

Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C		
• Compressor Bolt - Rear	50 N·m	37 lb ft
• Compressor Bolt - Front	23 N·m	17 lb ft
• Compressor Bracket Bolt - Front	50 N·m	37 lb ft
• Compressor Hose Assembly Bolt	9 N·m	80 lb in
Camshaft Cap Bolt	10 N·m	89 lb in
Camshaft Cover Bolt	10 N·m	89 lb in
Camshaft Intermediate Drive Sprocket Bolt - Idler Sprocket	58 N·m	43 lb ft
Camshaft Position Actuator		
• Camshaft Bolt	58 N·m	43 lb ft
• Oil Control Valve Bolt	10 N·m	89 lb in
Camshaft Position Sensor Bolt	10 N·m	89 lb in
Catalytic Converter		
• Exhaust Manifold Nut	50 N·m	37 lb ft
Close Out Cover Bolt	10 N·m	89 lb in
Clutch Pressure Plate Bolts	23 N·m	17 lb ft
Connecting Rod Bolt		
• First Pass	30 N·m	22 lb ft
• Second Pass - Counterclockwise	Back Off to Zero	
• Third Pass	25 N·m	18 lb ft
• Final Pass	110 Degrees	
Coolant Outlet Bolt	10 N·m	89 lb in
Crankshaft Balancer Bolt		
• First Pass	100 N·m	74 lb ft
• Final Pass	150 Degrees	
Crankshaft Main Bearing Bolt - Inner		
• First Pass	20 N·m	15 lb ft
• Final Pass	80 degrees	
Crankshaft Main Bearing Bolt - Outer		
• First Pass	15 N·m	10 lb ft
• Final Pass	110 Degrees	
Crankshaft Main Bearing Bolt - Side		
• First Pass	30 N·m	22 lb ft
• Final Pass	60 Degrees	
Crankshaft Position Sensor Bolt	10 N·m	89 lb in

Crankshaft Rear Oil Seal Housing Bolt	10 N·m	89 lb in
Cylinder Head Bolt - M8		
• First Pass	15 N·m	11 lb ft
• Final Pass	75 Degrees	
Cylinder Head Bolt - M11		
• First Pass	30 N·m	22 lb ft
• Final Pass	150 degrees	
Cylinder Head Core Hole Plug	31 N·m	23 lb ft
Drive Belt		
• Idler Pulley Bolt	50 N·m	37 lb ft
• Tensioner Bolt	50 N·m	37 lb ft
ECM		
• Bolt	10 N·m	89 lb in
• Bracket Bolt - Front	23 N·m	17 lb ft
• Bracket Bolt - Side	10 N·m	89 lb in
• Grounding Bolt	4.5 N·m	40 lb in
ECT Sensor	30 N·m	22 lb ft
Engine Flywheel Bolt		
• First Pass	30 N·m	22 lb ft
• Final Pass	45 Degrees	
Engine Front Cover Bolt	23 N·m	17 lb ft
Engine Mount		
• Bracket Bolt to Engine Block - M8 (AWD)	38 N·m	28 lb ft
• Bracket Bolt to Engine Block - M8 (RWD)	22 N·m	16 lb ft
• Bracket Bolt to Engine Block - M10	60 N·m	45 lb ft
• Nut to Engine Mount Bracket	80 N·m	59 lb ft
• Nut to Frame	80 N·m	59 lb ft
Engine Wiring Harness Bracket		
• Bolt - Cylinder Head Rear	40 N·m	30 lb ft
• Bolt - ECM Bracket Side	23 N·m	17 lb ft
• Bolt - ECM Bracket Top	10 N·m	89 lb in
• Bolt - Left Side Oil Filter Adapter	10 N·m	89 lb in
• Bolt - Left Side Oil Pan	10 N·m	89 lb in
• Bolt - Near Crankshaft Position Sensor	50 N·m	37 lb ft
• Bolt - Right Side Block Front	23 N·m	17 lb ft
• Bolt - Right Side Head Front	10 N·m	89 lb in
Engine Wiring Harness Ground		
• Bolt - ECM Bracket Top	10 N·m	89 lb in
• Bolt - Left Cylinder Head Side	10 N·m	89 lb in
• Bolt - Right Cylinder Head Rear	10 N·m	89 lb in

EVAP Purge Valve Bolt	10 N·m	89 lb in
Exhaust Manifold		
• Bolt	20 N·m	15 lb ft
• Heat Shield Bolt	10 N·m	89 lb in
• Lower Heat Shield Bolt	58 N·m	43 lb ft
Fuel Rail Bolt	10 N·m	89 lb in
Generator		
• Bolt	50 N·m	37 lb ft
• Bracket Bolt - Front	50 N·m	37 lb ft
• Bracket Bolt - Side	22 N·m	16 lb ft
• Cable Nut	13 N·m	115 lb in
Ground Cable Bolt	50 N·m	37 lb ft
Heater Inlet/Outlet Pipe Assembly Bolt	10 N·m	89 lb in
Ignition Coil Bolt	10 N·m	89 lb in
Intake Manifold		
• Brace Bolt - Engine Front Cover M12	65 N·m	48 lb ft
• Brace Bolt/Ball Stud - Intake Manifold M6	10 N·m	89 lb in
• Sight Shield Ball Stud	9 N·m	80 lb in
• Tuning Valve Bolt	10 N·m	89 lb in
• Upper-to-Cylinder Head Bolt - Long	23 N·m	17 lb ft
• Upper-to-Cylinder Head Bolt - Short	23 N·m	17 lb ft
• Upper-to-Lower Intake Manifold Bolt	23 N·m	17 lb ft
Knock Sensor Bolt	23 N·m	17 lb ft
MAP Sensor Bolt	10 N·m	89 lb in
Oil Drain Plug	25 N·m	18 lb ft
Oil Filter Cap	25 N·m	18 lb ft
Oil Filter Housing Adapter		
• Bolt - Cylinder Head M10	65 N·m	48 lb ft
• Bolt - Engine Block M8	23 N·m	17 lb ft
Oil Gallery Plug	31 N·m	23 lb ft
Oil Level Indicator Tube Bolt	10 N·m	89 lb in
Oil Pan		
• Bolt - Block M8	23 N·m	17 lb ft
• Bolt - Crankshaft Rear Oil Seal Housing M6	10 N·m	89 lb in
• Windage Tray Bolt	10 N·m	89 lb in
Oil Pressure Sender	20 N·m	15 lb ft
Oil Pump		
• Bolt	23 N·m	17 lb ft
• Cover Bolt	13 N·m	115 lb in
Oxygen Sensor		

• Pump Converter Pipe	40 N·m	30 lb ft
PCV Tube Bracket Bolt	10 N·m	89 lb in
Piston Oil Cooling Nozzle Bolt	10 N·m	89 lb in
Power Steering Pump		
• Bracket to Engine Bolt	50 N·m	37 lb ft
• Pump to Bracket Bolt	22 N·m	16 lb ft
• Reservoir Bolt - Lower	25 N·m	18 lb ft
• Reservoir Bolt - Upper	9 N·m	80 lb in
Primary Camshaft Drive Chain		
• Left Lower Guide Bolt - Oil Pump - Second Design	23 N·m	17 lb ft
• Tensioner Bolt	23 N·m	17 lb ft
• Upper Guide Bolt	23 N·m	17 lb ft
Radiator Outlet Pipe		
• Bolt - Generator Bracket	23 N·m	17 lb ft
• Bolt - Right Cylinder Head Rear	50 N·m	37 lb ft
• Bolt - Thermostat Housing	23 N·m	17 lb ft
Secondary Camshaft Drive Chain		
• Guide Bolt	23 N·m	17 lb ft
• Shoe Bolt	23 N·m	17 lb ft
• Tensioner Bolt	23 N·m	17 lb ft
Spark Plug	18 N·m	13 lb ft
Starter Motor		
• Bolt	50 N·m	37 lb ft
• Cable Nut	13 N·m	115 lb in
Suction Tube Bolt	10 N·m	89 lb in
Suction Screen Bolt	10 N·m	89 lb in
Thermostat Housing Bolt	10 N·m	89 lb in
Throttle Body Bolt	10 N·m	89 lb in
Torque Converter Bolt	60 N·m	44 lb ft
Transmission		
• Mount Bolt to Transmission - RPO M82	60 N·m	45 lb ft
• Range Selector Lever Nut	9.5 N·m	84 lb in
• To Engine Bolt	50 N·m	37 lb ft
Water Pump		
• Bolt	10 N·m	89 lb in
• Pulley Bolt	10 N·m	89 lb in

Engine Mechanical Specifications (LP1)

Application	Specification	
	Metric	English
General		
• Engine Type	V-6	
• Displacement	2.8 Liter	171 cu in
• RPO	LP1	
• VIN	T	
• Bore	89 mm	3.5039 in
• Stroke	74.8 mm	2.9449 in
• Compression Ratio	10.0:1	
• Cranking RPM - at 40°C (104°F)	80 RPM	
• Idle Speed	600 A/C Off - 700 A/C On	
• Firing Order	1-2-3-4-5-6	
• Spark Plug Gap	1.1 mm	0.0433 in
Block		
• Crankshaft Main Bearing Bore Diameter	72.867-72.881 mm	2.8688-2.8693 in
• Cylinder Bore Diameter	88.992-89.008 mm	3.5036-3.5042 in
• Cylinder Bore Out-of-Round - Production Max.	0.013 mm	0.0005 in
Camshaft		
• Camshaft Bearing Inside Diameter - Front Number 1	35.000-35.020 mm	1.3779-1.3787 in
• Camshaft Bearing Inside Diameter - Middle and Rear Number 2-4	27.000-27.020 mm	1.0630-1.0638 in
• Camshaft End Play	0.045-0.215 mm	0.0018-0.0085 in
• Camshaft Journal Diameter - Front Number 1	34.936-34.960 mm	1.3754-1.3764 in
• Camshaft Journal Diameter - Middle and Rear Number 2-4	26.936-26.960 mm	1.0605-1.0614 in
• Camshaft Journal Out-of-Round	0.006 mm	0.0002 in
• Camshaft Journal to Bore Clearance	0.040-0.084 mm	0.0016-0.0033 in
• Camshaft Lobe Duration - Exhaust @ 0.150 mm (0.0059 in) Lift	252 degrees	
• Camshaft Lobe Duration - Intake @ 0.150 mm (0.0059 in) Lift	237 degrees	
• Camshaft Lobe Lift - Exhaust	42.456- m	1.6715- 1.6833 in

• Camshaft Lobe Lift - Intake	42.385- 42.685 mm	1.6687- 1.6805 in
• Camshaft Lobe Overlap @ 0.150 mm (0.0059 in) Lift	0 degrees	
• Camshaft Runout - Front and Rear Number 1 and 4	0.025 mm	0.0010 in
• Camshaft Runout - Middle 2 and 3	0.050 mm	0.0020 in
• Camshaft Timing @ 0.15 mm (0.0059 in) Lift		
• Valve Opens - Exhaust	-283 degrees BTDC	
• Valve Opens - Intake	14 degrees ATDC	
• Centerline - Exhaust	118 degrees ATDC	
• Centerline - Intake	132 degrees ATDC	
• Valve Closes - Exhaust	9 degrees ATDC	
• Valve Closes - Intake	251 degrees ATDC	
• Valve Lift - Exhaust	10.8 mm	0.4252 in
• Valve Lift - Intake	10.8 mm	0.4252 in
Cooling System		
• Thermostat Full Open Temperature	95°C	203°F
Connecting Rod		
• Connecting Rod Bearing Clearance	0.010-0.070 mm	0.0004- 0.0028 in
• Connecting Rod Bore Diameter - Bearing End	59.620- 59.636 mm	2.3472- 2.3479 in
• Connecting Rod Bore Diameter - Pin End	24.007- 24.021 mm	0.9452- 0.9457 in
• Connecting Rod Length - Center to Center	155.8 mm	6.1338 in
• Connecting Rod Side Clearance	0.095-0.355 mm	0.0037- 0.0140 in
• Connecting Rod Width - Bearing End		
• Production	21.775 mm	0.8573 in
• Service	21.770- 21.780 mm	0.8571- 0.8575 in
• Connecting Rod Width - Pin End		
• Production	26.000 mm	1.0236 in
• Service	25.950- 26.050 mm	1.0217- 1.0256 in
Crankshaft		
• Connecting Rod Journal Diameter	55.992- 56.008 mm	2.2044- 2.2050 in
• Connecting Rod Journal Out-of-Round	0.005 mm	0.0002 in
• Connecting Rod Journal Taper	0.005 mm	0.0002 in
• Connecting Rod Journal Width		
• Production	22.000 mm	0.8661 in

• Service	21.920- 22.080 mm	0.8630- 0.8693 in
• Crankshaft End Play	0.100-0.330 mm	0.0039- 0.0130 in
• Crankshaft Main Bearing Clearance	0.010-0.060 mm	0.0004- 0.0024 in
• Crankshaft Main Journal Diameter	68.000 mm	2.6772 in
• Crankshaft Main Journal Out-of-Round	0.005 mm	0.0002 in
• Crankshaft Main Journal Taper	0.005 mm	0.0002 in
• Crankshaft Main Journal Thrust Wall		
• Runout	0.000-0.040 mm	0.0000- 0.0016 in
• Square	0.000-0.010 mm	0.0000- 0.0004 in
• Crankshaft Main Journal Width, #2, 4		
• Production	24.000 mm	0.9449 in
• Service	23.900- 24.100 mm	0.9409- 0.9488 in
• Crankshaft Main Journal Width, #3		
• Production	24.400 mm	0.9606 in
• Service	24.360- 24.440 mm	0.9591- 0.9622 in
• Crankshaft Pilot Bearing Bore Diameter	20.965- 20.995 mm	0.8254- 0.8266 in
• Crankshaft Rear Flange Runout	0.025 mm	0.0010 in
• Crankshaft Reluctor Ring Runout - Maximum	2.000 mm	0.0787 in
• Crankshaft Runout	0.030 mm	0.0012 in
• Crankshaft Thrust Bearing Clearance	0.076-0.305 mm	0.0030- 0.0120 in
• Crankshaft Thrust Surface - Height Diameter	95.000 mm	3.7401 in
• Crankshaft Thrust Surface Runout	0.040 mm	0.0016 in
Cylinder Head		
• Combustion Chamber Volume	49.4 cc	3.015 cu in
• Valve Guide Bore - Exhaust	6.000-6.020 mm	0.2362- 0.2370 in
• Valve Guide Bore - Intake	6.000-6.020 mm	0.2362- 0.2370 in
• Valve Guide Installed Height	14.050- 14.550 mm	0.5531- 0.5728 in
• Valve Lifter Bore Diameter	12.008- 12.030 mm	0.4728- 0.4736 in
Lubrication System		
• Oil Capacity - With or Without Oil Filter Change	5.7 Liters	6 Quarts
• Oil Pressure - Minimum @ Idle	69 kPa	10 psi

