

HAYDEN[®] AUTOMOTIVE
A COMPANY OF FOUR SEASONS DIVISION / STANDARD MOTOR PRODUCTS, INC



Fan Clutch Operation & Troubleshooting Guide

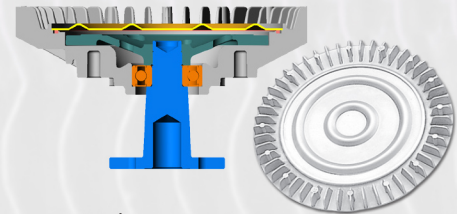


Hayden Fan Clutch Operation & Trouble Shooting

The Fan Clutch is a component of the cooling system that varies the fan speed to meet the cooling needs of the engine. Nearly all rear wheel drive vehicles use Fan Clutches to control fan speed because of their ability to provide high volumes of air and good fuel economy. Despite their popularity, they are one of the least understood cooling components. There are three types of Fan Clutches, the Non-Thermal (also called centrifugal), Thermal Fan Clutch and Electronic.

Non-Thermal Fan Clutch

- Low cost alternative for some standard thermal clutches
- Always engaged, less fuel savings than a thermal clutch
- Spins at about 30-60% of the water pump speed
- Shorter life expectancy
- Cannot replace a heavy-duty clutch
- Identified by the smooth, steel faceplate (without a thermal spring assembly) on the front



Thermal Fan Clutch

- Varies the fan speed with temperature of the air behind the radiator
- Engaged (high speed) operation provides maximum cooling
- Disengaged (low speed) operation provides fuel savings and noise reduction
- Greater life expectancy than a non-thermal clutch
- Briefly engaged at cold start-up
- Engages at approximately 170° radiator air temperature (about 30° lower than coolant temperature)

The air temperature passing through the radiator is sensed by the bi-metal thermal spring on the front of the thermal fan clutch. It expands and contracts with the change in air temperature operating a valve inside of the clutch. This valve works as a gate to a reservoir containing silicone drive fluid inside the clutch. When cold, the silicone drive fluid is pumped from the working area to the reservoir. When hot, the valve opens allowing fluid from the reservoir to be transferred to the working area thereby increasing the fan speed. The clutch disengages as the air temperature decreases, closing the valve and allowing the silicone fluid to be pumped back into the reservoir.

A thermal fan clutch is engaged on a cold startup because the fluid drains into the working area when the engine is shut off. The fan clutch will slow down shortly after startup as result of a pumping action produced by a difference in speed between the shaft and the body of a clutch.

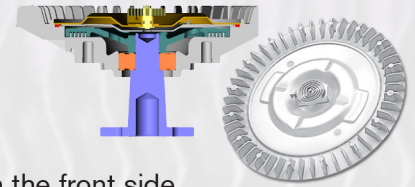
Most models are designed to duplicate original equipment performance. Some Chevrolet / GMC truck models are specifically designed to engaged at lower temperatures than the original equipment parts that they replace.

Thermal Fan Clutch Design Types

We manufacture four different types of thermal fan clutches; Standard, Heavy Duty, Severe Duty and Truck Fan Drives. Each type is engineered to simulate the performance, fit and appearance of the original equipment clutch that it replaces. All fan clutches are for specific applications and should only be applied for which they are cataloged. Use of the wrong fan clutch may result in poor cooling, excessive noise, reduced fuel economy, or fan clutch failure.

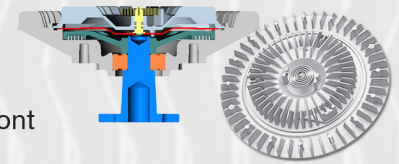
Standard Duty Thermal

- Turns fan 60-70% of shaft speed when engaged
- Disengage to 20-30% of the shaft speed
- Used with lighter pitch fans. (1-1/2" of pitch)
- Flat plate impeller design with up to 11.4 Sq. In. of working surface
- Identified by a smooth steel faceplate & thermal spring assembly on the front side



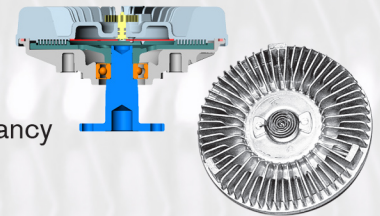
Heavy-Duty Thermal

- Turns the fan 70-90% of the shaft speed when engaged for increased cooling
- Turns the fan 25-35% of the shaft speed when disengaged
- Used with deeper pitch fans. (2-1/2" of pitch)
- Land and groove design with up to 27 Sq. In. of working surface
- Identified by finned aluminum faceplate and thermal spring on the front



