

Cummins

Parts Professional 29



INVEST IN THE BEST

Parts Professional 29 • Signature 600

What's So Special About The Signature 600?

The Signature 600 was designed as the next step in the evolution of the N14 engine family and includes all of the changes needed to meet government legislated emissions levels and continue the bullet proof performance of the N14. The Signature 600 was redesigned from the ground up, so even though there are similarities to the N14, this is really a completely new and different engine! These engines were designed with power in mind. They are capable of producing up to 600 horsepower and 2050 LB – FT torque. That's some serious muscle! The Signature is a completely new design from the oil pan all the way to its dual overhead cams. This new design incorporates every technological advantage Cummins could put into an engine. With one third fewer parts, this engine is lighter than the N14 by over 300 pounds. Increased injection pressure gives the Signature more power, better throttle response, and improved fuel economy. It is also more durable and dependable, designed to go well over a million miles with only regularly scheduled maintenance!

Fast Enough For A Race Car Driver

How do Mark Martin, Jeff Burton, Matt Kenseth, Kevin Lepage, and Chad Little get their teams to the races? In a Cummins' powered transport, that's how! Roush Racing recently announced a two-year deal with Cummins' powered trucks for their NASCAR transports. Jack Roush, owner of Roush Racing had this to say about this deal, "With the demanding NASCAR schedules, we need dependable equipment

to ensure that our transporters and merchandise trailers make it to the track each weekend."

The Signature has been so popular with some customers that Cummins recently held a Signature Customer Appreciation day which attracted over 200 Owner/ Operators with Signature powered trucks. The event was held at the Columbus, IN engine plant. Truckers showed off their rigs, took a plant tour, and received Chrome Signature nameplates for their rigs.

The Signature 600 has been receiving a great deal of positive press since it's launch. Sales and production have been ramping up at an accelerating rate. Success stories continue to pour in about the performance, reliability and power of the Signature 600. Let's find out why...

What's So Great About Dual Overhead Cams?

I'm glad you asked. This is one of the most revolutionary innovations to hit the diesel engine market since electronics. Signature's dual overhead cam design puts 1200 horsepower at your command. 600 to go...and 600 to slow. The first cam drives the high-pressure fuel injection



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system. Higher injection pressures mean increased power, improved throttle response and improved fuel economy. Extra-wide lobes on the cam reduce load factors and increase component life.

But ground-pounding power isn't the only reason for dual cams. Signature's revolutionary Intebrake® system delivers up to 600 brake horsepower, in a way that conventional engine designs can't match.

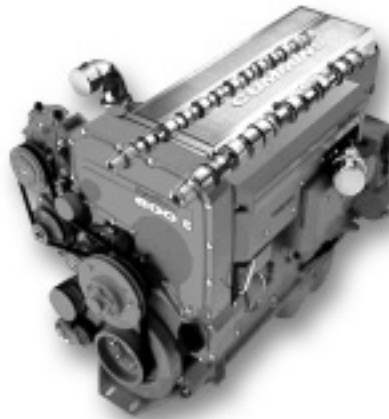
Here's why:

Conventional engines have to share a single cam lobe for engine braking and fuel injection, so you have to choose which system to optimize. With Signature's dual cam design, lobes on the second cam are designed solely to drive the engine brake, which we call the Intebrake. Intebrake is designed as an integral part of the engine...not an add-on.

Dual overhead cams enhance reliability, with fewer parts than conventional designs..and that means less to go wrong.

What Are Some Of The Other Features and Benefits?

