

Subaru Engines and Conversion Principles 101

There are many 80's cars that are being converted to the newer EJ motors, so it would be helpful to understand the older Gen's.

Disclaimer: The below is for reference purposes only. It may not be accurate. Again, The below information is just informational, use at your own risk.

Like Gen I's are pre 1982, Gen II's are 1982-84 for coupes and wagons and through 87 for hatchbacks and Brats, Gen III's are the "Loyale" cars from 1985 until the Legacy line (early 90's).

The engine in these cars are broken down also, lotsa people don't really get the pre EJ numbers, EA71 is a 1.6L OHV, EA81 is 1.8L OHV, EA82 is 1.8L SOHC, and the ER27 is 2.7L SOHC H6. These motors came with a variety of fuel systems as well, T designation is always turbo as EA81T or EA82T. The EA81 was the first turbocharged Subaru engine put into production (This is the car that I own, the Great Grandmother of the WRX).

Among the EA82 engine series there were a number of fuel systems. Carb'd is pretty easy 2bbl, which is a 2 barrel hitachi, feed back carburetor. Then there is SPFI, Single Point Fuel Injection, which was Subaru's way of saying Throttle body injection. MPFI is still used today, so no description needed. All of the turbo models were MPFI, and the ER27 only came as NA MPFI.

Gen I cars are EA71 powered, Gen II's are EA81 cars, and Gen III's are EA82 cars, the XT-6 (ER27) is considered a Gen III with the NA and Turbo Xt's.

When referring to a chassis alone, use the first two characters of the model code.

1993-2001 Impreza Chassis:

Sedan: GC
Coupe: GM
Wagon: GF

2002+ Impreza Chassis:

Sedan: GD
Wagon: GG

1990-1994 Legacy Chassis:

Sedan: BC
Wagon: BF
(Yes, the C and F indicate the same chassis as Imprezas)

1995-1999 Legacy Chassis:

Sedan: BD
Outback Wagon: BG
Wagon: BK

2000+ Legacy Chassis:

Sedan: BE
Wagon: BH

Forester Chassis:

1998-2002: SF
2003+: SG

SVX Chassis:

1992-1997: CX

The third character refers to the engine that particular chassis was equipped with from the factory. The engine code itself implies engine size, configuration, and other things like radiator type and crossmember

used.

Due to some confusion on the VIN versus the applied model code, the table has been revised to show Model Codes and VINs.

Applied Model Codes:

1.8L (NA-Impreza): 5 (ie: GC5 is a 1.8L Impreza Sedan)
2.0L (pre-MY01 WRX): 8 (ie: GC8 is a 2.0L Impreza WRX Sedan)
2.0L (MY01+ WRX): A (ie: GGA is a 2.0L Impreza WRX Wagon)
2.0L (MY02+ WRX STi): B (ie: GDB is a 2.0L Impreza WRX STi Sedan)
2.2L (NA): C (ie: GFC is a 2.2L Impreza Wagon)
2.5L (NA-Impreza): E (ie: GME is a 2.5L Impreza Coupe)
2.5L (NA-Legacy): 6 (ie: BE6 is a 2.5L Legacy Sedan)
2.5L (XT): 9 (ie: SG9 is a 2.5L Forester XT)
2.5L (STi): F (ie: GDF is a 2.5L Impreza WRX STi Sedan)
3.0L (H6): 9 (ie: BE9 is a 3.0L Legacy Sedan)

VIN Chassis Codes:

1.8L: 2 (ie: GC2 is a 1.8L Impreza Sedan)
2.0L: 2 (ie: GD2 is a 2.0L Impreza WRX Sedan)
2.2L: 4 (ie: GF4 is a 2.2L Impreza Wagon)
2.5L (NA and XT): 6 (ie: GM6 is a 2.5L Impreza Coupe)
2.5L (STi): 7 (ie: GD7 is a 2.5L Impreza WRX STi Sedan)
3.0L (H6): 8 (ie: BH8 is a 3.0L Legacy Wagon)
3.3L (H6): 3 (ie: CX3 is a 3.3L SVX)

Some of this information may seem unimportant, but you should always be specific to ensure the correct answer to your question.

Specific model code indication required:

If you are requesting fitment of a radiator into a GFA, there are two things to consider: GF indicates pre-MY02 Impreza chassis, while A indicates it is a 2.0L turbo engine. For a vendor to simply reply saying that, yes, they have a GC8 radiator (when it is really a GC4/6 radiator) does NOT mean it will apply to your application. It does mean it will fit the GC/GF chassis, however. Since you have a turbo engine (A), it means you probably do not want a radiator designed for a naturally aspirated engine (6).

