EJ Engines 101

Disclaimer: The below is for reference purposes only. It may not be accurate. It was collected from many sources and again, the below information is just informational. Please use at your own risk.

Identifying An EJ

A 10-digit engine code is used by Subaru: the first 2 characters identify the engine series. The 3rd & 4th identify displacement volume in liters.

The 5th digit is a sub-series identifier and fuel system flag. The 6th digit identifies emissions regulations it conforms to, while the 7th digit shows the intended transmission it was mated with. The final 3 digits are minor production change codes. The series engine is also physically embossed on the top of the engine block, to the left of the alternator.

EJ15

1.5 Litre SOHC

Usage:

* Impreza (JDM only, though often seen in gray market exports to eastern Europe and Russia.)

EJ16

1.6 Litre SOHC, 90 hp (67 kW) @ 5600 rpm.

Usage:

* Impreza 93-94 (JDM only)
* Impreza 93-06 (Europe & Middle East)
* Impreza 93-97 (Australia)

EJ18

1.8 Litre SOHC 110 hp (82 kW) @ 5600 rpm.

Usage:

* Impreza 93-99
* Legacy (non-USDM) 90-96

EJ20

2.0 Litre SOHC or DOHC

EJ20T

This is not actually a valid code from Subaru, but is mostly used by enthusiasts and also mechanics to describe the entire line of 2.0 litre turbocharged engines that have been available over time. When referring to the EJ20T, one is speaking of one of the following:

EJ20G

EJ20G fall in to 2 categories -early engines 1989-9/1996 -late wagon and automatic sedans from 1994/1996 and later

to identify an early EJ20G

* Coil on plug
* Divorced idle air wer q

Late model EJ20Gs are the same general design as the EJ20K 3a q3t Usage:

* Legacy RS 89-93
* Legacy RS-RA 89-93
* Legacy GT 89-93
* Impreza WRX 92~96
* Impreza WRX Wagon 92~98
* Impreza WRX STi 94~96

227 hp (169 kW) @ 4000 rpm

EJ20K

to identify an EJ20K

* Wasted spark coil pack on center of manifold
* Inlet under manifold
* Divorced idle air controller

Usage:

* Impreza WRX & STi 9/96~9/98

EJ205

This engine series is used for non-Japanese marketed WRX models in the world market as of 1999. The Japanese WRX models use the EJ207 from 1999~2001, except the 5-door wagon which also uses the EJ205. After 2001, all WRXs use the EJ205. to identify an EJ205:

* Coil on plug
* idle air integrated into throttle body

Usage: Impreza WRX

* 99~01 (JDM Wagon Body only)
* 01~current (all JDM)
* 02~05 (USDM)
* 99~current (all other markets)

EJ207

to identify an 9/99-9/2000 EJ207

* Wasted spark coil pack off center of manifold
* Inlet under manifold
* Red manifold

Usage:

* Impreza WRX STi 1998~present (JDM, specifically Homologation models for World_Rally_Championship)

2.0L Quad Cam Twin-turbo from JDM 1996 Subaru Legacy GT

EJ20TT

This can refer to one of the 2.0 Litre DOHC Sequential Twin Turbo and intercooled engines (EJ20H/EJ20R/EJ206/EJ208). Yet like EJ20T, it is not actually a valid code used by Subaru themselves. Used from 1995-2005 in various iterations listed below.

Usage:

* Legacy GT, RS & B4 (JDM)

EJ20H

Usage:

* Legacy BD/BG5 JDM GT's (183 kW manual & auto) and GTB's (190 kW auto)

EJ20R

Usage:

* Legacy BD/BG5 JDM RSB and GTB's (205 kW Manual)

EJ206

Usage:

* Legacy BE/BH5 JDM GT's, GTB's and B4's (190 kW Auto)

EJ208

Usage:

* Legacy BE/BH5 JDM GT's, GTB's and B4's (205 kW Manual)

EJ22

2.2 Litre SOHC 135 bhp (101 kW) @ 5800 rpm 140 ft·lbf (190 N·m) @ 4800 rpm Subaru EJ22

Usage:

* Impreza 95-01
* Legacy 90-99

EJ22 Enhancements and Improvements

2.2 Liter Engine Enhancements Beginning in the 1997 Model Year, the 2.2 liter engine for 1997 Legacy and Impreza models has had internal and external changes that yield an approximately 10% increase in power and 3% increase in fuel economy.