• Oil Pressure - Minimum @ 2,000 RPM	138 kPa	20 psi
• Piston Cooling Jet Valve Opening Pressure	1.7-2.3 bar	25-33 psi
Oil Pump		
• Gear Diameter - Outer	87.095-87.175 mm	3.4289-3.4321 in
• Gear Pocket - Depth	15.565-15.600 mm	0.6128-0.6142 in
• Gear Pocket - Diameter	87.275-87.325 mm	3.4360-3.4380 in
• Gear Thickness - Drive/Driven	15.511-15.536 mm	0.6107-0.6117 in
• Gear-to-Cover Clearance - Drive/Driven	0.030-0.085 mm	0.0012-0.0033 in
• Gear-to-Housing Clearance - Drive/Driven	0.100-0.230 mm	0.0039-0.0091 in
• Inner Gear Tip Clearance	0.075-0.180 mm	0.0030-0.0071 in
• Crankshaft Clearance to Housing	0.040-0.130 mm	0.0016-0.0051 in
• Inner Gerotor Hub Diameter	53.310-53.335 mm	2.0988-2.0998 in
• Housing Hub Diameter	53.380-53.420 mm	2.1016-2.1031 in
• Inner Gerotor Hub Clearance to Housing	0.045-0.110 mm	0.0018-0.0043 in
Piston Rings		
• Piston Ring End Gap		
• First Compression Ring	0.150-0.300 mm	0.0059-0.0118 in
• Second Compression Ring	0.280-0.480 mm	0.0110-0.0189 in
• Oil Control Ring	0.150-0.600 mm	0.0059-0.0236 in
• Piston Ring to Groove Clearance		
• First Compression Ring	0.030-0.065 mm	0.0012-0.0026 in
• Second Compression Ring	0.015-0.060 mm	0.0006-0.0024 in
• Oil Control Ring	0.030-0.170 mm	0.0012-0.0669 in
• Piston Ring Thickness		
• First Compression Ring	1.175-1.190 mm	0.0463-0.0469 in
• Second Compression Ring	1.470-1.495 mm	0.0579-0.0589 in
		0.0929-

• Oil Control Ring	2.360-2.480 mm	0.0976 in
Pistons and Pins		
• Piston		
• Piston Diameter	88.956-88.974 mm	3.5022-3.5029 in
• Piston Pin Bore Diameter	24.007-24.012 mm	0.9452-0.9454 in
• Piston Ring Groove Width - First Compression Ring	1.220-1.240 mm	0.0480-0.0488 in
• Piston Ring Groove Width - Second Compression Ring	1.510-1.530 mm	0.0595-0.0602 in
• Piston Ring Groove Width - Oil Control Ring	2.510-2.530 mm	0.0988-0.0996 in
• Piston to Bore Clearance	0.022-0.032 mm	0.0008-0.0013 in
• Pin		
• Piston Pin Clearance to Connecting Rod Bore	0.007-0.024 mm	0.0003-0.0010 in
• Piston Pin Clearance to Piston Pin Bore	0.007-0.015 mm	0.0003-0.0006 in
• Piston Pin Diameter	23.997-24.000 mm	0.9448-0.9449 in
• Piston Pin Length	65.24-65.74 mm	2.5685-2.5882 in
Valve System		
• Valves		
• Valve Face Angle	44.25 degrees	
• Valve Face Runout	0.038 mm	0.0015 in
• Valve Face Width - Exhaust	2.750 mm	0.1083 in
• Valve Face Width - Intake	2.180 mm	0.0858 in
• Valve Head Diameter - Exhaust	30.470-30.730 mm	1.1996-1.2098 in
• Valve Head Diameter - Intake	35.03-35.29 mm	1.3791-1.3894 in
• Valve Installed Height	35.23-36.69 mm	1.3870-1.4445 in
• Valve Length - Exhaust	97.11 mm	3.8232 in
• Valve Length - Intake	101.23 mm	3.9854 in
• Valve Seat Angle - Seating Surface	45 degrees	
• Valve Seat Angle - Relief Surface	30 degrees	
• Valve Seat Angle - Undercut Surface	60 degrees	
• Valve Seat Roundness- Maximum	0.025 mm	0.0010 in
• Valve Seat Runout - Maximum	0.080 mm	0.0032 in
• Valve Seat Width - Exhaust Seating Surface	1.400-1.800 mm	0.0551-

		0.0709 in
• Valve Seat Width - Exhaust Relief Surface	0.700-0.900 mm	0.0276-0.0354 in
• Valve Seat Width - Intake Seating Surface	1.000-1.400 mm	0.0394-0.0551 in
• Valve Seat Width - Intake Relief Surface	0.500-0.700 mm	0.0197-0.0276 in
• Valve Stem Diameter - Exhaust	5.945-5.965 mm	0.2341-0.2348 in
• Valve Stem Diameter - Intake	5.955-5.975 mm	0.2344-0.2352 in
• Valve Stem-to-Guide Clearance - Exhaust	0.035-0.075 mm	0.0014-0.0030 in
• Valve Stem-to-Guide Clearance - Intake	0.025-0.065 mm	0.0010-0.0026 in
• Valve Lifters - Stationary Hydraulic Lifter Assembly (SHLA)		
• Valve Lifter (SHLA) Diameter	11.989-12.000 mm	0.4720-0.4724 in
• Valve Lifter (SHLA)-to-Bore Clearance	0.037-0.041 mm	0.0015-0.0016 in
• Rocker Arms		
• Valve Rocker Arm Ratio	1.68 to 1	
• Valve Rocker Arm Roller Diameter	17.740-17.800 mm	0.6987-0.7008 in
• Valve Springs		
• Valve Spring Coil Thickness	3.250 x 3.900 mm	0.1280 x 0.1535 in
• Valve Spring Diameter - Inside Top	12.090-12.590 mm	0.4760-0.4957 in
• Valve Spring Diameter - Outside Top	20.140 mm	0.7929 in
• Valve Spring Diameter - Inside Bottom	17.950-18.450 mm	0.7067-0.7264 in
• Valve Spring Diameter - Outside Bottom	26.000 mm	1.0236 in
• Valve Spring Free Length	42.050-44.850 mm	1.6555-1.7657 in
• Valve Spring Installed Height - Closed	35.000 mm	1.3779 in
• Valve Spring Installed Height - Open	24.000 mm	0.9449 in
• Valve Spring Load - Closed	247-273 N	56-61 lb
• Valve Spring Load - Open	598-662 N	134-149 lb
• Valve Spring Total Number of Coils	7.1	

Engine Mechanical Specifications (LY7)

Application	Specification	
	Metric	English
General		
• Engine Type	V-6	
• Displacement	3.6 Liter	217 cu in
• RPO	LY7	
• VIN	7	
• Bore	94 mm	3.7008 in
• Stroke	85.6 mm	3.37 in
• Compression Ratio	10.2:1	
• Cranking RPM - at 40° C (104°F)	80 RPM	
• Idle Speed	600 A/C Off - 700 A/C On	
• Firing Order	1-2-3-4-5-6	
• Spark Plug Gap	1.1 mm	0.0433 in
Block		
• Crankshaft Main Bearing Bore Diameter	72.867-72.881 mm	2.8688-2.8693 in
• Cylinder Bore Diameter	93.992-94.008 mm	3.7005-3.7011 in
• Cylinder Bore Out-of-Round - Production Max.	0.013 mm	0.0005 in
Camshaft		
• Camshaft Bearing Inside Diameter - Front Number 1	35.000-35.020 mm	1.3779-1.3787 in
• Camshaft Bearing Inside Diameter - Middle and Rear Number 2-4	27.000-27.020 mm	1.0630-1.0638 in
• Camshaft End Play	0.045-0.215 mm	0.0018-0.0085 in
• Camshaft Journal Diameter - Front Number 1	34.936-34.960 mm	1.3754-1.3764 in
• Camshaft Journal Diameter - Middle and Rear Number 2-4	26.936-26.960 mm	1.0605-1.0614 in
• Camshaft Journal Out-of-Round	0.006 mm	0.0002 in
• Camshaft Journal to Bore Clearance	0.040-0.084 mm	0.0016-0.0033 in
• Camshaft Lobe Duration - Exhaust @ 0.150 mm (0.0059 in) Lift	238 degrees	
• Camshaft Lobe Duration - Intake @ 0.150 mm (0.0059 in) Lift	237 degrees	
• Camshaft Lobe Lift - Exhaust	42.425-mm	1.6703-1.6821 in

• Camshaft Lobe Lift - Intake	42.385- 42.685 mm	1.6687- 1.6805 in
• Camshaft Lobe Overlap @ 0.150 mm (0.0059 in) Lift	0 degrees	
• Camshaft Runout - Front and Rear Number 1 and 4	0.025 mm	0.0010 in
• Camshaft Runout - Middle 2 and 3	0.050 mm	0.0020 in
• Camshaft Timing @ 0.15 mm (0.0059 in) Lift		
• Valve Opens - Exhaust	-229 degrees BTDC	
• Valve Opens - Intake	14 degrees ATDC	
• Centerline - Exhaust	111 degrees ATDC	
• Centerline - Intake	132 degrees ATDC	
• Valve Closes - Exhaust	9 degrees ATDC	
• Valve Closes - Intake	251 degrees ATDC	
• Valve Lift - Exhaust	10.8 mm	0.4252 in
• Valve Lift - Intake	10.8 mm	0.4252 in
Cooling System		
• Thermostat Full Open Temperature	95°C	203°F
Connecting Rod		
• Connecting Rod Bearing Clearance	0.010-0.070 mm	0.0004- 0.0028 in
• Connecting Rod Bore Diameter - Bearing End	59.620- 59.636 mm	2.3472- 2.3479 in
• Connecting Rod Bore Diameter - Pin End	24.007- 24.021 mm	0.9452- 0.9457 in
• Connecting Rod Length - Center to Center	150.400 mm	5.9212 in
• Connecting Rod Side Clearance	0.095-0.355 mm	0.0037- 0.0140 in
• Connecting Rod Width - Bearing End		
• Production	21.775 mm	0.8573 in
• Service	21.725- 21.825 mm	0.8553- 0.8593 in
• Connecting Rod Width - Pin End		
• Production	21.775 mm	0.8573 in
• Service	21.725- 21.825 mm	0.8553- 0.8593 in
Crankshaft		
• Connecting Rod Journal Diameter	55.992- 56.008 mm	2.2044- 2.2050 in
• Connecting Rod Journal Out-of-Round	0.005 mm	0.0002 in
• Connecting Rod Journal Taper	0.005 mm	0.0002 in
• Connecting Rod Journal Width		
• Production	22.000 mm	0.8661 in

• Service	21.920- 22.080 mm	0.8630- 0.8693 in
• Crankshaft End Play	0.100-0.330 mm	0.0039- 0.0130 in
• Crankshaft Main Bearing Clearance	0.010-0.060 mm	0.0004- 0.0024 in
• Crankshaft Main Journal Diameter	67.992- 68.008 mm	2.6768- 2.6775 in
• Crankshaft Main Journal Out-of-Round	0.005 mm	0.0002 in
• Crankshaft Main Journal Taper	0.005 mm	0.0002 in
• Crankshaft Main Journal Thrust Wall		
• Runout	0.000-0.040 mm	0.0000- 0.0016 in
• Square	0.000-0.010 mm	0.0000- 0.0004 in
• Crankshaft Main Journal Width, #2, 4		
• Production	24.000 mm	0.9449 in
• Service	23.900- 24.100 mm	0.9409- 0.9488 in
• Crankshaft Main Journal Width, #3		
• Production	24.400 mm	0.9606 in
• Service	24.360- 24.440 mm	0.9591- 0.9622 in
• Crankshaft Pilot Bearing Bore Diameter	20.965- 20.995 mm	0.8254- 0.8266 in
• Crankshaft Rear Flange Runout	0.025 mm	0.0010 in
• Crankshaft Reluctor Ring Runout - Maximum	1.500 mm	0.0591 in
• Crankshaft Runout	0.030 mm	0.0012 in
• Crankshaft Thrust Bearing Clearance	0.076-0.305 mm	0.0030- 0.0120 in
• Crankshaft Thrust Surface - Height Diameter	95.000 mm	3.7401 in
• Crankshaft Thrust Surface Runout	0.040 mm	0.0016 in
Cylinder Head		
• Combustion Chamber Volume	53.6 cc	3.271 cu in
• Valve Guide Bore - Exhaust	6.000-6.020 mm	0.2362- 0.2370 in
• Valve Guide Bore - Intake	6.000-6.020 mm	0.2362- 0.2370 in
• Valve Guide Installed Height	14.050- 14.550 mm	0.5531- 0.5728 in
• Valve Lifter Bore Diameter	12.008- 12.030 mm	0.4728- 0.4736 in
Lubrication System		
• Oil Capacity - with Filter	5.68 Liters	6 Quarts

• Oil Capacity - without Filter	5.20 Liters	5.5 Quarts
• Oil Pressure - Minimum @ Idle	69 kPa	10 psi
• Oil Pressure - Minimum @ 2,000 RPM	138 kPa	20 psi
• Piston Cooling Jet Valve Opening Pressure	1.7-2.3 bar	25-33 psi
Oil Pump		
• Gear Diameter - Outer	87.095-87.175 mm	3.4289-3.4321 in
• Gear Pocket - Depth	15.565-15.600 mm	0.6128-0.6142 in
• Gear Pocket - Diameter	87.275-87.325 mm	3.4360-3.4380 in
• Gear Thickness - Drive/Driven	15.511-15.536 mm	0.6107-0.6117 in
• Gear-to-Cover Clearance - Drive/Driven	0.030-0.085 mm	0.0012-0.0033 in
• Gear-to-Housing Clearance - Drive/Driven	0.100-0.230 mm	0.0039-0.0091 in
• Inner Gear Tip Clearance	0.075-0.180 mm	0.0030-0.0071 in
• Crankshaft Clearance to Housing	0.040-0.130 mm	0.0016-0.0051 in
• Inner Gerotor Hub Diameter	53.310-53.335 mm	2.0988-2.0998 in
• Housing Hub Diameter	53.380-53.420 mm	2.1016-2.1031 in
• Inner Gerotor Hub Clearance to Housing	0.045-0.110 mm	0.0018-0.0043 in
Piston Rings		
• Piston Ring End Gap		
• First Compression Ring	0.150-0.300 mm	0.0059-0.0118 in
• Second Compression Ring	0.280-0.480 mm	0.0110-0.0189 in
• Oil Control Ring	0.150-0.600 mm	0.0059-0.0236 in
• Piston Ring to Groove Clearance		
• First Compression Ring	0.030-0.065 mm	0.0012-0.0026 in
• Second Compression Ring	0.015-0.060 mm	0.0006-0.0024 in
• Oil Control Ring	0.030-0.170 mm	0.0012-0.0067 in
• Piston Ring Thickness		
• First Compression Ring	1.175-1.190 mm	0.0463-0.0469 in

• Second Compression Ring	1.470-1.495 mm	0.0579-0.0589 in
• Oil Control Ring	2.360-2.480 mm	0.0929-0.0976 in
Pistons and Pins		
• Piston		
• Piston Diameter	93.956-93.974 mm	3.6990-3.6998 in
• Piston Pin Bore Diameter	24.004-24.009 mm	0.9450-0.9452 in
• Piston Ring Groove Width - First Compression Ring	1.220-1.240 mm	0.0480-0.0488 in
• Piston Ring Groove Width - Second Compression Ring	1.510-1.530 mm	0.0595-0.0602 in
• Piston Ring Groove Width - Oil Control Ring	2.510-2.530 mm	0.0988-0.0996 in
• Piston to Bore Clearance	0.026-0.052 mm	0.0010-0.0021 in
• Pin		
• Piston Pin Clearance to Connecting Rod Bore	0.007-0.024 mm	0.0003-0.0010 in
• Piston Pin Clearance to Piston Pin Bore	0.004-0.012 mm	0.0002-0.0005 in
• Piston Pin Diameter	23.997-24.000 mm	0.9448-0.9449 in
• Piston Pin Length	60.600-61.100 mm	2.3858-2.4055 in
Valve System		
• Valves		
• Valve Face Angle	44.25 degrees	
• Valve Face Runout	0.038 mm	0.0015 in
• Valve Face Width - Exhaust	2.750 mm	0.1083 in
• Valve Face Width - Intake	2.180 mm	0.0858 in
• Valve Head Diameter - Exhaust	30.470-30.730 mm	1.1996-1.2098 in
• Valve Head Diameter - Intake	36.830-37.090 mm	1.4500-1.4602 in
• Valve Installed Height	35.23-36.69 mm	1.3870-1.4445 in
• Valve Length - Exhaust	97.110 mm	3.8232 in
• Valve Length - Intake	101.230 mm	3.9854 in
• Valve Seat Angle - Seating Surface	45 degrees	
• Valve Seat Angle - Relief Surface	30 degrees	
• Valve Seat Angle - Undercut Surface	60 degrees	