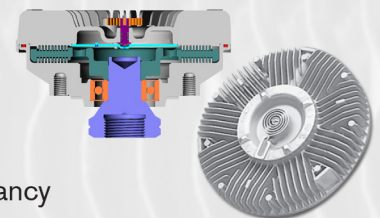
Severe Duty Thermal

- Turns the fan 80-90% of the shaft speed when engaged
- Turns the fan 20-30% of the shaft speed when disengaged
- Used with deeper pitch fans. (2-1/2" of pitch)
- Land and groove design with up to 72 Sq. In. of working area
- Larger working surface provides cooler running and longer life expectancy
- Thicker body and deep finned faceplate dissipate more heat
- Can be used in place of many heavy-duty clutches



Truck Fan Drive

- Turns the fan 80-90% of the shaft speed when engaged
- Turns the fan 20-30% of the shaft speed when disengaged
- Used with larger fans found on medium-duty truck applications
- Land and groove design with up to 150 Sq. In. of working area
- Larger working surface provides cooler running and longer life expectancy



Fan Clutch Trouble Shooting

Faulty fan clutches can be detected by checking for obvious indications of failure such as:

- Leaking Fluid - oily build up around the bearing or thermal spring
- Bad Bearing - seized, turns rough or has excessive play (more than 1/4" at fan tip)
- Worn Thermal Spring - spring is loose

Some fan clutches will show no visible indication of a problem yet may still be faulty.

The following may also indicate a faulty fan clutch

- Fan Spins Excessively - three or more times when hot engine is shut off
- Poor Air Conditioning - at low speed due to excessive high side refrigerant pressures
- Doesn't engage or "lockup" - fan speed does not increase when engine is hot
- Does not disengage - fan speed does not decrease when engine is cold

Other Cooling System Problems Affecting Fan Clutch Operation

- Plugged radiator (inside or outside) can delay or eliminate fan clutch engagement
- Partially opened thermostat does not allow full coolant flow to the radiator
- Too much antifreeze concentration does not transfer heat as well as 50/50% mixture

Symptoms of Fan Clutch Problems

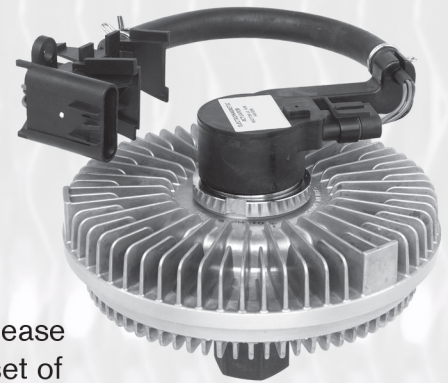
- Poor cooling at low speed but good cooling at high speeds
- Poor air conditioning at low speeds
- No increase in fan noise when engine is hot

Symptoms of Radiator Problems

- Poor cooling at high speeds
- Good cooling at low speeds

Electronic - Viscous EV Fan Clutch Operation

The ECM/PCM signal controls the level of engagement of the EV clutch. An internal solenoid opens a spring loaded valve which allows silicone drive fluid to flow from the storage reservoir to the working area of the unit engaging the clutch. This engagement process is ultimately controlled through the ECM/PCM by the following input variables: Coolant Temperature, Intake Manifold Temperature, Transmission Oil Temperature, A/C Pressure and Engine Oil Temperature. These variables are manufacture specific and fan speed is dictated based on the level of cooling required. Please consult the Original Equipment specifications to determine which set of variables apply to your vehicle.



Electronic-Viscous Fan Clutch Troubleshooting

- During engine start up, the EV fan clutch will engage and match engine speed for up to 3 minutes. This is considered normal and may last more than 3 minutes in cooler climates or at lower driving speeds resulting in fan roar. This condition will cease shortly upon disengagement. Additionally, you may hear an audible “clicking” sound when the vehicle is stationary. These conditions are normal and should cease once the fan clutch disengages.

IMPORTANT:

- Do NOT replace EV fan clutch unless a specific issue is identified by proper SI (Service Indicator / Check Engine) diagnosis.
- Do NOT replace an EV fan clutch for fan noise.
- Do NOT replace an EV fan clutch unless a specific condition related to the EV fan clutch is identified using SI diagnostics. If the EV fan clutch has a condition that warrants replacement, a DTC (Diagnostic Trouble Code) should set and/or SI diagnostics should lead to the replacement of the fan clutch.
- Do not attempt to replace EV Fan Clutch without proper tools. Please refer to manufacturer requirements for proper tools and replacement.