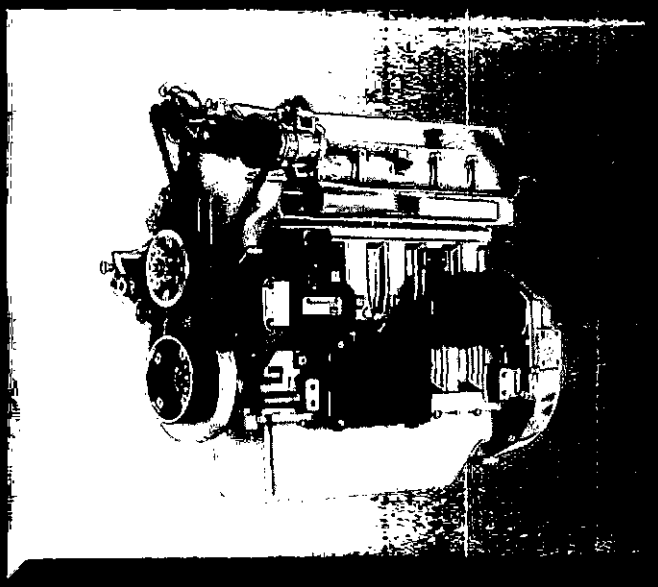
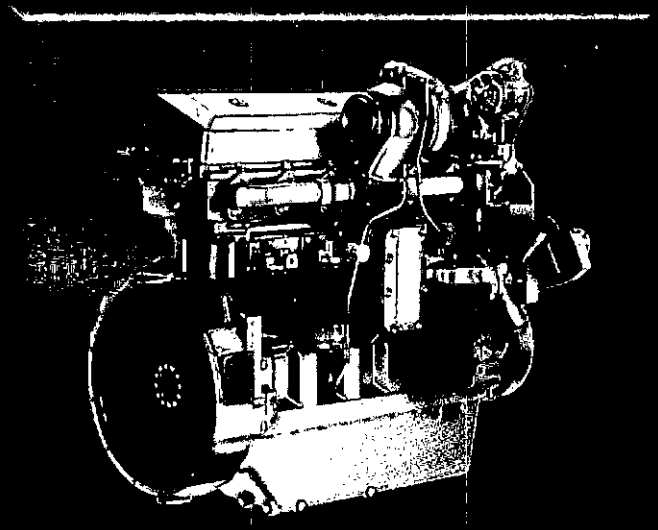
JOHN DEERE

POWERTECH

ENGINES



10.5 Liter



12.5 Liter

PRODUCT INFORMATION MANUAL

POWERTECH 10.5L/12.5L

Introduction

This product information manual provides basic marketing and product information on John Deere *POWERTECH* 10.5 and 12.5 liter diesel engines. Its primary purpose is to help salespeople refresh and improve their product knowledge.

The information contained in this manual is intended for exclusive use by Deere and Company and John Deere Distributor/Dealer personnel.

All information is current as of April 1997. Design and specifications are subject to changes without notice.

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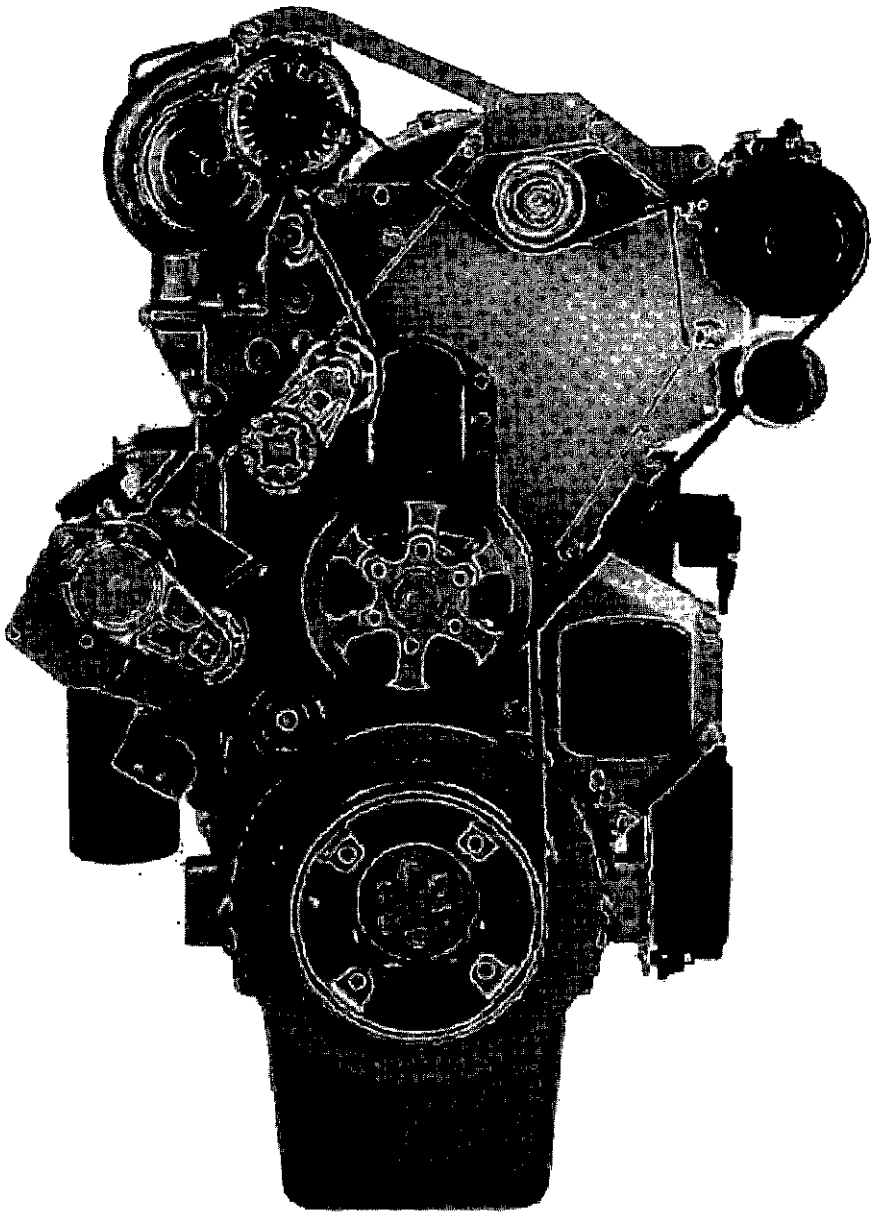
POWERTECH 10.5L/12.5L

Contents

POWERTECH 10.5L/12.5L

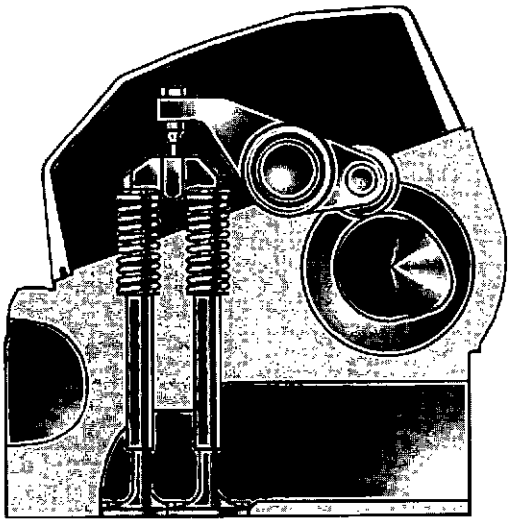
Major Advancements in Design & Development

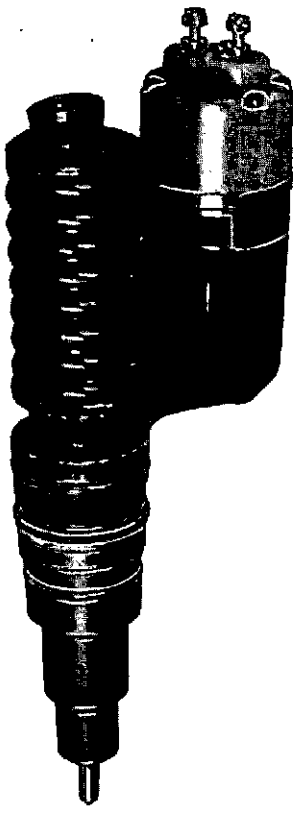
John Deere has advanced diesel engine design to new levels of proficiency with better performance, greater efficiencies, application flexibility and a bigger payback in both reliability and durability. The ***POWERTECH*** 10.5 and 12.5 liter engines represent a major departure from the prevailing designs of comparably sized diesels. These compact, in-line, six-cylinder models reflect significant engineering improvements. They truly are the "best in class."



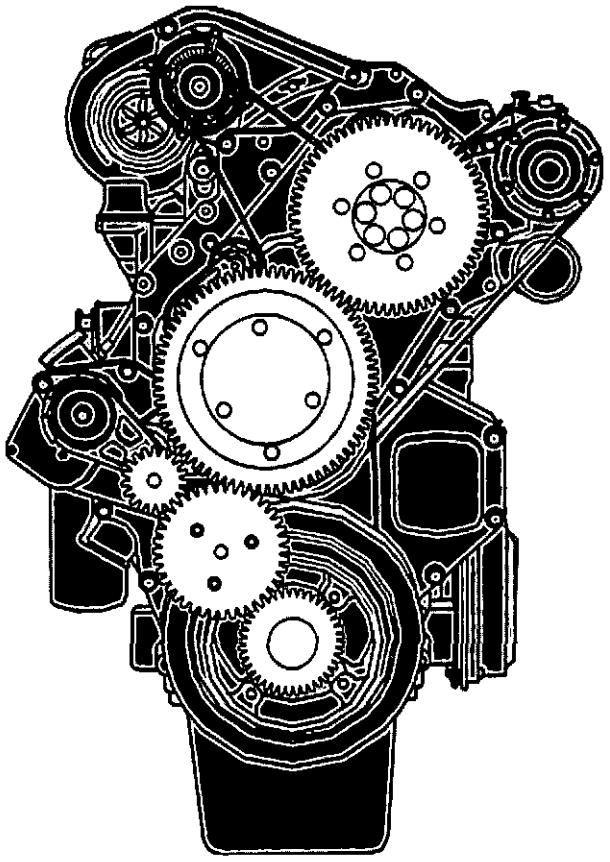
POWERTECH 10.5L/12.5L

Deere engineers began by redesigning the basics. First, the cylinder head was reconfigured to accommodate an overhead camshaft. This "in-head cam" eliminates the need for traditional pushrods and lifters. The result is fewer wear points and optimum control of valve events.





Other state-of-the-art cylinder head features include high flow ports, four valves per cylinder, and high-pressure electronic unit injectors (EUIs). The fuel system and electronics reflect advanced concepts in engine design and development.



In addition, the ***POWERTECH*** 10.5 L and 12.5 L gear train has been redesigned with high contact ratio spur gears for smooth, quiet operation. There are only five active gears, requiring fewer parts and resulting in fewer wear points.

POWERTECH 10.5L/12.5L

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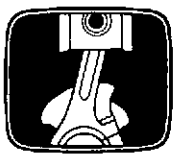

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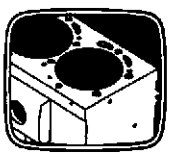

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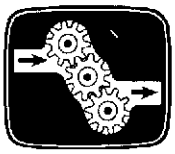

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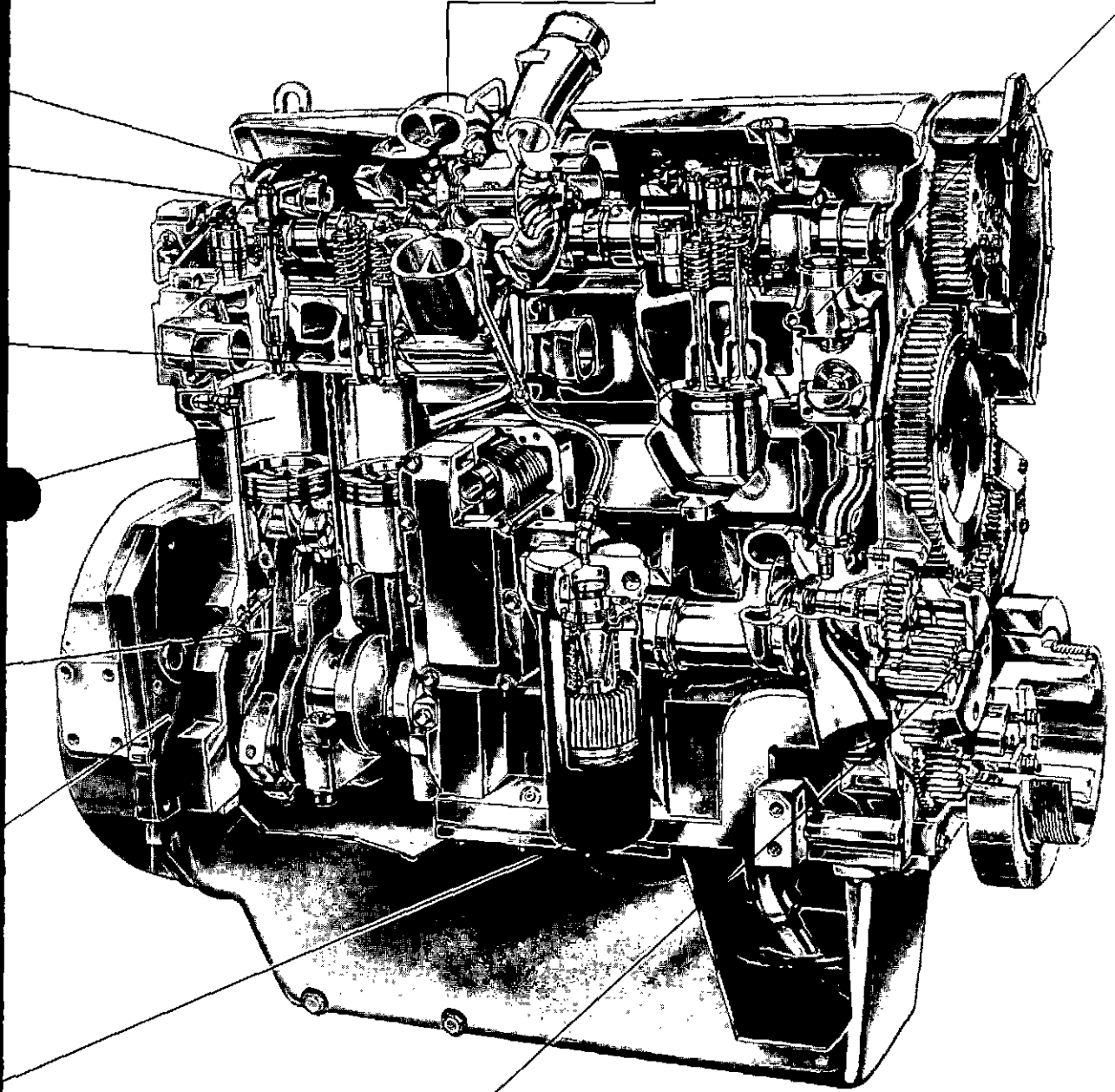

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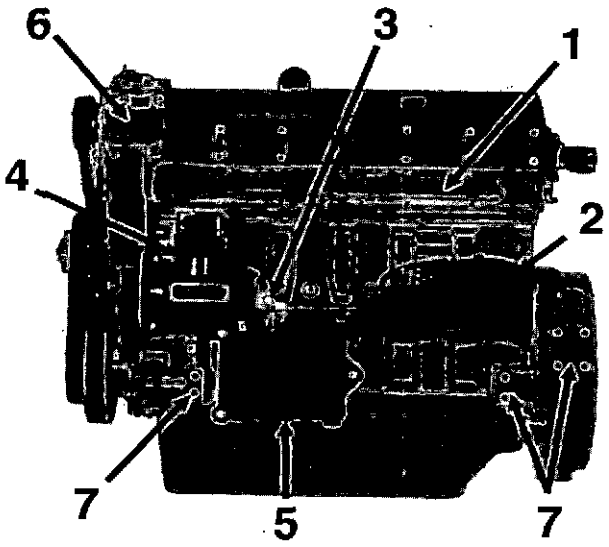
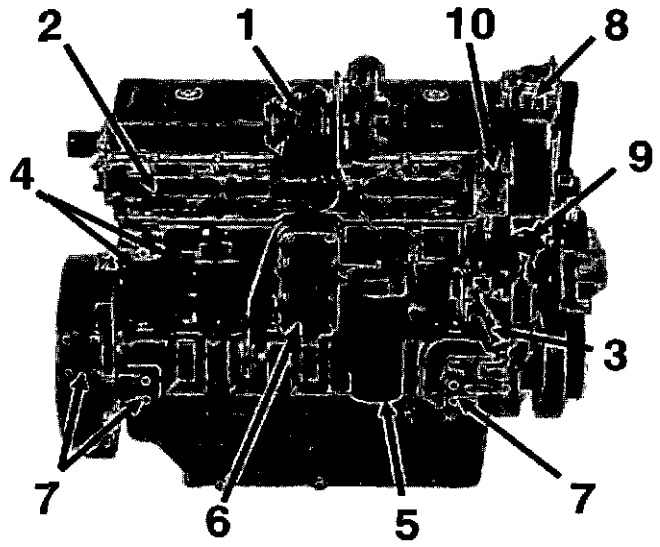