Accomplishing this involves many factors, one of which is engine friction reduction. The piston, a major source of engine friction, has been coated with a friction reducing agent called Molybdenum. This thin coating not only allows smoother travel through the cylinder, but also reduces cylinder wall scuffing.

The skirt of the piston has been reshaped and the overall weight has been reduced by approximately 100 grams. Compression ratio has been increased to 9.7 to 1 by reshaping the crown of the piston. This eliminates the clearance that was available between the piston at TDC and the fully opened valve.

Piston pin offset has been changed to 0.5 mm. Piston to cylinder wall clearance has been reduced by increasing the piston diameter.

Another source of high engine friction is the valve train. Hydraulic lash adjusters (HLAs) are always in

contact with the valves. The hydraulic pressure of the lash adjuster must be overcome during operation and during the most critical time of engine start.

To overcome this situation and to contribute to the total reduction of friction loss, 1997 and later SOHC engines have solid valve adjusters. The scheduled service of this valve train is set at 100,000 miles (160,000 km). SOHC engines now use an adjustment screw to adjust valve clearance.

The roller rocker cam follower system that was introduced on the 1.8L Impreza engines, is installed on all 1995 model year and later 2.2 liter engines.
The roller assemblies are not serviceable separately, but the rocker arms may be serviced as individual units.

The carbon composition head gaskets with integrated o-rings are interchangeable from left to right on 1990 to 1994 N/A engines only.

Other Engine Modifications (2.2L 1997) The intake manifold has been reshaped to increase the airflow mass and speed, contributing to improved low and mid engine speed operation. Components located on the intake manifold have been relocated as compared to the 1996 models. EGR Solenoid, Purge Control Solenoid,
etc.

1999 2.2 Liter Phase 2 Engine Enhancements (from endwrench article H-4 and H-6 service): All 2.2 liter engine for 1999 are the Phase 2 design. The 2.2 liter Phase 2 engines are a SOHC design, with a newly-designed cylinder head. Changes in the 2.2 liter Phase 2 engines are as follows:

* The engine and transmission are fastened with six bolts and two studs.
* The thrust bearing has been moved to the number 5 position.
* The oil groove in the number 1 and 3 have been changed to supply additional lubrication to the crank journal.

Additional Phase 2 Engine Features

* The cylinder head is a two-rocker shaft, solid type valve system with roller followers.
* The valves are positioned at a larger angle than previous model years. The intake valves are positioned 23 degrees off-center with the exhaust valves

positioned 20 degrees off-center. Prior model year engines utilized a 15-degree positioning angle.

* Head gasket thickness is 0.7 mm.
* The intake rocker arms are marked so they are correctly placed on the rocker shaft when servicing. An IN1 or IN2 will be embossed on each rocker arm.
As viewed from the front of the engine the Number 1 intake valve of ach cylinder and the number 2 intake valve have an IN1 marked and IN2 arked rocker arm that mates with it. New IN1 rocker arms can also be identified by a Green painted mark on the top of the rocker arm. The IN2 rocker arms have a white mark. Proper positioning is maintained through the use of a wave washer located between the rocker shaft arm and rocker arm shaft support.
* The camshaft is secured to the cylinder head with the cam case. An oil passage in the cylinder head provides the passageway in the cam case with oil
that leads to the intake rocker shaft. Oil from the camshaft is collected on the opposite side of the passageway leading to the intake rocker shaft to
provide oil to the exhaust rocker shaft.

Note: Cylinder head and cam case must be replaced together (line bored).

* The sparkplug pipe is pressed into the cylinder head and is not serviceable.

If it becomes damaged the cylinder head must be replaced. The seals installed onto the ends of the sparkplug pipes seal against the valve covers and should be replaced when the valve cover is removed.