Specific model code indication not required:

If you ask if a STi V6 drivetrain will fit into a GC8 chassis, then of course it will. That is the exact car the engine is in. However, if you are asking if it will fit into a GC/GF chassis (or maybe just GF4 specifically), then your question is less ambiguous as to what you are trying to do. However, it is obvious to see what is being asked.

Subaru has a high interchangeability rate as far as drivetrain components go. If your car came with an EJ series engine, then any other EJ series engine will "drop" into your chassis. I say "drop" because while they do share the same engine mounts, some other components may be required to change first before the engine can go in

What is an 'EJ' series engine?"

EJ is the engine code for many Subaru engines. It is thought to have the following definition: E-Engine and J-H4. They are commonly found in the Impreza, Legacy, Liberty (overseas Legacy), Forester, and WRX. The typical naming convention is the engine code followed by the engine size. ie: a 1.8L engine from a 1993 Subaru Impreza is EJ18.

swap options

Some model history first:

EJ18: Found in Imprezas from 1993-1997. Rated at 110hp and 120 ft-lbs

EJ22 Phase I: Found in Legacies from 1990-1998 and Imprezas from 1995-1998. Comes rated at 130hp and 137 ft-lbs, 135hp and 140 ft-lbs, or 137hp and 145 ft-lbs.

EJ22 Phase II: Found in Legacies in 1999 and Imprezas from 1999-2001. Rated at 142hp and 149 ft-lbs.

EJ22-T Phase I: Found in Sport Sedan and Touring Wagons (Legacies) from 1990-1994. Turbocharged and non-intercooled. Rated at 160hp and 181 ft-lbs. Closed deck, cast pistons, forged rods, oil squirters: turbo motor. Poor flowing heads.

EJ25 DOHC Phase I: Found in Legacies from 1996-1999, Imprezas in 1998, and Foresters in 1998. Rated at either 155hp and 140 ft-lbs in 1996 or 165hp and 162 ft-lbs in 1997-1999.

EJ25 SOHC Phase II: Found in Legacies from 2000+, Imprezas from 1999+, and Foresters from 1999+. Rated at 165hp and 166 ft-lbs. There was a slight compression ratio change from 1999-2000 where it went from 9.7:1 to 10.0:1.

USDM EJ20: US Domestic Market WRX. Found in 2002+ WRXs. Rated at 227hp and 217 ft-lbs. Turbocharged, intercooled, open deck, and decent heads.

EJ25T DOHC: Available in 2004 in the Forester XT. Rated at 210hp and 235 ft-lbs. Turbocharged, intercooled, VVTi (Variable Valve Timing), and drive by wire.

EJ25T-STi DOHC: Available in 2004 in the WRX STi. Rated at 300hp and 300 ft-lbs. Turbocharged, intercooled, AVCS (Active Valve Control System), drive by wire, intercooler sprayer, and semi-closed design.

There is also a large variety of engines available from the JDM and EDM locales. The EG33 from the SVX and the EZ30 from the new H6 Legacy can also be found, but they are larger and will be more difficult to swap.

With that out of the way, the choices are pretty limitless. As stated previously, since these are all EJ series engines, they will all bolt into any Forester, Impreza, or Legacy. If the recipient car was and is receiving a turbo motor from a donor car, then swapping in a turbo crossmember is mandatory to clear the turbo up-pipe. A turbo crossmember from the 1990-1994 Legacy is a direct

Updating my Impreza to look like a 2.5RS?"

The chassis has remained the same from 1993-2001. There have been very few drastic updates over the years. There was a facelift done in 1997, but it uses the same mounting points. The RS bumper was updated in 1999 to use the Version V bumper. This required a new bumper beam.

"I'm doing an EJ20 swap, which exhaust should I use?"

Until proven otherwise, the exhaust from a standard WRX from 1993-2004 has remained relatively unchanged. This means that if you are performing a swap from an Impreza chassis to an Impreza chassis, you can use any complete WRX exhaust. If you are swapping from an Impreza chassis to a Legacy chassis, then the exhaust must be lengthened to accommodate the longer chassis.

