Off-Highway Diesel Engine Ratings

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Model designation key

Below is a key for the engine models shown in this guide.

A model designated as 6135H is a 6-cylinder, 13.5-liter turbocharged and aftercooled, air-to-air engine. A model designated as a 4045T is a 4-cylinder, 4.5-liter turbocharged engine.

6135H

Indicates air intake system
Displacement in liters
Number of cylinders

EPA Tier 1/E.U. Stage I  PowerTech technology
EPA Tier 2/E.U. Stage II  PowerTech technology
EPA Tier 3/E.U. Stage III A  PowerTech M, PowerTech E, or PowerTech Plus technology
The ultimate in performance, fuel economy, and emissions compliance is available with John Deere engines.

To meet Tier 3/Stage III A standards, John Deere worked closely with equipment manufacturers to identify engine technologies that best suited their needs. We quickly recognized that no single technology would satisfy the diverse needs of our off-highway customers. This is why we created three engine solutions: PowerTech M, PowerTech E, and PowerTech Plus.

John Deere engines comply with non-road emissions regulations for the U.S. Environmental Protection Agency (EPA), the European Union (EU), and the California Area Resources Board (CARB). John Deere also provides Tier 1/Stage I and Tier 2/Stage II engines for non-regulated countries.
**PowerTech M™ engines**

**2.4L and 4.5L engines**

- **Naturally aspirated**
  In naturally aspirated engines, the combustion air is drawn into the cylinder when the piston moves down. The amount of air is limited by the displacement of the engine (2.4L).

- **Turbocharged**
  In turbocharged engines, the air is pre-compressed. Due to the higher pressure, more air is supplied into the combustion chamber allowing a corresponding increase in fuel injection, which results in greater engine output (2.4L and 4.5L).

- **Air-to-air intercooling**
  This is the most efficient method of cooling intake air to help reduce engine emissions while maintaining low-speed torque, transient response time, and peak torque. It enables an engine to meet emissions regulations with better fuel economy and the lowest installed costs (4.5L).

- **Compact size**
  Mounting points are the same as Tier 2/Stage II engine models.

- **Engine performance**
  - Multiple rated speeds to further reduce noise and improve fuel economy
  - New power bulge feature (4.5L)
  - New higher-peak torque speed

- **Additional features**
  - Self-adjusting poly-vee fan drive
  - Forged-steel connecting rods
  - Replaceable wet-type cylinder liners (4.5L)
  - Either-side service
  - 500-hour oil change
  - Optional final fuel filter with water separator and water-in-fuel sensor (4.5L)
  - Optional balancer shafts

**2-valve cylinder head**
Cross-flow head design provides excellent breathing from a lower-cost 2-valve cylinder head.

**Mechanical rotary fuel pump**
The timing and fuel injection pressures are optimized to maximize performance and fuel economy at a given rated speed (4.5L).

**Mechanical unit fuel pump**
This system uses a camshaft driven pump, connected to the injector by a short fuel line. This short fuel line between the unit pump and the injector helps to alleviate after-injection, secondary injection, and other injection abnormalities (2.4L).

**Fixed geometry turbocharger**
Fixed geometry turbochargers are precisely matched to the power level and application.
PowerTech M 2.4L engines

- Power range:
  - 4024D: 31 – 35 kW (42 – 46 hp)
  - 4024T: 36 – 37 kW (48 – 49 hp)
- Improved unit pumps
- Improved governor serviceability
- Improved timing cover access

PowerTech M 4.5L engines

- Power range:
  - 4045T: 56 – 63 kW (75 – 85 hp)
  - 4045H: 74 kW (99 hp)
- New power bulge feature – up to 1%
- Higher-peak torque speed
- World-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- Maintain Tier 2/Stage II compact size and mounting locations

PowerTech M 2.4L engines

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*Meets both Interim Tier 4 and Stage III A emissions regulations.
†Advanced rating.

Tier 3/Stage III A PowerTech M 4.5L engines

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<th>Engine model</th>
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Ratings are subject to change.
**PowerTech E™**

**2.4L, 3.0L, 4.5L, and 6.8L engines**

**Electronic Unit Pump (EUP) fuel system**
Regulated rated speed flexibility and improved cold-start and warm-up control (2.4L and 3.0L).

