1st week

Resistor Color Code

Electronic color code for resistors

- The electronic color code is used to indicate the values or ratings of electronic components.
  (resistors, capacitors, inductors)
- The electronic color code was developed in the early 1920s by the Radio Manufacturers Association (now part of Electronic Industries Alliance[1] (EIA)).

- Merits
  1.They were easily printed on tiny components, decreasing construction costs.
  2. Advances in printing technology have made printed numbers practical for small components

- Drawback
  1. Color blind people can not read it.
  2. Overheating of a component, or dirt accumulation, may make it impossible to distinguish brown from red and orange.

Electronic color code for resistors

- Resistors use preferred numbers(표준수) for their specific values, which are determined by their tolerance(허용오차).
- The values of preferred numbers repeat for every decade of magnitude:

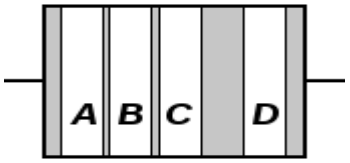
  For instance,

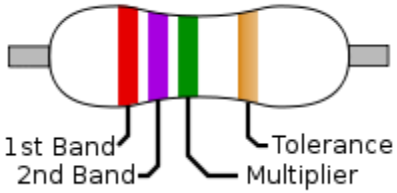
  1. 2.2Ω 22Ω, 220Ω, 2.2kΩ, 220kΩ, 2.2MΩ
  2. 6.8Ω, 68Ω, 680Ω, 6.8k, 68k, 680k

  and so forth.

- A 0Ω resistor, marked with a single black band.

Electronic color code for resistors

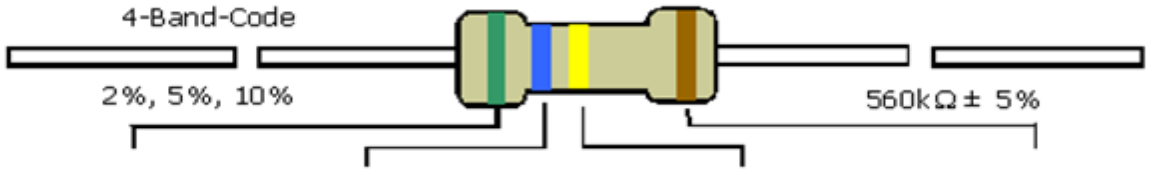




- Band A is first significant figure of component value (left side)
- Band B is the second significant figure
- Band C is the decimal multiplier
- Band D if present, indicates tolerance of value in percent (no band means 20%)

To distinguish left from right there is a gap between the C and D bands.

Resistor color code chart



COLOR	1st BAND	2nd BAND	3rd BAND	MULTIPLIER	TOLERANCE
Black	0	0	0	1Ω	
Brown	1	1	1	10Ω	± 1% (F)
Red	2	2	2	100Ω	± 2% (G)
Orange	3	3	3	1KΩ	
Yellow	4	4	4	10KΩ	
Green	5	5	5	100KΩ	±0.5% (D)
Blue	6	6	6	1MΩ	±0.25% (C)
Violet	7	7	7	10MΩ	±0.10% (B)
Grey	8	8	8		±0.05%
White	9	9	9		
Gold				0.1	± 5% (J)
Silver				0.01	± 10% (K)

Electronic color code for resistors

- For example, a resistor with bands of *yellow, violet, red, and gold* will have
  - First digit 4 (yellow in table below),
  - Second digit 7 (violet),
  - Third digit 2 (red) zeros: 4,700 Ω = 4.7kΩ
  - Fourth gold band signifies that the tolerance is ±5%, so the real resistance could lie anywhere between 4,465 and 4,935 ohms.