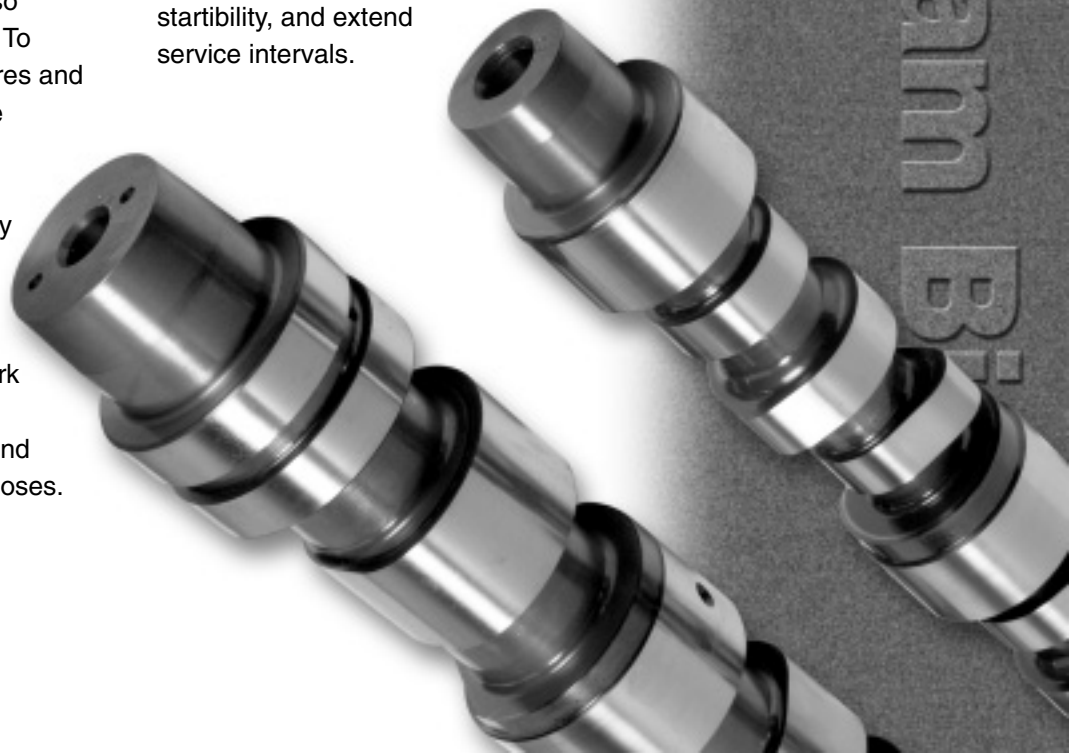
One look at this bright red engine and you know it's different.. In addition to the dual overhead cams, this engine was also radically redesigned in other areas. To begin with, there are no external wires and hoses hanging on the outside of the engine. Many of these have been incorporated in the block and head. This helps in several ways. One way is that it reduces the number of parts by a third! This means that there are fewer areas that can go wrong. It also makes it easier to work on for repair and maintenance. No more trying to angle your tools around annoying obstacles like wires and hoses.



Specifically, the fuel pump, fuel filter head, and electronics, including the Electronic Control Module (ECM), are all centrally located under a single control panel. Keeping everything in a single location improves quality control on the production line and down the road.

Signature is also the first engine to take advantage of designing engine hardware and electronics as a total unit. This is unique in that most of the electronic packages on today's engines are "add-ons," connected to the engine after it is built.

This engine was also designed to reduce fuel consumption, reduce oil consumption, improve engine response and startability, and extend service intervals.



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Supersession Information and Recommended Stocking Kits

The Signature 600 has had many supersessions on components since its launch. Careful attention should be paid when ordering parts, that the most current part number is used. Superseded

Recommended Stocking Kits

4024856	Upper/Head
4024763	Lower Engine
3800940	Piston
4024764	Cyl Kit
3800453	Liner Kit
4024845NX	Water Pump
4024814NX	Lube Pump
4024855NX	Turbo
3800297	Rod Bearing Kit
3800609	Ring Lit
4024890NX	Actuator(o/mold)
4024891NX	Actuator(o/mold)
4024766NX	Fuel Pump Kit

numbers show up when placing an order. The kits in the chart at left are recommended stocking for the Signature 600.

From a Parts Point of View, What Are The Major Improvements On This Engine?

There are many improvements to all components on this engine from the computer-designed crankshaft which engineered weight out, to the chrome head covers, this is a special engine. From a parts

perspective the main improvements include.

- Dual Overhead Camshafts
- Patented Variable Output-Turbo System
- One-Third Fewer Parts
- Heavy-Duty Rings, Pistons, and Bearings
- Patented Mid-Stop Cylinder Liners
- Cummins Intebrake
- High-Pressure Fuel System
- Fully Integrated Electronic Controls

Now, let's get to the nuts and bolts of these parts. In the following section, we will list all the major components and the characteristics of each. Pay close attention, I have a funny feeling some of this information will show up on the quiz.

PARTS BREAK DOWN

Life-to-overhaul

The Signature engine was designed to meet the demanding power requirements of the future. The Signature has a longer life-to-overhaul than engines in the same class 14 liter engine or higher. It is designed to run well over 1 million miles with only regularly scheduled maintenance.