* Pistons on the 2.2 liter engines have a 0.5 mm offset with the engine having a compression ratio of 10.0 to 1. The horsepower has increased to 142 hp (106 kW) @ 5600 rpm. Maximum torque is149 ft·lbf @ 3600 rpm.
* Camshaft sprockets are constructed of a resin type material with a metal key pressed into the sprocket for maintaining proper sprocket to shaft orientation.

EJ22E

2.2 litre
AUDM Subaru EJ22E

135 bhp (101 kW) @ 5800 rpm 140 ft·lbf (190 N·m) @ 4800 rpm

Australian model - 100 kW (130 hp) @ 6000 rpm 189 N·m (139 ft·lbf) @ 4800 rpm

Usage:

* Legacy 89-99
* Impreza 93-01

EJ22T

2.2 Litre SOHC Turbo, fully closed deck, oil squirters, no intercooler

* Legacy 89-94 (North American market from 1991-1994)

EJ22K

turbocharged 2.2 litre DOHC with 2.5 litre heads. Usage:

* Impreza WRX STi 22B (JDM)

EJ25

2.5 Litre

EJ251
Flat four EJ251

The EJ251 is a 2.5 L (2457 cc) Horizontally Opposed DOHC Engine with a bore of 99.5 mm (3.92 in) and a stroke of 79.0 mm (3.11 in). Intake volume is regulated by the use of a MAP sensor, unlike the EJ253 which uses a MAF sensor. Compression ratio is 10.0: 1. Power ISO:

123 kW (165 hp) and 226 N·m (167 ft·lbf)

Usage:

* Impreza 2.5RS 00-04 (US)
* Impreza Outback Sport 02-04 (US)
* Forester 00-04 (US)
* Legacy 00-04 (US)
* Outback 00-04 (US)
* Baja 03-04 (US)

EJ252

SOHC The EJ252 is a 2.5 L (2457 cc) Horizontally Opposed SOHC. Power ISO 115 kW (156 hp) Usage:

* Legacy 00
* Forester 00

EJ253

SOHC - ISO 156 hp (116 kW) @ 5600 rpm, 166 ft·lbf (225 N·m) torque @ 4000 rpm. Intake volume is regulated by use of a MAF sensor, unlike the EJ251 which is regulated by a MAP sensor. I-Active valves (VVT intake side) on 05+ models.

* Impreza 99, 05+
* Legacy 05+
* Forester 99, 05+
* Baja 05+

EJ25D

DOHC - SAE - 165 hp (123 kW) @ 5600 rpm 162 ft·lbf (220 N·m) at 4000 rpm

Usage

* Impreza 98
* Legacy 96~99
* Forester 98

EJ254

SOHC 16 valve Power SAE 121 kW (165 hp), 2005-present - 175 hp (130 kW).

Usage:

* Impreza RS 02~04
* Forester 04
* Legacy 02~04

EJ255

2.5 litre DOHC AVCS turbocharged, with sodium-filled valves originally designed for North American market, now sees usage in some European Imprezas and Legacies destined for Australia and South Africa. Power JIS 169 kW/230 hp

Usage in North America:

* Impreza: 2006 - present
* Forester: 2004 - present
* Legacy: 2005 - present
* Baja: 2004 - 2006

Usage in the rest of the world:

* Legacy: 2005 - present
* Impreza: 2006 - present

EJ257

DOHC 16 valve turbo

Usage:

* US Market Impreza WRX STi MY04~present (300 hp)

* Asian, European Market Impreza WRX STi 05~present (280 hp, 40KGh/m)

Subaru Formula One Flat-12

An unexpected contract with Subaru, the automobile branch of Fuji Heavy Industries, brought substantial monetary backing and additionally an exclusive "works" engine for free. The Japanese took over 51% of Coloni formula, paid the debts and supported the new alliance with a brand new, unique engine.

