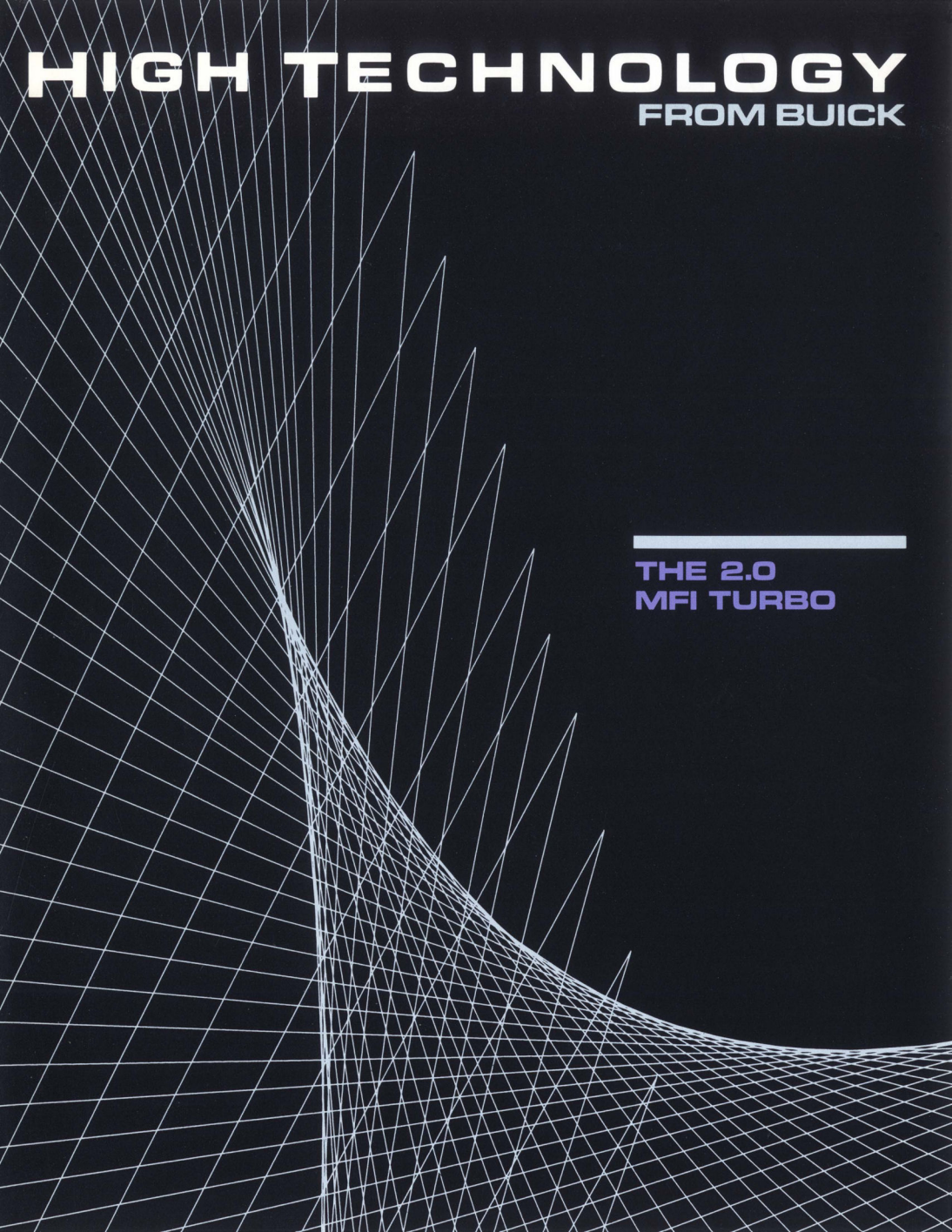
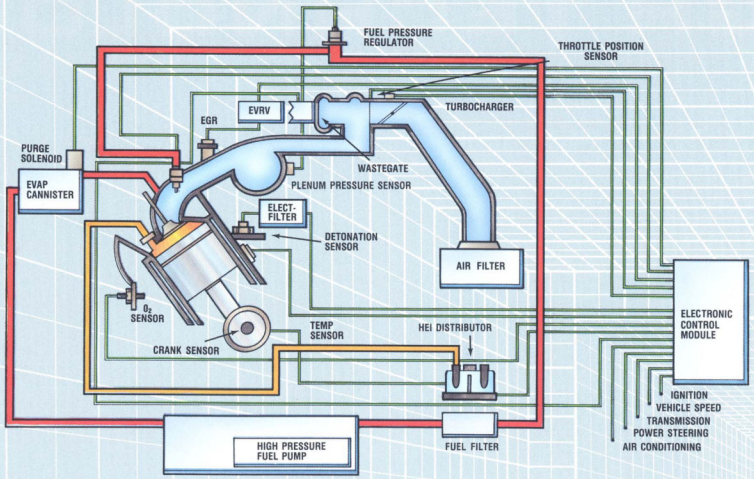
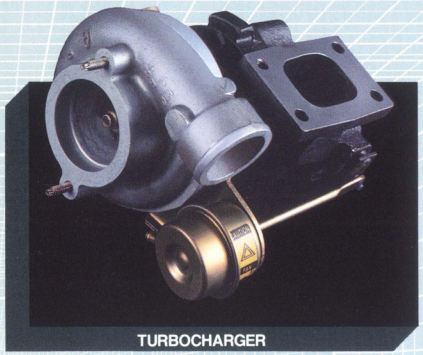
HIGH TECHNOLOGY
FROM BUICK