Fuel System

The fuel system on the Signature engine has many special features. The time pressure feature designates the fueling control. The time is the control variable and the supply pressure is held constant. Timing and fuel metering are controlled by regulated pressure via electronic actuation.

Fuel System/Electronics

The Signature engine has full authority electronic controls with a modular ECM and software for maximum flexibility when upgrading or adding features. The controls allow individual cylinder control capability for fueling and timing.

ECM 3681405NX

A new ECM design has been introduced and is referred to as the CM570. The ECM contains three 50-pin Deutsch connectors. The ECM dataplate is simultaneously laser etched with the engine dataplate for the same engine. The Signature ECM offers a greater capacity for features and memory.

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ECM Cooling Plate 3681059

The ECM cooling plate is located on the intake side of the cylinder head and uses intake air rather than fuel to cool the ECM.

Actuators 4024890NX & 4024891NX

The low-pressure actuators are on two common rails to improve serviceability. The actuators on the Signature engine are external to the cylinder head. The engine is divided into front and rear banks with the front three cylinders being controlled by two actuators and the rear three cylinders being controlled by two actuators. One set of the actuators controls the amount of fuel injected and the other set controls the timing.

Fuel Pump 4024766NX

The fuel pump is a three-piece high efficiency design that regulates supply pressure to complement the time pressure-metering concept for timing and fueling quantity.

Fuel Filter Available Through Fleetguard

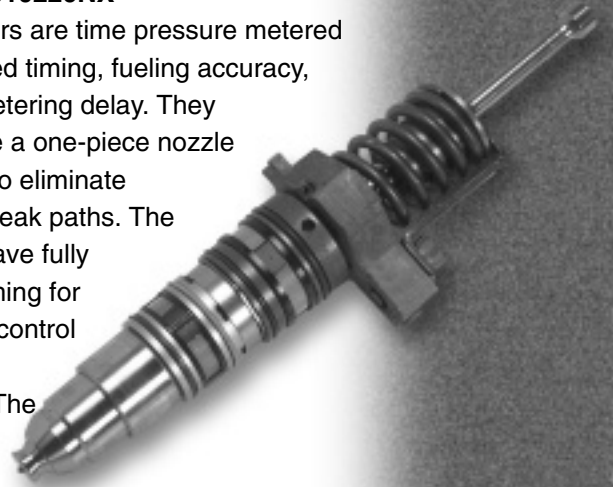
The Signature engine offers two new options. These new options are an engine mounted fuel filter with a water-in-fuel sensor and a remote mounted fuel filter with a water-in-fuel sensor. The fuel/water filter, Part No. FS1007, has no clear bowl, but is equipped with a sensor/drain combination. When water covers the electrodes in the water-in-fuel sensor, the maintenance lamp is illuminated. The sensor also contains a threaded drain that can be loosened to remove any water in the filter. The overall length of the filter is the same length as the FS1000 filter. The water-in-fuel sensor attaches to the main engine harness through a breakout cable supplied by Fleetguard.

Ambient Air Pressure Sensor 3331044

This sensor is located on the intake side of the engine just below the ECM and has a 14-mm thread size.

Injector 4010226NX

The injectors are time pressure metered for improved timing, fueling accuracy, and low metering delay. They incorporate a one-piece nozzle assembly to eliminate traditional leak paths. The injectors have fully variable timing for emissions control and fuel economy. The Signature engine has trapped volume spill and timing spill control for lower burned hydrocarbons and parasitics.



Combination Oil Pressure/ Temperature Sensor 3417185

The Signature engine has combined both the oil pressure and oil temperature sensor into one unit. This unit measures absolute pressure and has a metric thread size (M14 x 1.5). The combination oil pressure/temperature sensor is located in the main oil rifle of the engine below the fuel system housing.

Intake Air Pressure/ Temperature Sensor 3417183

This sensor monitors intake manifold pressure and turbocharged intake air temperature. The intake air pressure/temperature sensor is located in the intake air connection.