**Fixed geometry turbocharger**
Fixed geometry turbochargers are precisely matched to the power level and application.

**Turbocharged**
In turbocharged engines, the air is pre-compressed. Due to the higher pressure, more air is supplied into the combustion chamber allowing a corresponding increase in fuel injection which results in greater engine output (2.4L, 3.0L, and 4.5L).

**Air-to-air intercooling**
This is the most efficient method of cooling intake air to help reduce engine emissions while maintaining low-speed torque, transient response time, and peak torque. It enables an engine to meet emissions regulations with better fuel economy and the lowest installed costs.

**Compact size**
Mounting points are the same as Tier 2/Stage II engine models.

**Multiple injection strategy**
The new HPCR fuel system and engine control unit (ECU) allow for multiple fuel injections. The number of fuel injections, based on speed and load, help contribute to lower combustion temperatures, which reduce the formation of NOx and particulates. The multiple injection strategy also provides an added benefit of noise reduction (4.5L and 6.8L).

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**2-valve cylinder head**
Cross-flow head design provides excellent breathing from a lower-cost 2-valve cylinder head.

**High Pressure Common Rail (HPCR) and Engine Control Unit (ECU)**
The HPCR fuel system provides variable common rail pressure, multiple injections, and higher injection pressures, up to 1600 bar (23,000 psi). It also controls fuel injection timing and provides precise control for the start, duration, and end of injection (4.5L and 6.8L).
**John Deere electronic engine controls**

Electronic engine controls monitor critical engine functions providing warning and/or shutdown to prevent costly engine repairs and eliminate the need for add-on governing components all lowering total installed costs. Snapshot diagnostic data can be retrieved using commonly available diagnostic service tools.

Controls utilize new common wiring interface connector for vehicles or available OEM instrumentation packages; new solid conduit and “T” connectors reduce wiring stress, providing greater durability and improving appearance.

Factory-installed, engine-mounted ECU comes with wiring harness and associated components. Industry standard SAE J1939 interface communicates with other vehicle systems, eliminating redundant sensors and reducing vehicle total installed cost.

**Engine performance**

- New power bulge feature (4.5L and 6.8L)
- Increased low-speed torque
- New higher-peak torque ratings
- Faster torque rise
- Multiple rated speeds to further reduce noise and improve fuel economy

**Additional features**

- Self-adjusting poly-vee fan drive
- Forged-steel connecting rods
- Replaceable wet-type cylinder liners (4.5L and 6.8L)
- Either-side service
- 500-hour oil change
- Standard gear auxiliary drive

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**Power curves**

**Tier 3/Stage III A PowerTech E 4.5L vs. Tier 2/Stage II PowerTech 4.5L**

**Torque curves**

**Tier 3/Stage III A PowerTech E 4.5L vs. Tier 2/Stage II PowerTech 4.5L**
**PowerTech E 2.4L engines**

- Power range: 45 – 60 kW (60 – 80 hp)
- Superior cold-start and warm-up capability
- Torque curve shaping capability
- Improved smoke control
- Higher supply pressure for the EUP fuel system

**PowerTech E 3.0L engines**

- Power range:
  - 5030T: 48 kW (65 hp)
  - 5030H: 57 – 74 kW (76 – 99 hp)
- Superior cold-start and warm-up capability
- Torque curve shaping capability
- Improved smoke control
- Higher supply pressure for the EUP fuel system

### PowerTech E 2.4L engines

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*Meets both Interim Tier 4 and Stage III A emissions regulations.
**Meets Tier 3/Stage III A emissions regulations.

### PowerTech E 3.0L engines

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*Meets both Interim Tier 4 and Stage III A emissions regulations.
**Meets Tier 3/Stage III A emissions regulations.
†Advanced rating.