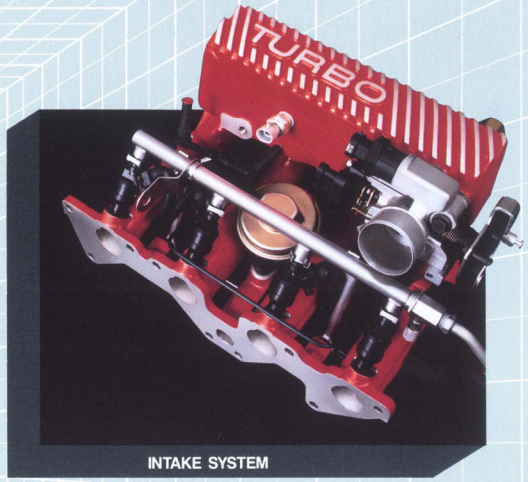


THE 2.0 MFI TURBO





TURBOCHARGER



INTAKE SYSTEM

2.0 LITRE OVERHEAD CAM MFI ENGINE

Buick is committed to offering advanced engine and drivetrain technology to customers. The 2.0 litre Overhead Cam Multi-port Fuel Injected Turbocharged engine offered on the Skyhawk includes improvements in maximum torque, horse-power, internal vibration reduction, and internal friction reduction.

Many major components have been revised, and the displacement on the second generation engine has been increased from 1.8 to 2.0 litres. This was accomplished by increasing the bore size from 84.8mm to 86.0mm, and increasing the stroke from 79.5mm to 86.0mm.

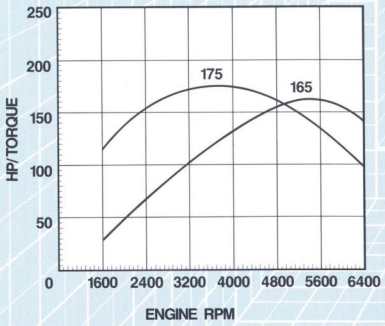
An Electronic Control Module (ECM) is used to match fuel delivery to engine requirements. Sensors read engine speed, manifold pressure, intake charge air temperature, engine temperature, throttle position, and atmospheric pressure.

A High Energy Ignition system provides the spark. It uses a cam-driven distributor, and high output coil. An electronic spark control sensor detects engine detonation, and sends signals to temporarily retard spark timing if necessary.

The intake runners are of a low restriction, cast aluminum design. The length is specific to tune the intake flow to the power curve of the engine.

Engine output is at 165 horsepower at 5600 RPM, and 175 foot pounds of torque at 4000 RPM.

2.0 MFI
TURBO HP/TORQUE CURVES



TURBOCHARGER

A T-2.5 turbocharger is used on the 2.0L engine. It provides a higher air flow rate than the T-2.0 previously used on the 1.8L, to accommodate the increase in engine displacement.

The turbocharger body is made of a high temperature cast steel alloy. The unit provides up to 65 Kilo Pascals (KPa), or 9 psi of boost, with a maximum air flow rate of 7.938 Kilograms (Kg) per minute.

To do so, the turbine blades turn at up to 130,000 RPM. To protect the bearings from extremely high temperatures caused by friction and exhaust gases flowing through the unit, engine coolant circulates through the center housing of the turbo.

MULTI-PORT FUEL INJECTION

Rather than using a single injector to spray fuel into the intake air flow, and relying on the plenum to distribute the mixture, Multi-port Fuel Injection is used. A fuel rail is located on top of the engine, and supplies fuel to injectors located at the intake port of each cylinder.

Fuel pressure is measured by a regulator which ties plenum chamber pressure to fuel pressure. The fuel system is pressurized by a roller vane fuel pump located in the fuel tank.