• Valve Seat Roundness- Maximum	0.025 mm	0.0010 in
• Valve Seat Runout - Maximum	0.080 mm	0.0032 in
• Valve Seat Width - Exhaust Seating Surface	1.400-1.800 mm	0.0551-0.0709 in
• Valve Seat Width - Exhaust Relief Surface	0.700-0.900 mm	0.0276-0.0354 in
• Valve Seat Width - Intake Seating Surface	1.000-1.400 mm	0.0394-0.0551 in
• Valve Seat Width - Intake Relief Surface	0.500-0.700 mm	0.0197-0.0276 in
• Valve Stem Diameter - Exhaust	5.945-5.965 mm	0.2341-0.2348 in
• Valve Stem Diameter - Intake	5.955-5.975 mm	0.2344-0.2352 in
• Valve Stem-to-Guide Clearance - Exhaust	0.035-0.075 mm	0.0014-0.0030 in
• Valve Stem-to-Guide Clearance - Intake	0.025-0.065 mm	0.0010-0.0026 in
• Valve Lifters - Stationary Hydraulic Lifter Assembly (SHLA)		
• Valve Lifter (SHLA) Diameter	12.008-12.030 mm	0.4728-0.4736 in
• Valve Lifter (SHLA)-to-Bore Clearance	0.037-0.041 mm	0.0015-0.0016 in
• Rocker Arms		
• Valve Rocker Arm Ratio	1.68 to 1	
• Valve Rocker Arm Roller Diameter	17.750-17.800 mm	0.6988-0.7008 in
• Valve Springs		
• Valve Spring Coil Thickness	3.250 x 3.900 mm	0.1280 x 0.1535 in
• Valve Spring Diameter - Inside Top	12.090-12.590 mm	0.4760-0.4957 in
• Valve Spring Diameter - Outside Top	20.140 mm	0.7929 in
• Valve Spring Diameter - Inside Bottom	17.950-18.450 mm	0.7067-0.7264 in
• Valve Spring Diameter - Outside Bottom	26.000 mm	1.0236 in
• Valve Spring Free Length	42.050-44.850 mm	1.6555-1.7657 in
• Valve Spring Installed Height - Closed	35.000 mm	1.3779 in
• Valve Spring Installed Height - Open	24.000 mm	0.9449 in
• Valve Spring Load - Closed	247-273 N	56-61 lb
• Valve Spring Load - Open	598-662 N	134-149 lb
• Valve Spring Total Number of Coils	7.1	

Engine Mechanical Specifications (LLT)

Application	Specification	
	Metric	English
General		
• Engine Type	V-6	
• Displacement	3.6 Liter	217 cu in
• RPO	LLT	
• VIN	V	
• Bore	94 mm	3.7008 in
• Stroke	85.6 mm	3.37 in
• Compression Ratio	11.4:1	
• Cranking RPM - at 40° C (104°F)	80 RPM	
• Idle Speed	600 A/C Off - 700 A/C On	
• Firing Order	1-2-3-4-5-6	
• Spark Plug Gap	1.1 mm	0.0433 in
Block		
• Crankshaft Main Bearing Bore Diameter	72.867-72.881 mm	2.8688-2.8693 in
• Cylinder Bore Diameter	93.992-94.008 mm	3.7005-3.7011 in
• Cylinder Bore Out-of-Round - Production Max.	0.013 mm	0.0005 in
Camshaft		
• Camshaft Bearing Inside Diameter - Front Number 1	35.000-35.020 mm	1.3779-1.3787 in
• Camshaft Bearing Inside Diameter - Middle and Rear Number 2-4	27.000-27.020 mm	1.0630-1.0638 in
• Camshaft End Play	0.045-0.215 mm	0.0018-0.0085 in
• Camshaft Journal Diameter - Front Number 1	34.936-34.960 mm	1.3754-1.3764 in
• Camshaft Journal Diameter - Middle and Rear Number 2-4	26.936-26.960 mm	1.0605-1.0614 in
• Camshaft Journal Out-of-Round	0.006 mm	0.0002 in
• Camshaft Journal to Bore Clearance	0.040-0.084 mm	0.0016-0.0033 in
• Camshaft Lobe Duration - Exhaust @ 0.150 mm (0.0059 in) Lift	238 degrees	
• Camshaft Lobe Duration - Intake @ 0.150 mm (0.0059 in) Lift	237 degrees	
• Camshaft Lobe Lift - Exhaust	42.425-mm	1.6703-1.6821 in

• Camshaft Lobe Lift - Intake	42.385- 42.685 mm	1.6687- 1.6805 in
• Camshaft Lobe Overlap @ 0.150 mm (0.0059 in) Lift	0 degrees	
• Camshaft Runout - Front and Rear Number 1 and 4	0.025 mm	0.0010 in
• Camshaft Runout - Middle 2 and 3	0.050 mm	0.0020 in
• Camshaft Timing @ 0.15 mm (0.0059 in) Lift		
• Valve Opens - Exhaust	-229 degrees BTDC	
• Valve Opens - Intake	14 degrees ATDC	
• Centerline - Exhaust	111 degrees ATDC	
• Centerline - Intake	132 degrees ATDC	
• Valve Closes - Exhaust	9 degrees ATDC	
• Valve Closes - Intake	251 degrees ATDC	
• Valve Lift - Exhaust	10.8 mm	0.4252 in
• Valve Lift - Intake	10.8 mm	0.4252 in
Cooling System		
• Thermostat Full Open Temperature	95°C	203°F
Connecting Rod		
• Connecting Rod Bearing Clearance	0.010-0.070 mm	0.0004- 0.0028 in
• Connecting Rod Bore Diameter - Bearing End	59.620- 59.636 mm	2.3472- 2.3479 in
• Connecting Rod Bore Diameter - Pin End	24.007- 24.021 mm	0.9452- 0.9457 in
• Connecting Rod Length - Center to Center	150.400 mm	5.9212 in
• Connecting Rod Side Clearance	0.095-0.355 mm	0.0374- 0.0140 in
• Connecting Rod Width - Bearing End		
• Production	21.775 mm	0.8573 in
• Service	21.725- 21.825 mm	0.8553- 0.8593 in
• Connecting Rod Width - Pin End		
• Production	21.775 mm	0.8573 in
• Service	21.725- 21.825 mm	0.8553- 0.8593 in
Crankshaft		
• Connecting Rod Journal Diameter	55.992- 56.008 mm	2.2044- 2.2050 in
• Connecting Rod Journal Out-of-Round	0.005 mm	0.0002 in
• Connecting Rod Journal Taper	0.005 mm	0.0002 in
• Connecting Rod Journal Width		
• Production	22.000 mm	0.8661 in

• Service	21.920- 22.080 mm	0.8630- 0.8693 in
• Crankshaft End Play	0.100-0.330 mm	0.0039- 0.0130 in
• Crankshaft Main Bearing Clearance	0.010-0.060 mm	0.0004- 0.0024 in
• Crankshaft Main Journal Diameter	67.992- 68.008 mm	2.6768- 2.6775 in
• Crankshaft Main Journal Out-of-Round	0.005 mm	0.0002 in
• Crankshaft Main Journal Taper	0.005 mm	0.0002 in
• Crankshaft Main Journal Thrust Wall		
• Runout	0.000-0.040 mm	0.0000- 0.0016 in
• Square	0.000-0.010 mm	0.0000- 0.0004 in
• Crankshaft Main Journal Width, #2, 4		
• Production	24.000 mm	0.9449 in
• Service	23.900- 24.100 mm	0.9409- 0.9488 in
• Crankshaft Main Journal Width, #3		
• Production	24.400 mm	0.9606 in
• Service	24.360- 24.440 mm	0.9591- 0.9622 in
• Crankshaft Pilot Bearing Bore Diameter	20.965- 20.995 mm	0.8254- 0.8266 in
• Crankshaft Rear Flange Runout	0.025 mm	0.0010 in
• Crankshaft Reluctor Ring Runout - Maximum	1.500 mm	0.0591 in
• Crankshaft Runout	0.030 mm	0.0012 in
• Crankshaft Thrust Bearing Clearance	0.076-0.305 mm	0.0030- 0.0120 in
• Crankshaft Thrust Surface - Height Diameter	95.000 mm	3.7401 in
• Crankshaft Thrust Surface Runout	0.040 mm	0.0016 in
Cylinder Head		
• Combustion Chamber Volume	53.6 cc	3.271 cu in
• Valve Guide Bore - Exhaust	6.000-6.020 mm	0.2362- 0.2370 in
• Valve Guide Bore - Intake	6.000-6.020 mm	0.2362- 0.2370 in
• Valve Guide Installed Height	14.050- 14.550 mm	0.5531- 0.5728 in
• Valve Lifter Bore Diameter	12.008- 12.030 mm	0.4728- 0.4736 in
Lubrication System		
• Oil Capacity - with Filter	5.68 Liters	6 Quarts

• Oil Capacity - without Filter	5.20 Liters	5.5 Quarts
• Oil Pressure - Minimum @ Idle	69 kPa	10 psi
• Oil Pressure - Minimum @ 2,000 RPM	138 kPa	20 psi
• Piston Cooling Jet Valve Opening Pressure	1.7-2.3 bar	25-33 psi
Oil Pump		
• Gear Diameter - Outer	87.095-87.175 mm	3.4289-3.4321 in
• Gear Pocket - Depth	15.565-15.600 mm	0.6128-0.6142 in
• Gear Pocket - Diameter	87.275-87.325 mm	3.4360-3.4380 in
• Gear Thickness - Drive/Driven	15.511-15.536 mm	0.6107-0.6117 in
• Gear-to-Cover Clearance - Drive/Driven	0.030-0.085 mm	0.0012-0.0033 in
• Gear-to-Housing Clearance - Drive/Driven	0.100-0.230 mm	0.0039-0.0091 in
• Inner Gear Tip Clearance	0.075-0.180 mm	0.0030-0.0071 in
• Crankshaft Clearance to Housing	0.040-0.130 mm	0.0016-0.0051 in
• Inner Gerotor Hub Diameter	53.310-53.335 mm	2.0988-2.0998 in
• Housing Hub Diameter	53.380-53.420 mm	2.1016-2.1031 in
• Inner Gerotor Hub Clearance to Housing	0.045-0.110 mm	0.0018-0.0043 in
Piston Rings		
• Piston Ring End Gap		
• First Compression Ring	0.150-0.300 mm	0.0059-0.0118 in
• Second Compression Ring	0.280-0.480 mm	0.0110-0.0189 in
• Oil Control Ring	0.150-0.600 mm	0.0059-0.0236 in
• Piston Ring to Groove Clearance		
• First Compression Ring	0.030-0.065 mm	0.0012-0.0026 in
• Second Compression Ring	0.015-0.060 mm	0.0006-0.0024 in
• Oil Control Ring	0.030-0.170 mm	0.0012-0.0067 in
• Piston Ring Thickness		
• First Compression Ring	1.175-1.190 mm	0.0463-0.0469 in

• Second Compression Ring	1.470-1.495 mm	0.0579-0.0589 in
• Oil Control Ring	2.360-2.480 mm	0.0929-0.0976 in
Pistons and Pins		
• Piston		
• Piston Diameter	93.956-93.974 mm	3.6990-3.6998 in
• Piston Pin Bore Diameter	24.004-24.009 mm	0.9450-0.9452 in
• Piston Ring Groove Width - First Compression Ring	1.220-1.240 mm	0.0480-0.0488 in
• Piston Ring Groove Width - Second Compression Ring	1.510-1.530 mm	0.0595-0.0602 in
• Piston Ring Groove Width - Oil Control Ring	2.510-2.530 mm	0.0988-0.0996 in
• Piston to Bore Clearance	0.026-0.052 mm	0.0010-0.0021 in
• Pin		
• Piston Pin Clearance to Connecting Rod Bore	0.007-0.024 mm	0.0003-0.0010 in
• Piston Pin Clearance to Piston Pin Bore	0.004-0.012 mm	0.0002-0.0005 in
• Piston Pin Diameter	23.997-24.000 mm	0.9448-0.9449 in
• Piston Pin Length	60.600-61.100 mm	2.3858-2.4055 in
Valve System		
• Valves		
• Valve Face Angle	44.25 degrees	
• Valve Face Runout	0.038 mm	0.0015 in
• Valve Face Width - Exhaust	2.750 mm	0.1083 in
• Valve Face Width - Intake	2.180 mm	0.0858 in
• Valve Head Diameter - Exhaust	30.470-30.730 mm	1.1996-1.2098 in
• Valve Head Diameter - Intake	36.830-37.090 mm	1.4500-1.4602 in
• Valve Installed Height	35.23-36.69 mm	1.3870-1.4445 in
• Valve Length - Exhaust	97.110 mm	3.8232 in
• Valve Length - Intake	101.230 mm	3.9854 in
• Valve Seat Angle - Seating Surface	45 degrees	
• Valve Seat Angle - Relief Surface	30 degrees	
• Valve Seat Angle - Undercut Surface	60 degrees	

• Valve Seat Roundness- Maximum	0.025 mm	0.0010 in
• Valve Seat Runout - Maximum	0.080 mm	0.0032 in
• Valve Seat Width - Exhaust Seating Surface	1.400-1.800 mm	0.0551-0.0709 in
• Valve Seat Width - Exhaust Relief Surface	0.700-0.900 mm	0.0276-0.0354 in
• Valve Seat Width - Intake Seating Surface	1.000-1.400 mm	0.0394-0.0551 in
• Valve Seat Width - Intake Relief Surface	0.500-0.700 mm	0.0197-0.0276 in
• Valve Stem Diameter - Exhaust	5.945-5.965 mm	0.2341-0.2348 in
• Valve Stem Diameter - Intake	5.955-5.975 mm	0.2344-0.2352 in
• Valve Stem-to-Guide Clearance - Exhaust	0.035-0.075 mm	0.0014-0.0030 in
• Valve Stem-to-Guide Clearance - Intake	0.025-0.065 mm	0.0010-0.0026 in
• Valve Lifters - Stationary Hydraulic Lifter Assembly (SHLA)		
• Valve Lifter (SHLA) Diameter	12.008-12.030 mm	0.4728-0.4736 in
• Valve Lifter (SHLA)-to-Bore Clearance	0.037-0.041 mm	0.0015-0.0016 in
• Rocker Arms		
• Valve Rocker Arm Ratio	1.68 to 1	
• Valve Rocker Arm Roller Diameter	17.750-17.800 mm	0.6988-0.7008 in
• Valve Springs		
• Valve Spring Coil Thickness	3.250 x 3.900 mm	0.1280 x 0.1535 in
• Valve Spring Diameter - Inside Top	12.090-12.590 mm	0.4760-0.4957 in
• Valve Spring Diameter - Outside Top	20.140 mm	0.7929 in
• Valve Spring Diameter - Inside Bottom	17.950-18.450 mm	0.7067-0.7264 in
• Valve Spring Diameter - Outside Bottom	26.000 mm	1.0236 in
• Valve Spring Free Length	42.050-44.850 mm	1.6555-1.7657 in
• Valve Spring Installed Height - Closed	35.000 mm	1.3779 in
• Valve Spring Installed Height - Open	24.000 mm	0.9449 in
• Valve Spring Load - Closed	247-273 N	56-61 lb
• Valve Spring Load - Open	598-662 N	134-149 lb
• Valve Spring Total Number of Coils	7.1	