It was a flat-12 engine which in fact was penned by Carlo Chiti. Chiti's Motori Moderni company at Novara had supplied V6 Turbo engines for the Minardi Formula One team from 1985 to 1987, and in 1988 Chiti had penned a normally aspirated V12 engine that attracted Subaru. In late 1988, the Japanese commissioned Chiti to design a new Formula One engine with a "flat" layout - as used in their road cars - that was ready in the Summer of 1989.
The engine - now with a Subaru badge - was tested in a Minardi M188 chassis but due to a severe lack of power Minardi very soon lost interest. After a few months of searching, Subaru found the Coloni team. Eventually, the "Subaru Coloni" Team was founded with Enzo Coloni staying on board as the man for operational business.

By the beginning of 1990, the "Subaru" flat engine was not producing more than 500 bhp, so the Coloni Subaru was by far the least competitive machine regularly competing in Formula One in 1990. Subaru and Chiti agreed to build a new V12 engine for Summer 1990 together with a completely new chassis, but in the meantime the flat engine should be used by the "Coloni Subaru" Team in a carry-over chassis.

Early in 1990, a handful of Enzo Coloni's mechanics worked on a single C3 and tried to put the Subaru engine in it. The work was not done until the day the FIA started shipping the Formula One material to Phoenix. In the pits at Phoenix, the car was assembled for the very first time, and a short private "practice" took place on a parking area of an American supermarket. On prequalification day of Phoenix the world saw Coloni's "new" model C3B which wore a white, red and green livery. Without an airbox but with wide, long sidepods, it looked like a tank, was overweight by 300 pounds and nearly impossible to handle.

Neither at Phoenix nor at any other event, did Bertrand Gachot, Coloni's new driver, manage to prequalify the car. As the season went on, improvements were few and results stayed nowhere. Meanwhile, no success could be seen at Coloni's plant in Perugia where obviously nobody worked seriously on a new car. In May, Enzo Coloni was sacked by Subaru, but no improvement came. In June, the Japanese company withdrew completely and sold the team back to Enzo Coloni, debt free, but with no sponsors and no engines.

By the German Grand Prix Coloni had arranged a supply of Cosworth engines, prepared by Langford & Peck. An improved car also appeared in Germany. The "new" Coloni C3C was simply a 1989 C3 with minor changes in aerodynamics. The car was quicker, but not enough to achieve any serious results. Gachot was usually able to pre-qualify his car, but the "main" qualification was still out of reach. By the end of the season, Coloni had not taken part in a single Grand Prix.

Other Data

All the EJ series share compatibility and construction similarity and are 16 valved engines. The EJ series started with the EJ15, a 1.5 liter (SOHC) and makes ~90 hp, then the EJ16, a 1.6 litre single overhead cam (SOHC). Later followed by the EJ20, a 120 hp 2.0 litre single overhead cam and the EJ22, a 135 hp 2.2 litre single overhead cam. The EJ20 turbocharged version was developed with dual overhead cams, as well as non-turbo DOHC engines and DOHC twin-turbos. The EJ18 and EJ20 were most popular in Europe and the EJ22T SOHC, mostly in the US and is known as the bulletproof Subaru engine.

The SOHC EJ Subaru boxer engines were non-interference engines through 1996, run by a single timing belt driving both cams (both sides of the engine) and the water pump. Because they are non-interference engines, if the timing belt fails, the engine of the models up to 1996 will not be destroyed. The oil pump is driven directly from the crank shaft and the water pump by the timing belt. All DOHC and 1997-up SOHC EJ engines are interference engines, if the timing belt fails the engine will likely be destroyed or

the valves & piston will be heavily damaged.

All Subaru EJ engines have a 1-3-2-4 firing order.

Awards

Subaru 2.5-liter Turbo Boxer Engine won 'best engine' in the 2.0-2.5 litre category in both the 2006 and 2008[1] International Engine of the Year awards.