Fuel pressure ranges between 180 and 325 KPa, and is regulated at two-and-a-half atmospheres (approximately 250 KPa) more than plenum chamber pressure whether the vehicle is idling, or at maximum boost. The concept is to keep the pressure across the injector at a constant value for accurate fuel metering.

The injectors are state-of-the-art model EV 1.3, a top-feed design made by Bosch, and within General Motors are used exclusively on the 2.0 MFI. The injectors are activated simultaneously, once each engine revolution, on signal from the ECM.

Two peak-hold driver circuits in the ECM control the operating cycle of the injectors, with each driver controlling two injectors. The driver is a sophisticated circuit in the ECM which opens the injector valve, holds it open, and then closes it at the precise intervals required under all operating conditions.

The range where fuel has to be metered is the dynamic range of the injectors. It is between .227 and 13.5 grams per second.

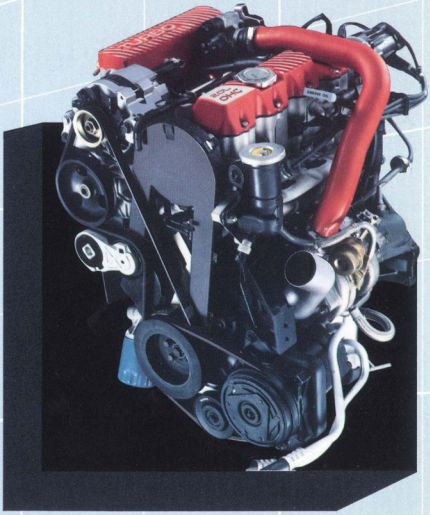
The camshaft is a reinforced iron casting with induction hardened lobes. To facilitate breathing, the diameter of the intake valves is increased from 41.0mm in the 1.8L to 43.0mm, and the exhaust valve size is increased from 35.0mm to 36.5mm.

And to reduce mass, the valve stem diameter has been reduced from 8mm to 7mm. Valve spring load has been reduced to lessen friction, and the spring load has been tuned to the 2.0L's peak engine speed of 6400 RPM.

The 2.0L cylinder block is a lightweight casting which is approximately five (Kg) lighter than the previous 1.8L design. Reinforcement ribbing on the block is designed to reduce noise radiation.

The water jacket volume is reduced from 1.96 in the 1.8L to 1.5 litres to increase the warm-up rate.

In order to place more of the combustion charge in the combustion chamber, the 2.0L's chamber deck height has been raised. This places a larger percentage of the charge in the head for efficient combustion.



RECIPROCATING COMPONENTS

The pistons used in the 2.0L engine are forged aluminum to withstand the severe operating stresses that are encountered, and dished to provide an 8.0 to 1 compression ratio. The piston pins are 61.5 mm in length, which is reduced from 70mm in the previous design, and are 21mm in diameter.

The weight of the 2.0L forged piston is 350 grams. The compression height of the pistons is reduced from 37mm to 30mm, which places the pin higher in the piston.

The first compression ring is barrel faced, chrome plated, and has a 1.5mm width. The second ring has the width reduced from 1.75mm to 1.5mm. The third ring width is 3.0mm, as opposed to the previous 4.0mm width. Reduction in ring width reduces friction against the cylinder walls.

Connecting rods are of a lightweight design, and are 143mm in length instead of the 1.8L's 136mm length. The small end width is reduced to 22mm instead of 26.5mm, and the diameter is reduced from 23mm to 21mm. The rod cap bolts thread directly into the rod, rather than using a bolt through the cap, with a nut.

The 2.0L crankshaft is manufactured from nodular iron, and is of a lightweight design. There are five main bearing journals, and eight counter weights. The guide bearing is located at the number three position, and controls crankshaft end-play.

The reduction in reciprocating mass, and redesign of components, have resulted in engine shaking forces being reduced by 14 per cent.

HIGH EFFICIENCY DESIGN

A baffle is installed in the top of the oil pan, and is suspended in the sump to prevent oil starvation during hard turns, rapid acceleration, or deceleration. The upper edges of the baffle are shaped to act as an oil scraper, wiping excess oil off of the crankshaft as it rotates approximately 1mm away from the scraper.

The timing belt width is 20mm, and the cover is of a new sealed design to prevent dust, oil, and water intrusion. It is a three piece design which replaces the existing front and rear covers and also reduces noise radiation.

A serpentine single accessory belt system is used which provides a long service life with a reduction in maintenance.

The availability of the 2.0 Litre OHC MFI Turbo engine in the Skyhawk confirms Buick's commitment to offering advanced powertrain technology.

BUICK

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