[2009 Cadillac CTS](#) | [CTS \(VIN D\) Service Manual](#) | [Engine](#) | [Engine Mechanical - 2.8L, 3.0L, 3.2L, or 3.6L](#) | [Specifications](#)
| Document ID: 994266

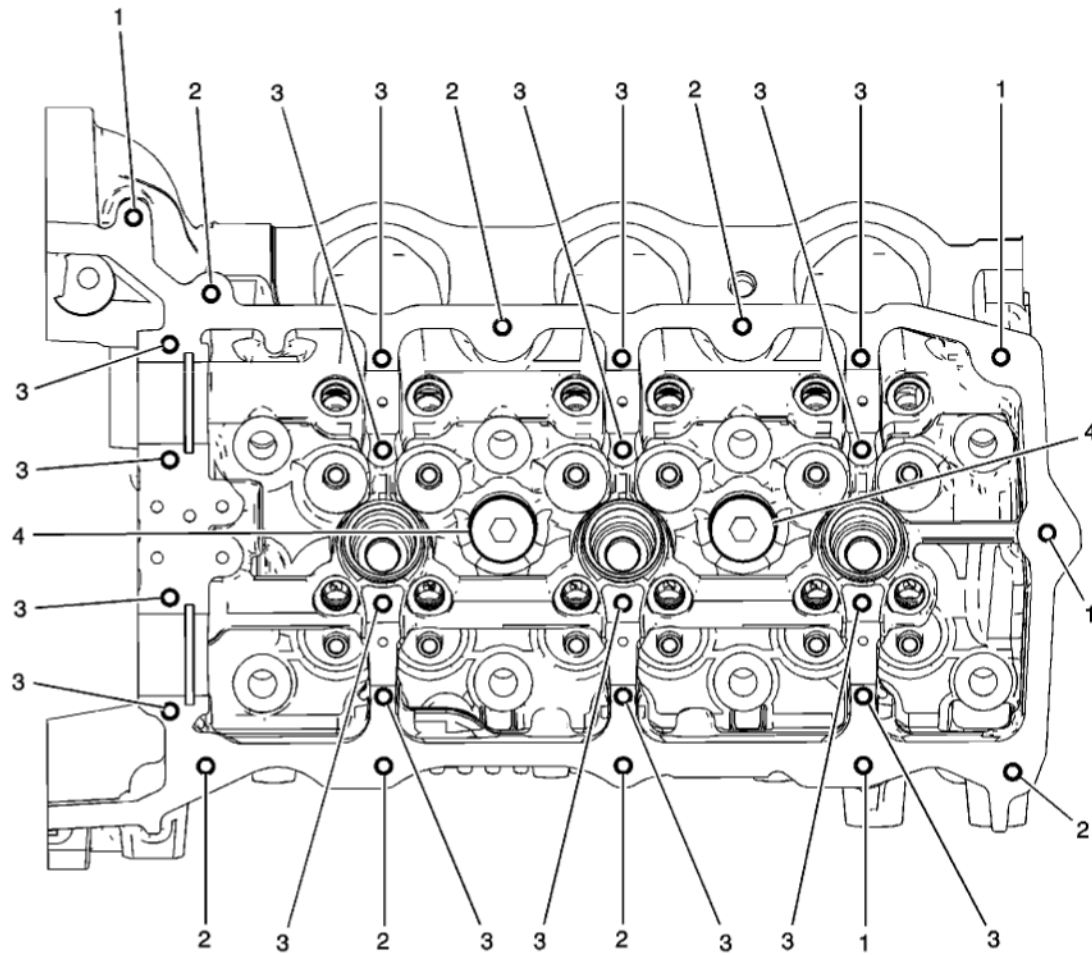
Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	
		United States	Canada
Camshaft Prelube	Lubricant	12345501	993362
Coolant and Oil Plug Threads	Sealant	12346004	10953480
Crankshaft Prelube	Lubricant	1052367	992869
Engine Oil	5W-30 Oil	12345610	993193
Oil Pan, Engine Front Cover, Crankshaft Rear Oil Seal Housing, Expansion Plugs	Sealant	12378521	88901148

Thread Repair Specifications

Table 1:	Left Cylinder Head Camshaft Cover Face
Table 2:	Left Cylinder Head Front Face
Table 3:	Left Cylinder Head Intake Face
Table 4:	Left Cylinder Head Exhaust Face
Table 5:	Left Cylinder Head Rear Face
Table 6:	Right Cylinder Head Camshaft Cover Face
Table 7:	Right Cylinder Head Front Face
Table 8:	Right Cylinder Head Intake Face
Table 9:	Right Cylinder Head Exhaust Face
Table 10:	Right Cylinder Head Rear Face
Table 11:	Engine Block Front (LP1)
Table 12:	Engine Block Front (LY7)
Table 13:	Engine Block Left Side
Table 14:	Engine Block Right Side (LP1)
Table 15:	Engine Block Right Side (LY7)
Table 16:	Engine Block Rear
Table 17:	Engine Block Bottom
Table 18:	Engine Block Left Deck Face (LP1)
Table 19:	Engine Block Left Deck Face (LY7)
Table 20:	Engine Block Right Deck Face (LP1)
Table 21:	Engine Block Right Deck Face (LY7)
Table 22:	Engine Front Cover
Table 23:	Upper Intake Manifold - Top
Table 24:	Upper Intake Manifold - Front
Table 25:	Upper Intake Manifold - Rear
Table 26:	Lower Intake Manifold - Top
Table 27:	Oil Pan Front (RWD)
Table 28:	Oil Pan Front (AWD)
Table 29:	Oil Pan Left Side (RWD)
Table 30:	Oil Pan Left Side (AWD)
Table 31:	Oil Pan Right Side (RWD)
Table 32:	Oil Pan Right Side (AWD)
Table 33:	Oil Pan Rear (RWD)
Table 34:	Oil Pan Rear (AWD)
Table 35:	Oil Pan Top (RWD)
Table 36:	Oil Pan Top (AWD)

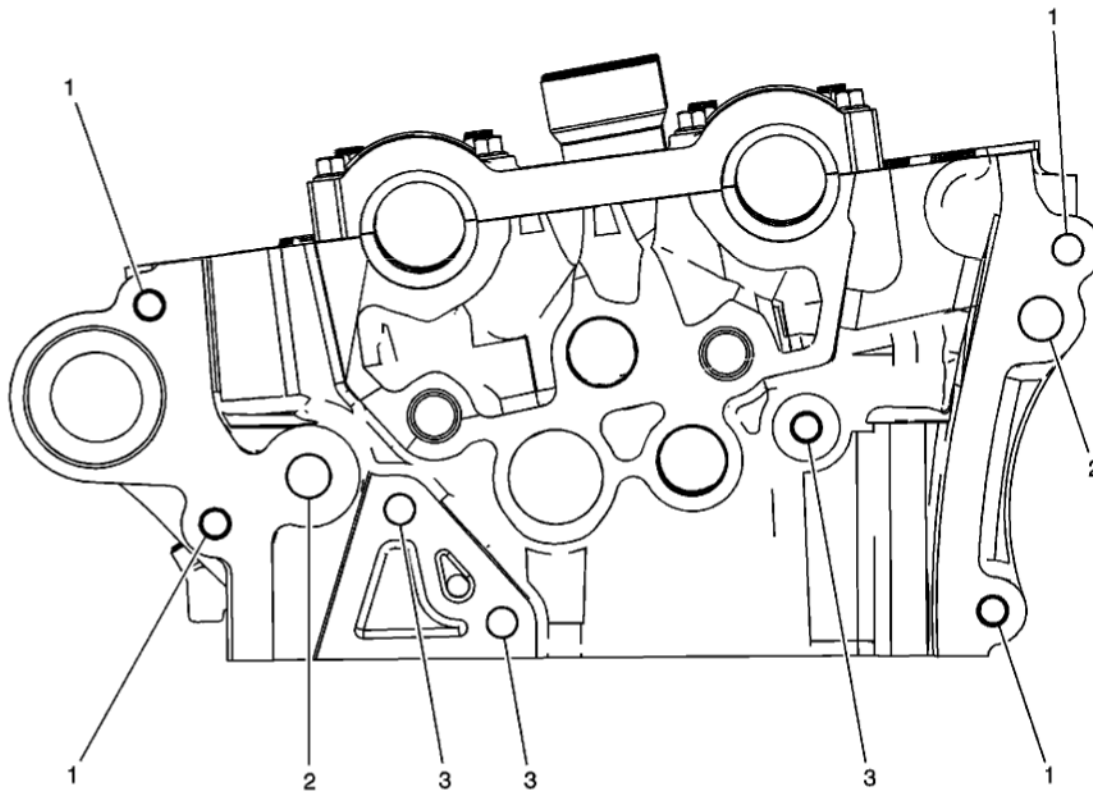
[Left Cylinder Head Camshaft Cover Face](#)



Left Cylinder Head Camshaft Cover Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087
2	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	
3	M6 x 1.0	701	N/A	N/A	203	204	205	28.5	1.1220	24.0	0.9449
4	M20 x 1.5	715	716	N/A	717	718	719	25.0	0.9842	17.0	0.6693

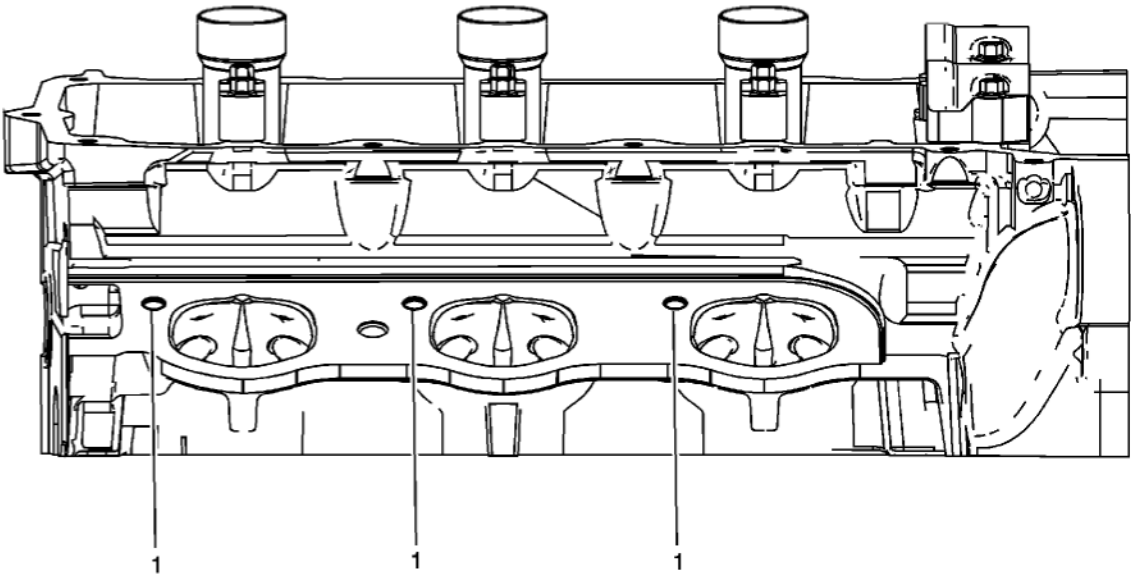
Left Cylinder Head Front Face



Left Cylinder Head Front Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	THRU		THRU	
2	M12 x 1.75	856	857	N/A	858	859	416	40.0	1.5748	32.5	1.2795
3	M8 x 1.25	206	207	N/A	208	209	210	18.0	0.7087	22.5	0.8858

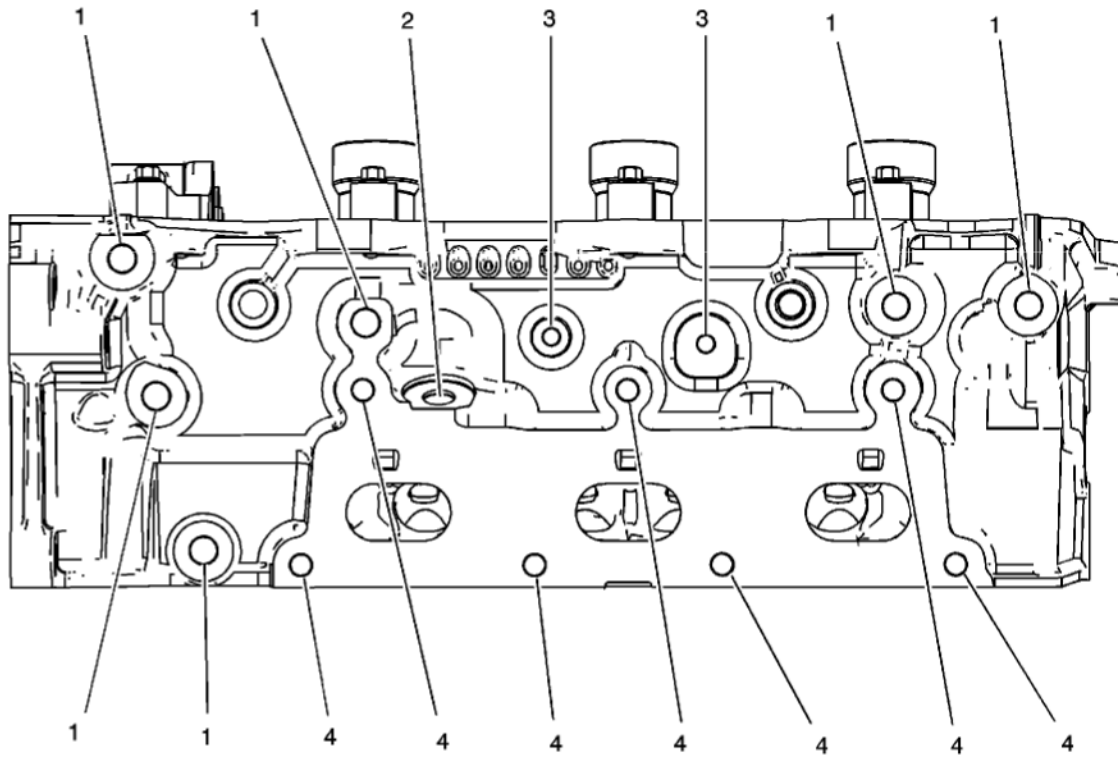
Left Cylinder Head Intake Face



Left Cylinder Head Intake Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055