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Ratings are subject to change.
**PowerTech E 4.5L engines**

- Power range:
  - 4045T: 63 – 74 kW (85 – 99 hp)
  - 4045H: 86 – 104 kW (115 – 140 hp)
- New power bulge feature – up to 6%
- Higher-peak torque – up to 30%
- More low-speed (1000 rpm) torque – up to 130% of rated speed torque
- Transient response that meets or exceeds Tier 2/Stage II
- World-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- Maintain Tier 2/Stage II compact size and mounting locations

---

**PowerTech E 6.8L engines**

- Power range: 104 – 149 kW (139 – 200 hp)
- New power bulge feature – up to 7%
- Higher-peak torque – up to 32%
- More low-speed (1000 rpm) torque – up to 132% of rated speed torque
- Transient response that meets or exceeds Tier 2/Stage II
- World-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- Maintain Tier 2/Stage II compact size and mounting locations

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**Tier 3/Stage III A PowerTech E 4.5L engines**

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**Tier 3/Stage III A PowerTech E 6.8L engines**

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**Ratings are subject to change.**
**PowerTech Plus™**

**4.5L, 6.8L, 9.0L, and 13.5L engines**

4-valve cylinder head

The 4-valve cylinder head provides excellent airflow resulting in greater low-speed torque and better transient response time. There are the cross-flow design (4.5L, 6.8L, and 13.5L) and the new 4-valve U-flow head design (9.0L).

Cooled Exhaust Gas Recirculation (EGR)

EGR cools and mixes measured amounts of cooled exhaust gas with incoming fresh air to lower peak combustion temperatures, thereby reducing NOx.

Variable Geometry Turbocharger (VGT)

Varies exhaust pressure based on load and speed to ensure proper EGR flow; greater low-speed torque, quicker transient response, higher-peak torque, and best-in-class fuel economy.

Air-to-air intercooling

This is the most efficient method of cooling intake air to help reduce engine emissions while maintaining low-speed torque, transient response time, and peak torque. It enables an engine to meet emissions regulations with better fuel economy and the lowest installed costs.

Compact size

- Horsepower/displacement ratio is best-in-class
- Lower installed cost
- Mounting points for Tier 3/Stage III A engine models same as Tier 2/Stage II engine models

---

**High Pressure Common Rail (HPCR) and Engine Control Unit (ECU)**

The HPCR fuel system provides variable common rail pressure, multiple injections, and higher injection pressures, up to 1600 bar (23,000 psi). It also controls fuel injection timing and provides precise control for the start, duration, and end of injection (4.5L, 6.8L, and 9.0L).

**Electronic Unit Injector (EUI) and Engine Control Unit (ECU)**

The EUI fuel system provides variable common rail pressure, and multiple injections, and higher injection pressures, up to 2000 bar (29,000 psi). It also controls fuel injection timing and provides precise control for start, duration, and end of injection (13.5L).
**Engine performance**
- Multiple rated speeds to further reduce noise and improve fuel economy
- New higher-peak torque ratings
- Better transient response time
- Greater levels of low-speed torque
- New power bulge feature (4.5L and 6.8L)
- Higher levels of power bulge (9.0L and 13.5L)

**Engine performance curves**

**Power curves**

![Power curves graph](image)

**Torque curves**

![Torque curves graph](image)

**John Deere electronic engine controls**
Electronic engine controls monitor critical engine functions, providing warning and/or shutdown to prevent costly engine repairs and eliminate the need for add-on governing components all lowering total installed costs. Snapshot diagnostic data can be retrieved using commonly available diagnostic service tools.

Controls utilize new common wiring interface connector for vehicles or available OEM instrumentation packages; new solid conduit and “T” connectors reduce wiring stress and provide greater durability and improved appearance.

Factory-installed, engine-mounted ECU or remote-mounted ECU comes with wiring harness and associated components. Industry-standard SAE J1939 interface communicates with other vehicle systems, eliminating redundant sensors and reducing vehicle installed cost.

