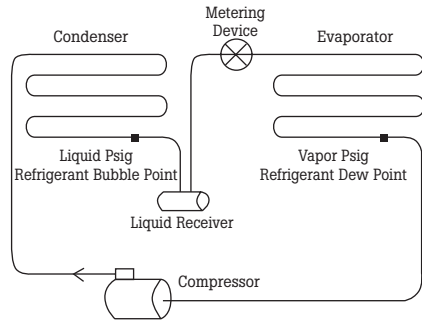
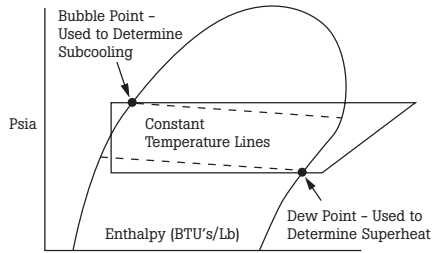




# Refrigeration Cycle



Pressure-Enthalpy (PH) Diagram for Refrigerant Blends



## Measuring superheat and subcooling using Fluke meters:

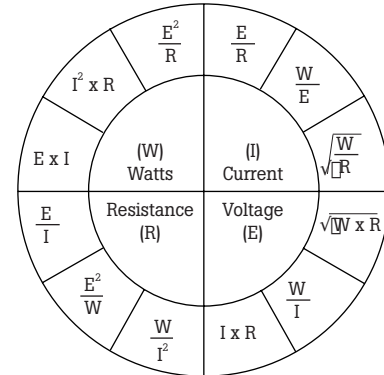
### To measure superheat:

- 1) Measure suction pressure with the Fluke PV350 Pressure Module and your digital multimeter (DMM). Convert pressure to temperature using your PT chart.
- 2) Measure the pipe temperature at the outlet of the evaporator with the Fluke 80PK-8 Pipe Clamp and your temperature meter.
- 3) Subtract the difference in temperatures to obtain superheat.

### To measure subcooling:

- 1) Measure liquid line pressure (or discharge pressure if there is no liquid line access valve) with the Fluke PV350 Pressure Module and your DMM. Convert the pressure to temperature using your PT chart.
- 2) Measure the pipe temperature at the outlet of the condenser with the Fluke 80PK-8 Pipe Clamp and your temperature meter.
- 3) Subtract the difference in temperatures to obtain subcooling.

# Ohms Law Wheel



## Handy electrical formulas

### Single Phase (1Ø) Power

$$KW = \frac{I \times E \times PF}{1000} \quad I = \frac{Hp \times 746}{\{E \times (\% \text{ effic.}) \times PF\}}$$

### Three Phase (3Ø) Power

$$\text{Watts} = E \times I \times \sqrt{3} \times \text{Power Factor (PF)}$$

$$I = \frac{\text{Watts}}{E \times \sqrt{3} \times PF} \quad E = \frac{\text{Watts}}{I \times \sqrt{3} \times PF}$$

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## Handy HVAC Formulas

- BTUH (sensible heat) = CFM x 1.08 x ΔT
- BTUH (latent heat) = CFM x 4750 x (Humidity Ratio Diff.)
- BTUH (total heat) = CFM x 4.5 x (Enthalpy Difference)
- BTUH (hydronic) = 500 x GPM x ΔT
- CFM = FPM x (Duct Area in square feet)
- FPM = 4005 x (√VP)      VP = TP - SP

$$\text{Motor Sheave Pitch} = \frac{\text{Required Fan RPM} \times \text{Fan Sheave Pitch}}{\text{Motor RPM}}$$

$$\text{CFM2} = \text{CFM1} \times \frac{\text{RPM2}}{\text{RPM1}} \quad \text{RPM2} = \text{RPM1} \times \frac{\text{CFM2}}{\text{CFM1}}$$

$$\text{RPM2} = \text{RPM1} \times \sqrt[3]{\frac{\text{BHP2}}{\text{BHP1}}} \quad \text{BHP2} = \text{BHP1} \times \left(\frac{\text{RPM2}}{\text{RPM1}}\right)^3$$

$$\text{RPM2} = \text{RPM1} \times \sqrt{\frac{\text{SP2}}{\text{SP1}}} \quad \text{SP2} = \text{SP1} \times \left(\frac{\text{RPM2}}{\text{RPM1}}\right)^2$$

- BTUH = British Thermal Units per Hour
- CFM = Cubic Feet Per Minute
- FPM = Feet Per Minute
- RPM = Revolutions Per Minute
- VP = Velocity Pressure
- SP = Static Pressure
- TP = Total Pressure
- BHP = Brake Horsepower
- ΔT = Temperature Difference (T<sub>1</sub> - T<sub>2</sub>)