Engine Left Side

The right and left sides of John Deere engines are viewed from behind the flywheel, looking forward over the engine. Major components on the left side of the engine are:

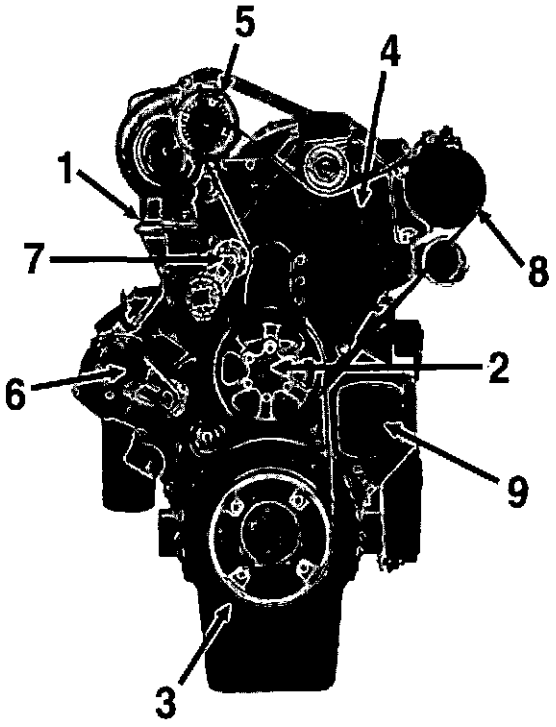
1. Air Intake Cover
2. Starter Motor
3. Optional Dipstick Location
4. Air Compressor
5. Engine Control Unit (ECU)
6. R134a Refrigerant Compressor
7. Engine Mounting Locations



Engine Right Side

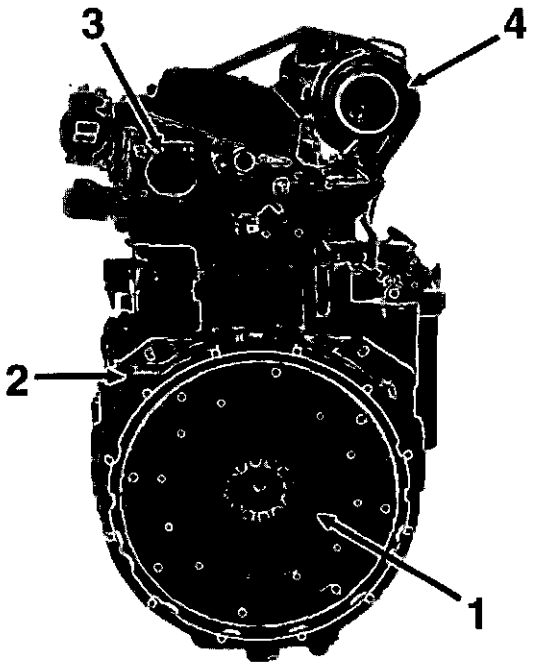
Components on the right side of the engine are:

1. Turbocharger
2. Exhaust Manifold
3. Water Pump
4. Fuel Filters
5. Oil Filter
6. Oil Cooler
7. Engine Mounting Locations
8. Alternator
9. Oil Fill
10. Thermostat



Engine Front
The front of the engine mounts most drive accessories, including the front auxiliary drive. Major components seen from this view are:

1. Thermostat Housing
2. Fan Drive Mount
3. Vibration Damper
4. Gear Housing Cover
5. Alternator
6. Self Adjusting Fan Drive Tensioner
7. Self Adjusting Accessory Drive Tensioner
8. A/C Compressor
9. Auxilary Drive



Engine Rear
The rear of the engine mounts the flywheel and flywheel housing. Major components seen from this view are:

1. Flywheel
2. Flywheel Housing
3. Fuel Transfer Pump
4. Turbocharger

POWERTECH 10.5L/12.5L

Engine Specifications

Take a close look at the *POWERTECH* 10.5 L (Model 6105) and the 12.5 L (Model 6125) diesel engines' lower profile, compact size and specifications Both engines are available in either air-to-water or air-to-air configurations.

Displacement	10.5 L	644 in^3	12.5 L	766 in^3
Bore	127 mm	5 in	127 mm	5 in
Stroke	138 mm	5.43 in	165 mm	6.49 in
Length	1326 mm	52.2 in	1326 mm	52.2 in
Height	1239 mm	48.8 in	1239 mm	48.8 in
Width	741 mm	29.2 in	741 mm	29.2 in
Weight	1211 Kg	2665 lb	1216 Kg	2675 lb

The *POWERTECH* 10.5 L and 12.5 L diesel engines pack added performance capabilities, extended power ratings and world-class technology into a compact, clean profile. They offer better economy, easier serviceability and greater application flexibility. And each is backed by a global service organization that accentuates the "Deere Advantage."

John Deere stands the test of time because the name has always stood for uncompromising product quality and total customer satisfaction. The *POWERTECH* 10.5 and 12.5 liter engines continue this tradition of excellence.

....Performance

....Durability

....Economy *....Environmental*

....Reliability

....Serviceability

....Application Flexibility

POWERTECH 10.5L/12.5L

A Commitment to the Future

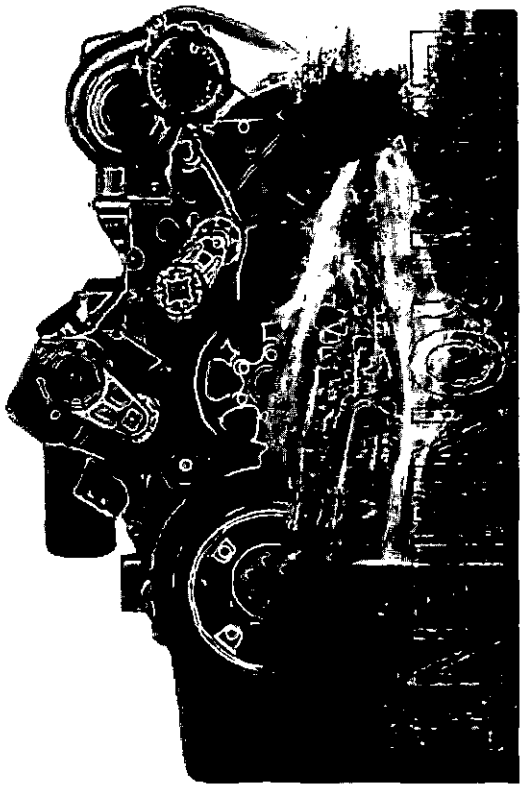
Reducing emissions is a battle measured in microns and milligrams, but it's no small concern at John Deere.

We may never completely eliminate engine emissions, but we can come close. Currently, less than 0.5% of engine exhaust contains emissions pollutants like nitrogen oxide (Nox), carbon monoxide, sulphur oxide, hydrocarbons, and particulate matter. The rest (99.5%) of the engine exhaust is made of elements like nitrogen, oxygen, carbon dioxide and water vapor.

In their effort to improve engine emissions, John Deere engineers access the latest technology through a global network of technical resources. Our latest engine design incorporates many new features that directly reduce emissions.

John Deere engineers have discovered how to deliver lower emissions without sacrificing performance. Many of our recent engine advancements not only reduce emissions, they also improve fuel economy, performance and durability.

Our efforts to produce high-performance, low emission engines is just the latest example of John Deere's leadership in the engine industry. You can count on John Deere to continually work to improve the engine industry, as well as the environment.



POWERTECH 10.5L/12.5L

Worldwide Engine Support

POWERTECH 10.5 L and 12.5 L engine customers can obtain aftermarket support wherever you see the John Deere sign.

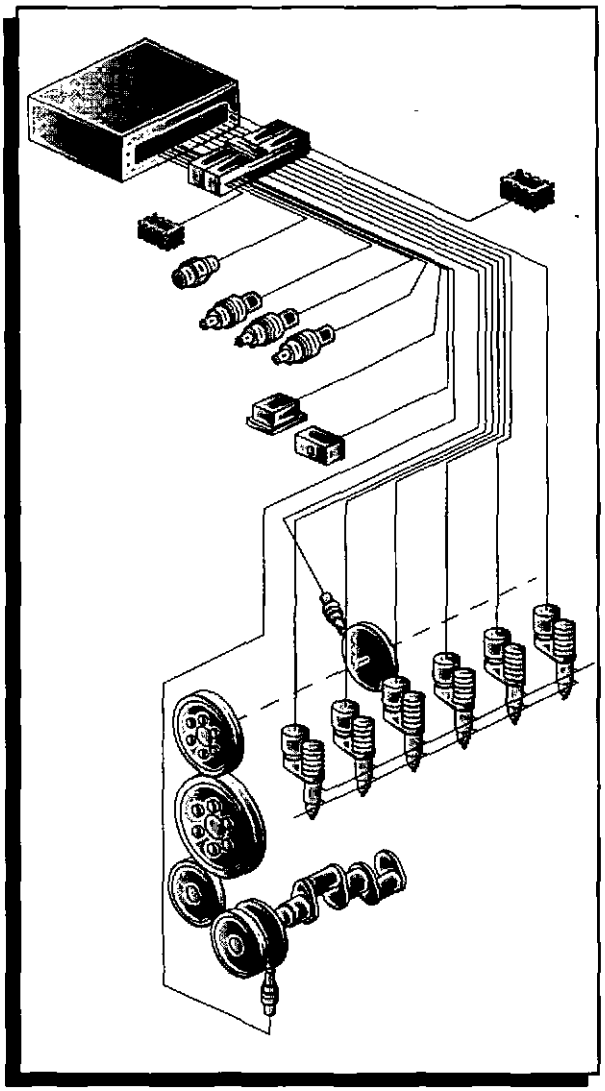
Every day, John Deere engines go to work in literally thousands of machines around the world. All of this John Deere engine power is backed by two parts distributions centers, 20 regional parts depots, and more than 4,000 service locations worldwide. In total, we have manufacturing, distribution, and service facilities in more than 100 countries.

So when you buy John Deere *POWERTECH* 10.5 L/12.5 L engines, you not only get the latest engine technology, you also get a world of engine support.

POWERTECH 10.5L/12.5L

Fuel Control System

Feature	Advantage	Benefit
1. Engine Control Unit	*Microprocessor control over fuel injection responding to varying conditions*	**Performance**
2. Sensors & Harness	*Continuously monitoring conditions, relaying data to ECU*	**Performance Reliability**
3. Electronic Unit Injectors	*Permits variable timing, allows precise injection control and higher pressures for better combustion efficiencies*	**Performance Reliability**
4. Fuel Filters	*Spin-on primary & secondary filters; primary has water separator with bleed valve*	**Reliability Serviceability**

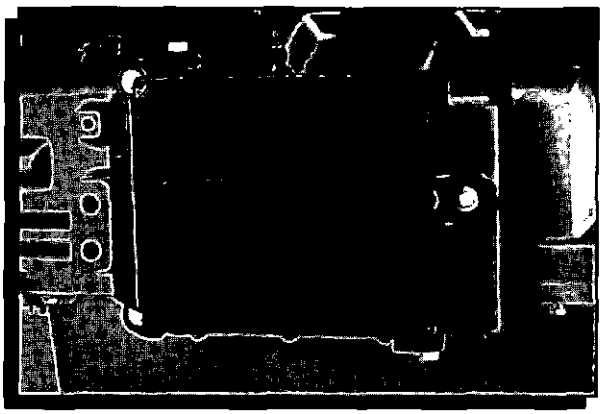


The Electronic System – The intelligence and immediacy of a full-featured electronic system make the John Deere ***POWERTECH*** 10.5 L and 12.5 L engines more responsive with optimized performance and outstanding fuel economy.

A network of sensors continuously report operating conditions for critical engine functions, which the Engine Control Unit (ECU) computes. It instantly adjusts timing and duration commands to the Electronic Unit Injectors (EUIs).

EUIs respond with precision synchronization, providing precise injector timing. Engine speed is controlled by the duration of the fuel injection.

POWERTECH 10.5L/12.5L



①**Engine Control Unit** – The John Deere Engine Control Unit (ECU) is a reliable, state-of-the-art microprocessor that drives the engine's electronic system. It uses engine data gathered by a network of sensors to adjust fuel delivery. Torque curves, horsepower ratings and options required for the application are written at the factory.

Take a close look at the ECU's many features:

- Dynamic timing control
- Power bulge
- Multiple power/torque curves
- Enhanced low speed torque
- Timed power boost
- Cruise control*
- Decelerator*
- Isochronous governing
- On-board diagnostics
- Expanded engine protection
- Password protection
- Communicates with other controllers*
- Key start and stop

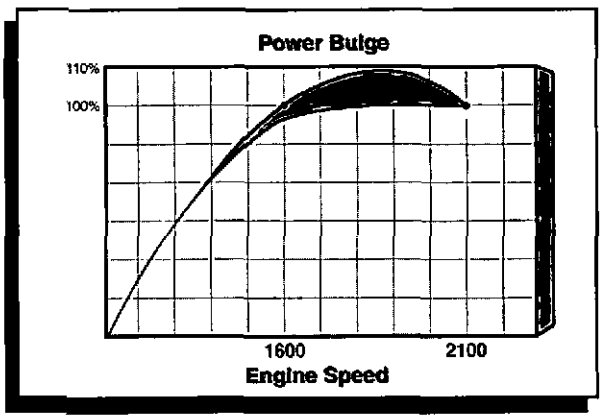
*Mobile applications only

The ECU, interacting with advanced engine features of the 10.5 L and 12.5 L ***POWERTECH*** models, produces the following advantages:

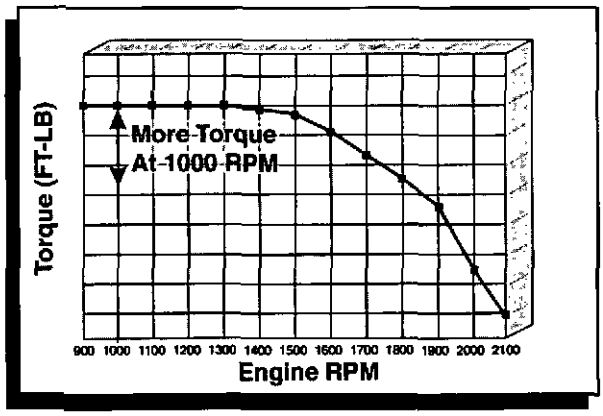
Increased Power Bulge
Up to 43% more, 10% at 1900 RPM
Increased Power Boost
5% to 10% when you need it,
30 to 50 extra horsepower
More Torque Rise
22% at 1900 RPM, 35% at 1400 RPM
Improved Low-Speed Driveability
135% of rated speed torque at 900 RPM

The engine control unit provides the "brains" for continuously monitoring and adjusting engine performance based on real-time operating conditions.

