SSR Cooling System Briefing

by
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Cooling System Components

- **Main Cooling Fan**
  - **Provides airflow across the radiator and the A/C condenser**
  - **“Turn-on” logic is controlled by the computer**
    - **Main fan to low at 226F (rising) and off at 219F (falling)**
    - **Main fan to high at 235F (rising) and to low at 226F (falling)**
    - **Main Fan off at speeds above 35mph**
    - **Main fan to low when A/C reaches 200psi (rising) and off at 150psi (falling)**
    - **Main fan to high when A/C reaches 230psi (rising) and to low at 215psi (falling)**
- **Thermostat**
  - **Will not allow any coolant to the radiator until the water pump inlet temperature reaches 187F**
  - **Modulates radiator (cool) and the engine return (hot) flow to maintain water pump inlet at 187F**
- **Pressure Cap**
  - **Maintains 15psi pressure on an operating engine**
  - **Provides escape route for excess coolant**
  - **Provides air inlet route for maintaining system volume when cooling**

Cooling System Components cont'd.

- **Surge Tank**
  - **Acts as an accumulator in the cooling system to allow for coolant expansion when hot**
  - **Provides air bubble removal central point in system**
  - **Provides buffering of surges in cooling system volume that come with engine rpm changes**
- **Radiator**
  - **Exchanges heat from the cooling system into the air**
  - **Has 30 – 40 degree F drop across the radiator for supplying "cool" coolant to the engine**
  - **Bleed line removes air bubbles that accumulate in the upper tank of the radiator and sends them to the surge tank**
- **Water Pump**
  - **Pulls coolant through the thermostat housing and provides it throughout the engine for cooling**
- **Steam Vent Line**
  - **Bleed line that removes air bubbles from the cylinder heads and sends them to the surge tank**

Know your cooling system regulation point

- **Highway cruise speed will yield "nominal" point for reference on the temp gauge**
  - **Low speed issues typically indicate an airflow problem**
  - **High speed issues typically indicate all except an airflow problem**

- **Symptoms related to parts:**
  - **Main Cooling Fan**
    - **Causes overheating at speeds below 35 mph.**
    - **Most evident in "stop-and-go" traffic**
  - **Thermostat**
    - **Causes shift from "nominal" reference point**
    - **Can show up at various conditions, depending on the type of malfunction**
  - **Pressure Cap**
    - **Causes shift from "nominal" reference point**
    - **Can show up at various conditions, depending on the type of malfunction**
    - **Collapsing upper hose is a dead give-away**
  - **Pressure Tank**
    - **Causes shift from "nominal" reference point**
  - **Radiator**
    - **Causes shift from "nominal" reference point when taxed**
    - **Noticeable inability to recover from short term heat load**
  - **Water Pump**
    - **Causes shift from "nominal" reference point at low speeds**

Things to know

- Properly pressurizing system will run at 15psi
- 3 degrees F for every PSI of pressure (15psi = 45F)
- Altitude affects boiling point of cooling system
  - 5,000 feet lowers boiling point about 9 degrees
- Air in coolant increases coolant temperature in cylinder heads
- Air in coolant decreases radiator efficiency
- High rpm engine operation tends to cavitate water pump (creating more air bubbles)
- Water pump cavitation is suppressed with increased pressure (like 15psi)
- Air Dam reduces re-ingestion of hot air at low speeds
- Foam air blocking pads are critical to forcing air through the radiator
- Overheating at high speed is a system problem
- Overheating at low speed is an airflow problem

