

FA20 ENGINE

Naturally aspirated, flat four engine for Subaru and Toyota sports cars

BY **DAVE HAGEN**

At the beginning of 2012, the joint Subaru and Toyota model was put into production. You know it as Subaru BRZ, Toyota 86 or Scion FR-S. This new, naturally aspirated, flat four FA20 engine was developed specially for these sports cars. It was built based on a FB20 cylinder block, modified into square bore/stroke ratio. The diameter of its cylinders and piston stroke is 86mm. Unlike the usual FB20, this motor uses new pistons, a new crankshaft, and the compression ratio was increased to 12.5:1.

FA20 engines use new heads with a direct injection system of the Toyota D4S, a variable valve timing system AVCS that is used on both intake and exhaust camshafts. Also, 4-2-1 headers are installed on this motor.

The naturally aspirated engine was called FA20D or Toyota 4U-GSE and it showed 200 horsepower at 7,000 rpm, and torque 205 Nm at 6,400-6,600 rpm.

Along with the FA20D, there is also turbocharged version which is called FA20F/FA20E, and better known as FA20DIT. This motor replaced the Subaru EJ207 and EJ205 engines.

FA20DIT engine uses non-forged pistons with the decreased compression ratio 10.6:1, and it is reported the heads flow better as the combustion chambers were improved and new camshafts are applied.

On the intake part there is the plastic intake manifold with TGV (tumble generator valve) valves, and a new turbo manifold is also used.

FA20 DIT engine uses a twin scroll Garrett MGT2259S turbocharger. The maximum boost pressure is 15.9 psi (1.1 bar), and power is 272 HP at 5,600 rpm, torque 350 Nm at 2,000-5,200 rpm. Also, there is an over boost mode available, at this mode boost pressure can increase to 22 psi (1.5 bar) for several seconds. The firing order of the FA20 is the conventional 1-3-2-4.

For this engine, it's necessary to use the best quality gasoline you can find and also to use original high-quality engine oil. It's even suggested to change it twice more often than it is recommended. Doing so will allow you to maintain reliability and increase the life cycle of the engine.

FA20 Engine Specs

Piston Stroke, mm (inch)	86.0 (3.39)
Cylinder Bore, mm (inch)	86.0 (3.39)
Displacement	1998 cc (121.9 cu in)
Production	2011-Present
Cylinder Block Alloy	Aluminum
Configuration	Flat Opposed 4
Valvetrain	DOHC 4 valves per cylinder
Compression Ratio	10.6:1 or 12.5:1

There are many additional performance options available and to accomplish 350+ horsepower, you'll need a new fuel pump, fuel injectors, front pulley and water/methanol injection. Oh, don't forget about the transmission cooler and aftermarket radiator. ■



AERA Technical Specialist Dave Hagen has over 44 years of experience in our industry. As an ASE-certified Master Machinist, Dave specialized in cylinder head work and complete engine assembly for the first 17 years of his career. For more information, email: dave@aera.org.

Power in a small package...
direct injection, high compression,
four valves per cylinder, and variable
valve timing for both intake and
exhaust events.

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