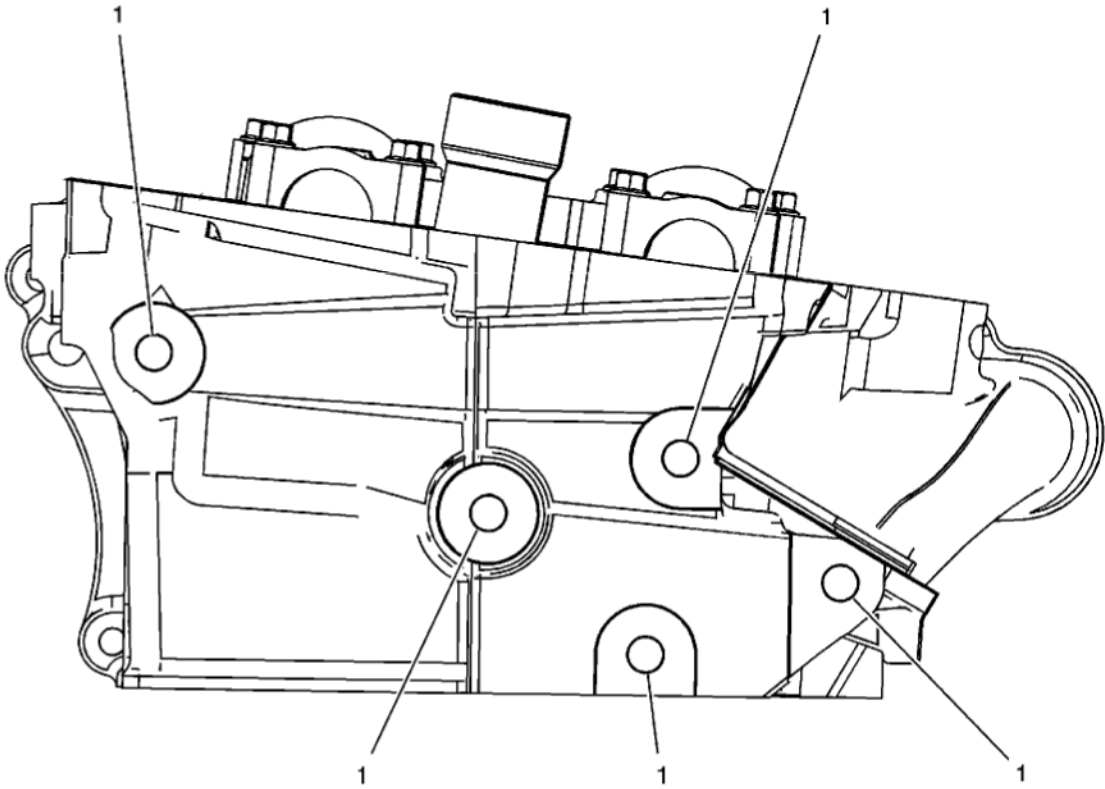
Left Cylinder Head Exhaust Face



Left Cylinder Head Exhaust Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630
2	M12 x 1.5	705	706	N/A	707	708	709	27.5	1.0827	13.0	0.5118
3	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.0000
4	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055

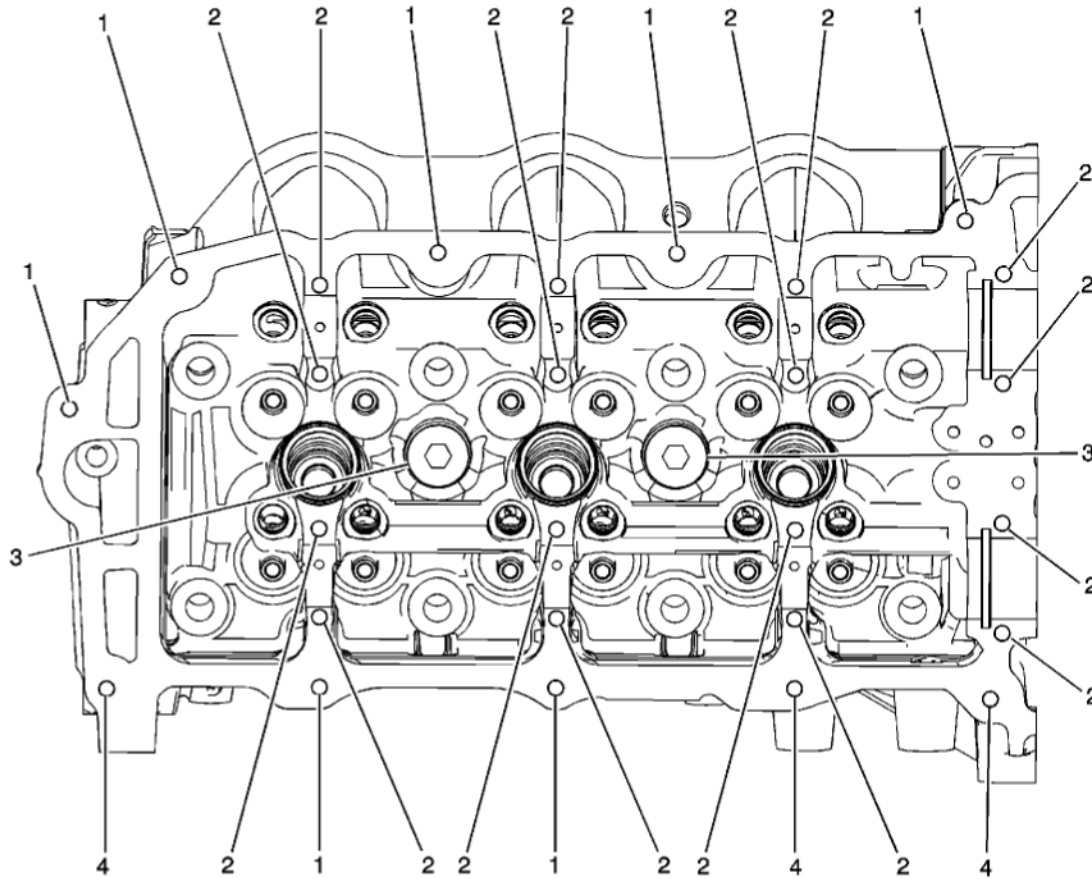
Left Cylinder Head Rear Face



Left Cylinder Head Rear Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630

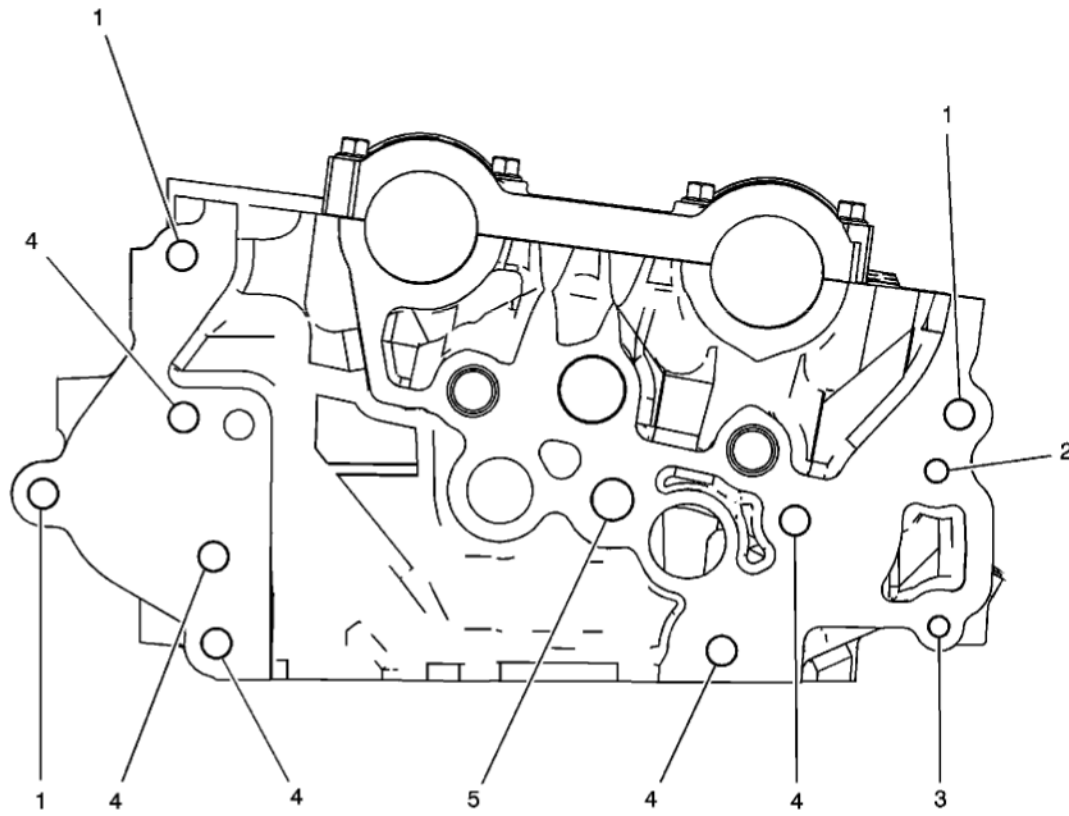
Right Cylinder Head Camshaft Cover Face



Right Cylinder Head Camshaft Cover Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	
2	M6 x 1.0	701	N/A	N/A	203	204	205	28.5	1.1220	24.0	0.9449
3	M20 x 1.5	715	716	N/A	717	718	719	25.0	0.9842	17.0	0.6693
4	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087

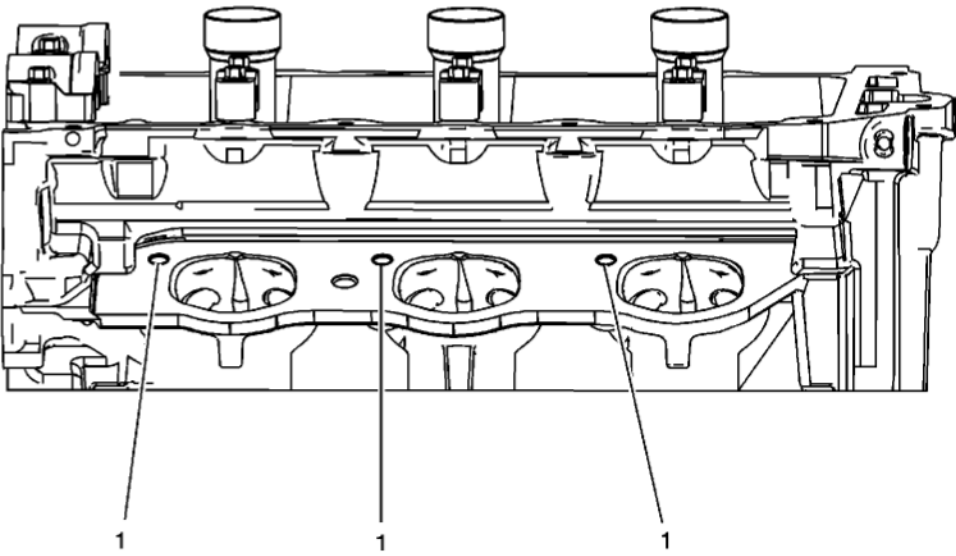
Right Cylinder Head Front Face



Right Cylinder Head Front Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	THRU		THRU	
2	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8880	18.0	0.7087
3	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	
4	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
5	M12 x 1.75	856	857	N/A	858	859	416	40.0	1.5748	32.5	1.2795

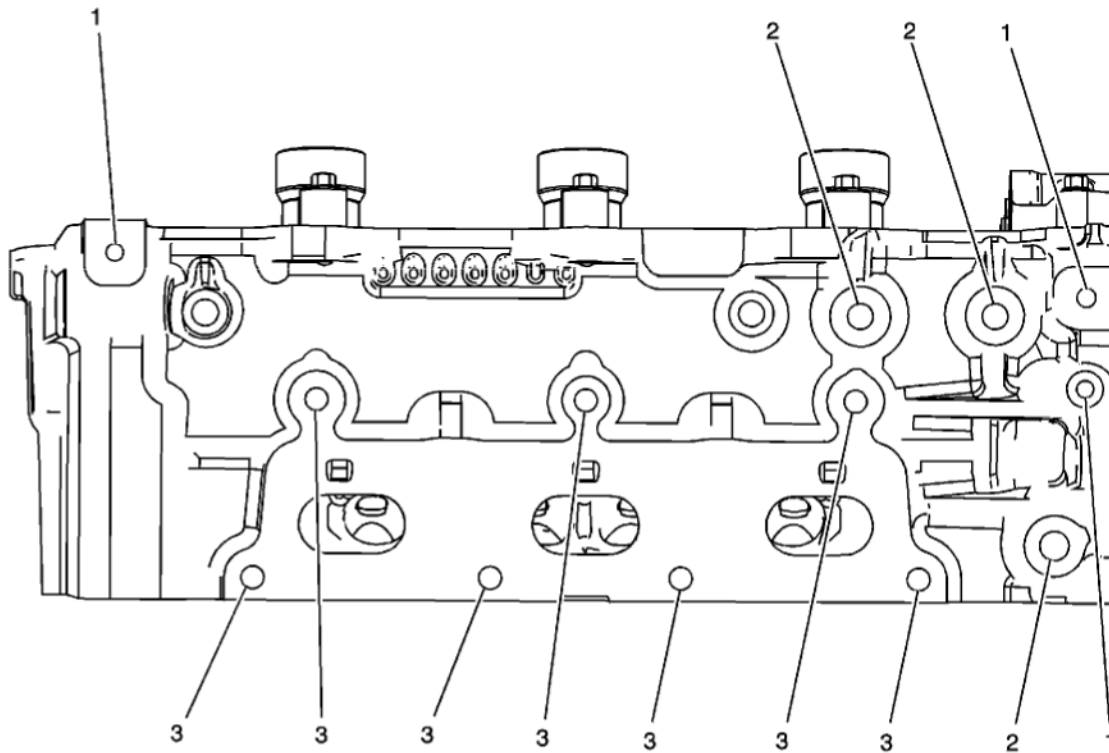
Right Cylinder Head Intake Face



Right Cylinder Head Intake Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055

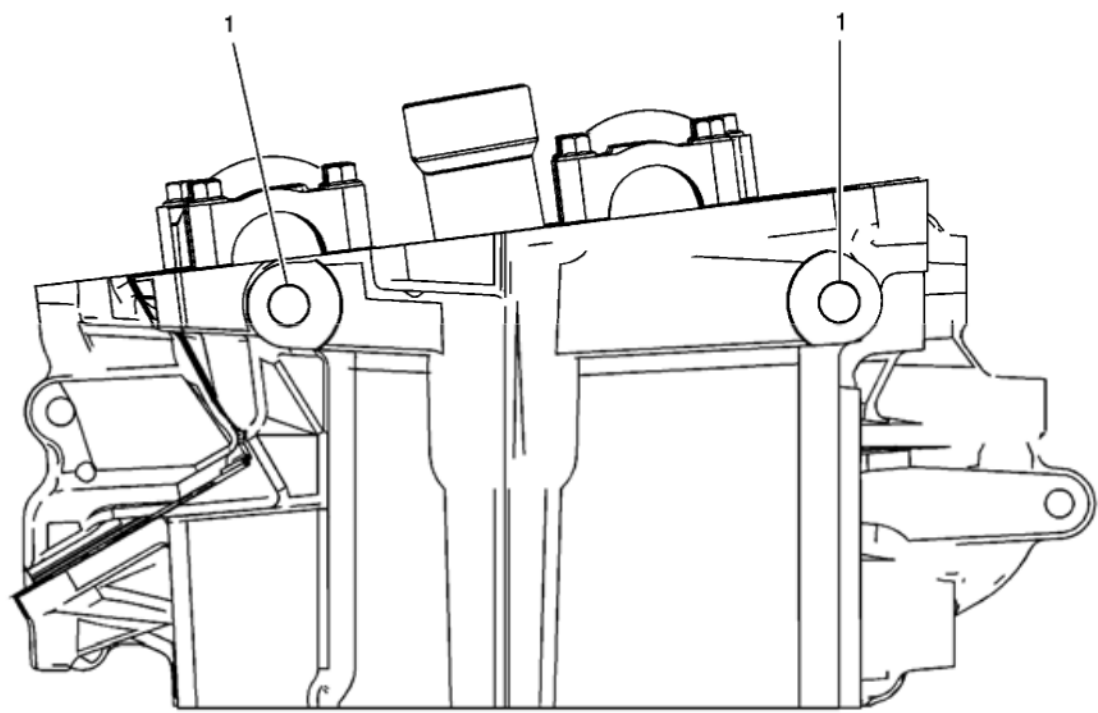
Right Cylinder Head Exhaust Face



Right Cylinder Head Exhaust Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.0000
2	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630
3	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055