Radiator Efficiency

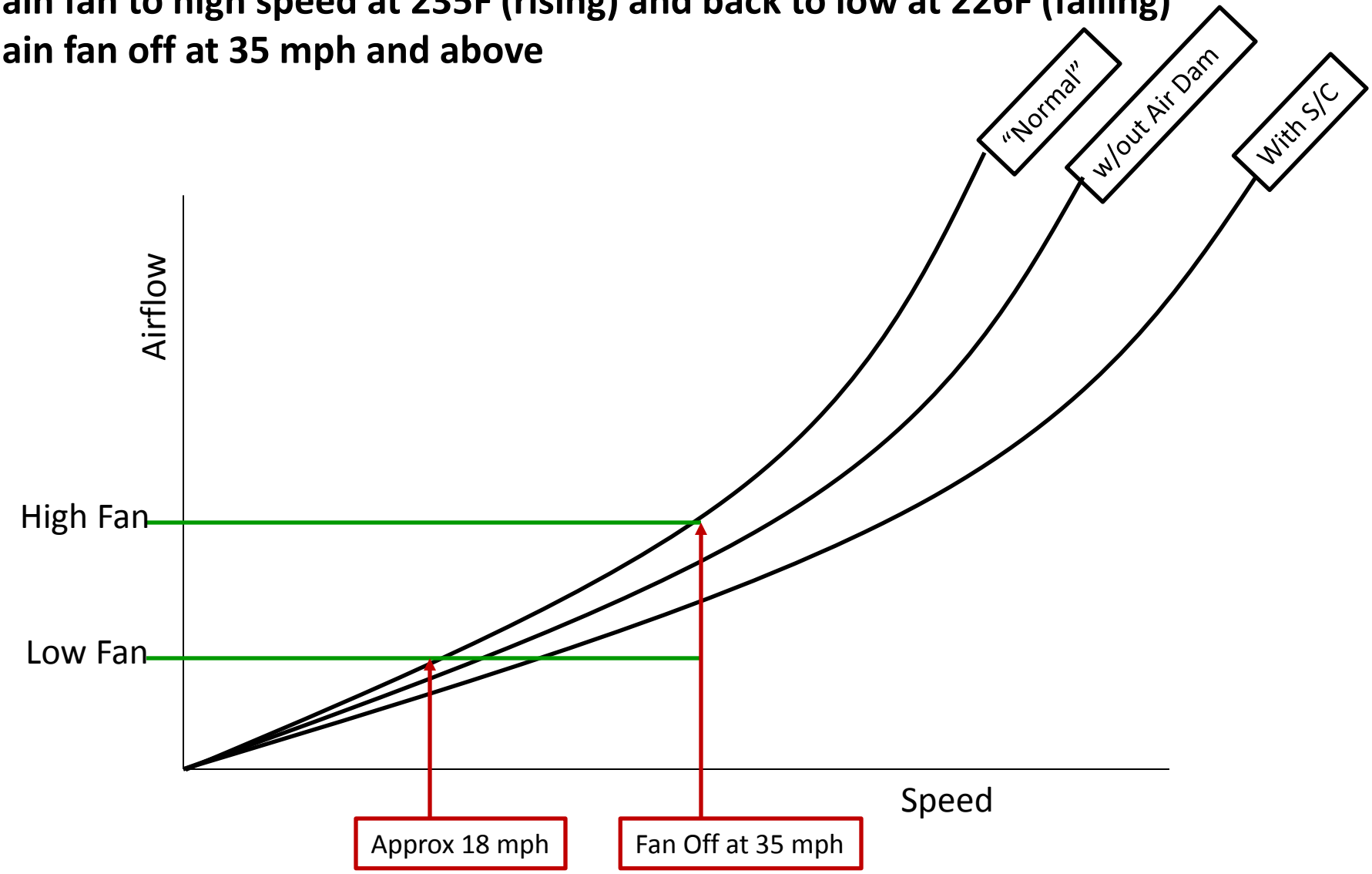
BTU Extraction = (Surface Area) x (Delta T) x (Airflow)

This is a primary system capacity consideration

- **Surface Area = Cooling tube surface area + Fin surface area**
  - **More surface area means more heat can be transferred**
- **Delta T = Difference between coolant and air temperatures**
  - **Higher Delta T means more heat can be transferred**
- **Airflow = Mass flow across the radiator**
  - **Higher flow across radiator means more heat can be transferred**
  - **Mass flow is used, because it takes air density into consideration**
  - **Denser air means more heat can be transferred**

