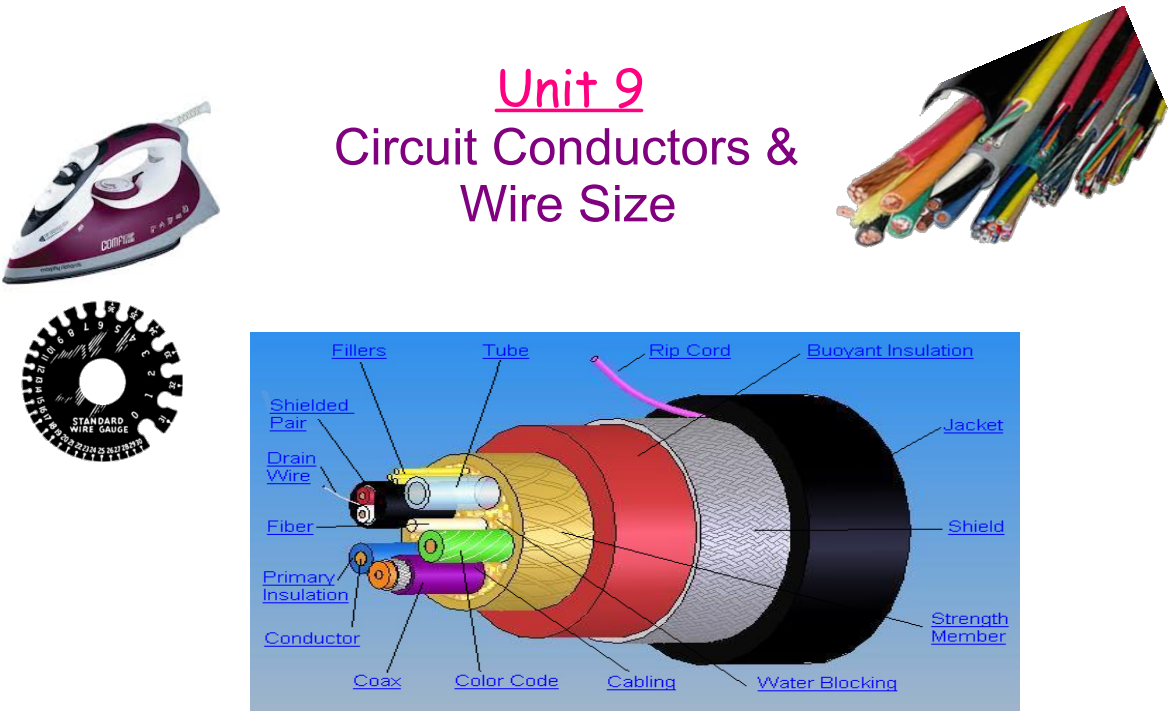


## Unit 9

### Circuit Conductors & Wire Size



The diagram shows a cross-section of a cable with the following components labeled:

- Fillers
- Tube
- Rip Cord
- Buoyant Insulation
- Jacket
- Shield
- Strength Member
- Water Blocking
- Cabling
- Color Code
- Coax
- Conductor
- Primary Insulation
- Fiber
- Drain Wire
- Shielded Pair

Jan 29-10:29 AM

### Conductor Forms

-Most popular type of resistance wire is copper  
 \*easy to work with

#### 4 Common conductor forms

-Copper conductors used for wiring circuits can be made in the form of wire,  
cable, cord  
 or printed circuit board.

-A solid wire is a single conductor covered by some form of insulation

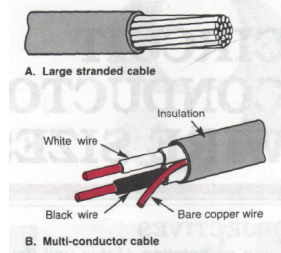
-A stranded wire is a single conductor made up of small diameter wires running along side each other. Provides flexibility

Both use in electronic equipment hook ups

Feb 10-2:27 AM

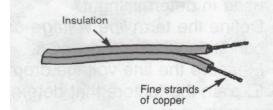
-**Cable** is a larger stranded insulated wire or 2 or more separately insulated wires within a common covering. (used in circuits that require large amount of current)  
such as house wiring

FIGURE 9-2 CABLE FORMS



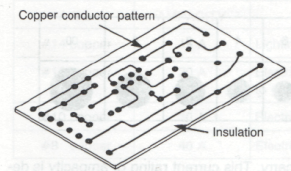
-**A Cord** is very flexible cable used to supply current to appliances or tools. Made of strands of very fine wire twisted together.

FIGURE 9-3 LAMP CORD



**Printed circuits** - used in low current electronic equipment  
\*consist of conducting paths of thin copper strips etched or printed on a flat insulated plate

FIGURE 9-4 PRINTED CIRCUIT BOARD



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### Conductor Insulation

[http://www.youtube.com/watch?v=YJS\\_Jqw3Sy0](http://www.youtube.com/watch?v=YJS_Jqw3Sy0)

-Factor when selecting wire insulation:

- \*Circuit Voltage
- \*Surrounding Temperature
- \*Moisture
- \*Conductor Flexibility

DON'T COPY black

-Thermoplastic is commonly used as an insulator.