Idler Pulley 3680196NX

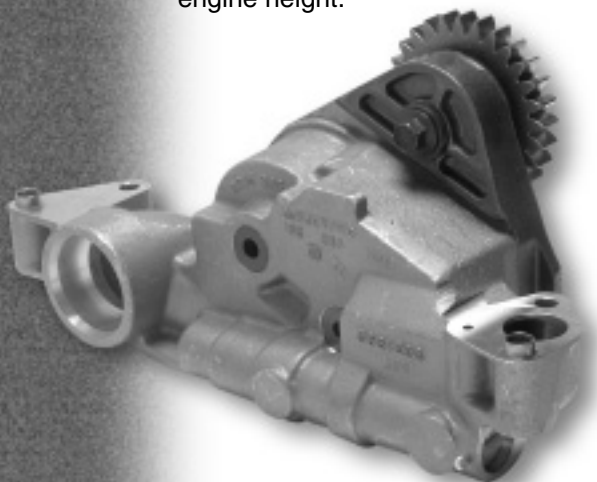
The Idler Pulley is also new on the Signature 600 engine.

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Intebrake (Multiple P/N's)

The Intebrake has been designed to accommodate the increased engine cylinder pressures and to achieve maximum brake horsepower, up to 600 HP! The brake utilizes dedicated lobes on the valve cam and dedicated lever/cam followers. These levers contain a piston and control valve actuated by three solenoids. Solenoid No. 1 controls cylinder No. 1, solenoid No. 2 controls cylinders No. 2 and 3, and solenoid No.3 controls cylinders No. 4, 5, and 6. The brake can be controlled in range from one to six cylinders by an OEM switch in the cab. The Intebrake does not increase the engine height.



Lubricating Oil

Pump 4024814NX or 3800753NX??

The lubricating oil pump is crankshaft driven and located in the front of the oil pan. The pump has a built-in pressure regulator that receives a pressure signal via a drilling in the lubricating oil pump-mounting surface on the block. The pump also has a built-in, high-pressure regulator.

Lubricating Oil Pan 3680530

A stamped steel, reversible lubricating oil pan can be installed on the Signature engine as a front or rear sump, pan and utilizes a reusable mounting gasket. Changing sump orientation requires replacement of the oil suction tube.

Lubricating Oil Filter and Head

The lubricating oil filter head has unique threads to accommodate the new LF9001 filter, which is a venturi style filter that eliminates the need for bypass flow. These filters combine the bypass discs for excellent filtration and advanced filter medium with venturi technology. This combination creates the pressures needed to filter the oil most effectively. The LF9000 is 2.1 inches longer than the LF3000.

Oil Cooler and Filter

The oil cooler is a new design with cooling elements protruding into the block water passage that reduces the overall size and weight of the cooler and improves heat transfer.

Block 3800452

The cylinder block is a new, innovative, lightweight design with a block stiffener plate for reinforcement. The cylinder block also utilizes straight thread o-ring ports to reduce the likelihood of leaks.

Piston 3800940

The Signature engine features articulated pistons with a forged steel crown and an aluminum skirt, that allow for higher top ring position. This design will optimize efficiency and durability. The Signature engine utilizes targeted piston cooling nozzles.

Connecting Rods 36811343, 3680214NX

The connecting rods are a new 4-bolt cap design to accommodate increased cylinder pressures and a larger bearing surface.

Intake Manifold (Incorporated in Cylinder Head)

The intake manifold is incorporated into the cylinder head. The boost sensor and wastegate controllers are located in the air inlet connection.

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Valve Cover 4026509 (Head) & 4026507 (GSR)

The new one-piece valve cover is made of a composite to reduce weight. The cover contains a molded, reusable gasket that is held on the cover by a retaining groove.

Accessory Drive

The accessory drive on the Signature engine drives both the Freon compressor and alternator. Accessory drive is accomplished through the use of additional grooves on the water pump pulley.

Flywheel Housing 3412303

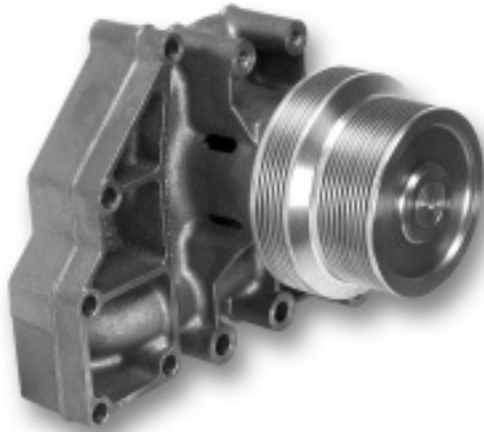
A standard SAE sized flywheel housing is mounted to the rear of the engine block. The housing is precision machined to accept the rear crankshaft seal. Redoweling of the flywheel housing is not necessary.