1. Determine the resistor color code of the following example

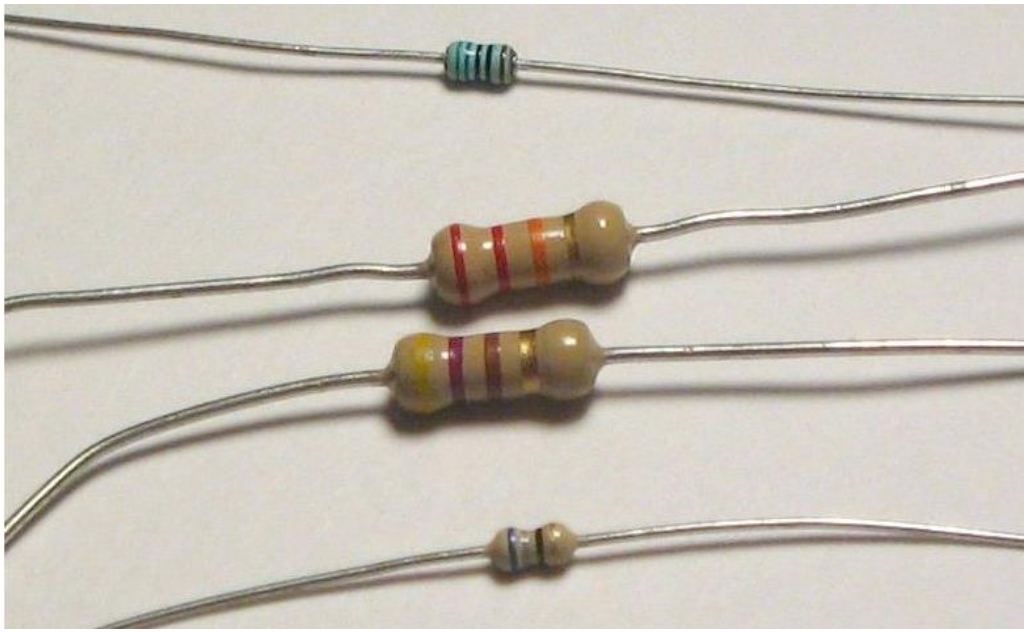
Ex1. A 33Ω, 5% through-hole resistor(관통형 저항).

Ex2. A 470Ω, 10% through-hole resistor.

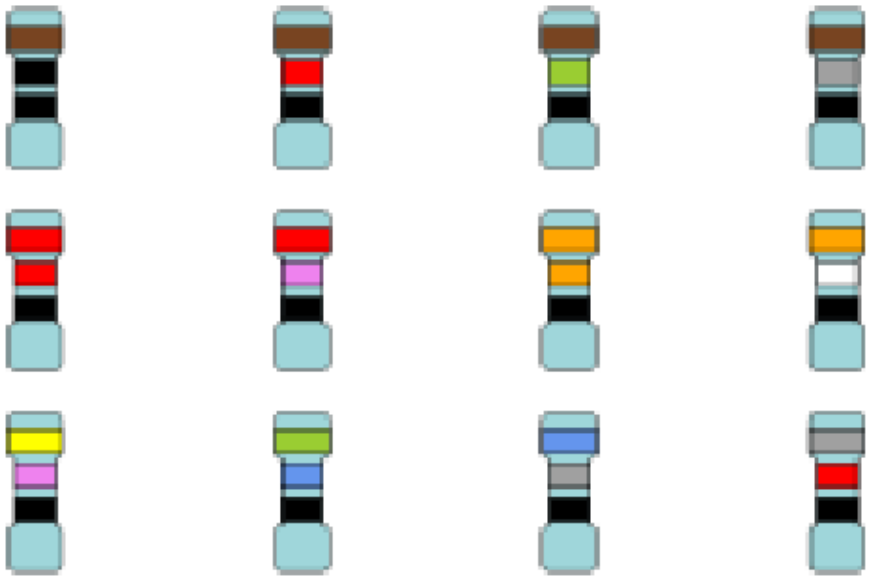
Ex3. A 2.2 kΩ, 5% through-hole resistor.

Ex41. A 100 kΩ, 10% through-hole resistor.