POWERTECH 10.5L/12.5L

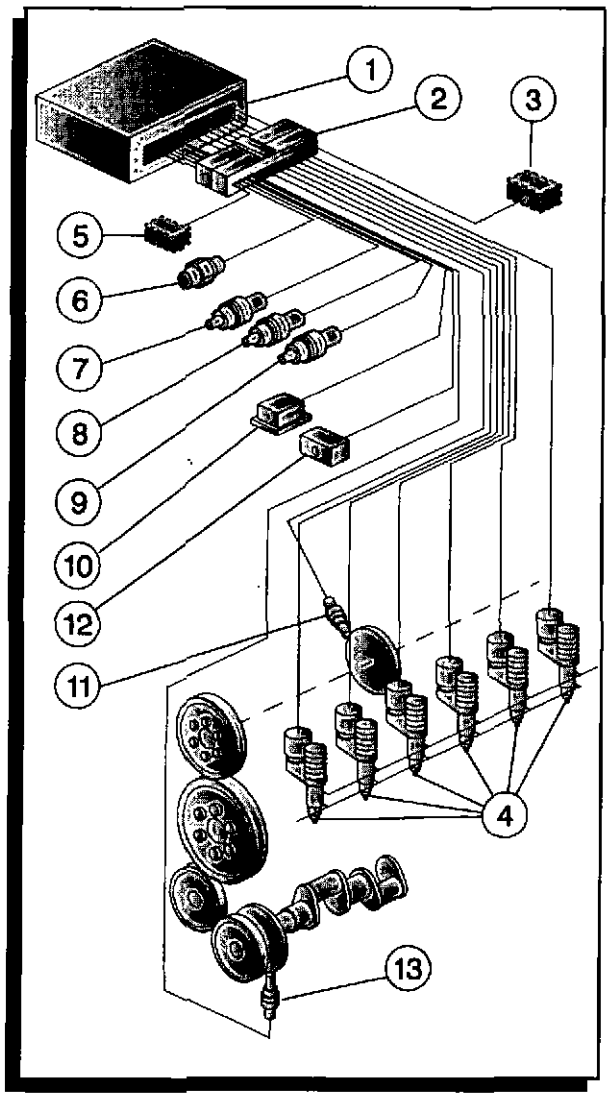


Power Bulge – Power bulge is programmed into the standard torque curve, so when an extra load begins to pull engine RPM down, the Engine Control Unit responds by commanding an increase in power. This pulls the engine through peak loads without compromising other machine functions. For example, at 1900 RPM, the ECU provides a power bulge that will increase engine power by 10%.



The engine's electronic controls also provide increased torque at lower engine speeds for better low-speed driveability in mobile applications. The engine is able to maintain the desired rated speed, increasing machine productivity.

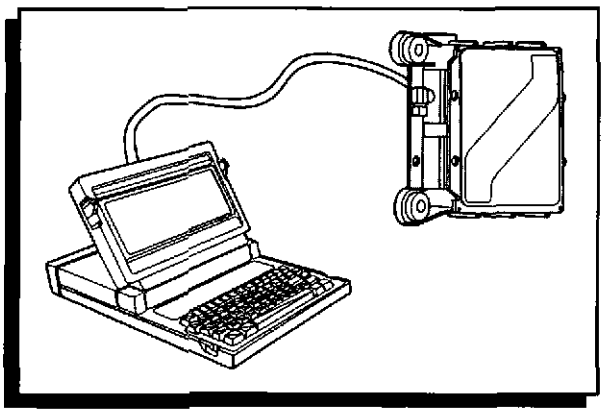
In certain applications, an optional timed power boost provides 30 to 50 extra horsepower for a limited time to satisfy peak demands. This allows these ***POWERTECH*** models to do the work of engines with much higher horsepower ratings.



②**Sensors and Harness** – A harness assembly connects electronic sensors to the engine's ECU. Weather-resistant electrical connectors are used at each connection to the harness. Engine sensors and system components are:

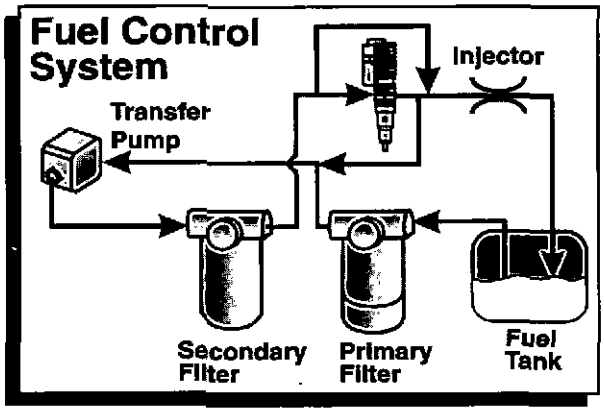
1. Engine control unit (ECU)
2. Wiring harness
3. Monitor output (Diagnostic Terminal)
4. Electronic unit injectors (EUIs)
5. Vehicle/Application inputs
6. Throttle sensor
7. Coolant temperature sensor
8. Manifold air temperature (MAT) sensor
9. Fuel temperature sensor
10. Manifold air pressure (MAP) sensor
11. Camshaft position sensor
12. Data port for diagnostic reader
13. Crankshaft position sensor

Just as the ECU provides the "brains" for the engine, the harness and electronic sensors function as the engine's "nervous system", sensing operating conditions and relaying the information to the EUI.



Diagnostic Software – John Deere provides diagnostic software and an interface device to be used with a laptop PC. This enables any authorized John Deere dealer to connect to the ECU and display diagnostic codes stored in its memory. Diagnostic time is shortened and money is saved.

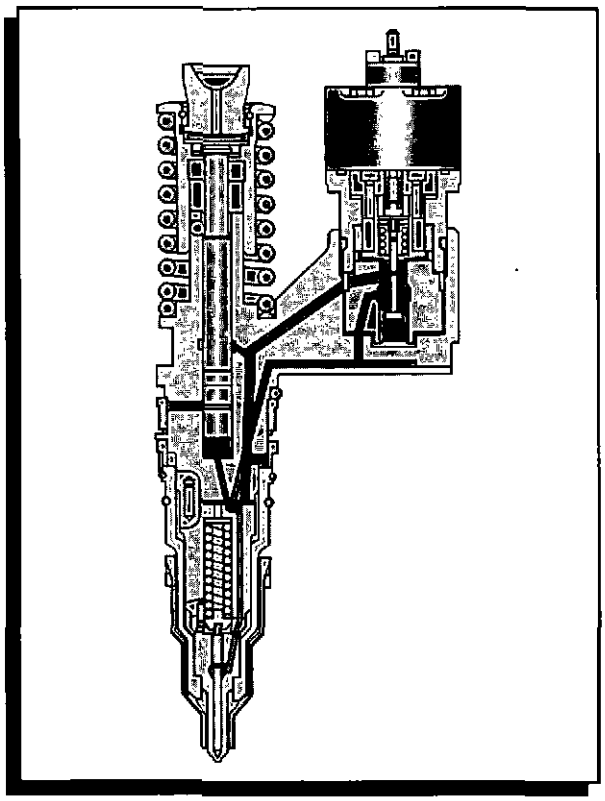
The software defines parameters for various engine operations and determines responses when parameters are reached. This software can be modified or reprogrammed to adjust engine performance for changing applications.



Fuel Control System – Coupled with John Deere Electronics is the fuel control system. It consists of:

- Fuel transfer pump with pressure relief valve
- Fuel filtration system
- Electronic unit injectors

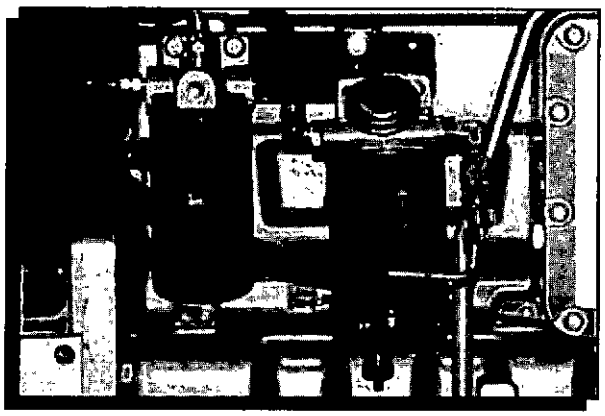
The flow configuration routes fuel from the fuel tank, through the primary filter / water separator and into the transfer pump. Leaving the pump, fuel is further filtered at the secondary filter before going to the EUIs. Fuel not used by the injectors is returned, 90% of the excess fuel returns to the inlet of the fuel transfer pump; the remaining 10% returns to the fuel tank.



③**Electronic Unit Injectors** – The ***POWERTECH*** 10.5 L and 12.5 L engines introduce John Deere owners to the advantages of Electronic Unit Injectors. The EUI combines a nozzle, pump assembly, and electronic solenoid valve into a single, compact unit. Injector pressure is developed within the EUI, and the ECU activates the solenoid to control timing and delivery.

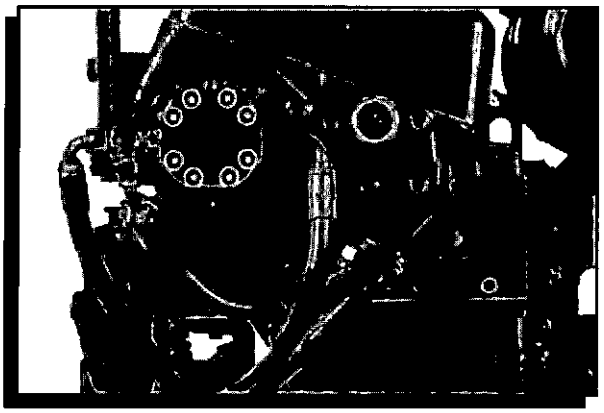
Because the start and duration of injection is precisely controlled and the injection pressure is very high, combustion is more efficient, resulting in reduced emissions and improved fuel economy.

These compact, self-contained unit injectors do not use a separate injection pump to perform. Instead, they internally create up to 27,000 PSI of injection pressure for each actuation.



④**Fuel Filtration System** – The fuel filtration system consists of a primary filter and a secondary filter. The primary filter is a spin-on type canister filtering down to 10 microns at 98% efficiency. It contains a water separator section at the bottom, which can be drained manually. The secondary fuel filter is also a spin-on type canister. It filters the fuel down to 2 microns at 98% efficiency.

Exceptional fuel filtration, and convenient serviceability, are provided through the use of these advance-designed, spin-on, vertically-mounted fuel filters.



Fuel Transfer Pump – The 10.5 L and 12.5 L engines' fuel transfer pump is a gear-type mechanism driven by the camshaft. A pressure relief valve located inside the pump's cast housing protects the fuel system from excess pressure. A pressure regulating valve in the fuel manifold assures constant fuel pressure for the EUI's.

The transfer pump is designed for reliable operation over an extended service life. Its location is easily accessible at the rear of the cylinder head.

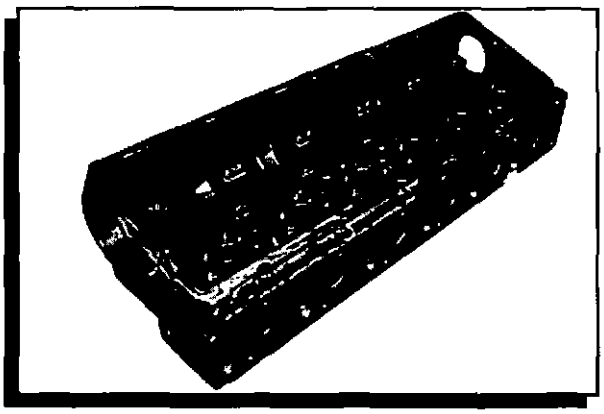
POWERTECH 10.5L/12.5L

Cylinder Head

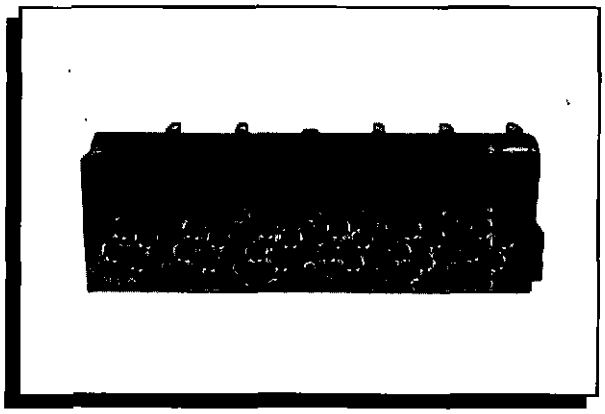
Feature	Advantage	Benefit
1. Heavy Section for Camshaft Mounting	*Strong, stiff head for high-power output*	**Durability**
2. Four Valves per Cylinder	*Permits better intake/exhaust flow*	**Performance Economy**
3. Integral Intake Manifold	*Expanded air intake capacity; deep cavity formed in head*	**Reliability Serviceability**
4. Integral Fuel Supply Passages	*Eliminates clutter & potential problems from external lines*	**Reliability**
5. Short Intake & Exhaust Ports	*Efficient, unrestricted air and exhaust flow; reduced heat transfer*	**Performance Economy**
6. Center Injector Mounting	*Holds injector at optimum position for fuel economy; increased power and reduced emissions*	**Durability Economy**

The 10.5 L/12.5 L engine cylinder head is a dramatic departure from other ***POWERTECH*** head designs.

It provides a high mounting for the camshaft, a vertical, center mounting for the EUI and locations for four valves per cylinder.

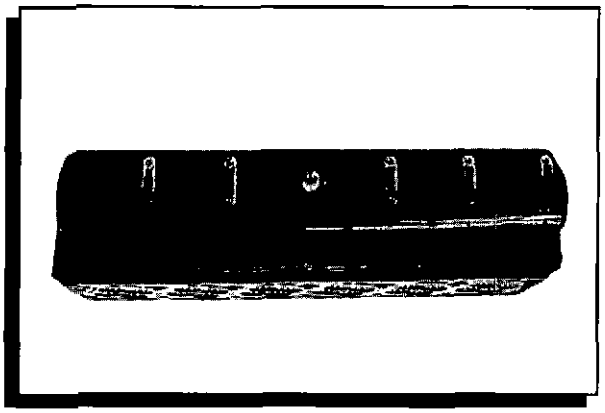


①**Heavy Section for Camshaft Mounting** – The engine's large diameter camshaft is supported and secured by large bushings in the head.

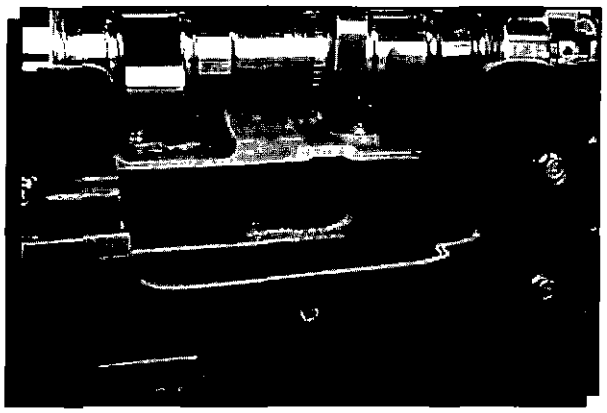


②**Four Valves per Cylinder** – By increasing the number of valves to four per cylinder, 10.5 L and 12.5 L engines increase intake and exhaust flow efficiency. Utilizing two intake valves provides a lower level of air swirl in the cylinder for better combustion. The additional exhaust valves aid in clearing combustion gases from the chamber. The combined benefits are: increased power, better fuel economy, and lower emissions.

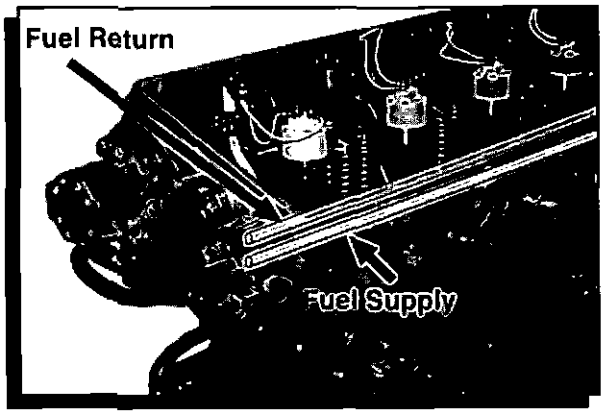
Four valves per cylinder facilitate better intake and exhaust flow in the combustion chamber.



③**Integral Intake Manifold** – The intake manifold has been cast into the right side of the cylinder head under the cam.

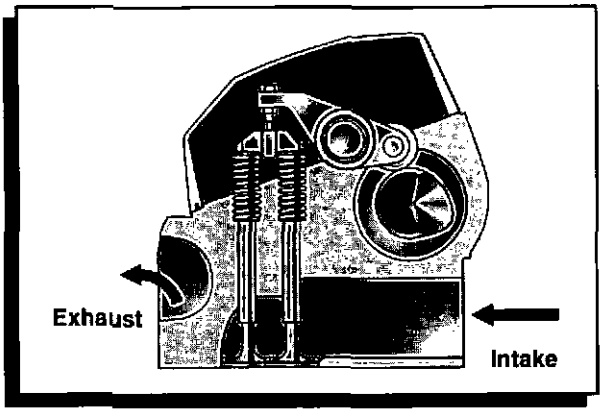


Camshaft Placement – This photograph of an engine cutaway shows the placement of the camshaft in the cylinder head in relationship with the placement of the integral intake manifold.



