


USDM Legacy 2.5GT BL5/BP5 NON-CAN BUS ONLY EJ20X/20Y Engine Swap

Alright, first off, why would anyone want to down-size from a 2.5L to an 2.0L?
“You’ll lose all your low end torque!” There’s three main reasons at play here.

- a) Cost
- b) Reliability
- c) Speed and Power

Before we get started, a small disclaimer here. I am an experienced Subaru technician. This write-up is not a step by step guide on how to pull and install your engine. This is essentially a reference guide to making an EJ20X or 20Y run smoothly in a US chassis car, and the changes you will have to make in order to make this process a bolt in engine replacement. Attempt this swap at your own risk and with the understanding of the trade-offs between a low comp 2.5 and a high comp 2.0.

A run of the mill EJ255 from a US junkyard with unknown history and unknown mileage can cost anywhere between \$1300 to \$2400 USD. Meanwhile, most JDM pullout importers guarantee their engines to be <100,000 KM, or approximately 60,000 Miles, and an EJ20X can run anywhere between \$650 to \$800 USD. This price includes the accessories, turbocharger, and sometimes can include other good spare parts as well. The EJ20X is understood to have a much higher compression ratio and far stronger internals than the US EJ255, as well as a much smaller likelihood of undergoing head gasket or ringland failure that our 2.5’s have become well known for. Armed with good prep work and a small shopping list of parts, both aftermarket and OE, the swap can be done with relative ease.



\$699.00

Years: 2003-2007

Engine Serial Number: C534510

Engine Displacement: 2.0L

Warranty: 30 Day Startup Warranty On Engine Internals

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Maryland ▾

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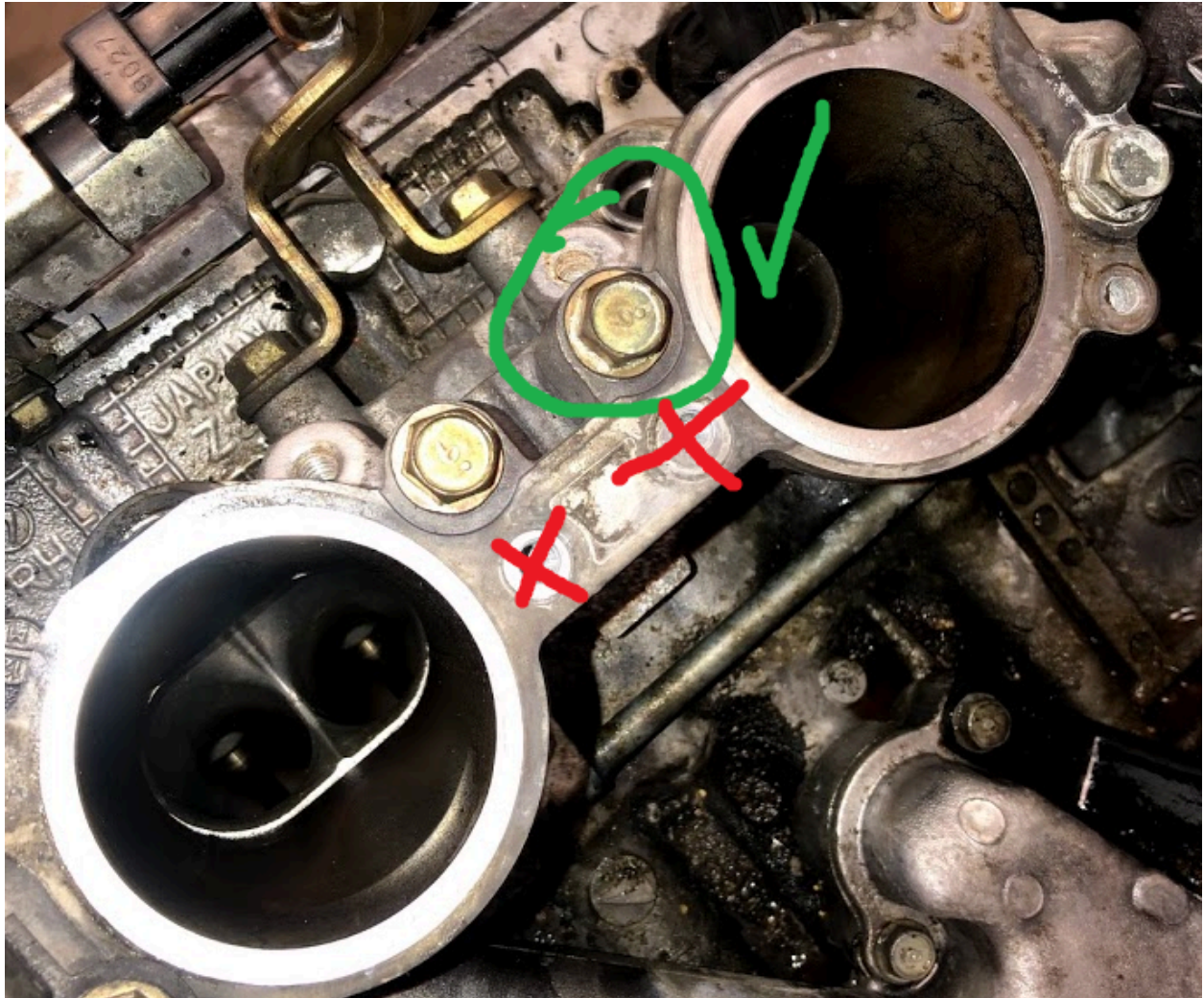
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Categories: EJ20X, EJ20Y SERIES SUBARU ENGINES, Subaru