**Additional features**
- Glow plugs (4.5L and 6.8L)
- Gear-driven auxiliary drives (4.5L, 6.8L, 9.0L, and 13.5L)
- 500-hour oil change (4.5L, 6.8L, 9.0L, and 13.5L)
- Self-adjusting poly-vee fan drive (4.5L, 6.8L, 9.0L, and 13.5L)
- R.H. and L.H. engine-mounted fuel filters (6.8L)
- Single-piece low friction piston (9.0L and 13.5L)
- Optional rear PTO (9.0L and 13.5L)
- Low-pressure fuel system with “auto-prime” feature (9.0L and 13.5L)
- Directed top-liner cooling (9.0L and 13.5L)
**PowerTech Plus 4.5L engines**

- Maintained power range: 111 – 129 kW (149 – 173 hp)
- New power bulge feature – up to 9%
- Higher level of peak torque – up to 29%
- More low-speed (1000 rpm) torque – up to 123% of rated speed torque
- Transient response that meets or exceeds Tier 2/Stage II
- Best-in-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- Maintained compact size and same mounting locations

**PowerTech Plus 6.8L engines**

- Maintained power range: 134 – 205 kW (180 – 275 hp)
- New power bulge feature – up to 13%
- Higher level of peak torque – up to 44%
- More low-speed (1000 rpm) torque – up to 145% of rated speed torque
- Transient response that meets or exceeds Tier 2/Stage II
- Best-in-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- New rear exhaust turbocharger and exhaust elbow options
- Maintained compact size and same mounting locations

### Tier 3/Stage III A PowerTech Plus 4.5L engines

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### Tier 3/Stage III A PowerTech Plus 6.8L engines

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Ratings are subject to change.
**PowerTech Plus 9.0L engines**

- Expanded power range: 168 – 298 kW (225 – 400 hp)
- Best-in-class power density
- Higher level of power bulge – up to 11%
- Higher level of peak torque – up to 50%
- More low-speed (1000 rpm) torque – up to 150% of rated speed torque
- Transient response that meets or exceeds Tier 2/Stage II
- Best-in-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- New compact size

**PowerTech Plus 13.5L engines**

- Maintained power range: 261 – 448 kW (350 – 600 hp)
- Best-in-class power density
- Higher level of power bulge – up to 14%
- Higher level of peak torque – up to 43%
- More low-speed (1000 rpm) torque – up to 138% of rated speed torque
- Transient response that meets or exceeds Tier 2/Stage II
- Best-in-class fuel economy
- Lower-rated speeds to reduce noise and improve fuel economy
- Cold-starting capabilities that meet or exceed Tier 2/Stage II
- Compact size

![PowerTech Plus 9.0L engine](image1)

**Tier 3/Stage III A PowerTech Plus 9.0L engines**

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**Tier 3/Stage III A PowerTech Plus 13.5L engines**

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**Bore x Stroke x Length x Width x Height x Weight**

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Ratings are subject to change.
Exhaust Gas Recirculation (EGR) myths

A lot of false and misleading information about cooled EGR and VGT has been circulated by engine manufacturers who have chosen less effective technologies for Tier 3/Stage III A. Here are some examples:

**Myth:** Cooled EGR adds more complexity than other technologies.

**Fact:** While cooled EGR engines require additional sensors and actuators, the control logic is designed into the engine control unit (ECU), which allows the complexity to be transparent, like that of a cell phone or home computer. The technology within may be complex to the average individual, but that technology is the key to the product’s function, performance, and reliability. Cooled EGR is a proven technology that is used to control NOx emissions by most on-road diesel engine manufacturers, as well as millions of gasoline and diesel passenger cars.

**Myth:** Cooled EGR causes lower power density.

**Fact:** With cooled EGR and VGT, John Deere has been able to maintain or increase the power density from each engine platform. With PowerTech Plus Tier 3/Stage III A engines, you will never be forced to go up in platform size. In fact, using John Deere PowerTech Plus engines may allow customers to go down in platform size, if they choose to do so, and lower their installed cost for a Tier 3/Stage III A engine compared to Tier 2/Stage II. While John Deere has maintained or increased power density, other manufacturers have announced significant decreases in power density for some Tier 3/Stage III A platforms.