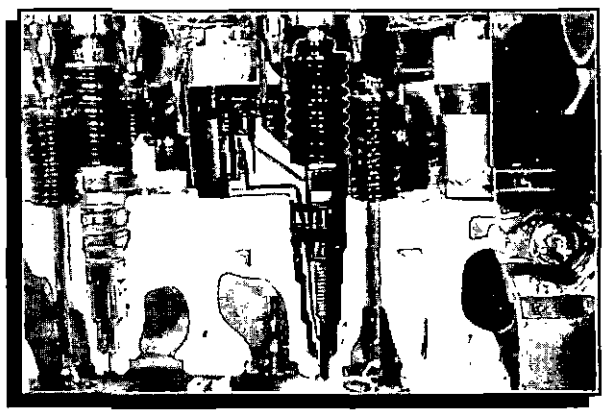
④**Integral Fuel Supply Passages** – Passages are drilled the length of the head to provide fuel flow to each unit injector. This integral fuel passage eliminates the clutter and potential problems of external fuel lines.

Integral fuel supply passages deliver fuel to the EUIs and reduce potential for leaks.



⑤**Short Ports with Cross-Flow Design** – The cross-flow design uses short intake and exhaust ports in the cylinder head. Utilization of the short ports provides efficient, unrestricted air flow from the intake manifold, through the cylinder and out the exhaust manifold. This reduces the amount of heat transfer into the cylinder head.

Short ports provide efficient, unrestricted air flow. The cross-flow design directs intake-to-exhaust air movement along the most direct and efficient path.



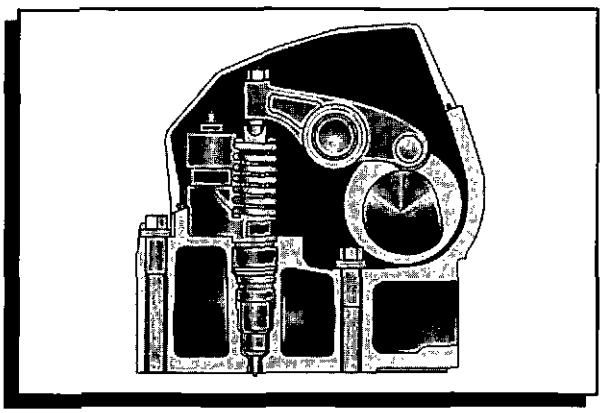
⑥**Center Injector Mounting** – The EUIs are mounted vertically over the center of each cylinder. The center position assures optimum fuel delivery to the combustion chamber.

Locating the injection of fuel at the center of the combustion chamber promotes thorough and rapid fuel-air mixing.

POWERTECH 10.5L/12.5L

Cylinder Head Components

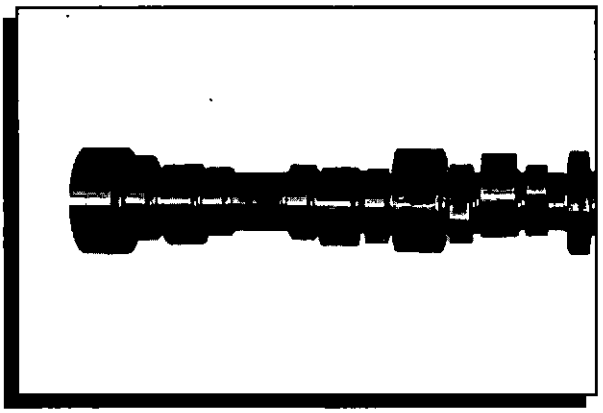
Feature	Advantage	Benefit
1. Camshaft	*Larger diameter camshaft provides rigidity needed for the increased load associated with high-pressure EUIs; in-head placement reduces parts and improves performance*	**Performance Durability**
2. Rollller Rocker Arms	*Roller design eliminates wear resulting in precise control over valve events*	**Performance Reliability**
3. Intake & Exhaust Valves	*Larger size produces better performance, lower emissions*	**Performance**
4. Replaceable Seats & Seals	*Replaceability extends valve and head life*	**Serviceability Durability**
5. Head Gasket	*Five-layer steel and graphite composition with stainless steel fire rings*	**Reliability Durability**
6. Head Bolts	*Direct tensioning assures maximum, consistent clamping on cylinder head*	**Reliability Serviceability**



POWERTECH 10.5 L and 12.5 L diesel engines have dramatically altered the configuration and operating efficiency for engines of this class.

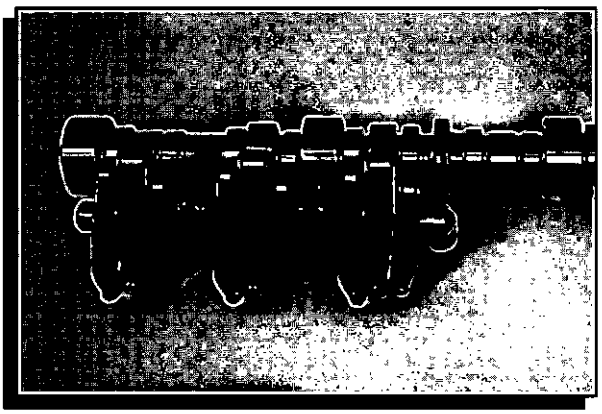
Topping the list of improvements is the cam-in-head design. Locating the cam in the head eliminates the need for push rods and lifters. The number of other components has been reduced, and there are fewer wear points.

But more importantly, the cam-in-head design elevates the ***POWERTECH*** 10.5 L and 12.5 L to a new level of performance and reliability. It means precise control over valve events, a one-time valve adjustment at 2500 hours, and improved serviceability.



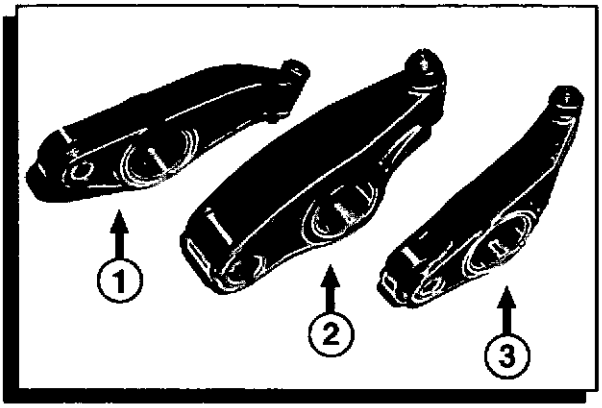
①**Camshaft** – The camshaft is machined from a steel alloy. Cam lobes and journals are precision ground and case hardened for long service life. The large diameter camshaft easily handles the increased loading of high-pressure electronic unit injectors and the 4-valve head design.

Large diameter camshaft provides strength and rigidity to function with the high-pressure EUIs.



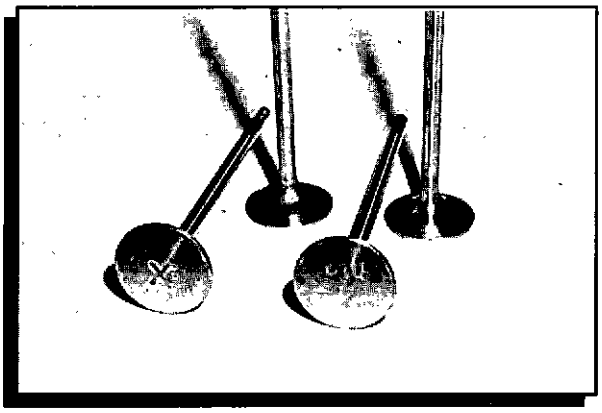
②**Roller Rocker Arms** – Rollers are integral parts of the rocker arms. There are no push rods or lifters to interconnect. This results in precise control of events. The rollers are barrel-shaped, made of heat-treated steel for excellent wear resistance. Each is mounted to a cast rocker arm assembly.

Rollers move "as one" with the rocker arms for precision actuation of valve events. Push rods and traditional lifters have been eliminated to avoid flex and wear concerns.



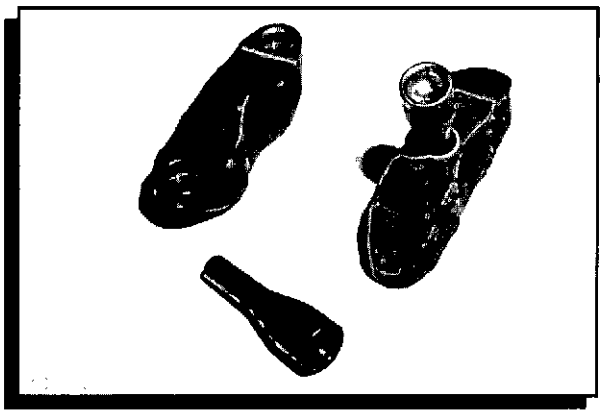
Pictured to the left are three roller rocker arms:

1) Intake Valves Roller Rocker Arm
2) Electronic Unit Injector Roller Rocker Arm
3) Exhaust Valves Roller Rocker Arm



③**Intake & Exhaust Valves** – To minimize air flow restrictions through the cylinder head, large valves are used for both intake and exhaust. Intake valves are contoured to promote high air flow. Exhaust valves are a bi-metal design. Valve heads are high in alloy content to stand up to the high temperatures. Stems are a chrome-plated, low carbon material made to resist scuffing.

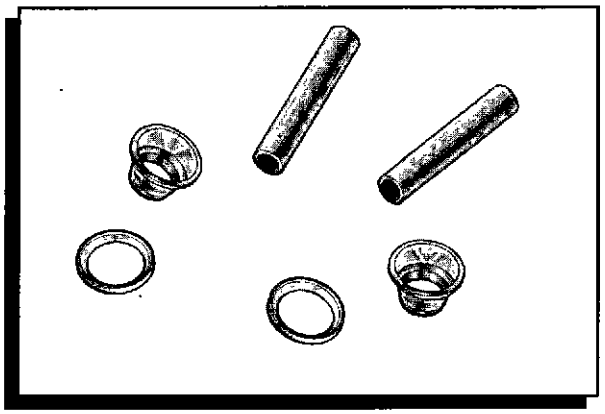
Large intake and exhaust valves promote better performance and longer service life.



Valve Bridges – With the four valves per cylinder, valve bridges are used to provide simultaneous operation the intake and exhaust valves.

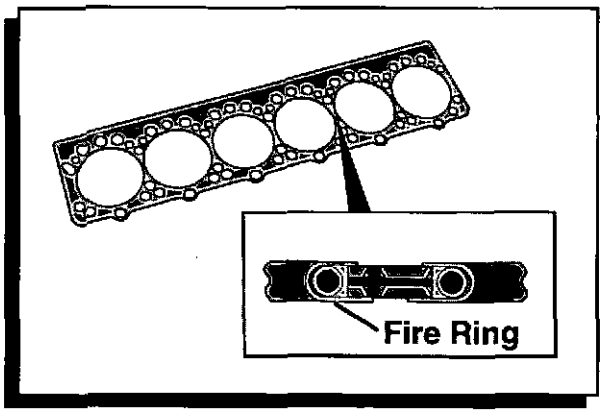
The valve bridges are precision formed from powdered metal process and have a deep section for maximum strength. To insure equal force on the valve stems a bridge pin is used between the rocker arm and the bridge. The pin contact point in the bridge is below the tops of the valves insuring stability.

The bridge and pivoting pin design eliminate stress and wear usually associated with valve bridges.



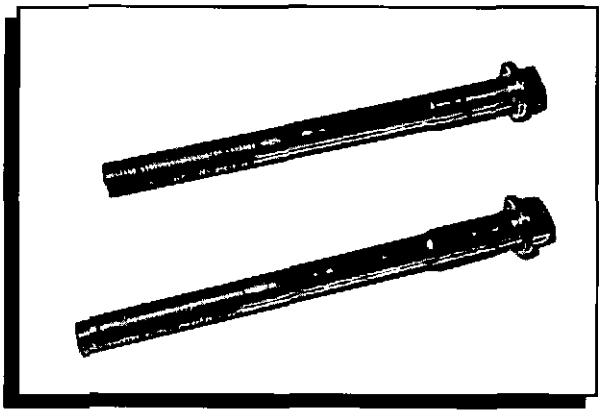
④**Replaceable Seats and Seals** – Valve guides are formed from powdered metal. By design, the porosity of the metal's microstructure retains oil for stem lubrication. Seats are shaped to match the contour of the ports, providing smooth intake and exhaust flow. Meanwhile, positive seals are in place at each valve, helping meter the oil to the valve guides. All guides, seats and seals are engineered for years of service. Seats and Seals are replaceable for extended engine life.

Advanced metallurgy is responsible for valve guides that combine outstanding strength with integral porosity for lubrication. Alloy valve seats extend both head and valve life. Seals on exhaust valves control lubrication.



⑤**Head Gasket** – Five layers of steel and graphite combine to form a head gasket that provides excellent sealing properties, exceptional resistance to heat and extremely long service life. A solid steel core supports stainless steel fire rings.

Graphite and steel combine to resist heat and form an excellent seal with long life expectations. Soft stainless steel fire rings provide metal-to-metal contact for extra strength.



⑥**Head Bolts** – 26 head bolts secure the head with even, consistent clamping force. This is accomplished through "direct-tensioning", using a computer to monitor each cylinder head bolt as it is tightened. Tightening stops at the optimum point of bolt load.

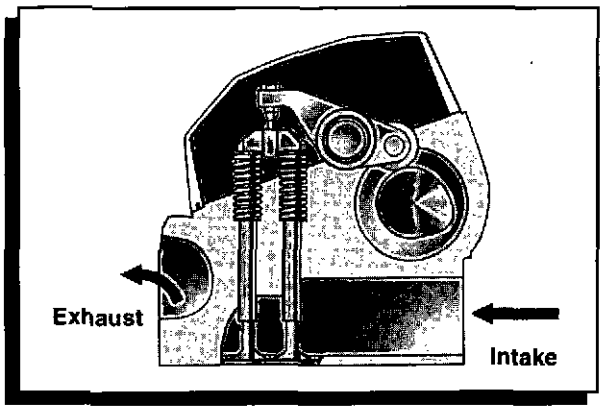
32,000 lb of force per bolt secures the head with maximum clamping force to contain the high combustion pressures required by these optimized engines.

POWERTECH 10.5L/12.5L

Air Intake & Exhaust System

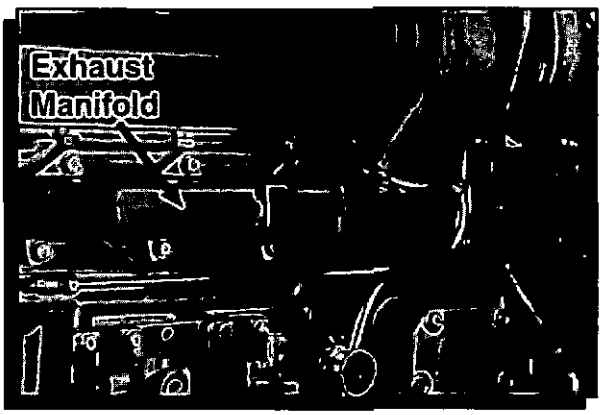
Feature	*Advantage*	Benefit
1. Cross-Flow System	*Efficient pattern for short-run, unrestricted air/exhaust flow*	**Performance**
2. Exhaust Manifold	*Smooth, low-mounted design that efficiently routes exhaust gases*	**Reliability Flexibility**
3. Low-Mount Turbocharger	*Matched engine turbocharging and low-profile design*	**Performance Flexibility**
4. Air-to-Air Aftercooler	*Most effective method of cooling charged air*	**Performance Economy Durability**
5. Air-to-Water Aftercooler	*Internal liquid heat exchanger adds density to charged air*	**Economy Durability**

The ***POWERTECH*** 10.5 L and 12.5 L engines' air intake and exhaust system is shaped by design factors and performance goals. Placement of functions in the head dictate a cross-flow system for efficient, unrestricted movement of air and combustion gases. The air is turbocharged and aftercooled (air-to-water or air-to-air). A number of components are integral to the engines, reducing external clutter. Other components are shaped or mounted in such a way that the engines maintain a low profile for broad application flexibility.



