

	Turbocharger oil seals leaking	REFER to Turbocharger Internal Oil Leak Test. REFER to: Turbocharger - 2.7L EcoBoost (238kW/324PS) or REFER to: Turbocharger - Turbocharger - 3.5L EcoBoost (272kW/370PS). TEST the system for normal operation after the repair.
Low or no oil pressure after an oil change 2.7L GTDI only	Oil filter housing	REMOVE the oil filter housing. INSPECT the oil filter housing for a missing or damaged center stem. INSPECT for a missing or damaged O-ring seal on the stem. REPAIR as necessary. TEST the system for normal operation after the repair.

DIAGNOSIS AND TESTING > ENGINE > SYMPTOM CHART - NVH

Symptom	Possible Sources	Action
Drone type noise	Powertrain mount(s)	CARRY OUT the Powertrain/Drivetrain Mount Neutralizing procedure. REFER to: Powertrain/Drivetrain Mount Neutralizing . TEST the system for normal operation after the repair.
Drumming noise - occurs inside the vehicle during idle or high idle, hot or cold. Very low-frequency drumming is very rpm dependent	Engine vibration excites the body resonances inducing interior noise	CARRY OUT the Powertrain/Drivetrain Mount Neutralizing procedure. REFER to: Powertrain/Drivetrain Mount Neutralizing . TEST the system for normal operation after the repair.
Engine drumming noise - accompanied by vibration	Powertrain mount(s)	CARRY OUT the Powertrain/Drivetrain Mount Neutralizing procedure. REFER to: Powertrain/Drivetrain Mount Neutralizing . TEST the system for normal operation after the repair.
Rattle - occurs at idle or at light acceleration from a stop	Powertrain mount(s)	CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, Refer to the appropriate Engine article for the procedure. For transaxle, Refer to the appropriate Automatic Transmission article or appropriate Manual Transmission, Clutch and Transfer Case article

		for the procedure. TEST the system for normal operation after the repair.
Whine/moan type noise - pitch increases or changes with vehicle speed	Powertrain mount(s)	CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, Refer to the appropriate Engine article for the procedure. For transaxle, Refer to the appropriate Automatic Transmission article or appropriate Manual Transmission, Clutch and Transfer Case article for the procedure. TEST the system for normal operation after the repair.
Clunk - occurs when shifting from PARK or between REVERSE and DRIVE	Powertrain mounts	CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, Refer to the appropriate Engine article for the procedure. For transaxle, Refer to the appropriate Automatic Transmission article or appropriate Manual Transmission, Clutch and Transfer Case article for the procedure. TEST the system for normal operation after the repair.
Idle speed is too high		CHECK for the correct idle speed. TEST the system for normal operation after the repair.
Accessory drive bearing hoot - occurs at idle or high idle in cold temperatures of approximately 4°C (40°F) or colder at the first start of the day	Accessory drive idler or tensioner pulley bearing is experiencing stick/slip between ball bearings and the bearing race	CARRY OUT the Engine Cold Soak procedure. REFER to: Noise, Vibration and Harshness (NVH) . PLACE the EngineEAR probe directly on the idler/ tensioner center post or bolt to verify which bearing is making the noise. INSTALL new parts as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Accessory drive belt noise, squeal or chirping	Defective/worn or incorrect accessory drive belt Misaligned pulley(s) Pulley runout Damaged or worn accessory	CARRY OUT the Engine Accessory Test. REFER to: Noise, Vibration and Harshness (NVH) . INSPECT components and INSTALL new parts as

	drive component or idler Fluid contamination of the accessory drive belt or pulleys Damaged or worn accessory drive belt tensioner Damaged pulley grooves	necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Pop noise - happens approximately 30 seconds after cold start up	Turbocharger bypass valve	Acceptable condition. The turbocharger bypass valve closes approximately 30 seconds after cold start up.
Clunking noise	Coolant pump has excessive end play or imbalance	CHECK the coolant pump for excessive end play. INSPECT the coolant pump for imbalance with the drive belt off. INSTALL a new coolant pump as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Whine/hum - occurs when unlocking the vehicle or opening the door with the engine off Gasoline Turbocharged Direct Injection (GTDI) only	Fuel pump module	Acceptable condition. Fuel pump module turns on before engine starts to prime the fuel system.
Whine or moaning noise	Air intake system	CHECK the air cleaner and ducts for correct fit. INSPECT the air intake system for leaks or damage. REPAIR as necessary. TEST the system for normal operation after the repair.
Whistling noise - normally accompanied with poor idle condition	Air intake system	CHECK the air intake ducts, air cleaner, throttle body and vacuum hoses for leaks and correct fit. REPAIR or ADJUST as necessary. TEST the system for normal operation after the repair.
	Turbocharger intake tube assembly leaking	REPAIR or INSTALL a new tube as necessary. TEST the system for normal operation after the repair.
	Loose connections or damage to air intake hoses and tubes	TIGHTEN hose clamps. INSPECT for damage and REPAIR as necessary. TEST the system for normal operation after the repair.
	Air leaks at turbine housing, blown joints or damaged exhaust	INSPECT for leaks. Leaks can usually be detected audibility or visually, by a discoloration caused