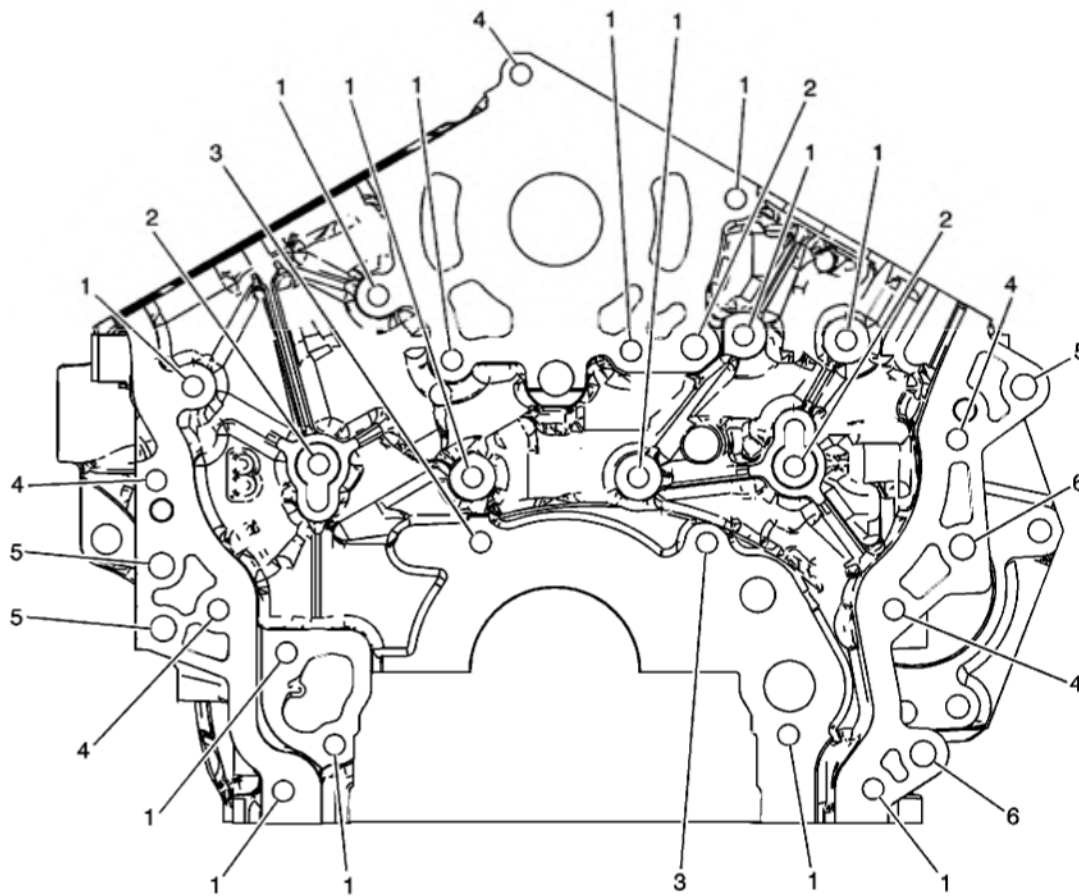
Right Cylinder Head Rear Face



Right Cylinder Head Rear Face

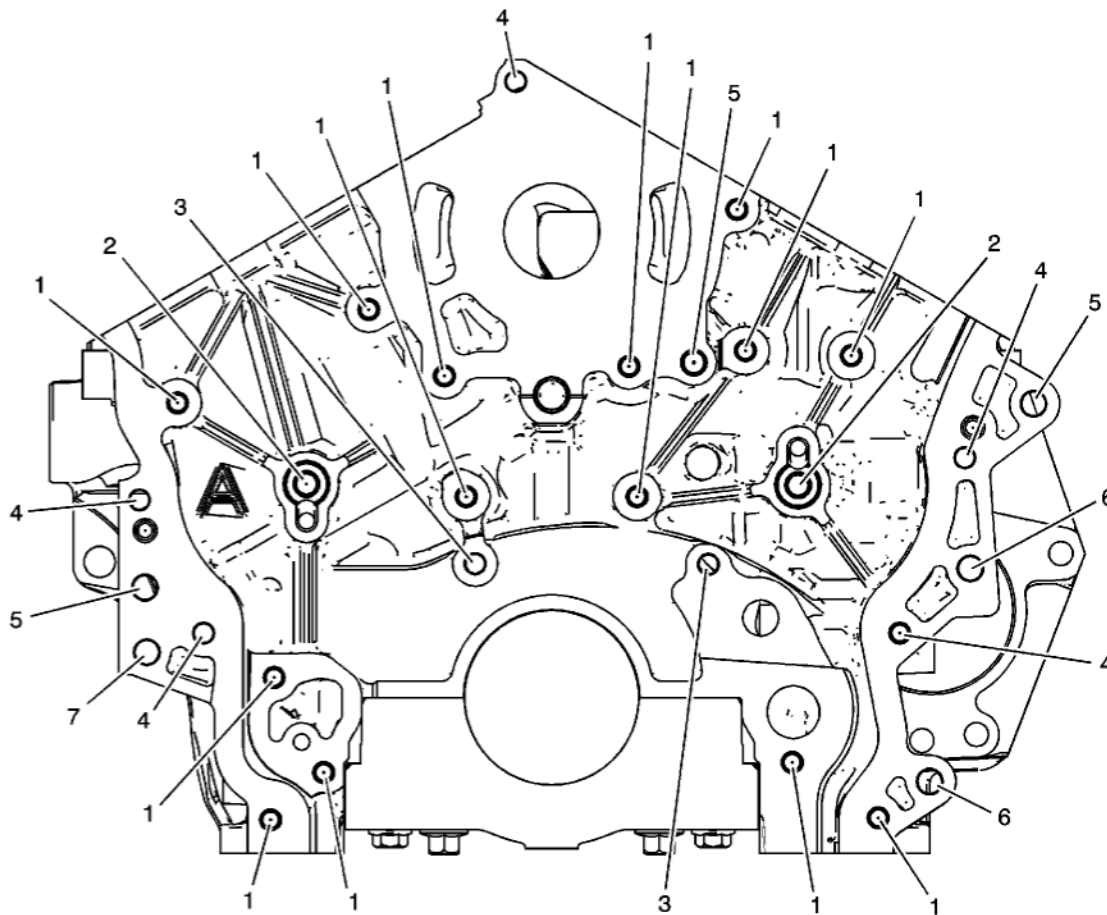
Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630

Engine Block Front (LP1)



Engine Block Front (LP1)

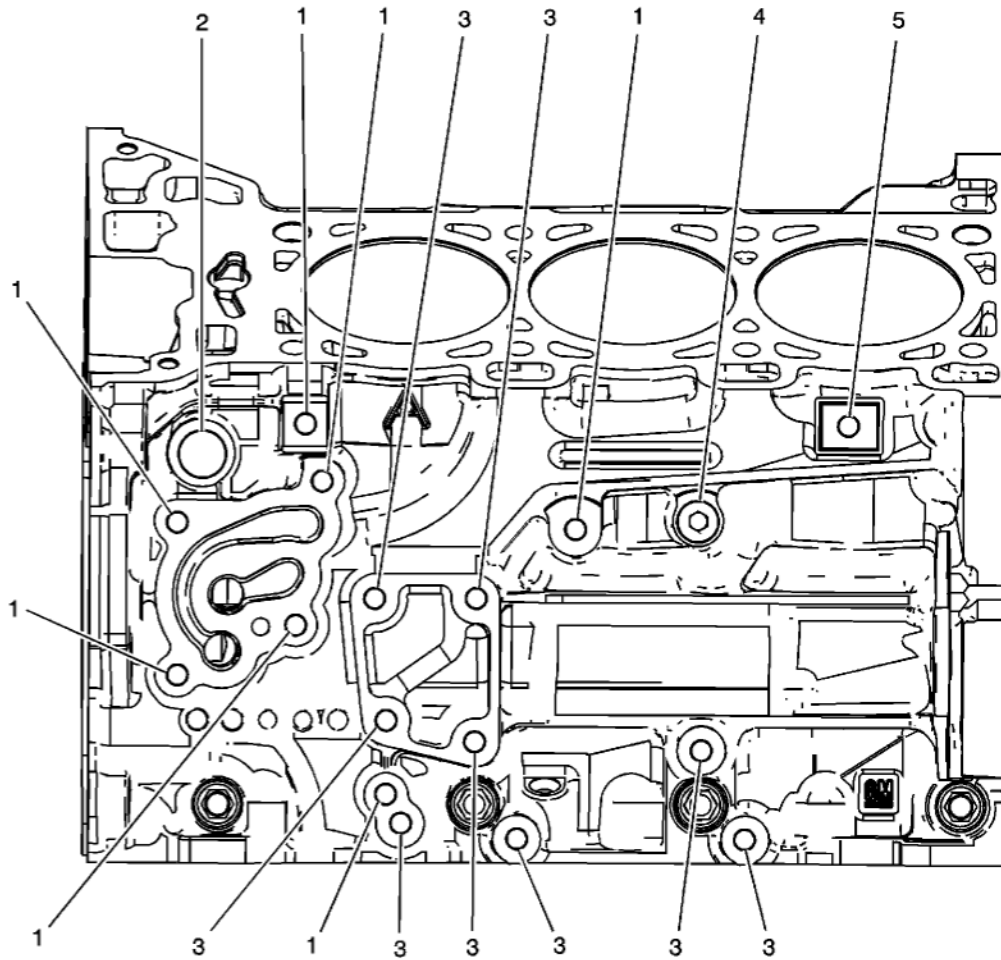
Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
2	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630
3	M8 x 1.25	206	207	N/A	208	209	210	THRU		23.0	0.9055
4	M8 x 1.25	206	207	N/A	208	209	210	THRU		THRU	
5	M10 x 1.5	211	212	N/A	213	214	215	THRU		28.0	1.1024
6	M10 x 1.5	211	212	N/A	213	214	215	THRU		20.0	0.7874

Engine Block Front (LY7)**Engine Block Front (LY7)**

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
2	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630
3	M8 x 1.25	206	207	N/A	208	209	210	THRU		23.0	0.9055
4	M8 x 1.25	206	207	N/A	208	209	210	THRU		THRU	
5	M10 x 1.5	211	212	N/A	213	214	215	28.0	1.1024	28.0	1.1024

6	M10 x 1.5	211	212	N/A	213	214	215	THRU	20.0	0.7874
7	M10 x 1.5	211	212	N/A	213	214	215	THRU	28.0	1.1024

Engine Block Left Side

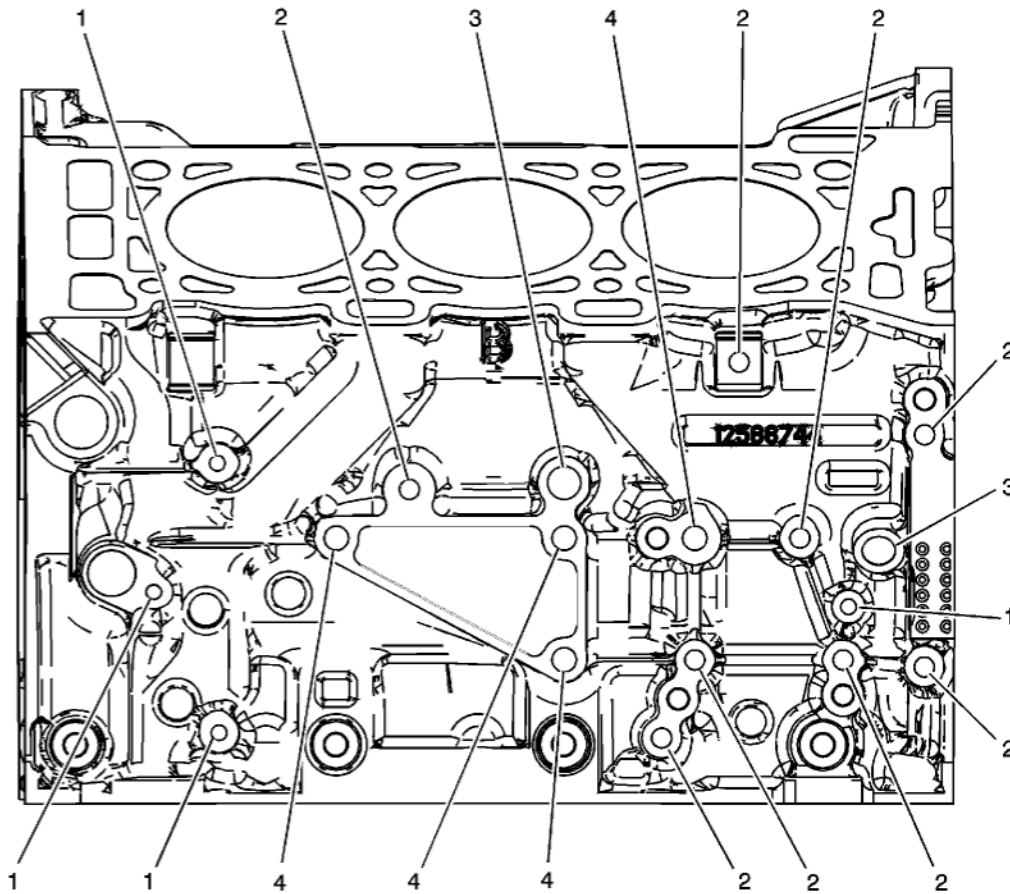


Engine Block Left Side

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
2	M20 x 1.5	715	716	N/A	717	718	719	30.0	1.1810	20.0	0.7874

3	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3190	27.0	1.0630
4	M14 x 1.5	409	410	N/A	411	412	735	THRU		15.0	0.5905
5	M8 x 1.25	206	207	N/A	208	209	415	16.5	0.6496	11.0	0.4331

Engine Block Right Side (LP1)