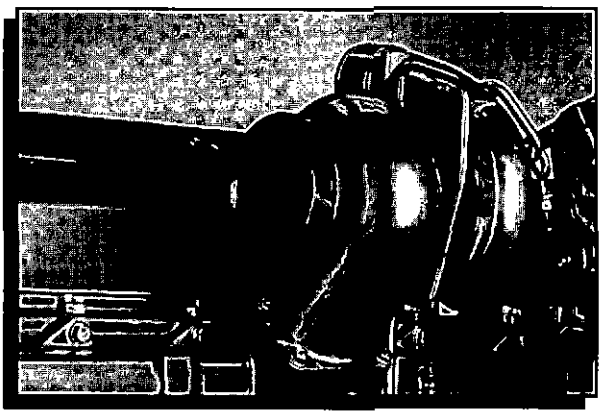
①**Cross-Flow System** – The cross-flow intake and exhaust pattern is determined by the location of the integral intake manifold near the cylinders and logical placement of the exhaust manifold. This promotes unrestricted flow using very short ports. Efficiencies are high. Heat transfer is low.

The cross-flow design directs intake air and exhaust along the shortest, straightest route for unrestricted flow and greater efficiency.



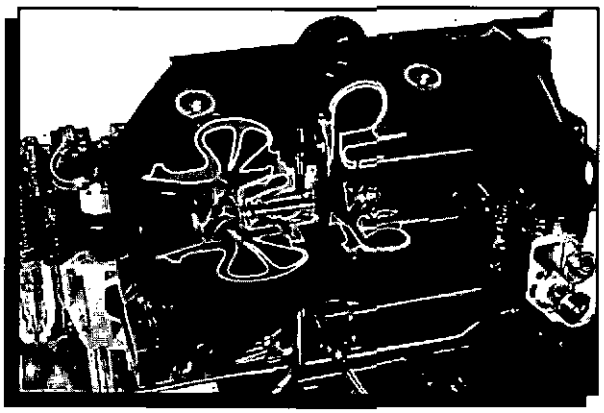
②**Exhaust Manifold** – The exhaust manifold separates the exhaust pulses as it directs combustion gases away from the cylinder head. The manifold receives the gases from six separate ports (one per cylinder) and directs them via two flows, mating with the turbocharger turbine housing. Its smooth design complements the uncluttered lines of the engine.

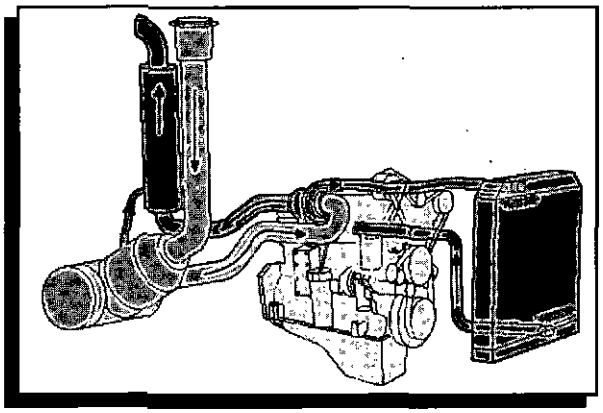
The exhaust manifold delivers combustion gases to the turbocharger in an efficient manner that maintains exhaust energy for driving the turbine blade.



③**Low-Mount Turbocharger** – The high efficiency turbocharger is sized to match engine output. It compresses intake air to optimize combustion, resulting in increased performance and better fuel economy. Mounted low on the engine, the turbocharger helps maintain a low profile for broader application of these *POWERTECH* models. Cool, filtered oil is provided directly from the oil filter base for lubrication.

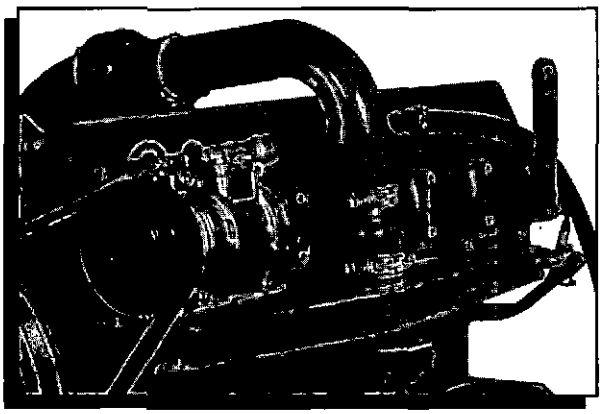
The turbocharger significantly increases engine performance and economy while reducing exhaust noise and emissions. John Deere engineers have matched the turbocharger with the engine and application.





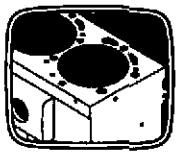
④**Air-to-Air Aftercooling** – This system centers on an air-to-air heat exchanger located side-by-side with the radiator at the front of the engine. Hot compressed intake air is cooled as it flows through the core. Outside air moves across the fins, reducing intake air temperatures by as much as 82°C to 94°C (180°F to 202°F). Lowering the intake air temperature makes the air more dense. This produces better combustion, dramatically improving engine power, performance and fuel economy.

Engine models equipped with the air-to-air aftercooler are fitted with the most efficient method of cooling charged air. This results in increased power with lower fuel consumption and reduced emissions.



⑤**Air-to-Water Aftercooling** – The air-to-water aftercooler mounts in the integral intake manifold. Liquid coolant from the engine circulates through a heat exchanger, transferring heat from the intake air in the manifold. Intake air temperatures can be reduced by as much as 30°C (100°F).

The air-to-water aftercooler is located inside the intake manifold. There are no external cores or lines to create clutter or require space. As a result, engine models with air-to-water aftercooling are more compact.

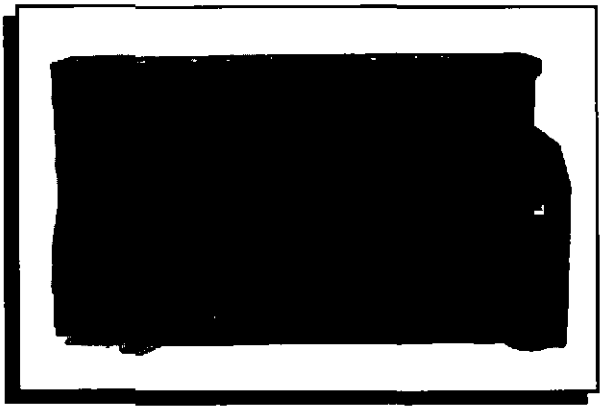


POWERTECH 10.5L/12.5L

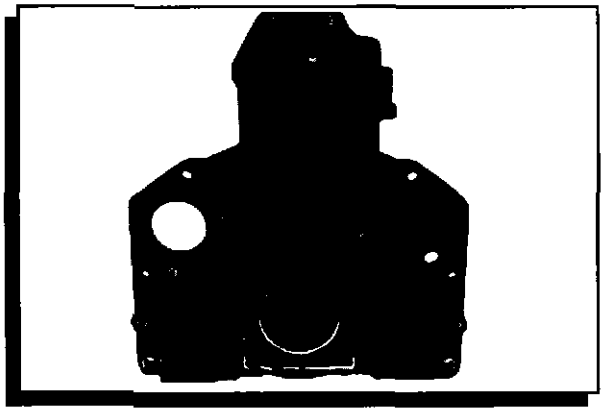
Cylinder Block

Feature	*Advantage*	Benefit
1. Cast in John Deere Foundry	*Strong, precision casting made with unequalled quality control*	**Reliability Durability**
2. Heavy Vertical Webbing; Weight-Saving Design	*Provides strength where needed, saves weight where possible*	**Performance Flexibility**
3. Integral Oil Cooler/Coolant Manifold	*No external tubes, reduces chance of leaks, more efficient*	**Reliability Durability**

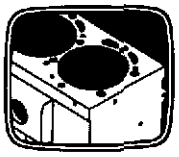
The ***POWERTECH*** 10.5 L and 12.5 L cylinder block saves weight at every opportunity without compromising structural integrity. This ultra-strong casting provides an intelligent alternative to the ordinary heavyweight block. Strategic reinforcements replace sheer bulk in a brilliant design that provides an outstanding foundation for these engines.



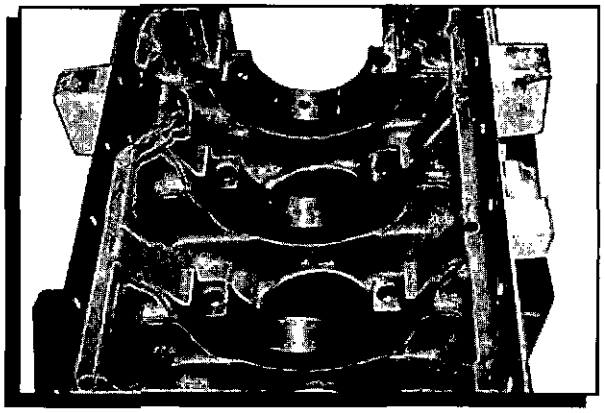
①**Cast in John Deere Foundry** – The John Deere Foundry takes an innovative design and turns it into a precision casting with unparalleled standards for performance. Using the proper materials, sophisticated equipment, and a commitment to excellence unequalled in the industry, Deere production processes and quality controls assure you of an outstanding cylinder block every time. Each one is machined to exacting tolerances and carefully inspected before assembly.



Rear view of the cylinder block

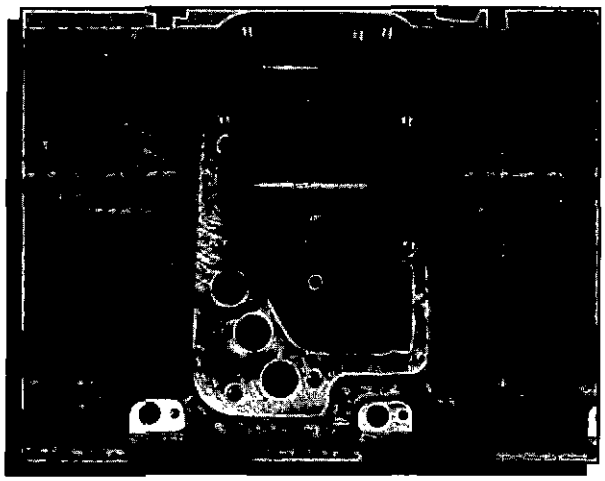


POWERTECH 10.5L/12.5L



②Heavy Vertical Ribbing, Weight-Saving Design – The cylinder block design trims unnecessary bulk while bolstering strategic areas of stress with patterned reinforcement. Internal webs add strength and durability while reducing engine noise. External vertical ribs provide "pillars of support" for block walls.

Internal webbing mirrors the external ribs that form block walls. This maintains strength while conserving weight and reducing noise.



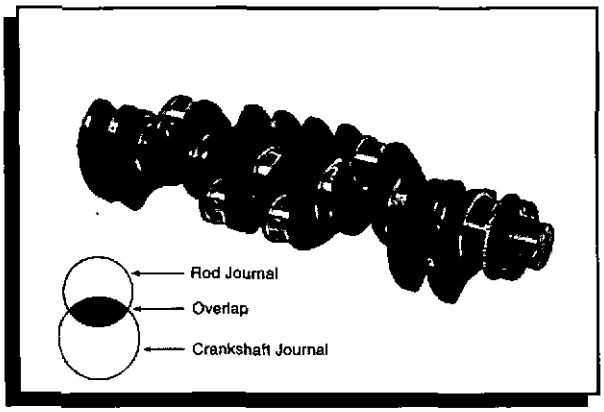
③Integrated Full-Flow Oil Cooler/ Coolant Manifold – *POWERTECH* 10.5 L and 12.5 L engines are designed with the oil cooler housing as an integral part of the block. A plate-type oil cooler fits into this housing, transferring heat from engine oil. Because 100% of the engine coolant circulates past this full-flow oil cooler, cooling efficiency is greatly improved. This results in lower engine oil temperatures. Elimination of external lines precludes the risk of leaks and frees the engine from clutter.

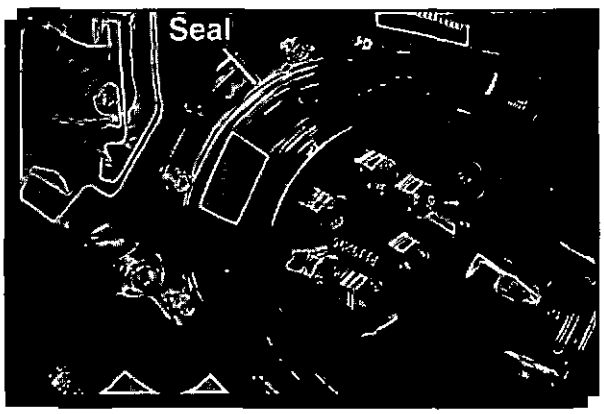
Forming the oil cooler housing in the block conserves space, eliminates external lines and improves cooling efficiencies.

POWERTECH 10.5L/12.5L

Power Train

Feature	Advantage	Benefit
1. Crankshaft	*Larger mains and rod journals for strength; unitized seals prevent oil leakage*	**Reliability Durability**
2. One-Piece Piston (10.5 L)	*Aluminum with dual Ni-resist insert; profile turned skirt*	**Performance Durability Economy**
3. Two-Piece Articulated Piston (12.5 L)	*Steel Alloy crown with aluminum skirt; high-ring design*	**Performance Durability**
4. Piston Rings	*Two keystone compression rings and an oil control ring*	**Reliability**
5. Tapered Connecting Rods	*Forged steel with tongue and groove split angle joint*	**Durability**

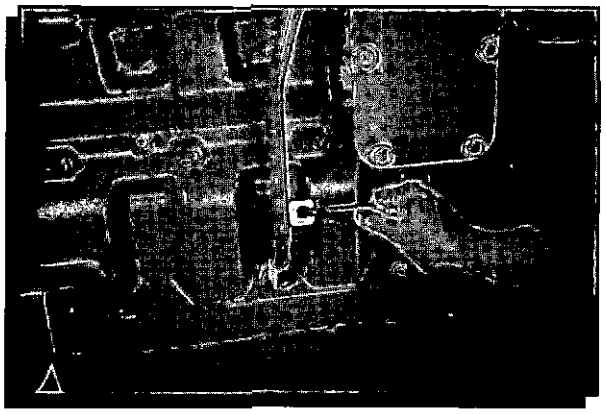




John Deere places high priority on the "lower end". The power train for these 10.5 L and 12.5 L engines complements the increased power and efficiency of this new-breed design in every way. From its heavy-duty crankshaft to the 12.5 L model's two-piece articulated piston, this power train far exceeds traditional expectations.

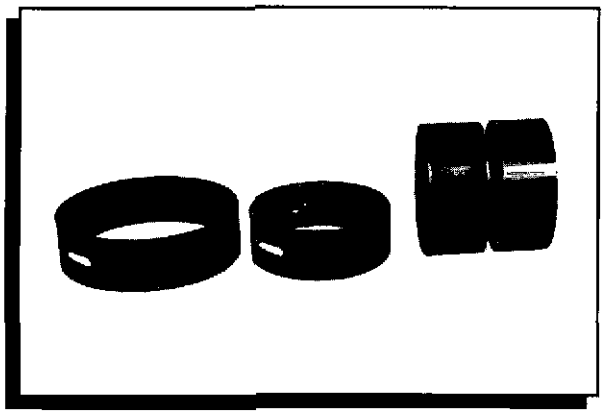
①**Crankshaft** – The crankshaft is machined from a heavy steel forging for outstanding strength and durability. The 10.5 L provides a 138 mm stroke and the 12.5 L a 165 mm stroke. Large diameter main and rod journals provide overlap, which further increases crankshaft durability. Both journals and radii are induction hardened for extended life. Counterweights, plus dynamic balancing, assure smooth, vibration-free power through the full range of RPM.

Of noteworthy importance is introduction of the **unitized crankshaft seal**, which replaces the individual seals and wear sleeves at the ends of the crankshaft. This flanged-carrier John Deere design incorporates the wear sleeve into the seal package. The unitized design improves the sealing function - and it assures there will be no wear at either end of the crankshaft.



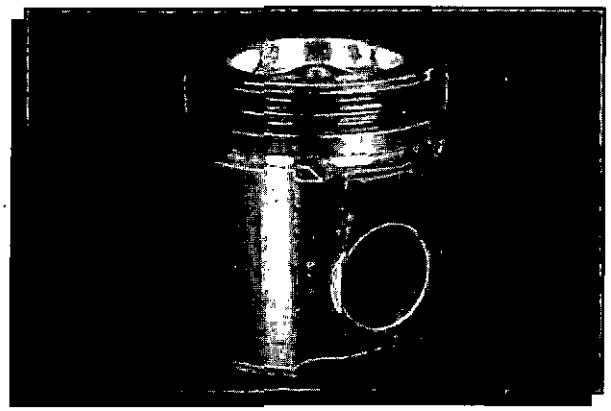
Also of special significance is the **timing notch** located in the crankshaft. The timing notch improves the accuracy of locating Top-Dead-Center (TDC). Accurate timing helps improve fuel economy, lower emissions, and optimize engine performance.