Engine Diagnostics

SAE J1708 and J1939 protocols will be available as engine diagnostic and communication devices. There are 128 fault codes and a new cylinder performance test for troubleshooting the fuel system and electronic components.

Cylinder Head 4026626NX

The new one-piece cylinder head includes an integral intake manifold, dual overhead camshafts and pedestal mounted rocker lever/cam follower shafts.



Water Pump 4024845NX

The Signature engine uses a new water pump with a phenolic impeller and rear cover plate to reduce weight. The water pump also has the new N14 style seal.

Cam Followers (Integrated)

The cam followers on the Signature engine are integral to the rocker levers. The exhaust, intake, and Intebrate levers/cam followers are on the valve camshaft. The injector levers/cam followers are on the injector camshaft.

Wiring Harness (Varies by application)

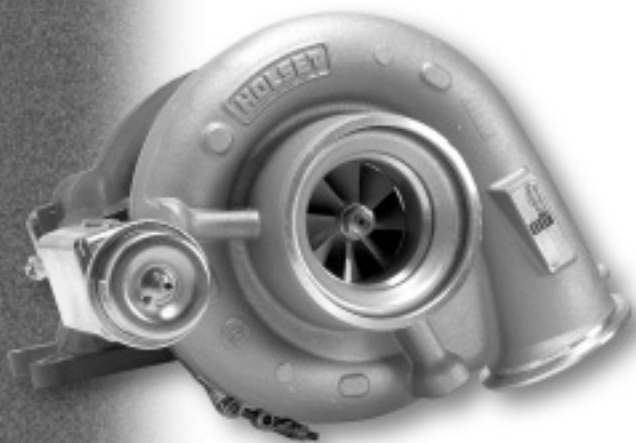
The engine harness can be disconnected from the cylinder head externally. The engine harness has added breakouts for a water-in-fuel sensor, a smart air governor, CENTINEL, and an engine brake auxiliary signal. The tubing covering the wires can withstand temperatures up to 125 C 257 F. Thin cross-linked covering and Teflon wire insulation are used to protect the internal actuator harness from extreme temperatures typically seen by this harness.

Rocker Levers (Multiple P/N's)

Four separate levers/cam followers are used: intake, exhaust, injector, and Intebrate. The levers cannot be interchanged.

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Turbocharger (HX60) 4024855NX

Holset has designed the new HX60. The wastegate controller is mounted on the air inlet horn and the wastegate actuator is mounted on the turbocharger. The wastegate controller is controlled by the ECM and regulates the amount of boost pressure sent to the wastegate actuator. Two valves similar to the fuel shut off valves are used to regulate the boost pressure.

Overhead Camshafts –

Valve and Injector 3681447 & 3680779

The Signature engine was designed with dual overhead camshafts. The valve and Intebrate camshaft is located on the exhaust side of the cylinder head. The intake valve, exhaust valve, and Intebrate levers are located on two shafts. One shaft has the levers for the front three cylinders. The other shaft has the levers for the rear three cylinders. Guideless crossheads are used for both the intake and exhaust valves. The injector camshaft is located on the intake side of the cylinder head. The injector camshaft has the fuel pump drive gear near the center of the shaft, and the camshaft position sensor pickup lobe near the front of the shaft. Two shafts are also used for the injector levers with three levers located on the front shaft and three levers located on the rear shaft. A center

drilled oil rifle in the camshaft supplies oil to the camshaft bearings.

Cooling System

The Signature engine utilizes a high-flow cooling system along with charge air cooler (CAC) that controls intake air temperatures.

Compressor 3681904NX

The new Cummins air compressor is governor-controlled for optimized operating efficiency. The air compressor has an integrated pressure relief valve to prevent damage in case the discharge line or downstream components become plugged or restricted. The single cylinder air compressor (318 cc) rated at 18.7 CFM is currently available for the Signature engine.



CENTINEL Oil Control Valve

An optional integrated oil replenishment system (CENTINEL) is available for the Signature engine. The oil control valve removes oil from the oil rifle, deposits the used oil in the fuel tank to be burned as fuel, and replaces the used oil with clean oil from a 5 or 8 gallon reservoir tank. Integrated CENTINEL is made up of fewer parts than the Aftermarket CENTINEL and is connected to the engine ECM through the main engine harness and a single jumper harness.

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