2. Determine the resistor values of the following figures



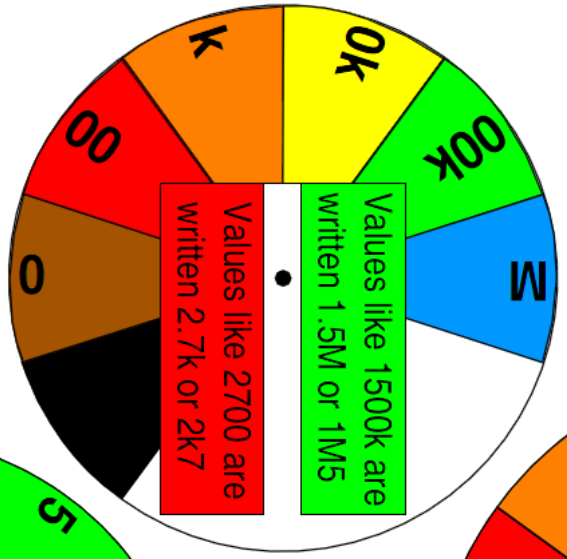
Preferred Resistor values



One decade of the E12 series (there are twelve preferred values per decade of values) shown with their electronic color codes on resistors.

Resistor Colour Code Calculator

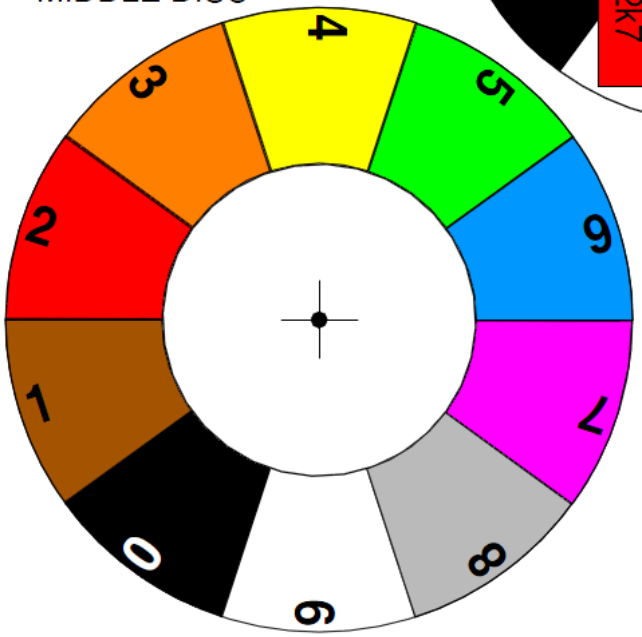
Using this you can convert values to colour codes or colour codes to values.