		by escaping hot exhaust gases. REPAIR as necessary. TEST the system for normal operation after the repair.
	Carbon build up in the turbine housing	INSPECT the turbocharger. REFER to the Check for Free Rotation - Off Vehicle. REFER to: Turbocharger - 2.7L EcoBoost (238kW/324PS) or REFER to: Turbocharger - Turbocharger - 3.5L EcoBoost (272kW/370PS). TEST the system for normal operation after the repair.
	Turbocharger imbalance due to foreign object/damage	REPAIR as necessary. TEST the system for normal operation after the repair.
	Turbine bearing failure	INSPECT the turbocharger. REFER to the Check for Free Rotation - Off Vehicle. REFER to: Turbocharger - 2.7L EcoBoost (238kW/324PS) or REFER to: Turbocharger - Turbocharger - 3.5L EcoBoost (272kW/370PS). TEST the system for normal operation after the repair.
	Inoperative turbocharger bypass valve	Refer to ENGINE CONTROLS - POWERTRAIN DTC CHARTS & DESCRIPTIONS (EXCEPT DIESEL & HYBRID) .
Whine or air rush type noise	Turbocharger	Acceptable condition. Some whine or air noise is common.
Chrip or whoosh sound	Turbocharger bypass valve	CHECK the turbocharger bypass valve. REPAIR as necessary. TEST the system for normal operation after the repair.
Hissing noise - occurs during idle or high idle that is apparent with the hood open	Vacuum leak	Use the Ultrasonic Leak Detector/EngineEAR to locate the source. Scan the air intake system from the inlet to each cylinder intake port. DISCARD the leaking parts, and INSTALL a new component. TEST the system for normal operation after the repair.
	Vehicles with a plastic intake manifold	Acceptable condition. Some plastic manifolds exhibit this noise, which is the effect of the plastic manifold.

Grinding noise - occurs during engine cranking	Incorrect starter motor mounting	INSPECT the starter motor for correct mounting. REPAIR as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Starter motor	CHECK the starter motor. INSTALL a new starter motor as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Incorrect starter motor drive engagement	INSPECT the starter motor drive for wear or damage. INSTALL a new starter motor as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair. INSPECT the flywheel/flexplate for wear or damage. INSTALL a new flywheel/flexplate as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Engine noise, front of engine - knocking noise from lower front of engine	Damaged or separated crankshaft pulley/damper	CHECK for obvious signs of damage or wobble during operation. INSTALL new as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Engine noise, front of engine - ticking, tapping or rattling noise from the front of the engine	Timing drive components	REMOVE the accessory drive belt. Refer to the appropriate Engine article for the procedure. USE the EngineEAR to isolate the noise to the engine front cover. REMOVE the engine front cover and INSPECT the timing drive components. INSTALL new parts as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Engine noise, upper end - ticking noise near the fuel rail and intake manifold	Fuel rail clip Fuel injector	CHECK for loose or damaged fuel rail clip(s). REPAIR as necessary. USE the EngineEAR to isolate the noisy injector(s). INSTALL a new

		injector(s) as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Fuel injection pump (GTDI only)	This is a normal engine noise that can be verified by listening to another vehicle. If noise is excessive, REPAIR as necessary. TEST the system for normal operation after the repair.
Engine noise, upper end - ticking, knocking or rattle noise that occurs during idle or high idle during the first cold start of the day and may disappear as the engine warms	Valve train noise (bled down lifter/lash adjuster)	CARRY OUT the VALVE TRAIN ANALYSIS 3.5L DURATEC & 3.5L Ecoboost or VALVE TRAIN ANALYSIS 2.7L ECOBOOST & 5.0L Ti-VCT . INSTALL new parts as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Engine noise, upper end - occurs mostly with a warm engine at light/medium acceleration	Worn or damaged spark plugs	REMOVE the spark plugs. INSPECT and INSTALL new as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Engine noise, upper end - rattling noise from the valve train. Worse when the engine is cold	Low oil level	CHECK the oil level. FILL as necessary.
	Thin or diluted oil	INSPECT the oil for contamination. If the oil is contaminated, CHECK for the source. REPAIR as necessary. CHANGE the oil and filter. TEST the system for normal operation after the repair.
	Low oil pressure	CARRY OUT the Oil Pressure Test . If not within specifications, REMOVE the engine oil pan. Refer to the appropriate Engine article for the procedure. INSPECT for a blocked oil pick up tube. TEST the system for normal operation after the repair.
	Worn valve train components	CARRY OUT the VALVE TRAIN ANALYSIS 3.5L DURATEC & 3.5L Ecoboost or VALVE TRAIN ANALYSIS 2.7L ECOBOOST & 5.0L Ti-VCT . INSTALL new parts

