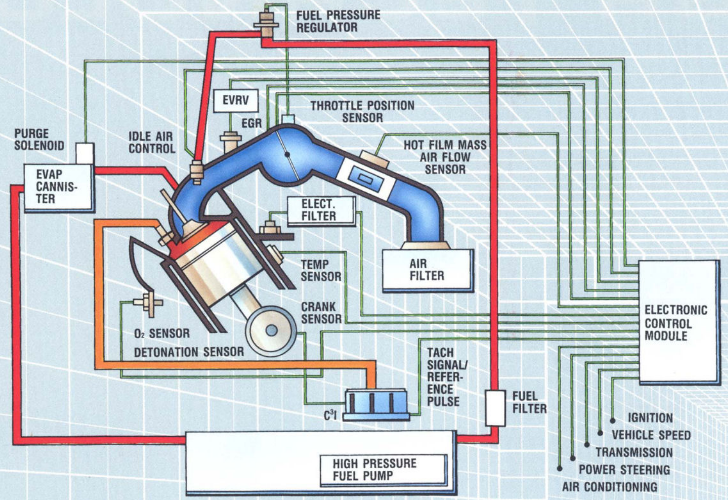
HIGH TECHNOLOGY
FROM BUICK

THE 2.8 MFI ENGINE



2.8 MFI

Buick Motor Division has a tradition of offering customers advanced engines and drivetrain components. Buick offers a revised version of the 2.8 litre 60-degree V6. The new version features Multi-port Fuel Injection (MFI), as well as other leading-edge technology.

In addition to mass reduction through the use of high strength alloys, new component designs, and friction reduction technology contribute to volumetric efficiency.

An on-board Electronic Control Module (ECM) monitors engine operations and environmental conditions. Incoming information is used to match fuel delivery to engine requirements. Fuel efficiency and emissions are controlled by maintaining a precise fuel-to-air ratio.

A Mass Air Flow sensor is located ahead of the throttle body in the air intake and uses a heated film and information from a temperature sensor to measure the actual mass of incoming air, rather than just the volume. An electronics package is located above the heated film and sends signals to the ECM which are used in calculating the proper fuel to air mixture.

The intake manifold is a two piece-cast aluminum design, with tuned runners. The entire air induction system is of a low restriction design for volumetric efficiency. The throttle bore diameter is approximately 52 millimetres.

The Idle Air Control (IAC) system uses a stepper motor to control the size of the idle air passage. It slides a plate over the orifice to regulate the air flow. This system allows optimum idle characteristics at low temperatures.

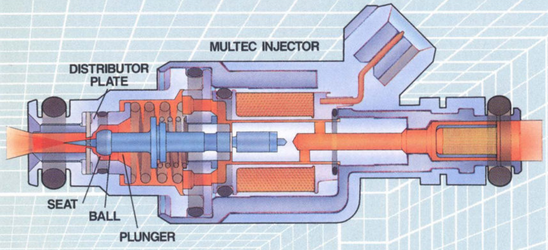
An Electronic Vacuum Regulator (EVRV) valve is used to control exhaust gas recirculation (EGR). The EVRV is a single, self-contained integrated unit. Signals from the ECM are sent to the Constant Current Electronic Circuit, which assures the integrity of the output signal. This signal is sent to the vacuum regulator which controls the amount of vacuum that is allowed to act on the EGR valve. The strength of the vacuum determines the amount of exhaust gases that are recirculated.

The 2.8 MFI uses a Computer Controlled Coil Ignition (C^3I) system, similar to that on the 3.8 SFI. An electronic coil module replaces the conventional distributor and coil. A magnetic pick-up mounted in the side of the engine block senses slots in a timing disc which is integral with the crankshaft. The crankshaft position readings are sent to the ignition module.

An Electronic Spark Control (ESC) is used to modify the calculated spark if detonation or pre-ignition is detected. Spark timing is adjusted in a range of up to 15 degrees.

Fuel is pumped from the fuel tank to the injector system by a high pressure positive displacement roller vane pump designed and produced by AC Division of General Motors. The pump keeps the fuel line pressurized at 300 Kilo-Pascals (KPa), or approximately 43 psi.

The Multi-port Fuel Injection system on the 2.8L uses fuel injectors which are mounted on an extruded dual aluminum fuel rail manufactured by General Motors. The injectors are activated simultaneously, once each engine revolution, on signal from the ECM. For each combustion cycle, two injections of fuel at each cylinder are mixed with incoming air.



MULTIPLE INJECTION TECHNOLOGY

The injectors are a new compact, lightweight design made by Rochester Products Division of General Motors. The new injectors are called Multec, which stands for Multiple Technology injector. Multec injector design represents leading-edge technology that offers performance and size advantages over other currently available gasoline fuel injectors.

The new Multec injectors use a stainless steel ball and seat valve, and a director plate for fuel control, instead of the more commonly used pintle. Use of the director plate allows precise spray pattern control. The ball, which is located on the end of a plunger, and seat are finished to a near-mirror polish to obtain a positive seal.

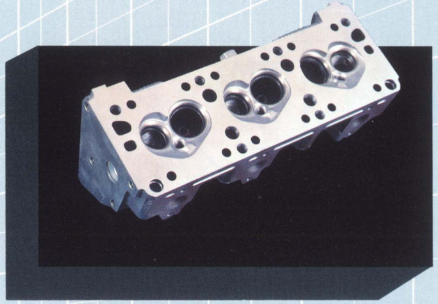
Computerized setting and calibration equipment is used in the manufacturing process to calibrate fuel flow. Laser welding is then used to ensure that the adjustment components are permanently locked in place after calibration.