**Myth:** Cooling systems will have to be larger because cooled EGR has higher heat rejection.

**Fact:** No one would argue that cooled EGR increases heat rejection to the coolant (radiator) side of an engine’s cooling system. However, John Deere has managed this with increased top tank temperatures, increased coolant flows, and decreased fuel consumption. From a Charge-Air-Cooler (CAC) perspective, the VGT has allowed John Deere to better manage airflows and maintain or lower heat rejection to the CAC side compared to less efficient competitive Tier 3/Stage III A engines. The overall heat rejection rate, relative to John Deere Tier 2/Stage II engines, will increase 10% for the 6.8L PowerTech Plus and 5% for the 9.0L. There is no increase on the 13.5L. As a result, heat rejection from PowerTech Plus engines will be no higher than less efficient competitive technologies.

**Myth:** Fuel consumption will be worse with cooled EGR because of high fan power requirements.

**Fact:** Heat rejection for Tier 3/Stage III A engines, regardless of engine manufacturer, will increase. However, with a properly designed (managed) cooling package, there is no reason why fan power has to increase. Even if OEMs choose to run 20% higher fan power, they would realize only a 1% increase in fuel consumption in a typical application. Compared to current Tier 2/Stage II and other Tier 3/Stage III A technologies, PowerTech Plus engines will achieve basic fuel consumption improvements of up to 12%, which far exceeds the 1% consumed by cooling systems with high fan power losses.

**Myth:** Engines with cooled EGR require more maintenance.

**Fact:** John Deere PowerTech Plus engines are actually increasing maintenance intervals across all models. A 500-hour oil change interval will be available on all Tier 3/Stage III A OEM engines from John Deere. New fuel filtration systems with water-in-fuel (WIF) and a low-pressure fuel sensor will help extend fuel filter replacement intervals.
**Myth:** Cooled EGR requires low sulfur on-road diesel fuel.

**Fact:** Diesel fuel recommendations are unchanged for Tier 3/Stage III A engines. All John Deere Tier 3/Stage III A engines are being developed to use worldwide off-road fuels with up to 5000 ppm sulfur. For those parts of the world that require Tier 3/Stage III A engine platforms, these countries are also mandating the adoption of low-sulfur and ultra-low-sulfur fuels. As of January 2006, the most commonly available diesel fuel in those parts of the world requiring Tier 3/Stage III A engines was 500 ppm sulfur or less.

**Myth:** Cooled EGR requires high-grade oils.

**Fact:** Regardless of the engine technology, oil standards are being upgraded industry-wide. Like all on-road and off-road engine manufacturers, John Deere recommends API CI-4 oils for Tier 3/Stage III A engines. These oils are currently available from all major oil companies and John Deere. John Deere Plus 50 and Torq-Gard Supreme 10W-30 oils already meet the new standard and will continue to be recommended for Tier 3/Stage III A, just as they were for previous engines.

**Myth:** Cooled EGR causes dangerously low engine life outside North America and Western Europe.

**Fact:** John Deere PowerTech Plus Tier 3/Stage III A engines have been designed with the same rigorous durability and reliability goals our customers have become accustomed to. When lubricating oils and diesel fuels meet the recommendations specified in the operator’s manual (and service is performed at prescribed intervals as well), there are no durability issues associated with cooled EGR technology.

**Myth:** Cooled EGR cannot be turned off for use outside North America and Western Europe.

**Fact:** Cooled EGR could easily be “turned off” for use in parts of the world where certified engines are not required. However, John Deere is not planning on this option because there are better, lower-cost engine technologies available for use in these markets. In addition, for OEMs who export a significant number of machines to countries that don’t require certification, we will continue to manufacture Tier 2/Stage II and Tier 1/Stage I engines in the same platform sizes and power ratings currently provided.

**Customer support**

With more than 4,000 service locations worldwide, John Deere is always handy when you need service and support. You’ll find an authorized John Deere dealer or engine distributor almost anywhere in the world.

We have centralized parts warehouses in the United States and Europe, plus numerous worldwide depots that employ overnight parts shipping – so you’ll never have to wait long for parts. In addition, John Deere service personnel are highly trained technicians who stay on top of changing engine technologies and service techniques.

John Deere dealers and distributors are your best source for service, knowledge, and engine accessories. They’re one of the many reasons to specify John Deere engines in your equipment.