tolerance. Thus, a resistor marked blue-red-gold-gold has a resistance of 6.2 ohms and a 5% tolerance.							

Color Code for House Wiring

Color Code	Purpose	Color Code for Chassis Wiring:
Black or **red**	**HOT**	**Red**
White	NEUTRAL (Return)	White
Green or bare	GROUND	Black