2002 ISX/M/B Engines Equipped With EGR

Cooled Exhaust Gas Recirculation

- What is cooled exhaust gas recirculation?
  - Exhaust gas recirculation (EGR) is where a portion of the exhaust gas is rerouted through a cooler, and then the cooled exhaust gas is reintroduced into fresh charge air. This mixture contains fewer oxygen atoms per volume of charge, which reduces the flame temperature during combustion, thus reducing emissions.

EGR System Flow

EGR Hardware - EGR Valve

- The EGR valve regulates the amount of exhaust gas that is recirculated into the intake system.
- The EGR valve is controlled by a high speed electric motor that is infinitely variable between fully open and fully closed.
**EGR Valve Internal Components**

- Motor Gear - mates with gear reduction
- Gear reduction with clutch
- Sector Gear
- Shaft for sector gear and position sensor
- Return spring to close valve if failure occurs
- Coolant passage for valve guide
- Flow of Exhaust Gas
- Poppet Valve

**EGR Cooler**

- Tube-and-shell design
- Stainless steel
- Self-cleaning tube design
Variable Geometry Turbocharging

- Integrated electronic controls
- Improves performance
  - vehicle acceleration from low speeds
  - Reduces turbo-lag
  - Increases engine braking power
  - Allows for higher power from smaller engines
  - Reduces driver shifts
- Improves fuel economy
- Lowers emission levels
VG Turbocharger Operation

Heron Valve Turbo Actuator (Latter Engines)
EGR System Flow

New EGR System Sensors

- Turbo Intake Air Temperature
- Turbo Speed
- EGR Valve Position
- Exhaust Pressure
- Exhaust Temperature
- Delta Pressure Sensor (EGR Flow Rate)
- The EGR Differential Pressure Sensor (EGR Flow Sensor) will be located on the air intake connection or in the exhaust transfer tube depending on the engine family.
- The EGR Differential Pressure Sensor is used to calculate the mass flow of exhaust gas mixing with the fresh air from the charge air cooler.
Oxygen as a function of EGR

Running Engine Demo