Subaru Engine Specs, 1970-1984 :

Year	Code	Bore x Stroke	Size in cc	Compression	HP	Torque	Notes
1958-1971	EK-31	61.5 X 60	356	6.7:1	25@4500	25@3000	360
1970-1971	EA-52	72 X 60	977.2	6.5:1	55@6000	57@3200	Non-USA
1970-1972	EA-61	76 X 60	1088.8	9.0:1	62@6400	63@3200	FF-1 Star
1971-1972	EA-61	76 X 60	1088.8	9.0:1	61@5600	65@4000	All
1971-1972	EA-62	82 X 60	1267.5	9.0:1	80@6400	73@4000	1300G Only
1973-1974	EA-63S	85 X 60	1362	8.5:1	61@5600	69@3600	All
1975-1976	EA-63	85 X 60	1362	8.5:1	58@5200	68@2400	2WD
1975-1976	EA-63	85 X 60	1362	8.5:1	56@5200	67@2400	4WD
1976-1979	EA-71	92 X 60	1595	8.5:1	67@5200	81@2400	2WD
1976-1979	EA-71	92 X 60	1595	8.5:1	65@5200	80@2400	4WD
1980-1987	EA-71	92 X 60	1595	8.7:1	69@4800	84@2800	All
1980-1982	EA-81	92 X 67	1781	8.5:1	72@4800	92@2400	2WD
1980-1982	EA-81	92 X 67	1781	8.5:1	71@4200	92@2800	4WD
1983-1984	EA-81T	92 X 67	1781	7.7:1	95@4200	123@2800	Turbocharged
1983-1989	EA-81	92 X 67	1781	8.7:1	73@4800	94@2400	All

Subaru Engine Specs, 1985-2008 :

Year	Code	Bore x Stroke	Size in cc	Compression	HP	Torque	Notes
1985-1988	EA-82	92 X 67	1781	9.5:1	84@5200	101@3200	SOHC 2bbl
1985-1989	EA-82	92 X 67	1781	8.7:1	97@5200	103@3200	SOHC MPFI
1985-1991	EA-82T	92 X 67	1781	9.5:1	111@5200	134@2800	SOHC Turbo
1985-1994	EA-82	92 X 67	1781	9.0:1	90@5200	101@2800	SOHC SPFI
1987-1991	ER-27	92 X 67	2672	9.5:1	145@5200	156@4000	XT-6 Only SOHC
1987-1990	EF-12	78 X 83	1189	9.0:1	66@5200	70@3600	Justy 2bbl SOHC
1990-1994	EF-12E	78 X 83	1189	9.1:1	73@5600	71@3600	Justy EMPI SOHC
1990-1994	EJ22E	96.9 X 75	2212	10.0:1	130@5600	137@2400	Legacy/Impreza
1991-1994	EJ22T	96.9 X 75	2212	8.5:1	160@5600	181@2800	Turbocharged

1992-1996	EJ18E	87.9 X 75	1820	9.5:1	110@5600	110@4400	Impreza Only
1992-1997	EG33	96.9 X 75	3318	10.0:1	230@5400	228@4400	SVX Only
1995-2001	EJ22	96.9 X 75	2212	10.0:1	142@5600	149@3600	Phase-II
1995-1999	EJ25D	99.5 X 79	2457	10.0:1	165@5600	155@2800	DOHC
2000-2002	EJ251	99.5 X 79	2457	10.0:1	165@5600	166@4000	SOHC
2000-2008	EJ253	99.5 X 79	2457	10.0:1	173@6000	166@4400	SOHC
2002-2005	EJ205	92 X 75	1994	8.0:1	227@6000	217@4000	WRX Only Turbo DOHC
2003-2008	EJ255	99.5 X 79	2457	8.3:1	210-250	235-250	Turbocharged DOHC
2003-2004	EZ30D	89.2 X 80	2999.6	10.7:1	212@6000	210@4400	H6 Only DOHC
2004-2007	EJ257	99.5 X 79	2457	8.3:1	300@6000	300@4000	STi Only DOHC Turbo
2005-2008	EZ30R	89.2 X 80	2999.6	10.7:1	250@6000	219@4200	3.0R/Tribeca DOHC
2008	EZ36	92 X 91	3629.6	10.5:1	256@6000	247@4400	Tribeca Only DOHC