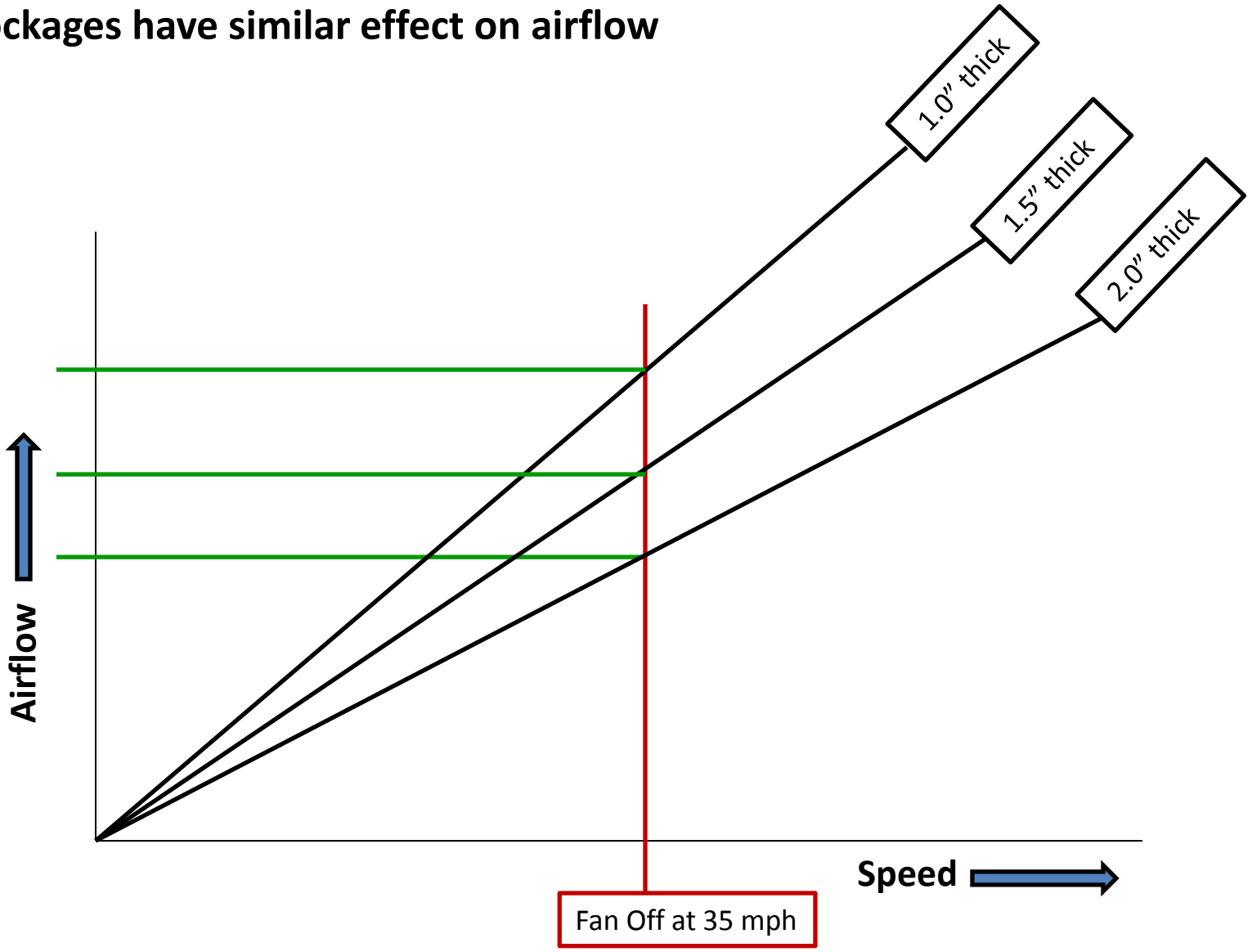
Airflow

- **Main fan to low speed at 226F (rising) and back off at 219F (falling)**
- **Main fan to high speed at 235F (rising) and back to low at 226F (falling)**
- **Main fan off at 35 mph and above**

