Electronics Resistors and Resistance

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Terry Sturtevant Electronics Resistors and Resistance

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistors and Measuring Resistance

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistors and Measuring Resistance

Resistance can only reliably be measured when a resistor is *not* part of a circuit.

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Resistance can only reliably be measured when a resistor is *not* part of a circuit.

If this can't be done, then the power to the circuit must be turned off.

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Resistance can only reliably be measured when a resistor is *not* part of a circuit.

If this can't be done, then the power to the circuit must be turned off.

Current and voltage must be measured with power applied to the circuit

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistors in Circuit Diagrams

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistors in Circuit Diagrams

Resistor symbols

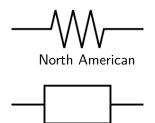
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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistors in Circuit Diagrams

Resistor symbols



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low power; 1/4 W

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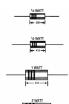


low power; 1/4 Wmedium power; 1/2 W

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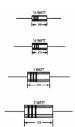
low power; 1/4 W

medium power; 1/2 W

medium high power; 1 W

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low power; 1/4 W

medium power; 1/2 W

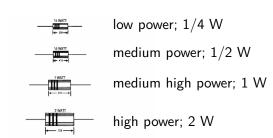
medium high power; 1 W

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high power; 2 W



Higher power resistors are bigger so they can dissipate more heat.

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"Normal" (i.e. 1/4 W) resistor

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1/2 W resistor

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One kind of high power resistor (fins)

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The wattage is indicated on this resistor.

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High power hollow resistor

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High power hollow resistor (end view)

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• Always measure resistance by ohmmeter when the power is off *but never when the power is on.*

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- Always measure resistance by ohmmeter when the power is off *but never when the power is on*.
- *Determine resistance* based on ohm's law using the voltage across the resistor and the current passing through it.

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- Always measure resistance by ohmmeter when the power is off *but never when the power is on*.
- *Determine resistance* based on ohm's law using the voltage across the resistor and the current passing through it.
- The most reliable measurement will be with the resistor removed from any circuit.

Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistor Colour Codes

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistor Colour Codes

Colour codes

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistor Colour Codes

Colour codes

• allow resistors to be identified visually

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Resistor Colour Codes

Colour codes

- allow resistors to be identified visually
- are international

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• Better (Black - 0)

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- Better (Black 0)
- Be (Brown 1)

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- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)

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- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)

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- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)
- Your (Yellow 4)

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- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)
- Your (Yellow 4)
- Great (Green 5)

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- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)
- Your (Yellow 4)
- Great (Green 5)
- Big (Blue 6)

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- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)
- Your (Yellow 4)
- Great (Green 5)
- Big (Blue 6)
- Venture (Violet 7)

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Colour Codes

- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)
- Your (Yellow 4)
- Great (Green 5)
- Big (Blue 6)
- Venture (Violet 7)
- Goes (Grey 8)

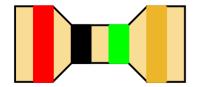
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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

Colour Codes

- Better (Black 0)
- Be (Brown 1)
- Right (Red 2)
- Or (Orange 3)
- Your (Yellow 4)
- Great (Green 5)
- Big (Blue 6)
- Venture (Violet 7)
- Goes (Grey 8)
- Wrong (White 9)

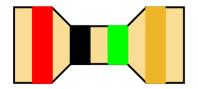
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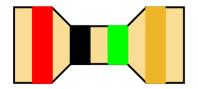
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• First 2 bands give prefix; eg. 20 (Red Black)

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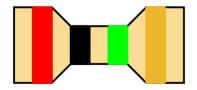
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- First 2 bands give prefix; eg. 20 (Red Black)
- Third band gives multiplier; eg. 5 (Green)

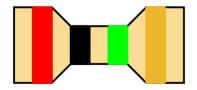
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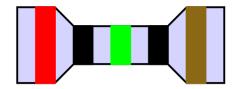
- First 2 bands give prefix; eg. 20 (Red Black)
- Third band gives multiplier; eg. 5 (Green)
- Fourth band gives tolerance; eg. 5% (Gold)

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- First 2 bands give prefix; eg. 20 (Red Black)
- Third band gives multiplier; eg. 5 (Green)
- \bullet Fourth band gives tolerance; eg. 5% (Gold)
- Result $20\times 10^5\pm$ 5%

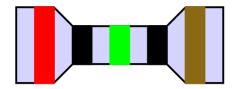
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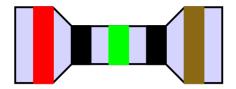
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• First 3 bands give prefix; eg. 205 (Red Black Green)

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- First 3 bands give prefix; eg. 205 (Red Black Green)
- Fourth band gives multiplier; eg. 0 (Black)

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- First 3 bands give prefix; eg. 205 (Red Black Green)
- Fourth band gives multiplier; eg. 0 (Black)
- Fifth band gives tolerance; eg. 1% (Brown)

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- First 3 bands give prefix; eg. 205 (Red Black Green)
- Fourth band gives multiplier; eg. 0 (Black)
- Fifth band gives tolerance; eg. 1% (Brown)
- Result $205 \times 10^0 \pm 1\%$

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

3 or 4 Band Tolerance Colour Codes

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

3 or 4 Band Tolerance Colour Codes

• Gold - 5%

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3 or 4 Band Tolerance Colour Codes

- Gold 5%
- Silver 10%

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

3 or 4 Band Tolerance Colour Codes

- Gold 5%
- Silver 10%
- No band 20%

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

5 or 6 Band Tolerance Colour Codes

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Resistors in Circuit Diagrams Resistor Colour Codes Tolerance Colour Codes

5 or 6 Band Tolerance Colour Codes

Black NA

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- Black NA
- Brown 1%

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- Black NA
- Brown 1%
- Red 2%

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- Black NA
- Brown 1%
- Red 2%
- Orange 3%

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- Black NA
- Brown 1%
- Red 2%
- Orange 3%
- Yellow 4%

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- Black NA
- Brown 1%
- Red 2%
- Orange 3%
- Yellow 4%
- Green 0.5%

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- Black NA
- Brown 1%
- Red 2%
- Orange 3%
- Yellow 4%
- Green 0.5%
- Blue 0.25%

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- Black NA
- Brown 1%
- Red 2%
- Orange 3%
- Yellow 4%
- Green 0.5%
- Blue 0.25%
- Violet 0.1%

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DQ P

- Black NA
- Brown 1%
- Red 2%
- Orange 3%
- Yellow 4%
- Green 0.5%
- Blue 0.25%
- Violet 0.1%
- Grey 0.05%

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- Black NA
- Brown 1%
- Red 2%
- Orange 3%
- Yellow 4%
- Green 0.5%
- Blue 0.25%
- Violet 0.1%
- Grey 0.05%
- White NA

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