The crankshaft is forged from heavy steel with large, overlapping journals that have been induction hardened for extra strength and durability. A unitized crankshaft seal guards against wear at either end. And a timing notch makes injector and valve timing an easy task. Counterweights and dynamic balancing assure smooth, vibration-free power through the entire range of RPM.



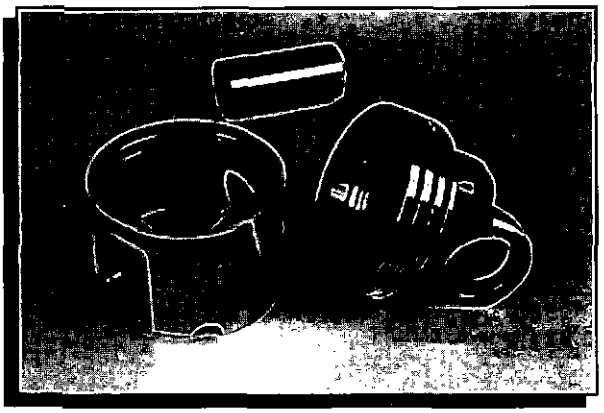
Main, Thrust & Rod Bearings – Main, thrust and rod bearings are made of steel-backed bushings with copper matrix lining and soft metal overlay. Main bearings have internal oil feed grooves. The WEAR-GARD bearing is used for rod bearings. Rod bearings have a built-in oil feed pocket, assuring uniform oil film over the journal at all times. This pocket in the bearing's surface also reduces peak oil film pressure and increases film thickness for fatigue resistance and longer life.

Design and construction of the main bearings result in excellent load-bearing properties with continuous lubrication. Thrust bearings are engineered for exceptional control over end play.



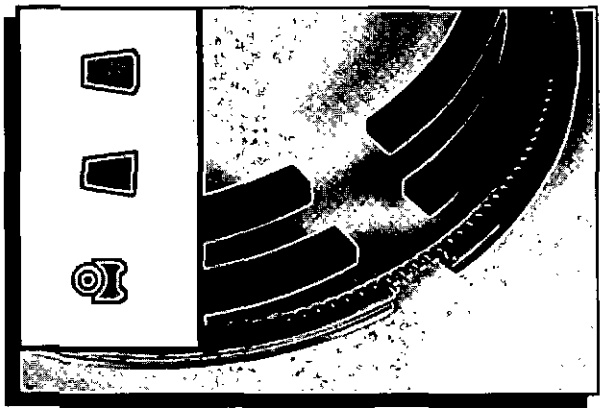
②**One-Piece Piston (10.5 L Engine)** – The 10.5 L engine's piston is a one-piece cast aluminum design. It is pressure balanced, with profile turned skirts and a quiescent combustion bowl. The piston is fitted with three rings. The top ring is positioned high at 6.5 mm from the top of the piston to reduce smoke and emissions. A Ni-resist insert has been cast into the piston to secure the top two rings. This provides excellent wear characteristics for the rings and grooves. Specially developed for the 10.5 L engine, this piston offers good performance over a long service life.

The 10.5 L engines are equipped with this one-piece cast aluminum piston. A proven high-ring design with conventional combustion bowl, the pistons are known for efficiency and economy.



③Two-Piece Articulated Piston (12.5 L Engine) The 12.5 L engine utilizes a two-piece articulated piston which consists of a steel crown and an aluminum skirt. The crown stands up to high temperatures generated by the high power levels. A piston pin secures the crown and skirt to the connecting rod. The skirt is gravity cast aluminum, and profile turned. Because it runs cooler, the fit to cylinder liners can be closer for less piston noise.

The 12.5 L engines rely on the two-piece articulated piston design that utilizes a steel crown to withstand the high temperatures generated by higher power levels. The aluminum skirt not only saves weight, it runs cooler, allowing a reduced piston-to-liner clearance.



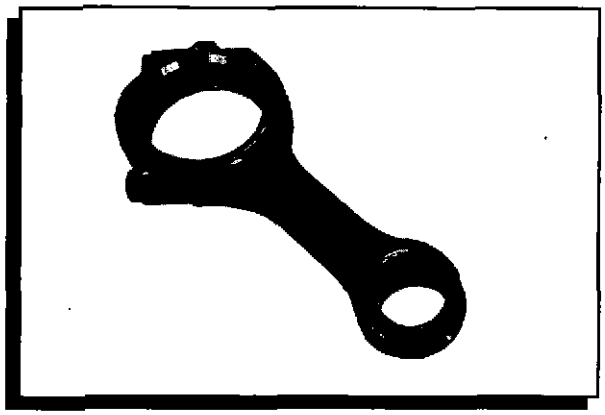
④Piston Rings – Both 10.5 L and 12.5 L engine pistons utilize three rings.

The top ring is high (6.5 mm from the top of the piston). The high ring position reduces top land crevice volume for better fuel economy, reduced emissions, and improved cold-weather start-up. This keystone-shaped ring is barrel-faced with a plasma coating.

The middle ring is similar to the top ring in structure. It is keystone-shaped and taper-faced with a plasma coating.

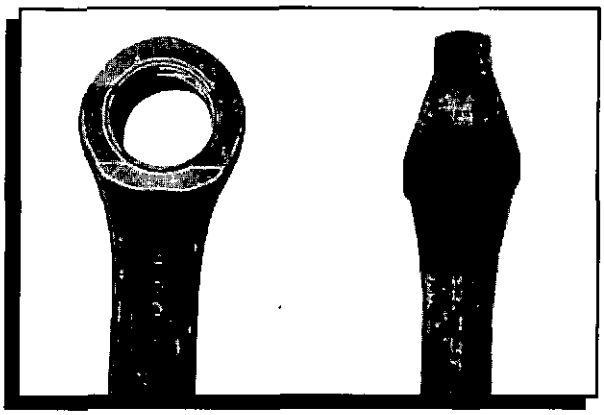
The bottom ring is the oil control ring. A double-rail type with a cast-iron outer element, it makes use of a coil spring expander for maintaining pressure against the cylinder liner. Holes drilled in the ring's groove to the interior of the piston drain any excess oil.

Three piston rings have been specially shaped for functionality and service life. The high top ring seals the piston for optimum combustion. The bottom ring controls oil for lubrication in the cylinder.



⑤**Tapered Connecting Rods** – Forged steel connecting rods are machined with an angle split joint to accommodate the larger journal diameter. This design allows rod removal in-frame. To ensure proper cap-to-rod alignment, the rod incorporates a tongue and grooved mounting surface. Meanwhile, the piston end of the rod is tapered. This places the large bearing contact area under the piston to effectively transfer combustion-stroke force to the crankshaft.

Connecting rods are high strength steel forgings designed with an angle split joint for allowing larger rod journals. The piston end tapers, enlarging the bearing contact area under the piston.

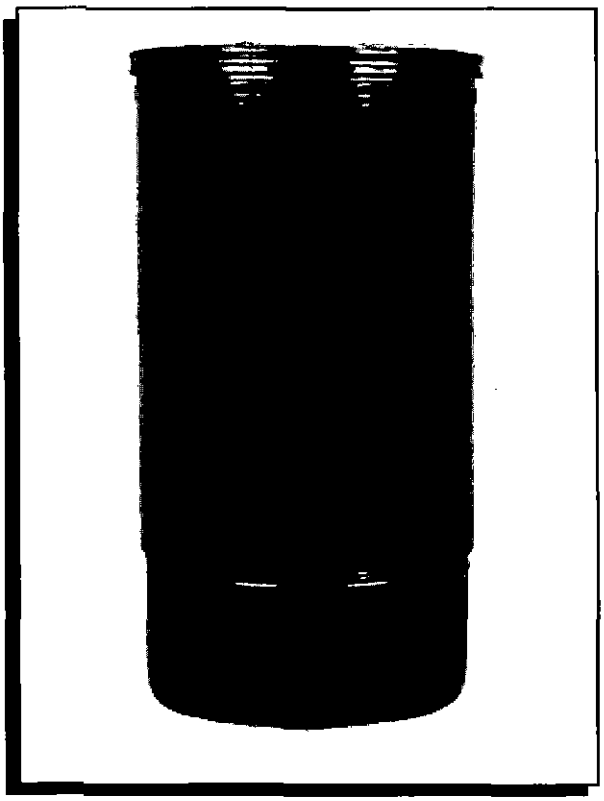


The piston end of the connecting rod is tapered. This taper design places the large bearing contact area under the piston pin, transferring the combustion force to the crankshaft during the power stroke.

POWERTECH 10.5L/12.5L

Wet Sleeve Cylinder Liner

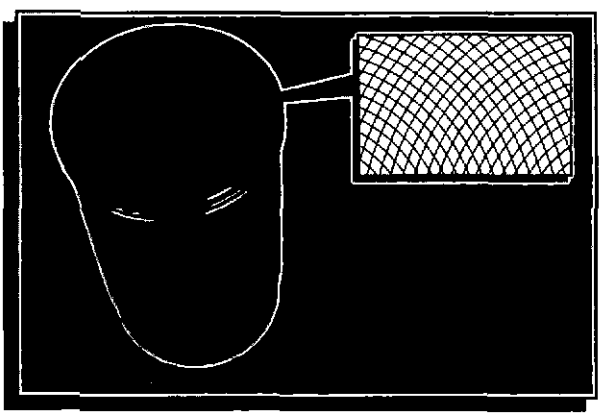
Feature	Advantage	Benefit
1. Bainitic Iron Casting	*Centrifugally-cast bainitic iron provides much greater tensile strength than gray iron*	**Durability**
2. Plateau-Honed Walls	*Excellent sealing surface to mate with piston rings*	**Performance** **Durability**
3. Directed Top-Liner Cooling	*Integral to liner; lowers liner and head gasket operating temperature*	**Performance** **Reliability** **Durability**



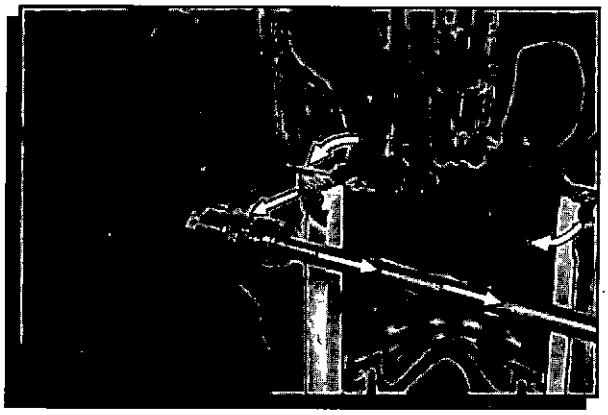
Wet-sleeve cylinder liners have proven their reliability in high-performance diesel engines. But John Deere takes the wet-sleeve liner design to a higher level. The liners used in the 10.5 L and 12.5 L engines incorporate advanced features that improve performance and extend service life.

①**Bainitic Iron Casting** – The engine's wet-sleeve cylinder liners are cast from bainitic iron for remarkable durability and outstanding strength. This very dense, hard premium metal provides much greater tensile strength than gray iron. Centrifugal casting forces any impurities in the molten material to the surface, where it is machined off. The result is a smooth, unblemished liner surface.

Major advancements in metallurgy move John Deere technology to the leading edge of liner development. These cylinder liners have greater tensile strength without need for hardening. Centrifugal casting results in an exceptional bore surface and better heat transfer capabilities.

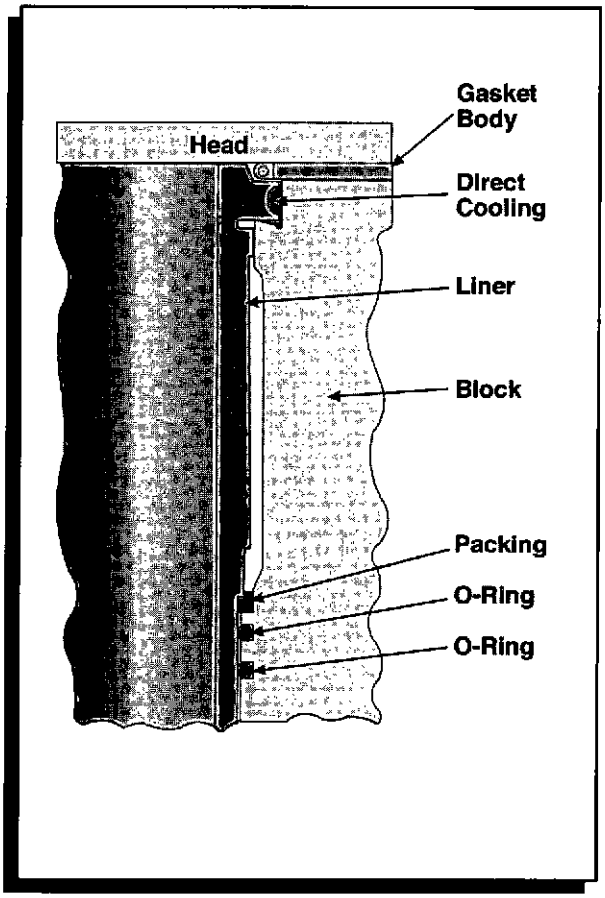


②**Plateau-Honed Walls** – Plateau honing provides an excellent sealing surface for mating with the piston rings. Oil is evenly distributed and controlled.



③**Directed Top-Liner Cooling** – The outside diameter of the cylinder liner mounting flange is grooved to permit coolant flow for directed top-liner cooling. This feature is important as extreme temperatures are generated at the top of the combustion chamber. Directed top-liner cooling helps to lower piston turn around area temperatures. Reducing temperatures also reduces oil consumption, lowers emissions, and extends power cylinder and head gasket joint durability.

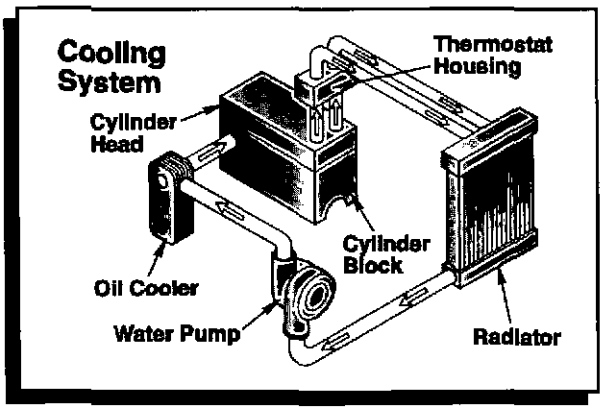
High combustion pressures and temperatures are very pronounced at the upper liner area. Directed top-liner cooling controls those temperatures, greatly improving component reliability.



Cooling System

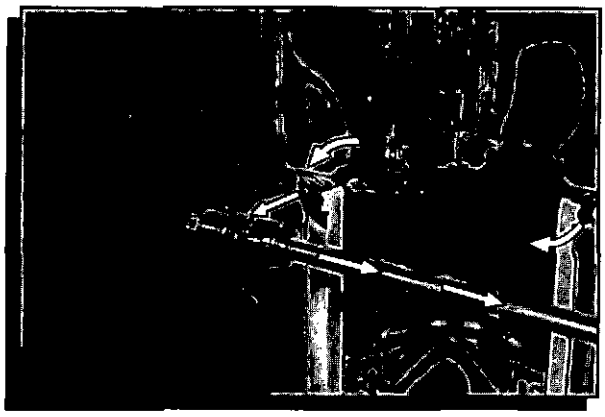
Feature	Advantage	Benefit
1. Directed Top-Liner Cooling	*Reduces liner and head gasket temperature; integral flow*	**Reliability Durability**
2. Gear-Driven Water Pump	*Higher efficiency, gear-driven pump independent of other components*	**Serviceability Reliability Durability**
3. Thermostats	*Proven performance; easy to access*	**Reliability Economy**
4. Air-to-Water Aftercooler	*Compact, heat exchange fits inside intake manifold*	**Performance Flexibility**

The cooling system incorporates the water pump, cylinder block, cylinder head, thermostat assembly, radiator and radiator fan, cooling circuit lines, and the directed top-liner cooling channels in the upper cylinder liner area.