First off, you'll want to source an engine from a reputable distributor. I personally used MD JDM motors as the shop I work for has a great relationship with the guys over there and we're relatively local to them. Once you have your new powerplant, get it on a stand and begin tearing it down. Begin by removing the accessories which will probably have hoses chopped off of them. Save these as spares! OE low mileage accessories are a far nicer replacement than a rock auto reman unit should the need arise. Disconnect the wiring harness anywhere it connects to the long block, such as the ignition coils, CMP and CKP sensors, coolant crossover pipe, and AVCS solenoids. Leave everything plugged into the manifold, fuel rails, and EVAP hose assembly. You'll be removing the entire wiring harness from the engine when you remove the intake manifold. Unbolt the intake manifold from the block at the Lower fuel injector housings, not the 10mm bolts

that bolt the plastic down to the injector housings.



I initially removed the manifold from the lower housings but realized later that this did nothing but free up more bolts to keep track of, as the JDM engine does not have TGVs to sort out. These lower housings can be used as an OEM TGV delete or be tossed in the bin depending on your state's emissions compliance, and your own willingness to get the car tuned for the delete. Congratulations! With the intake manifold, accessories, and wiring harness removed, you now have a longblock with a turbo stuck on it.

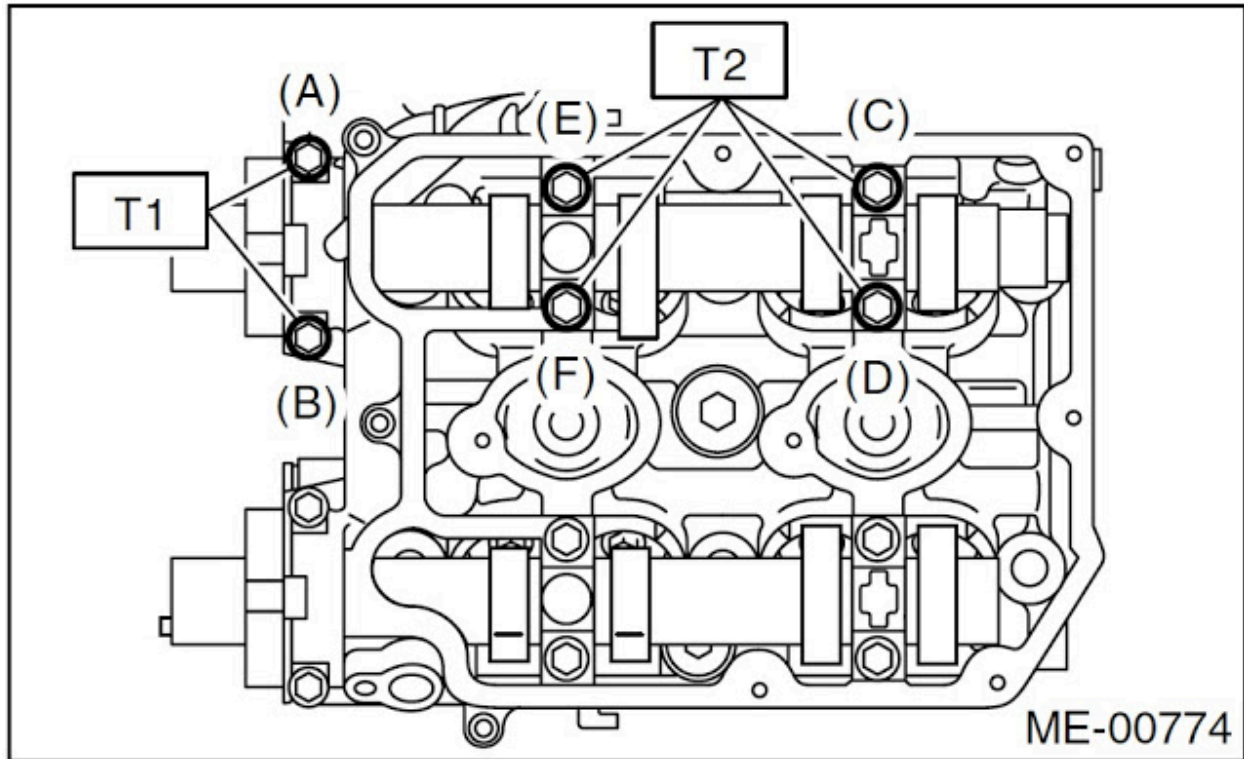


EJ20X time babeyyyy

Ignore my snapchat text and messy workspace, it's the weekend and I'm engine swapping my daily driver. With only 2 days of lift time I'd rather not spend it picking up the broom.

Ideally, you should have decided by now what your turbo situation is going to be. Either the turbo that came on your engine, or the USDM turbo of your choice. While the JDM twin scroll turbos are awesome, and will help solve that low RPM torque issue you'll experience by losing .5L, they require a different intercooler and downpipe that can be a pain to source in good condition. I had personally replaced my turbo with a billet impeller