\*sensitive to extreme temperature

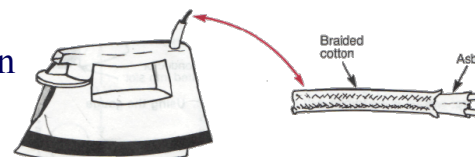
\*TW thermoplastic is waterproof

\*TWH is weatherproof and heat resistant

-Neoprene is a special rubber used on power cords on heat producing appliances such as kettles.

FIGURE 9-5 HEAT-PROOF IRON CORD INSULATION

-Asbestos is heat-proof used in braided cotton



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# Wire Size

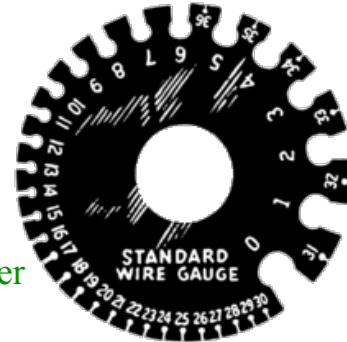
-size is determined by diameter

-For convince size is referred by an equivalent gauge number rather that actual diameter

-American Wire Gauge (AWG) table list sizes

-AWG 40 is the smallest

-the larger the gage number the smaller the diameter



AWG Number	18	16	14	12	10	8	6	4	2	0	00
Approximate Area											

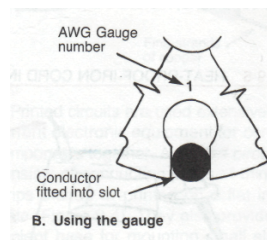
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## AGW gage

How to use???

Strip wire's end

Always insert bare end into the smallest slot in which it fits (without using force)



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## Conductor Ampacity

- Ampacity of a conductor is the maximum amount of current it can safely carry
- Determined by material, gauge size, type of insulation and conditions in which it is installed.
  - \*Copper is a better conductor than Aluminum so it can carry more current for a given gauge
  - \*the smaller the gauge number the larger the conductor and the more current it can carry
    - ↗ big wire

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### List of common ampacity

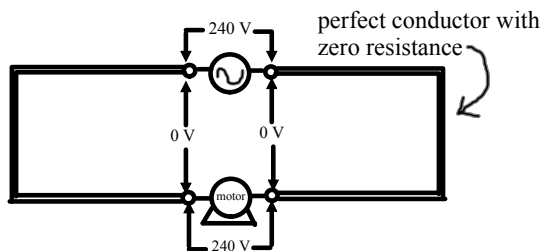
know this

AWG	AMPACITY	APPLICATION
#14 copper	15 A	Lighting and receptacle branch circuits.
#12 copper	20 A	Electric heating circuits and 240 V water heaters rated up to 4 500 W.
#10 copper	30 A	Electric dryers rated up to 7 000 W.
#8 copper	40 A	Electric ranges rated up to 12 000 W.

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## Conductor Resistance

- The resistance of the wire conductors of the circuit is low when compared to that of the load
- In most circuits the conductors are treated as being perfect conductors of electricity
- As a result they are solid and have zero resistance

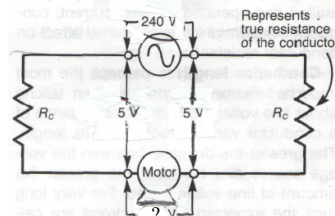


- **THUS** in tis case the voltage value of the source is the same as that across the load. (NO Voltage is lost in the line)

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- In some circuits the resistance of the conductors is important and must be taken into account
- This is often the case where the load is located some distance from the voltage source.  
load voltage is less than the energy source
- The difference in voltage between the voltage source and the load is called the line voltage drop.

FIGURE 9-9 10 V-LINE VOLTAGE DROP



Example) The line voltage drop for the above circuit is:  
 $5\text{ V} + 5\text{ V} = 10\text{ V}$

Example) The voltage applied to the motor for the circuit drawn above is:  
 $240\text{ V} - 10\text{ V} = 230\text{ V}$

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## Line Voltage Drops

- It is always desirable to keep the line voltage drop as low as possible. (so you don't rob the load of energy)
- Line voltage drops are kept low by keeping the resistance of the wires low
- The resistance of the length of wire is determined by:
  - \*type of metaal used
  - \*The operating temperature
  - \*length of the wire
  - \*AWG size or Cross sectional area of a wire

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- The resistance of a conductor varies with temperature. For copper the higher the temperature the higher the resistance.
- Conductor length is prehaps the most important factor to consider when talking about the voltage drops.
  - \* The greater the distance between the voltage source and the load, the greater the amount of load voltage drop
- AWG Size of the conductor is teh most important factor in correcting for excessive line voltage drops. The greater the cross-sectional area og the conductor, the lower is its resistance.

\*increase wire diameter above the rated current capacity to reduce line voltage losses

Feb 10-4:10 PM

Pg 87 textbook  
Review for Test

Test  
unit 9 MC

open book???

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