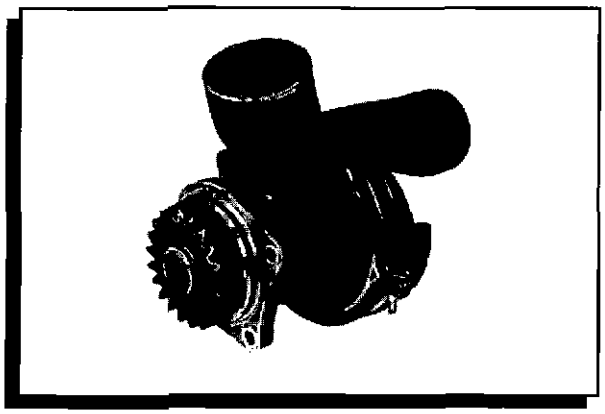
Circulation flow is driven by the water pump, which pulls coolant from the lower outlet of the radiator. Coolant passes through the pump and on to the oil cooler. From there, it flows into the block and around the liners. Then, it passes through a series of small passages into the cylinder head. In the head, coolant flows around the valve ports and into the thermostat housing. If coolant temperature is below the normal operating range, the thermostats direct it through a bypass line back to the water pump. When coolant reaches the operating temperature, the thermostats open and direct part or all of the flow to the radiator for cooling.

POWERTECH 10.5L/12.5L



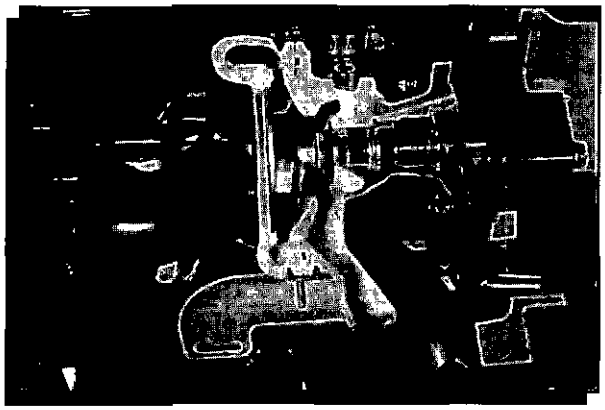
①**Directed Top-Liner Cooling** – The top part of the cylinder liner is above normal coolant level. Most engines in the 10-12 liter class conduct heat down the liner wall to the coolant passage. But ***POWERTECH*** models direct a flow of coolant to the upper liner area. There, it flows around a groove in the outside diameter of the flange, lowering the upper liner temperature by as much as 38°C (100°F). Temperatures are significantly reduced at the head gasket/liner joint as well, greatly increasing the reliability of both the gasket and liner.

Directed top-liner cooling improves the reliability of upper cylinder components by lowering temperatures encountered in high performance engines.

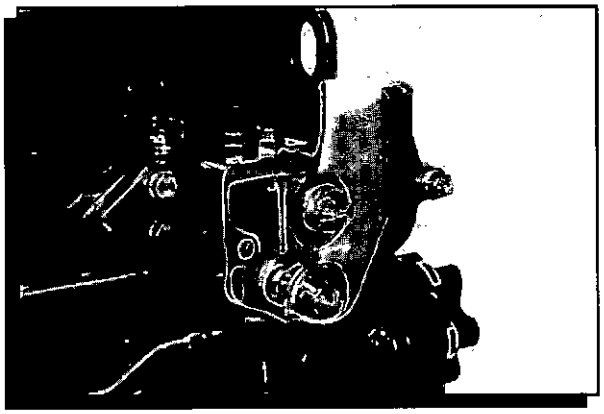


②**Water Pump** – A high-efficiency water pump with positive gear drive maintains coolant flow throughout the engine. Its high 68% efficiency lowers parasitic load which translates into better fuel economy. The unit is externally mounted and separate from the fan drive for improved serviceability. Water pump bearings are lubricated by engine oil for extended durability.

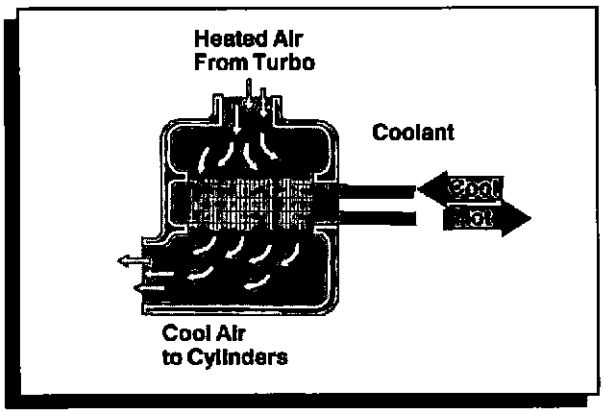
The gear-driven water pump functions with extremely high efficiency for better output, lower fuel consumption and reduced parasitic load.



Cutaway view of the water pump



③**Thermostats** – The thermostat housing mounted at the right-front of the cylinder head contains two thermostats. The thermostats are simple and reliable, with a normal operating range from 82°C to 94°C (180°F to 202°F).

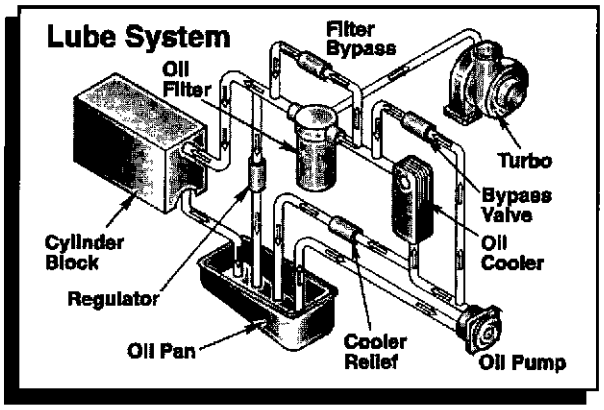


④**Air-to-Water Aftercooler** – On engines with the air-to-water aftercooler, a coolant core is fitted inside the intake manifold in the cylinder head. Coolant from the radiator flows continuously into the core.

The air-to-water (coolant) aftercooling is self-contained within the intake manifold. It is a compact, efficient way to lower the temperature of charged air.

Lubrication System

Feature	*Advantage*	Benefit
1. Gear-Type Oil Pump	*Simplified design, fewer parts and simplified service*	**Reliability Serviceability**
2. Oil Filter Base and Valves	*Vertical mount for convenient filter change; valves for flow and pressure control*	**Reliability Serviceability**
3. Plate-Type Oil Cooler	*Efficient, compact, simple heat transfer device*	**Performance Durability**
4. Combination-Type Oil Filter	*2-in-1 filter combines full-flow and bypass features in a spin-on canister*	**Reliability Serviceability Durability**
5. Piston Cooling Nozzle	*Continuous cooling of piston crown and lubricating of pin*	**Reliability Durability**

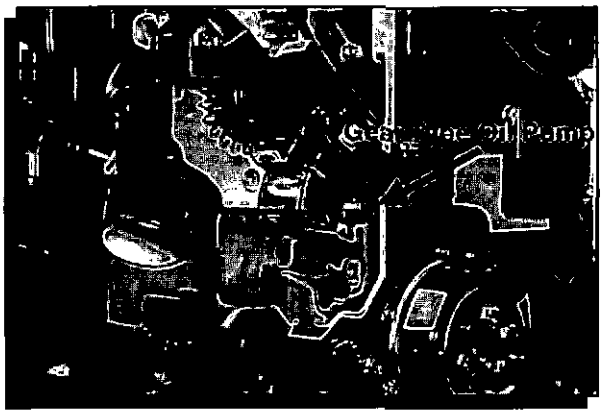


Lubrication flow begins when the oil pump picks up oil from the oil pan, directing it to the oil cooler. If the oil is cold, the cooler bypass valve opens, directing the oil around the cooler. From there, oil travels to the filter assembly, where two integral valves control flow.

The first valve is a filter bypass, routing cold oil around, not through, the oil filter. The filter bypass also opens if the filter is clogged. Normally, however, all oil flows through the filter.

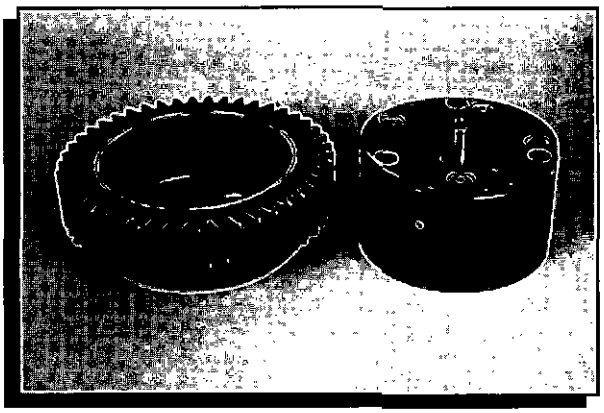
The second valve at the filter assembly regulates oil pressure. It maintains constant pressure by continuously returning extra flow back into the pan.

From the filter assembly, oil is channeled into the main oil gallery where it flows directly to the piston cooling nozzles. Seven drillings provide flow for the main and rod bearings. Oil also flows through these drilled passages into the head and to the cam bushings. Supply lines provide full pressure oil to the rocker arm assemblies. The turbocharger receives oil flow through a hose connected directly to the oil filter housing.

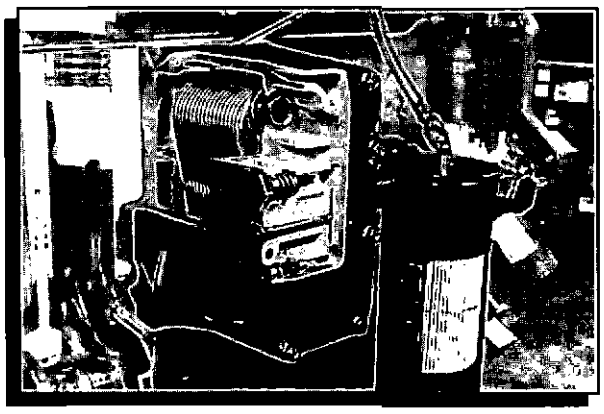


①**Gear-Type Oil Pump** – The oil pump, which has a 3-gear design normally used only on larger engines, is integrated into the front gear train for increased efficiency. This heavy-duty oil pump is driven by the crankshaft gear. When the engine is operating at 2100 RPM, the oil pump provides 182 L/m (48 gpm). The oil pump drive gear (lower idler) also drives the water pump.

The gear-driven oil pump is a high-capacity mechanism usually found only on larger engines. It provides reliable delivery of pressurized oil in full measure to all systems and components.

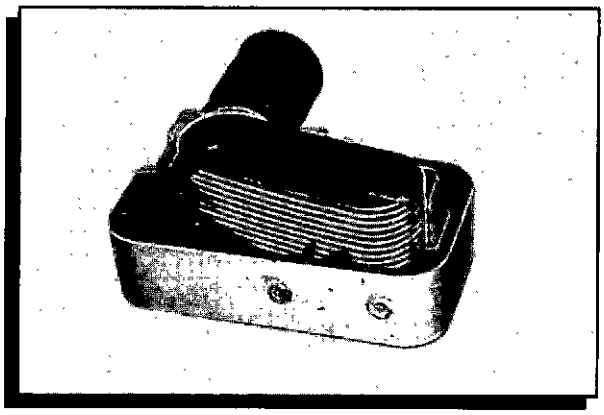


Drive Gear – The drive gear mounted on the pump body also acts as an idler gear to the camshaft gear, thereby reducing the number of active gears in the train. This highly simplified design reduces parts, improves reliability and simplifies service.



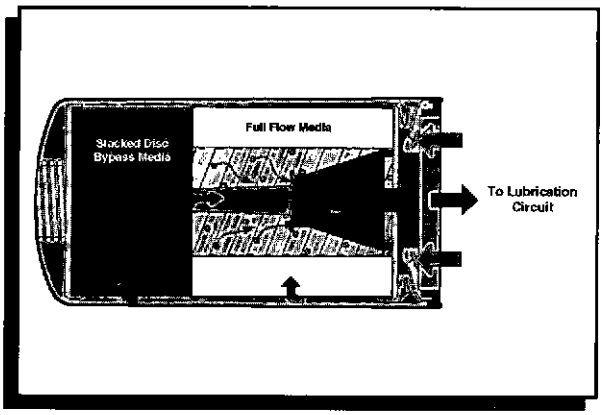
②**Oil Filter Base and Valves** – The oil filter base mounts the spin-on canister vertically for easy, no-mess filter element changes. The supply port for the turbocharger is at the top of this assembly. The base also accommodates the filter bypass valve–which allows cold, thick oil to bypass the filter–and the pressure regulator valve for maintaining consistent oil pressure throughout the entire lubrication system.

The oil filter base accommodates the spin-on canister, a filter bypass valve and the turbocharger supply port.



③**Plate-Type Oil Cooler** – The oil cooler assembly consists of a cover with cooler bypass valve and a plate-type cooler element. The element is positioned in the coolant manifold where it receives 100% of the coolant flow from the water pump. In this full-flow design, hot oil circulating through the element plates quickly transfers heat to the surrounding coolant.

The heat exchanger for cooling engine oil is located inside the block, conserving space and eliminating external lines and connectors.

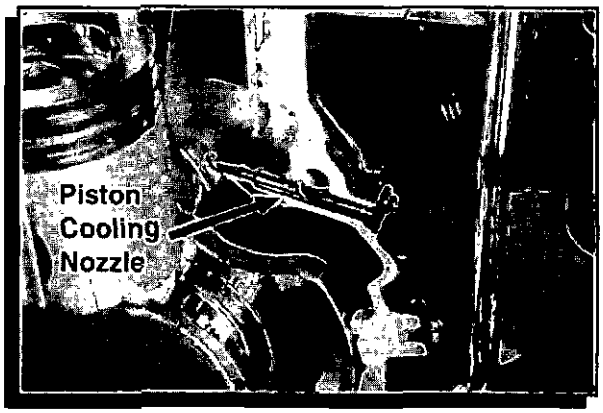


④**Combination-Type Oil Filter** – The new Venturi combination oil filter greatly improves engine protection by providing both full-flow and bypass filtration. The full-flow, low-restriction filter traps relatively large contaminants down to 40 microns in size on a continuous basis. And the stacked disc bypass section removes particles in the 5 micron range–one-tenth the diameter of a human hair! This represents a substantial improvement over filter designs utilizing pleated elements. All necessary plumbing is integral to the spin-on canister.

•The Venturi improves the overall efficiency of the combination oil filter.
•By removing parasitic loss of fluid to the sump, fuel consumption is improved.
•Excellent sludge removal maintains a clean oil condition while guarding against filter plugging.
•Heat transfer in the oil cooler is more efficient.
•Bearing, piston ring and other engine wear are significantly reduced.

All necessary plumbing is integral to the spin-on canister.

The combination-type oil filter provides full-flow and bypass filtration. It traps both large and small contaminants in a single unit. The plumbing that combines the two filtering functions is integral to the canister design.



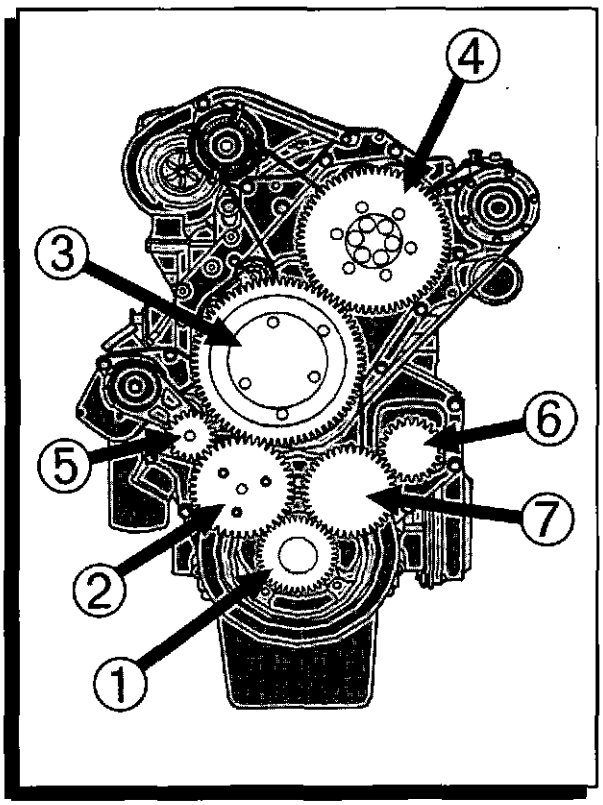
⑤**Piston Cooling Nozzle** – Each piston has a cooling nozzle located below the liner. This piston cooling nozzle receives oil flow from the main oil gallery. Its orifice is precision machined to direct a targeted stream of oil to the underside of the piston. This cools the crown and lubricates the piston pin and cylinder wall. The cooling nozzles are serviceable from the outside of the engine.