VF46 about a year before this engine swap, so I removed the twin scroll headers, uppipe and turbo and bolted on my USDM turbo hot side using fresh gaskets and crush washers for all the oil lines. It is also worth noting that the USDM headers need some heat shield clearancing with a precision adjustment strike device in order to clear the exhaust AVCS solenoids. Now is also the time to replace that heinous rubber oil drain pipe that looks like a physical manifestation of California Prop 65 warnings. I've done a handful of them with the engine in the car, and trust me you don't want to have to double back on that one.

Alright, with your turbo bolted up and your oil lines and gaskets sorted, its time to time! In a state that uses OBD2 for emissions compliance, you **MUST** use the USDM ECU. This means we'll be deleting that glorious quad cam AVCS and replacing the variable exhaust cam gears with a set of static units. This is where the prep work gets a little tricky and can be somewhat intimidating to those who have never had an engine cracked open. Set the engine to top dead center and remove the timing components. This includes the covers, belt, idlers, tensioner, cam gears and rear plastics. In order for this swap to perform correctly, we'll be tapping threads into the oil feed ports on the front of the exhaust camshafts and installing plugs to cap the oil flow. Rotate the engine on its stand and remove that valve cover!



Work backwards to remove the torque from the cam caps, from F to A. The cam will naturally begin to lift as the tension on the valve springs is relieved. Store the cam caps and bolts in a manner that they can all go back exactly where they came from when it comes time to reinstall them. Secure the cam LIGHTLY in a vise with a rag or similar material in order to prevent scraping or gouging. I cannot emphasize enough how important it is to only apply enough pressure to hold the cam in place while working the tap. For this modification, we'll be using a standard 10-64 tap that you can get ahold of just about anywhere, and working it slowly with tap oil into the holes on the front of the cam. The result should look something like this.