If you are doing a piece-meal exhaust, there are four types of downpipes available from any of the EJ20 equipped cars: the twin-turbo downpipe, a la GTB; the twin-scroll downpipe, a la STi Ver. VIII; the IHI flanged downpipe from a pre-MY01 JDM vehicle or post-MY01 non-JDM vehicle, a la USDM WRX or STi Ver. VI; or finally the IHI flanged downpipe from a post-MY01 JDM vehicle; a la STi Ver VII. The twin-turbo downpipe is only going to work in a RHD car, so this will almost never be used. The twin-scroll downpipe can only be used with an IHI twin-scroll turbo, so this will only be used with some STi Ver. VIII vehicles. The pre-MY01 JDM downpipe is the most common downpipe used with EJ20 vehicles. The post-MY01 JDM downpipe was introduced with the GG/GD chassis and is a few inches shorter than the pre-MY01 downpipe.

If you choose the pre-MY01, then you must mate it with a similar system. It can be mix-matched as long as it is not matched with a post-MY01 JDM system; this includes using cat-backs designed to work with

the EJ25 engines. If you choose the post-MY01, then you must mate it with what is commonly referred to as a "JDM cat-back". The flange at the axle was rotated on the GG/GD chassis so the mid-pipe and the axle-back must be from the same chassis generation.

The Engines

All EJ series engines share the same bolt pattern on the bellhousing. While some use fewer bolts than others, they will still bolt up.

One caution: the turbo transmissions use a pull-style clutch whereas the NA transmissions use a push-style clutch. If you are swapping transmission types, you need to match the transmission up with the correct clutch/flywheel assembly.

One more precaution: if you are swapping in a transmission, you need to be sure that your rear differential final drive ratio matches the final drive ratio of your transmissions. Installing a new transmission without checking this could permanently damage your center differential! Putting an engine from a FWD car into an AWD car or vice versa does not change the swap criteria as it will still all bolt together.

Thirdly, the older transmissions use a different shift linkage joint attaching to the shift forks of the transmission. The older transmissions have a fork that attaches to the rest of the shift linkage whereas the newer transmissions have a barrel joint. This must be updated if you are to change from an older tranny to a newer one or vice versa. It is believed that the older style shift linkage was used up until 1997. Beyond 1996, the transmission linkage should be the new style.

Finally, the older transmissions utilize a stud on the transmission for mounting the lower hole of the flange of the starter. If you swap in a newer transmission onto an older block, the block will not have the threads for the lower starter bolt. Some have reported success with just using the upper starter bolt, others have tapped a hole into the block.

Components needed to convert a FWD Subaru to AWD

A new transmission will be required. Along with the new transmission comes the front diff, center diff, and tail shaft. You must also get the corresponding driveline for the transmission (side note here, if you are merely swapping one AWD transmission for another the MT typically shares one driveline between all other MTs and the ATs share another driveline; the STi 6-speed uses an AT driveline). There are many rear diff options, and any of them can be used as long as the final drive matches the final drive of the rear diff of the donor car the transmission came from. Front axles should be interchangeable, but newer axles are thicker. CV strength has remained the same and are not a weak point. Rear open diffs can be found on most Subaru models. Rear LSD s came on some Legacy Turbos, Some SVXs, 2000-2001 2.5RSs, and 2002+ WRXs. While final drive ratios vary, the axle splines do not. Your diff choice governs which rear axles are to be used. You will either need rear axles from an open diff Legacy or GC/GF/GM Impreza for an open diff or rear LSD axles from a 2000-2001 Impreza 2.5RS (ask for axles from 05/2000+ to be safe) for a rear LSD. If you are converting from AT to MT or vice versa, you will need the corresponding ECU since the AT ECU expects a TCU signal. You can spoof it as some have done.

Along with the basic driveline components, you are going to need most of the rear suspension and mounts from the transmission back. This includes the transmission crossmember, rear diff crossmember (and all in between), AWD gas tank with driveline hump, struts and springs, AWD knuckles, a plethora of bushings, with the possibility of lateral links, swaybar, and trailing arms also being needed. Your best bet is to find an entire donor car that can be stripped.

The clutch and flywheel needed for your transmission swap are dictated by the transmission itself. If you are using a turbo transmission (commonly found in turbo Subarus like WRXs [non 6MT] and Legacy turbos) then you will need to use a pull-style clutch and corresponding flywheel. If you are using a transmission commonly found on a naturally aspirated Subaru, you will need to use a push-style clutch and flywheel.