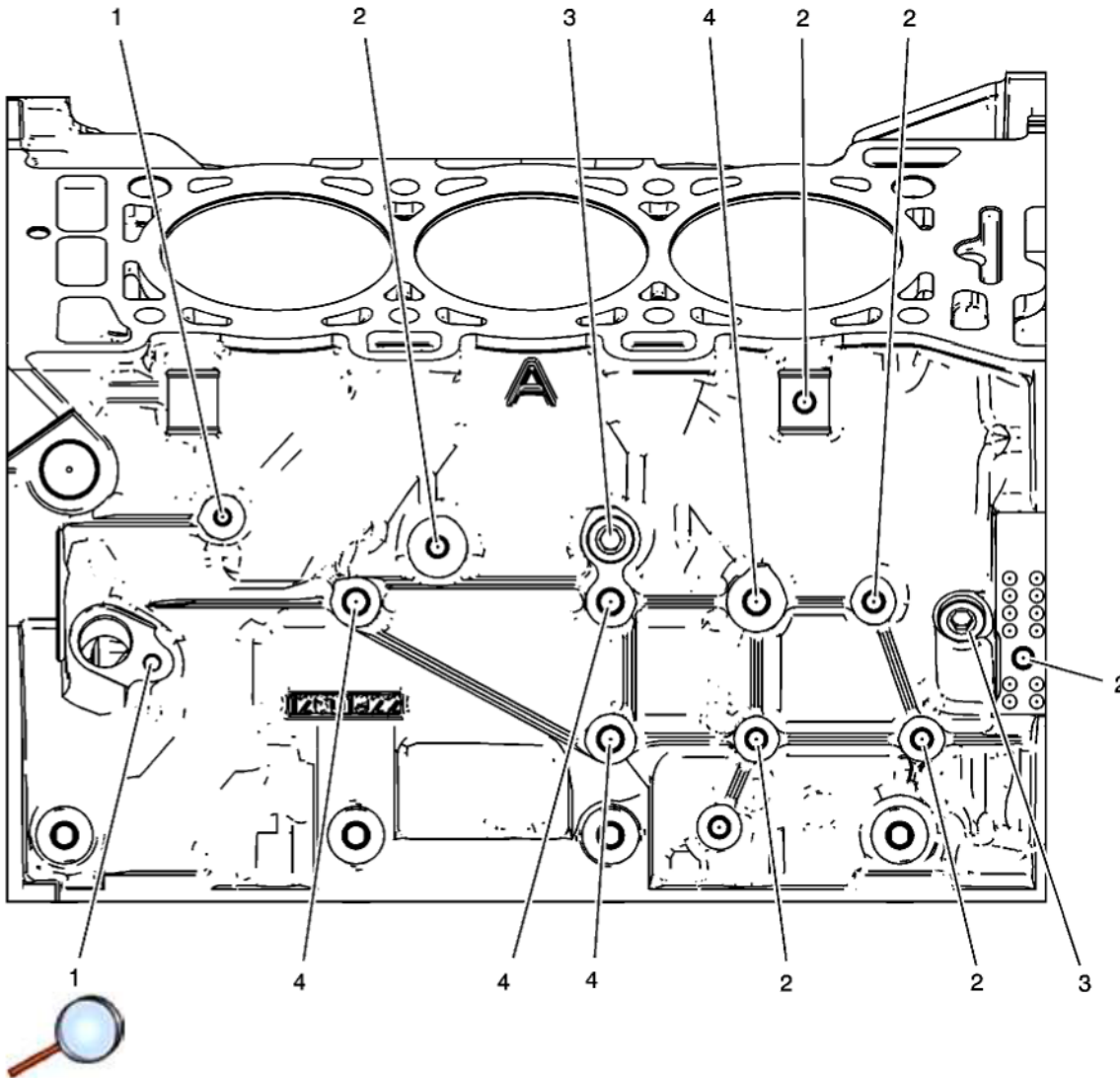


Engine Block Right Side (LP1)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087

2	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
3	M14 x 1.5	409	410	N/A	411	412	735	THRU		15.0	0.5905
4	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3190	27.0	1.0630

Engine Block Right Side (LY7)

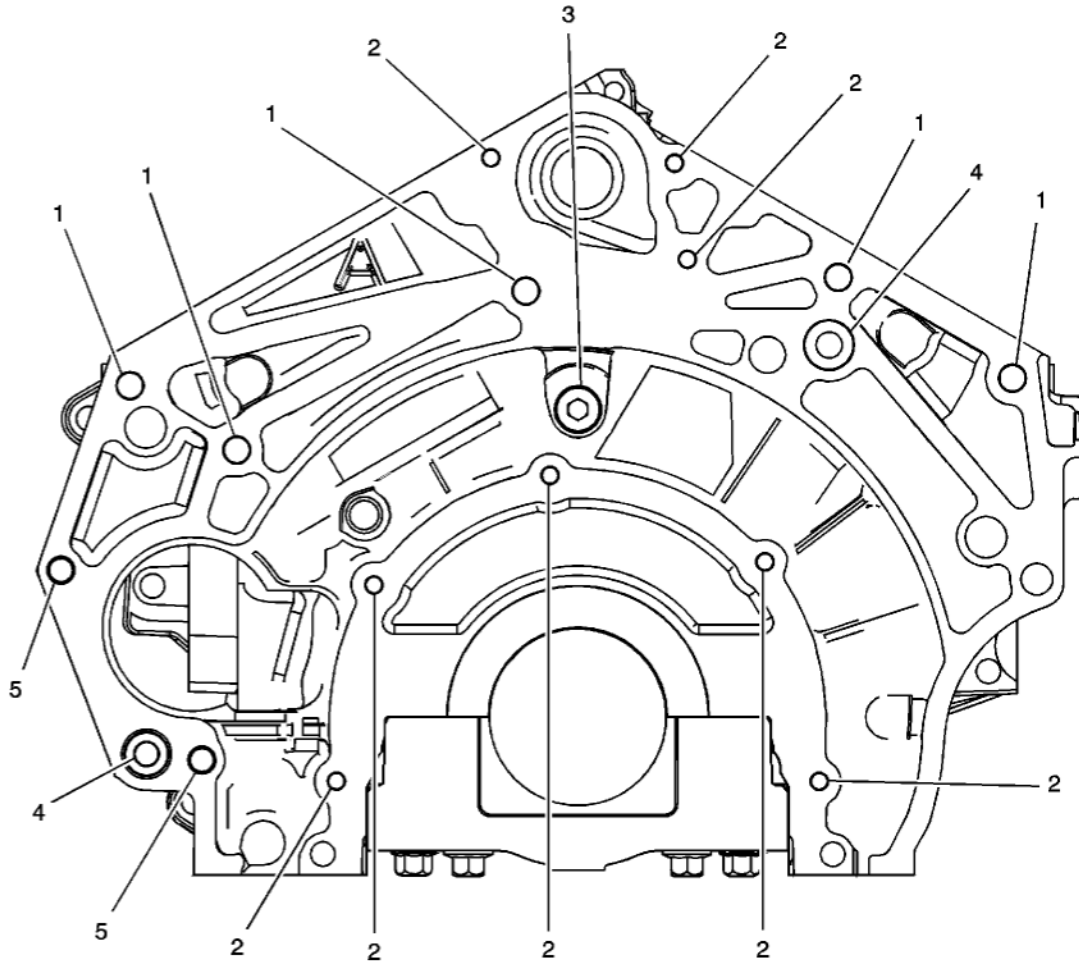


Engine Block Right Side (LY7)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087

2	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
3	M14 x 1.5	409	410	N/A	411	412	735	THRU		15.0	0.5905
4	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3190	27.0	1.0630

Engine Block Rear

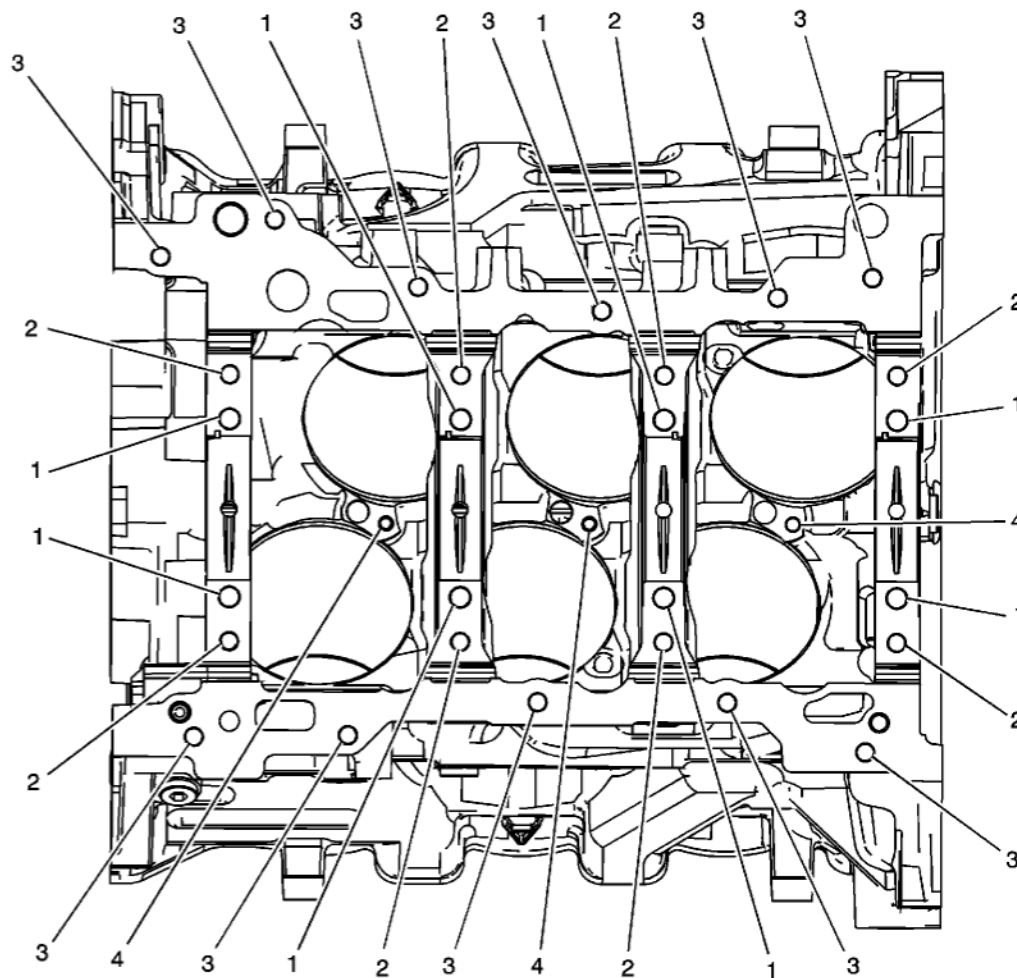


Engine Block Rear

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	420	33.5	1.3190	27.0	1.0630

2	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087
3	M14 x 1.5	409	410	N/A	411	412	735	THRU		15.0	0.5905
4	M10 x 1.5	211	212	N/A	213	214	216	39.5	1.5551	33.0	1.2992
5	M10 x 1.5	211	212	N/A	213	214	420	THRU		THRU	

Engine Block Bottom

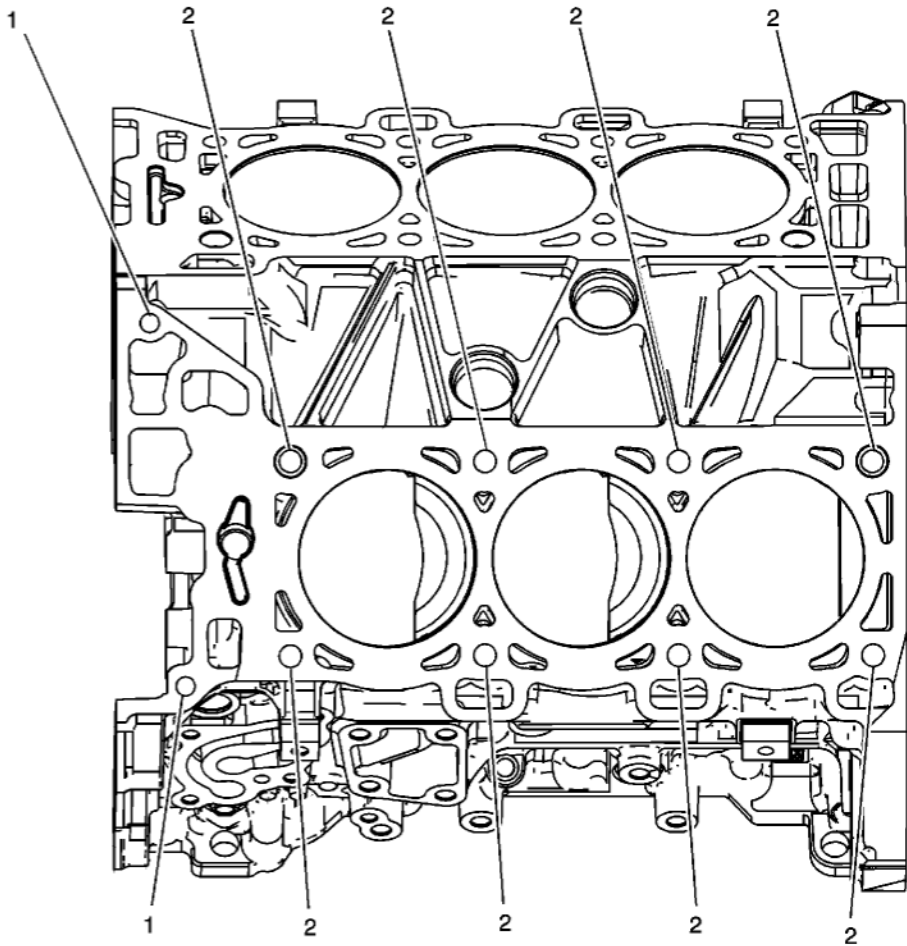


Engine Block Bottom

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)

1	M10 x 2.0	720	N/A	N/A	721	722	104	56.0	2.2047	49.0	1.9291
2	M8 x 1.25	702	N/A	N/A	703	704	620	46.0	1.8110	40.5	1.5945
3	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
4	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	

Engine Block Left Deck Face (LP1)

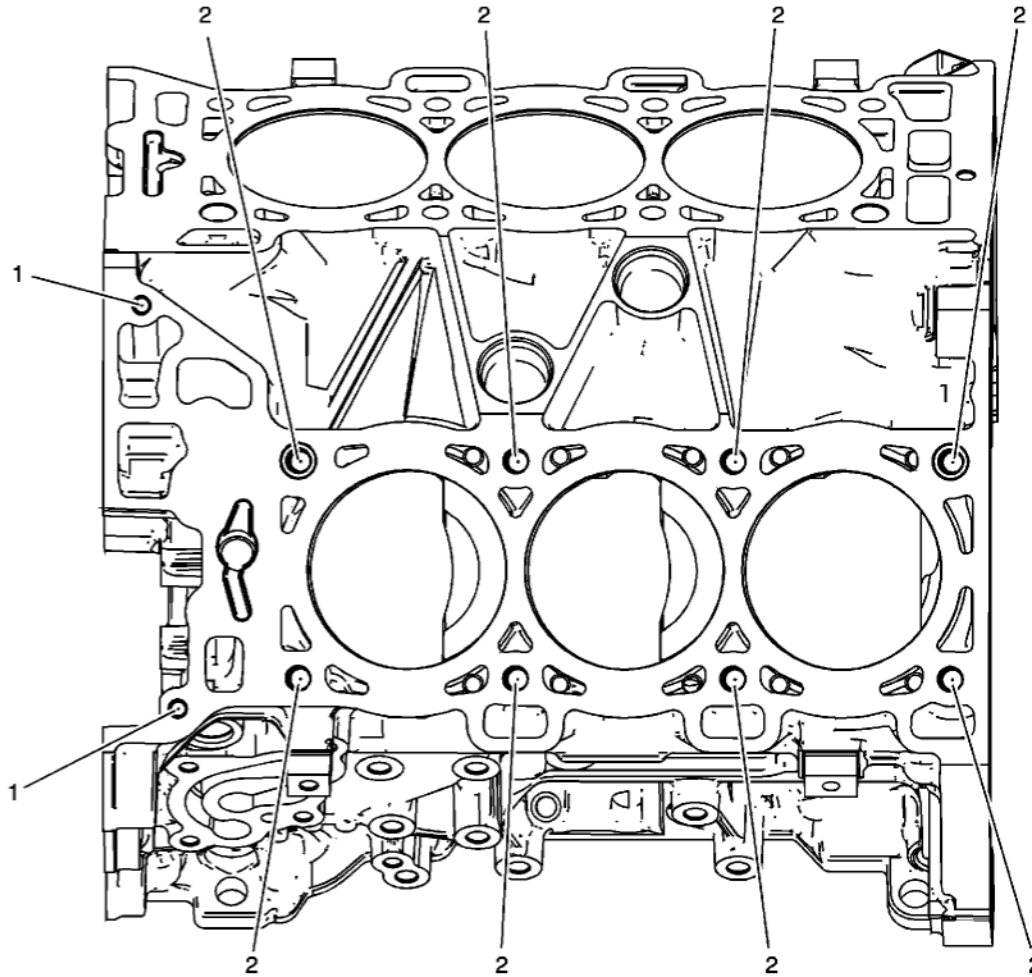


Engine Block Left Deck Face (LP1)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)