With these ports tapped you can now set the plugs to block off the oil feed! I used 10-64 set screws sealed with Permatex high temp thread sealant.



Use brake cleaner or a similar parts cleaner to spray out the ports and surfaces thoroughly to remove metal shavings and burrs, then dry and finish with compressed air. DO NOT use a rag or cloth of any kind to remove the shavings from the surfaces. Wiping metal shavings into polished surfaces leaves deep scratches and imperfections that could be detrimental! Following the diagram from above, working from bolt A to bolt F, reinstall the cam with plenty of assembly lube on the journals and lobes into the cylinder head. Torque the bolts in two steps at 10nm and 20nm. The forward cap that crosses from the intake to the exhaust cam will have RTV or a similar sealing substance that needs to be cleaned off and replaced.

Alright! We've got our oil ports deleted! Now the camshaft is static and we're all set, right? Not quite. We need to install some aftermarket cam gears to correct the exhaust timing, some different cam gear bolts, and an alternate cam seal! I used the Brian Crower adjustable cam gears, and cam gear bolts and seals from a US non-AVCS 2005 WRX. The cam gear bolts will be torqued to 72 lb-ft. Clean up your valve covers and install them with new gaskets. The EJ20X/20Y gaskets are different to account for the

exhaust AVCS, and will have to be sourced from an importer such as AVOJDM or iATuning. Use a blob of RTV wherever a corner is molded into the gasket for the best possible seal. Finally, set the adjustable cam gears to -2 teeth and tighten down the gear to the face. Retime the engine with all new components and rotate the crank twice, rechecking the timing marks before reinstalling the covers.



Last but not least, swap out the JDM coolant crossover pipe for a USDM model pipe to move the heater hose outlets to the correct side of the engine, and swap out the coolant ports in the heads for a set of plugs also found in a USDM engine. This engine is now fully prepped to be installed into a USDM Legacy GT or Outback XT! Remove the original EJ255 from your car, pop off the intake manifold and begin swapping the PCV hardlines over, replacing whatever fits the bill along the way. You don't want to pull this manifold again any time soon! Simply bolt the USDM intake manifold with the wiring harness attached to the EJ20X and proceed with the swap as if you were doing a stock engine replacement. With the engine off the stand and on the crane, now is also the time to replace your clutch and flywheel. I opted for a lightweight single mass flywheel and binned the dual mass. With the engine rotating assembly total mass decreased and the flywheel in the bin, your throttle response will blow you away! Here is a picture of the engine in the car:



And here is a picture of the finished product before installing the intercooler. I opted for a nice WRX belt cover as opposed to that monstrous engine cover.



Finally, here is a parts manifest of things I picked up along the way that were mentioned throughout this write-up.

Fujibond Silicone Sealant: 004403007
2x Subaru OEM non-AVCS cam seal: 806732160
2x Subaru OEM AVCS cam seal: 806742160
2x Subaru OEM non-AVCS cam gear bolt: 13199AA010
Right side valve cover gasket: 13270AA190
Left side valve cover gasket: 13272AA140
Brian Crower adjustable timing gears: BC8860-EX
AISIN Timing kit with Water pump: TKF-004
Subaru OEM Thermostat
Subaru OEM MLS Exhaust Gaskets
Subaru OEM Lower intake manifold gaskets

Subaru OEM Coolant Crossover pipe O-rings

SUB-003 COBB Accessport, custom tune required to run the EJ20X given the lower displacement and higher compression ratio.

Talk to your tuner about potentially raising the rev limit, as the 20X/Y naturally will LIVE in the upper RPM. With a downpipe and catback, this engine should sing a beautiful classic boxer note. My current setup and tune is set to 7500 RPM.

Best regards, and best of luck! Take your time and refer to the Subaru repair manuals that are readily available on the legacyGT forums for the engine removal and replacement procedures. Special thanks to the guys and gals over there and on the Forester forums for helping this swap happen.