Multec injectors operate by a sophisticated electronically-controlled peak-hold driver circuit in the ECM that opens the valve, holds it open, then closes it at the precise intervals required under all operating conditions. The initial voltage fires the injector, and then the voltage drops to a lower level, which keeps the injector open for the specified period of time.

Peak-hold driven injectors allow precise control of the fuel flow, and only have 2 ohms of resistance, as opposed to 16 ohms found in the saturated type.

When the ball is pulled against spring pressure away from its seat by electromagnetic attraction, fuel rushes past it, and through an orifice in the seat. Fuel then sprays through holes in the director plate, and into the intake port.

When the ball is released, it returns to its seat under spring pressure, ending the injection pulse. The throttle position sensor provides the ECM with throttle position information, which is used by the ECM to determine the duration of injector pulses. Other inputs include engine load, speed, and temperature.



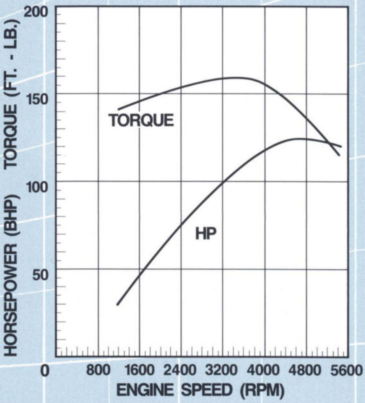
CYLINDER HEAD CONFIGURATION

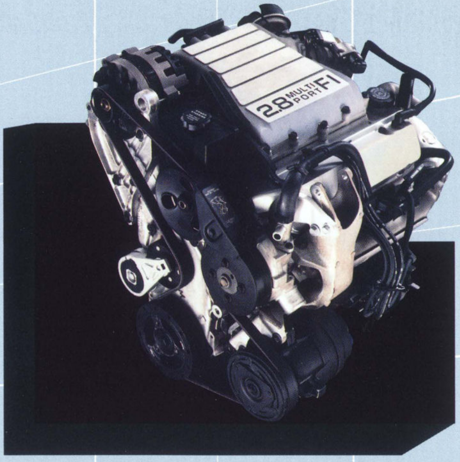
Cylinder heads are of a durable, yet lightweight aluminum alloy, and incorporate "fast burn" combustion chambers. This is accomplished by designing a compact combustion chamber with a centrally located spark plug so that no part of the combustion chamber is excessively far from the spark plug. By promoting combustion charge swirl, the flame of combustion is spread rapidly to all parts of the combustion chamber.

The combustion chamber is heart-shaped, formed by the cylinder head casting combined with a sumped piston top, and canted valves. Canting the valves also provides room for high-alloy valve seats, and enabling the spark plug to be 12mm closer to the center of the chamber. This has allowed the compression ratio to be increased from the previous 8.5 to 1, to 8.9 to 1.

The cylinder heads also feature a "net build" feature valve train, which eliminates the need to adjust the lash of each valve. This results in more consistent operation due to the decrease in variability. The valve springs used in this valve train have a variable rate during compression, which makes their movement self-dampening.

**2.8 MFI
HP/TORQUE CURVES**





ADVANCED COMPONENT PROCESSING

The 2.8 litre V6 includes many state-of-the-art manufacturing improvements. Cylinder bores, crankshaft journals, and camshaft lobes have low friction surface finishes. The cylinder bores are honed by a specific-surface-finish honing method which reduces dimensional variability, and therefore the need for selective fits. The surface finish also allows the use of low tension piston rings, thereby reducing friction against cylinder walls.

Crankshaft journals are machined by mill turning or broaching, and the final surface is microfinished. The crankshaft bearing bores are micro-sized, to eliminate the need for selective bearing fits.

The crankshaft is internally balanced, so that no counter weighting is needed in the flywheel, or integral pulley and vibration damper.

ADVANCED SEALING

Effective sealing is especially crucial at junctions of dissimilar metals, as between the cast iron cylinder block, and the aluminum alloy cylinder heads. Machining of the cylinder head mating surface is specified and controlled to an extremely close tolerance.

Because of the great difference in thermal expansion characteristics between cast iron and aluminum alloys, gasketing is especially critical. The gasket at each head-block interface on the 2.8 MFI is 50 percent thicker than previous applications.

It is constructed of a temperature-resistant non-asbestos synthetic material with a steel reinforcing interlayer and an added thickness of steel around the cylinder bores, where temperatures and pressures are extremely high. The cylinder head has "rolled" type threading at all attachment points for high strength, except for the exhaust manifolds, which have stainless steel heli-coil inserts.

COOLING AND ACCESSORIES

The cooling system is designed for a gradual and uniform warm-up. An external by-pass line routes 30 percent of the coolant flow back to the pump during closed-thermostat operation, thus the change in coolant flow is less abrupt when the thermostat opens.

The 2.8 MFI has a single serpentine belt to drive accessories. A dynamic tensioner, in the form of a spring-loaded idler pulley maintains the belt at the proper tension to drive accessory components.

Appearance of the 2.8 MFI is exceptional because the intake manifold, cylinder heads, front engine cover, accessories, and ignition system all reflect a high level of engineering design and function.

The highly efficient 2.8 litre MFI is another example of Buick Motor Division's commitment to offering the latest in advanced technology engines.

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