		as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Worn valve guides	CARRY OUT the Valve Guide Inner Diameter procedure. REFER to: Valve Guide Inner Diameter .
	Excessive runout of the valve seats on the valve face	INSPECT for abnormalities on the valve face and valve seat. INSTALL a new cylinder head assembly if abnormalities are found.
Engine noise, upper end - pinging noise	Gasoline octane too low	VERIFY with customer the type of gasoline used. CORRECT as necessary. TEST the system for normal operation after the repair.
	KS operation	CHECK the KS operation. INSTALL a new KS. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Incorrect spark timing	CHECK the spark timing. REPAIR as necessary. TEST the system for normal operation after the repair.
	High operating temperature	INSPECT the cooling system for leaks. CHECK the coolant level. REFILL as necessary. CHECK the coolant for the correct mix ratio. DRAIN and REFILL as needed. VERIFY the engine operating temperature is within specifications. REPAIR as necessary. TEST the system for normal operation after the repair.
	Spark plug	CHECK the spark plugs. REPAIR or INSTALL new spark plugs as necessary. TEST the system for normal operation after the repair.
	Catalytic converter	Compare with a similar vehicle for what is acceptable noise.
Engine noise, lower end - ticking or knocking noise near the oil filter adapter	Oil pump	USE the EngineEAR to verify the oil pump as the source of the noise at low rpm. REPAIR as necessary. Refer to the appropriate Engine article for the

		procedure. TEST the system for normal operation after the repair.
Engine noise, lower end - light knocking noise, also described as piston slap. Noise is most noticeable when the engine is cold with light to medium acceleration. The noise disappears as the engine warms	Excessive clearance between the piston and the cylinder wall	CARRY OUT the Piston Diameter procedure. REFER to: Piston Diameter . Measure the cylinder bore diameter. Subtract the piston diameter from the cylinder bore diameter to find the piston-to-cylinder bore clearance. REFER to the appropriate Engine article for specifications.
Engine noise, lower end - light double knock or sharp rap sound. Occurs mostly with a warm engine at idle or low speeds in drive. Increases in relation to engine load. Associated with a poor lubrication history	Excessive clearance between the piston and the piston pin	MEASURE the piston pin bore and the piston pin in 2 directions on each side. REFER to the appropriate Engine article for specifications.
Engine noise, lower end - light knocking noise. The noise is most noticeable when the engine is warm. The noise tends to decrease when the vehicle is coasting or in neutral	Excessive clearance between the connecting rod bearings and the crankshaft	CARRY OUT the Connecting Rod Bearing Journal Clearance procedure. REFER to: Connecting Rod Bearing Journal Clearance .
Engine noise, lower end - deep knocking noise. The noise is most noticeable when the engine is warm, at lower rpm and under a light load and then at float	Worn or damaged crankshaft main bearings	CARRY OUT the Crankshaft Main Bearing Journal Clearance procedure. REFER to: Crankshaft Main Bearing Journal Clearance .
Engine noise, rear of engine - knocking noise at rear of engine	Damaged flywheel/flexplate	INSPECT the flywheel/flexplate for wear or damage. INSTALL a new flywheel/flexplate as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
Engine vibration - vibration felt at all times	Excessive engine pulley runout	CARRY OUT the Engine Accessory Test. REFER to: Noise, Vibration and Harshness (NVH) . INSTALL a new engine pulley as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Damaged or worn accessory component	CARRY OUT the Engine Accessory Test. REFER to: Noise, Vibration and Harshness (NVH) . REPAIR or INSTALL a

		new component as necessary. TEST the system for normal operation after the repair.
Engine vibration - at idle, a low-frequency vibration (5-20 Hz) or mild shake that is felt through the seat/ floorpan	Cylinder misfire	Using the scan tool, CARRY OUT the cylinder power balance and the relative compression test. REPAIR as necessary. Refer to the appropriate Engine article for the procedure. TEST the system for normal operation after the repair.
	Engine or torque converter out of balance	VERIFY the torque converter to crankshaft pilot clearance is correct. REPAIR as necessary. RE-INDEX the torque converter on the flex plate by 120 degrees for a 3- bolt converter or 180 degrees for a 4-bolt converter. Refer to the appropriate Automatic Transmission article for the procedure. TEST the system for normal operation after the repair.
Engine vibration - is felt with increases and decreases in engine rpm	Powertrain mount(s)	CHECK the powertrain mounts for damage. INSTALL new mounts as necessary. For engine, Refer to the appropriate Engine article for the procedure. For transaxle, Refer to the appropriate Automatic Transmission article or appropriate Manual Transmission, Clutch and Transfer Case article for the procedure. TEST the system for normal operation after the repair.
	Engine or transmission grounded to chassis	INSPECT the powertrain/ drivetrain for correct clearances. REPAIR as necessary. TEST the system for normal operation after the repair.
Engine vibration - increases intensity as the engine rpm is increased	Engine out-of-balance	CARRY OUT the NERU Test. REFER to: Noise, Vibration and Harshness (NVH) . ROTATE the torque converter, 120 degrees for 3- bolt or 180 degrees for 4- bolt. INSPECT the torque converter pilot outer diameter-to-crankshaft pilot inner diameter. REPAIR as necessary. Refer to the