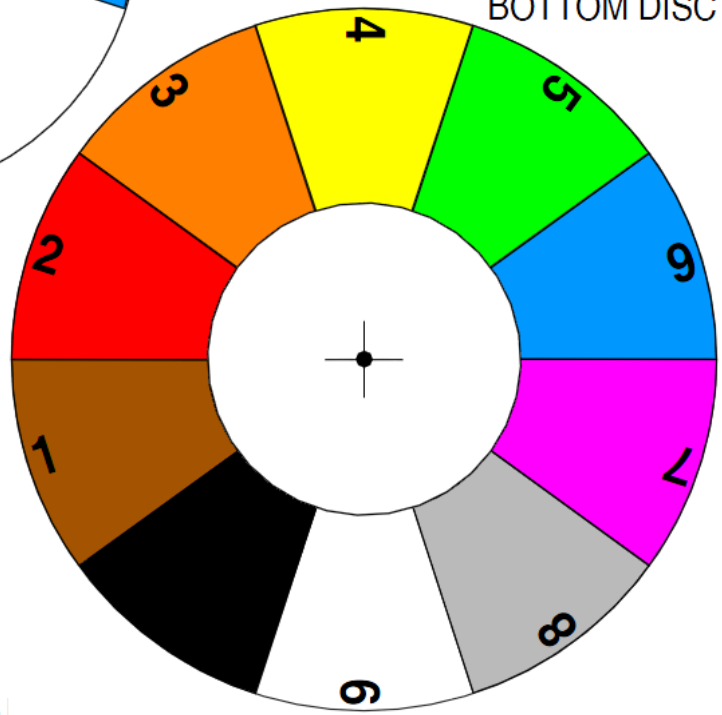
Instructions

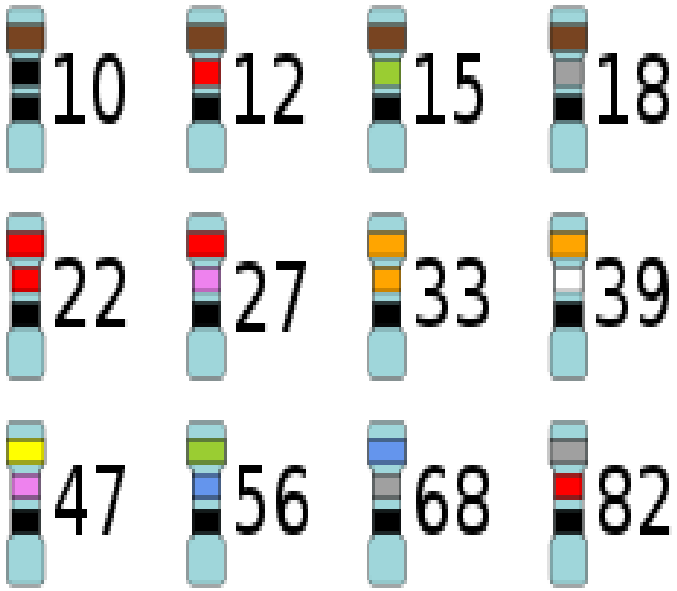
1. Carefully cut out each disc.
2. Make a small hole at the centre of each disc (marked ●).
3. Fasten the discs together with a paper fastener so they rotate.

MIDDLE DISC



BOTTOM DISC





From top to bottom:

Green-Blue-Black-Black-Brown
560 Ω ± 1%

Red-Red-Orange-Gold
22 kΩ ± 5%

Yellow-Violet-Brown-Gold
470 Ω ± 5%

Blue-Gray-Black-Gold
68 Ω ± 5%

1-7. 2 표준접두첨자

표 1-3 SI 접두첨자

첨자	약호 및 지수값	첨자	약호 및 지수값
atto-	(a-, 10^{-18})	deci-	(d-, 10^{-1})
femto-	(f-, 10^{-15})	deka-	(da-, 10^{1})
pico-	(p-, 10^{-12})	hecto-	(h-, 10^{2})
nano-	(n-, 10^{-9})	kilo-	(k-, 10^{3})
micro-	(μ-, 10^{-6})	mega-	(M-, 10^{6})
milli-	(m-, 10^{-3})	giga-	(G-, 10^{9})
centi-	(c-, 10^{-2})	tera-	(T-, 10^{12})

예제 1-7 다음의 양들을 표준접두첨자를 사용하여 적당히 표현하여라.

(a) R=10,000[Ω] (b) V=154,000[V]
(c) L=0.01[H] (d) C=0.00002[F]
(e) I=0.01[A] (f) P=3,000,000[W]

풀이 표 1-3을 참조하면 다음과 같이 표시할 수 있다.

(a) R=10,000[Ω]=10[kΩ] (b) V=154,000[V]=154[kV]
(c) L=0.01[H]=10[mH] (d) C=0.00002[F]=20[μF]
(e) I=0.01[A]=10[mA] (f) P=3,000,000[W]=3[MW]

Prefix	T	G	M	K	Unit	m	μ	p
				1000		0.001		
저항		1GΩ	1000MΩ					
[Ohm]			1MΩ	1000kΩ				
				1kΩ	1000Ω			
					1Ω	1000mΩ		
전력		1GW	1000MW					
[Watt]			1MW	1000kW				
				1kW	1000W			
					1W	1000mW		
전압			1MV	1000kV				
[Volt]				1kV	1000V			
					1V	1000mV		
전류				1kA	1000A			
[Ampere]					1A	1000mA		
						1mA	1000μA	
인덕턴스					1H	1000mV		
[Henry]						1mH	1000μH	
커패시턴스					1F	1000mF		
[Farad]						1mF	1000μF	
							1μF	1000pF
메모리용량	1TB	1024GB						
[Byte]	=1024GB	1GB	1024MB					
			1MB	1024kB				
				1kB	1024B			
					1Byte	8bit		