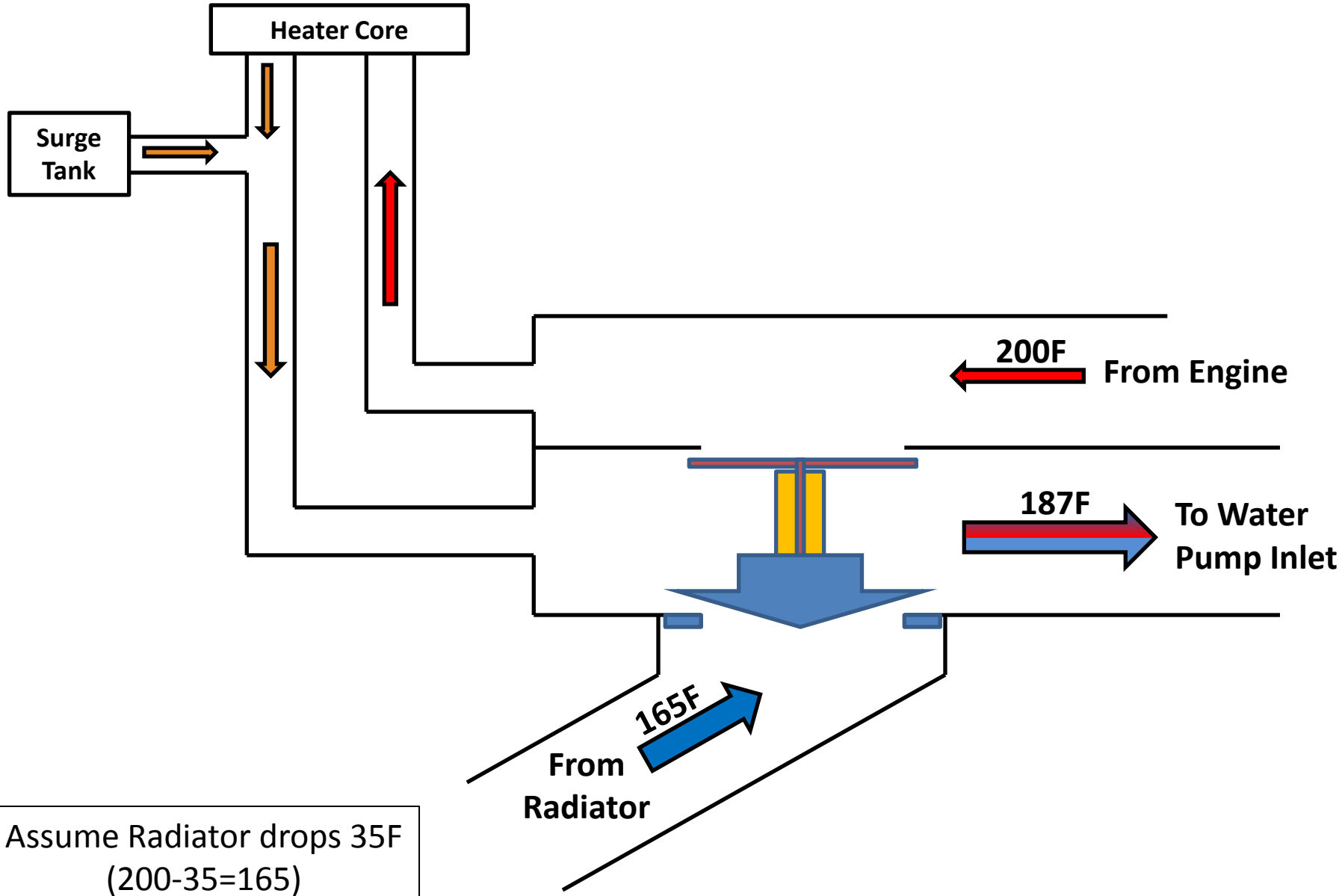


Airflow Restrictions

- Installing a thicker radiator does not necessarily improve cooling
- Any blockages have similar effect on airflow



Thermostat & Housing



Assume Radiator drops 35F
(200-35=165)

Thermostat Operation