POWERTECH cooling nozzles are compact, precision-machined steel units that fit into the block ports. They are designed to cool and lubricate power cylinder components.

POWERTECH 10.5L/12.5L

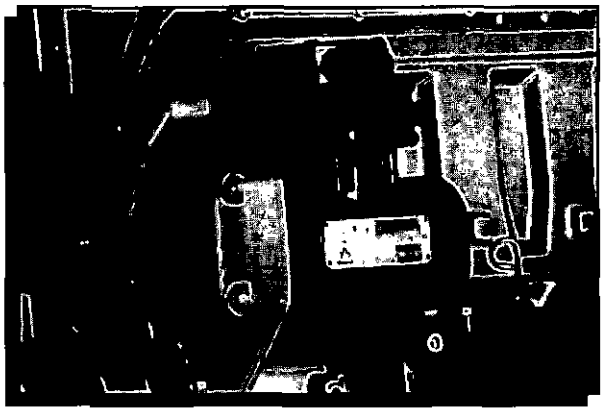
Gear Train

Feature	*Advantage*	Benefit
1. Larger Gears	*Higher contact ratio for less wear*	**Performance Durability**
2. Five Active Gears	*Intelligent design; fewer parts*	**Reliability Durability**
3. High Contact Ratio Spur Gears	*Excellent power transfer, with less backlash for quiet operation*	**Performance Durability**
4. Auxiliary Drive	*Provides application flexibility while reducing the number of belt-driven accessories*	**Performance Flexibility**



The ***POWERTECH*** 10.5 L and 12.5 L gear train is robust, featuring larger gears in a simplified design that actually reduces the number of active gears. The lower idler gear mounts onto and drives the oil pump. The high contact ratio spur gears are both strong and quiet.

The gears are:
1) Crankshaft Gear
2) Lower Idler Gear
3) Upper Idler Gear
4) Camshaft Gear
5) Water Pump Gear
6) Auxiliary Drive Gear
7) Auxiliary Drive Idler Gear



④**Auxiliary Drive** – An auxiliary gear drive operates at 1.22 times engine speed and provides up to 80 horsepower of intermittent power. This power provides the capability to run options such as an air compressor or hydraulic pump. Three SAE options greatly expand application flexibility:

1) Rear SAE "C" Flange Mounting (gear driven)
2) Rear SAE "B" Flange Mounting (spline driven)
3) Rear SAE "A" Flange Mounting (spline driven)
4) Front SAE "B" Flange Mounting (spline driven)

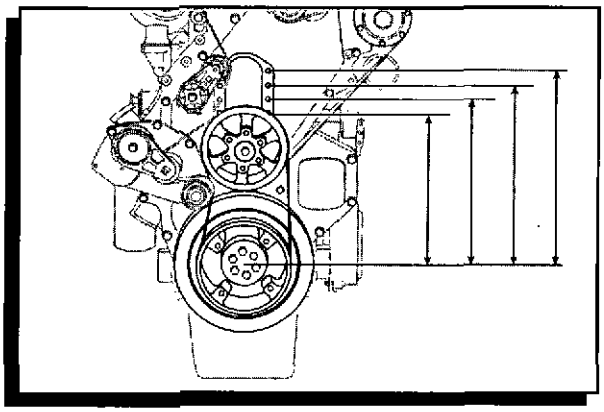
The auxiliary drive reduces the number of belt-driven accessory drives and expands application flexibility.

POWERTECH 10.5L/12.5L

Application Flexibility

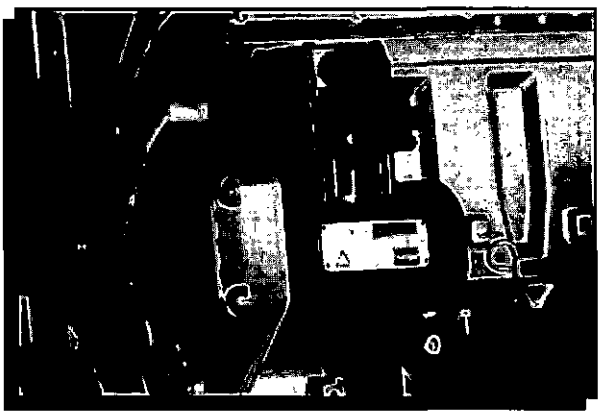
Feature	Advantage	Benefit
1. Adjustable Height Fan Drive	*Fan centers 12-18.3 inches*	**Flexibility**
2. Five Fan Drive Ratios	*Ratios from 0.5:1 to 1.1:1*	**Flexibility**
3. Factory-Installed Air Compressors	*Reduces cost and installation time*	**Flexibility Economy**
4. R134a Refrigerant Compressors	*Reliable factory installation*	**Flexibility Economy**
5. Either-Side Daily Service	*Dipstick and oil fill positions accessible from either side*	**Flexibility Serviceability**

Application Features – The *POWERTECH* 10.5 L and 12.5 L engine package has been reshaped into a compact envelope that fits easily into all installations. The engines are the shortest (1287 mm) and narrowest (741 mm) in their power class. Beyond the low-profile, uncluttered exterior, there are a number of important features that increase the application flexibility of these engines.

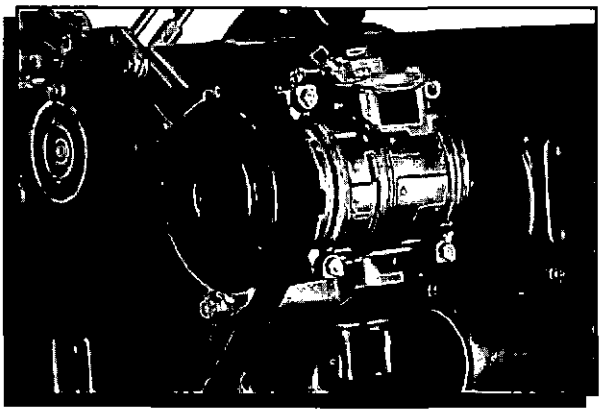


- Adjustable-height fan drive provides fan centers ranging from 12 to 18.3 inches
- Five different fan drive ratios from 0.5:1 to 1.1:1

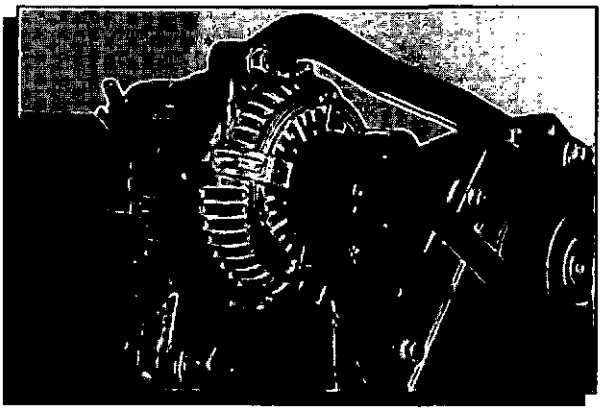
POWERTECH 10.5L/12.5L



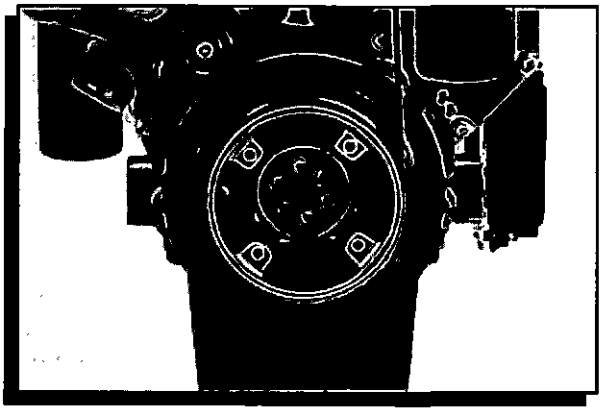
- Gear-driven auxiliary drive for optional equipment such as hydraulic pumps, air compressors and an alternate location for the fuel transfer pump
- Factory-installed air compressors



- Factory-installed R134a refrigerant compressors

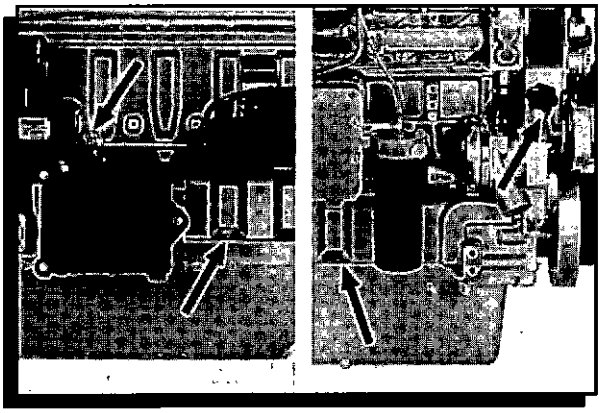


- Large 12-volt (90-140 amp) and 24-volt (60 amp) alternators and mounts for large frame/ brushless alternators

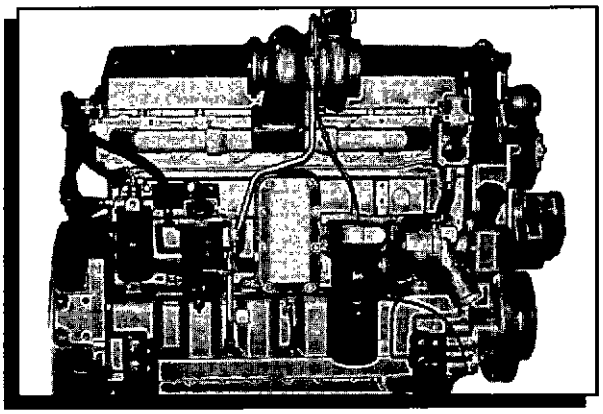


- Front PTO adaptation parts for the 1310, 1350, and 1410 Series drive-line couplings

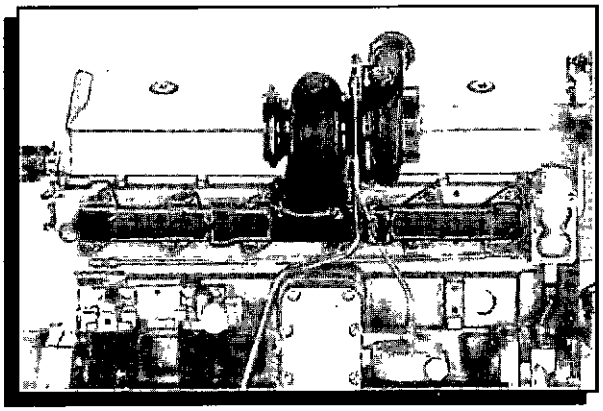
POWERTECH 10.5L/12.5L



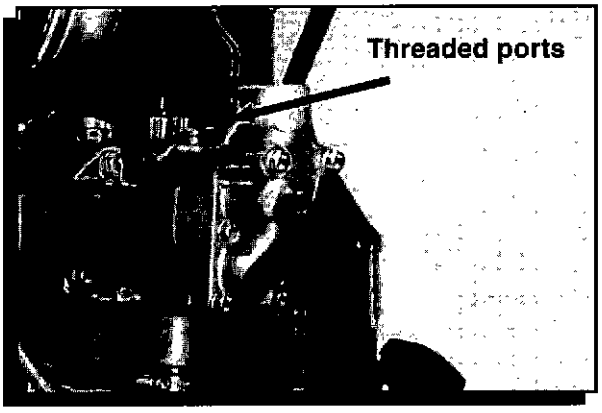
- Either-side dipstick and oil fill positions



- Engine-mounted or remote-mounted secondary and primary fuel filters
- Forward-mounted combination full-flow/bypass oil filter for convenient service in most mobile applications



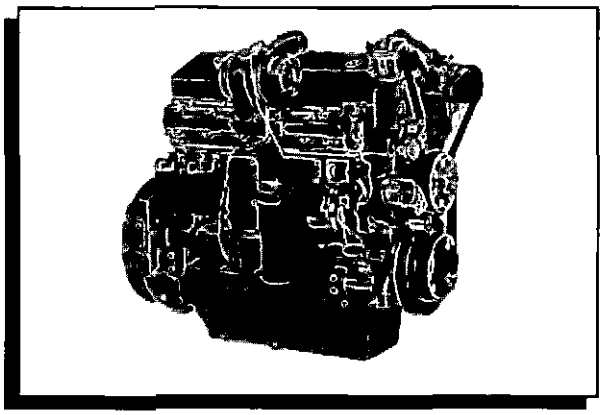
- Right-hand exhaust for simplified routing
- Low-profile turbocharger



- More threaded ports (thermostat, water pump, and oil cooler housings) for coolant sensors, oil heaters and coolant heater

POWERTECH 10.5L/12.5L

Serviceability Features – An important consideration satisfied by the ***POWERTECH*** 10.5 L and 12.5 L engine design is serviceability. The engines are intelligently configured and equipped for convenient, easy-to-reach maintenance that saves both time and money. Features that support serviceability include:



•Self adjusting, poly-vee accessory and fan drives for extended service life and capacity.

•Spin-on, vertically-mounted, combination oil filters and fuel filters to minimize spills.

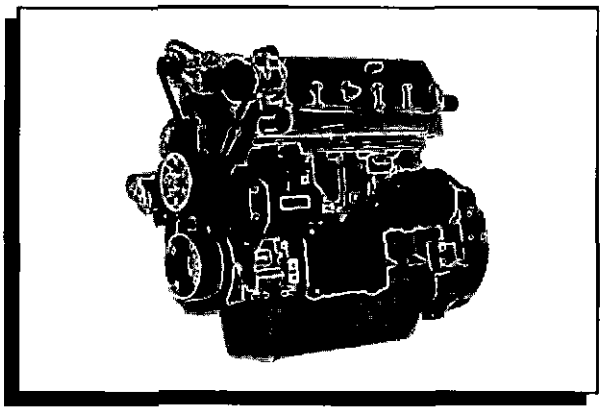
•Either-side daily service.

•Gear-driven water pump independent of the fan drive, designed for simpler, easier service.

•One-time valve adjustment at 2500 hours of operation.

•Elimination of injection nozzle service requirements

•Elimination of coolant conditioner filter

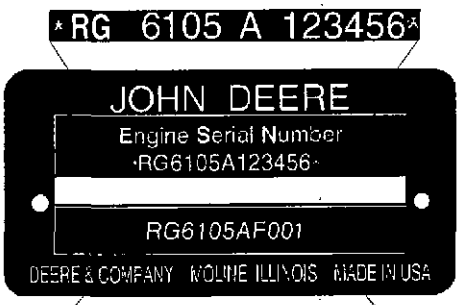


John Deere has advanced diesel engine design to new levels of proficiency.

The ***POWERTECH*** 10.5 L and 12.5 L engines truly are the best in class!

POWERTECH 10.5L/12.5L

Engine Identification Plate



- **RG** **Factory Produced By**
  RG = Waterloo, Iowa.
- **6105** **Number of Cylinders and Total Displacement**
  6105-6 Cylinders, 10.5 liters
  6125-6 Cylinders, 12.5 liters
- **A** **Fuel and Air Intake System**
  A = Turbocharged and Aftercooled, Air to Water
  H = Turbocharged and Aftercooled, Air to Air
- **123456** **Engine Serial Number**

RG 6 105 A F 001

- **6** **Number of Cylinders**
  6 - Six Cylinders
- **105** **Displacement**
  10.5 - liters
- **A** **Fuel and Air Intake System**
  A = Turbocharged and Aftercooled, Air to Water
  H = Turbocharged and Aftercooled, Air to Air
- **F** **User**
  F - OEM (Deere Power Systems Group)
  T - John Deere Dubuque Works
  N - John Deere Des Moines Works
  RW- John Deere Waterloo Works
  R - John Deere Waterloo Works, early models
  H - John Deere Harvester Works
  E - John Deere Ottumwa Works
  DW- John Deere Davenport Works
  L - John Deere Werke Manheim
  Z - John Deere Werke Zweibrucken
- **001** **Engine Application Version**

Notes:

Notes:

Deere Power Systems
3801 West Ridgeway Avenue
Waterloo, Iowa 50704

Deere Power Systems
John Deere Saran
B.P.13
45401 Fleury Les Aubrais - France

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DSEGPIM105125 (12-96)