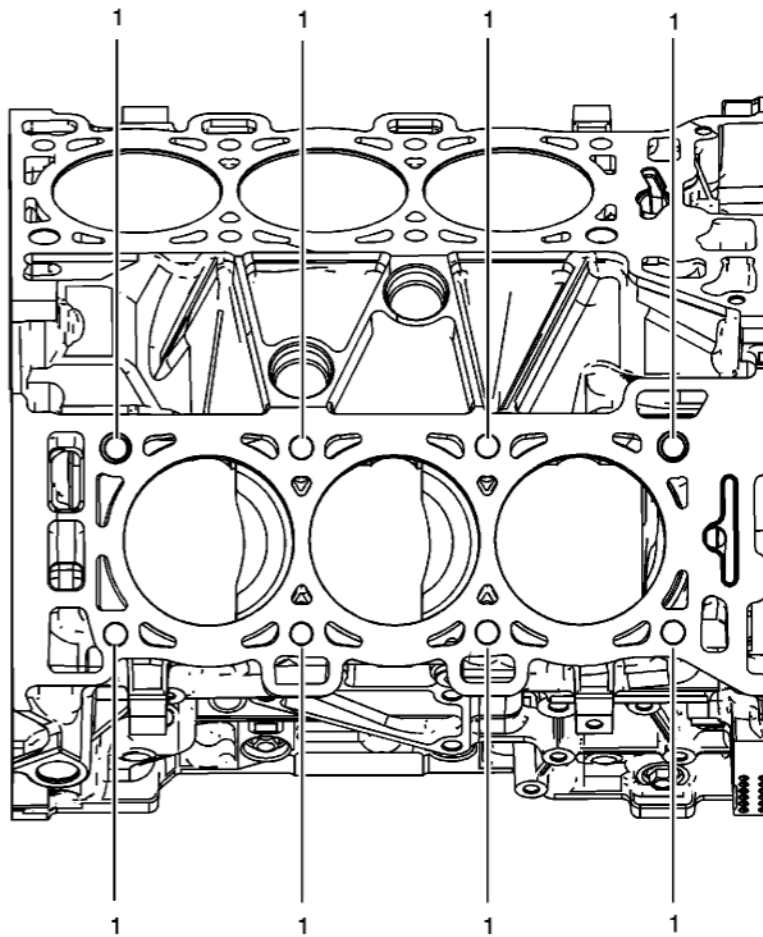
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
2	M11 x 2.0	723	N/A	N/A	724	725	108	102.5	4.0354	94.0	3.7008

Engine Block Left Deck Face (LY7)



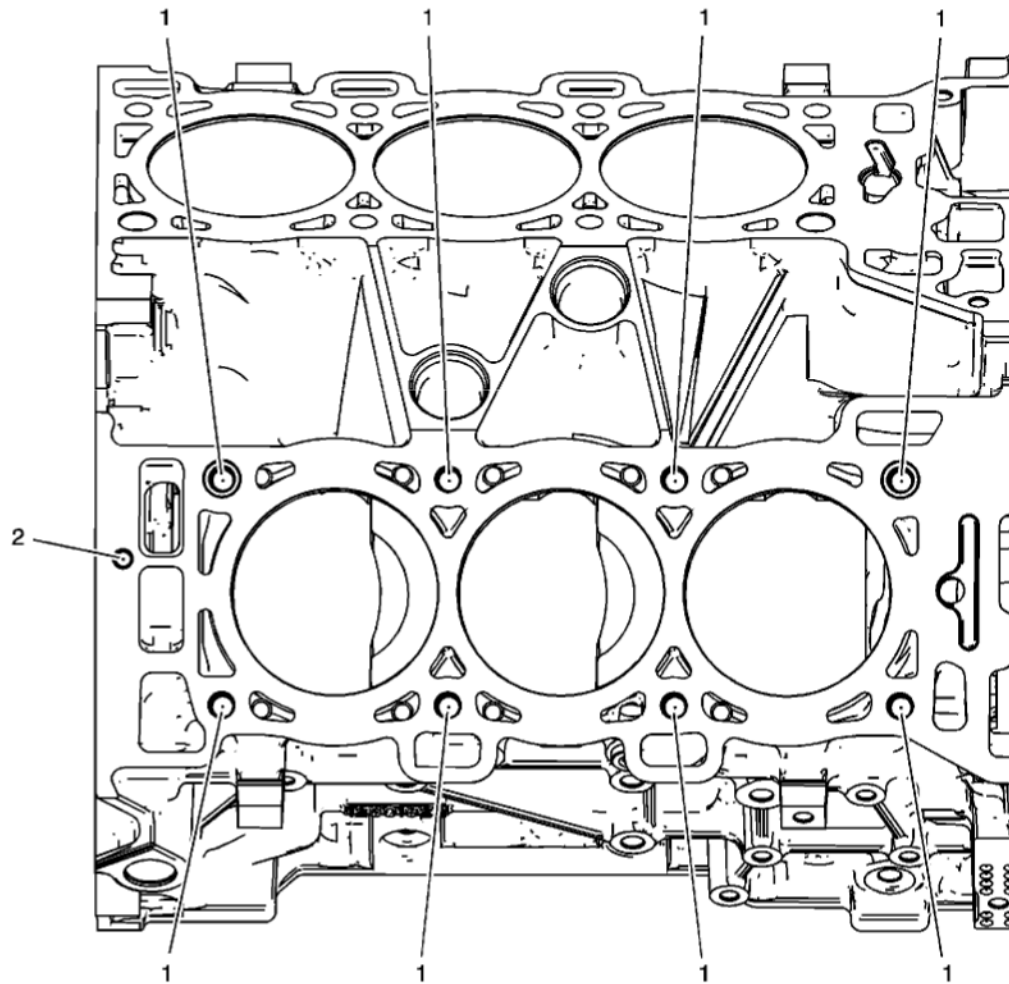
Engine Block Left Deck Face (LY7)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
2	M11 x 2.0	723	N/A	N/A	724	725	108	102.5	4.0354	94.0	3.7008

Engine Block Right Deck Face (LP1)**Engine Block Right Deck Face (LP1)**

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M11 x 2.0	723	N/A	N/A	724	725	108	102.5	4.0354	94.0	3.7008

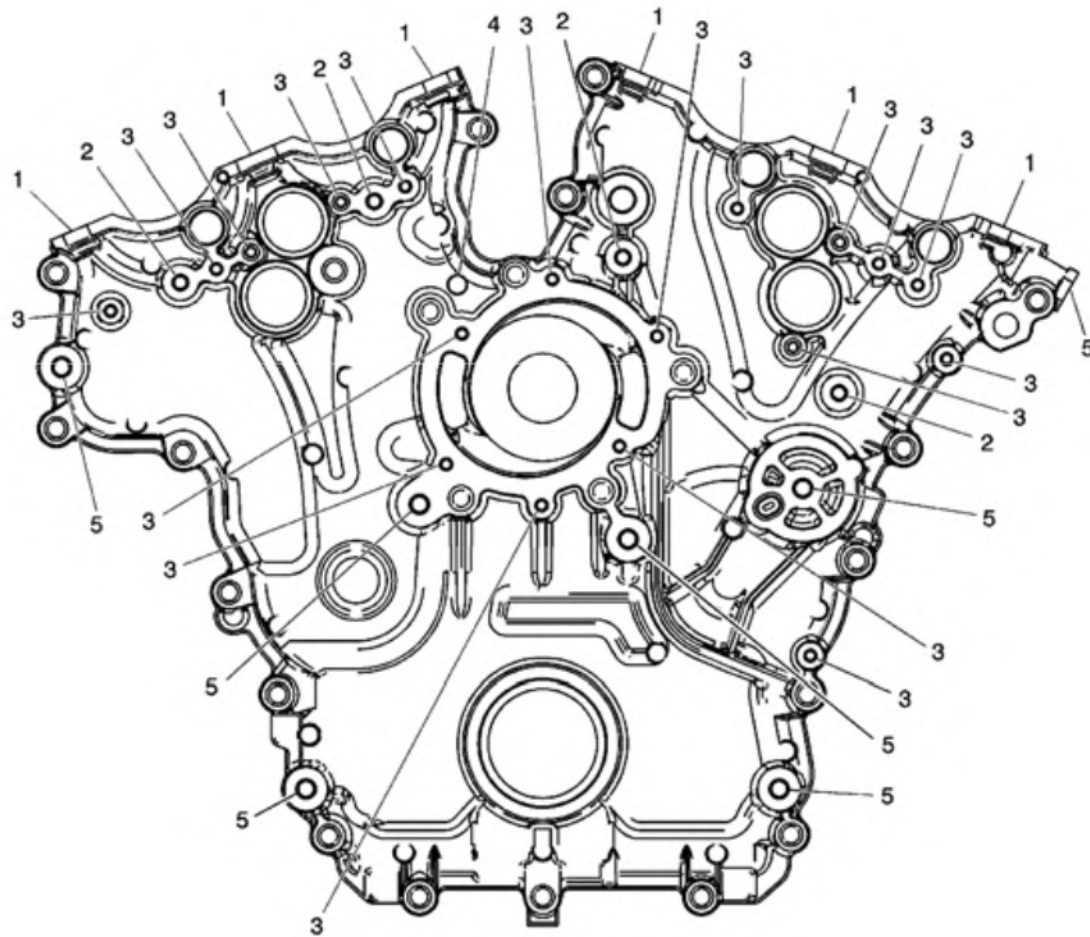
Engine Block Right Deck Face (LY7)



Engine Block Right Deck Face (LY7)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M11 x 2.0	723	N/A	N/A	724	725	108	102.5	4.0354	94.0	3.7008
2	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055

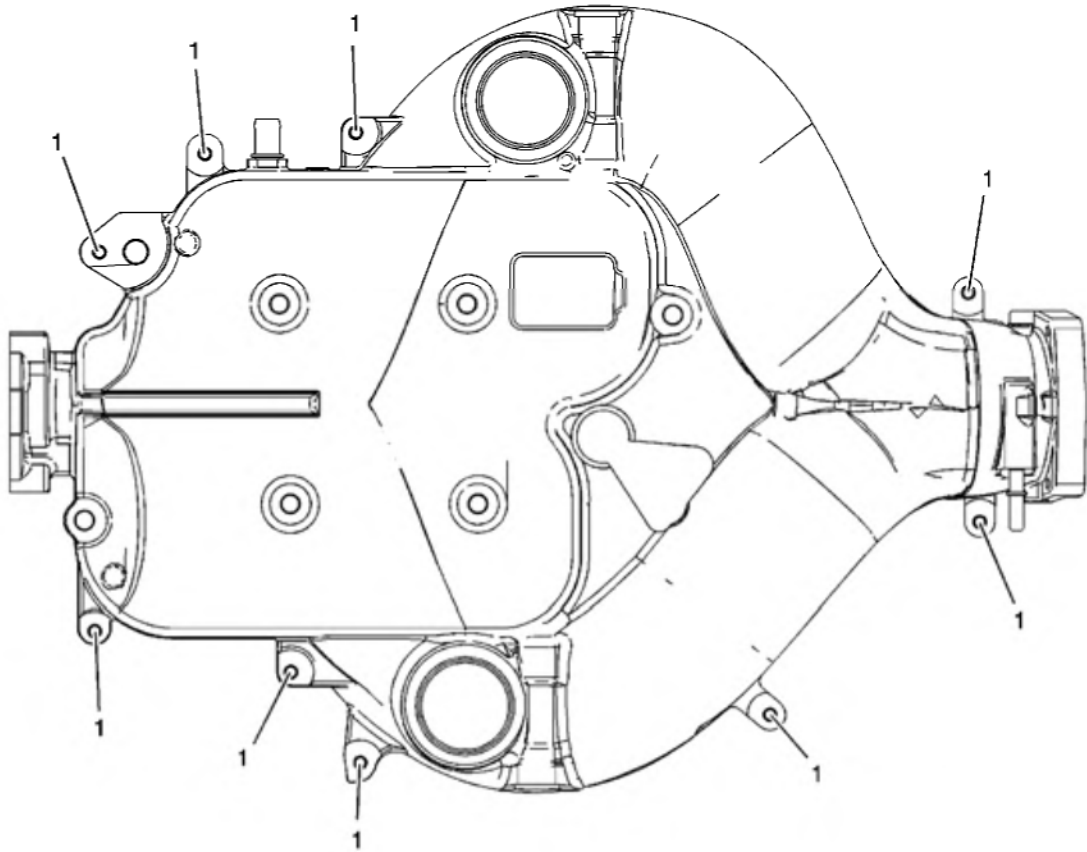
Engine Front Cover



Engine Front Cover

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	
2	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
3	M6 x 1.0	201	202	N/A	203	204	205	21.5	0.8465	18.0	0.7087
4	M10 x 1.5	211	212	N/A	213	214	215	THRU		THRU	
5	M10 x 1.5	211	212	N/A	213	214	420	32.5	1.2795	27.0	1.0630

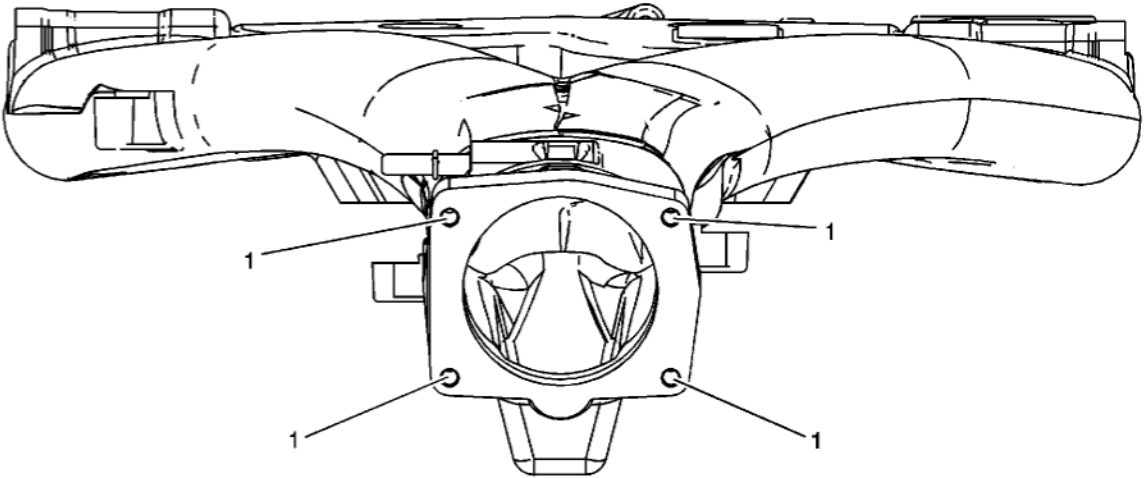
Upper Intake Manifold - Top



Upper Intake Manifold - Top

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	

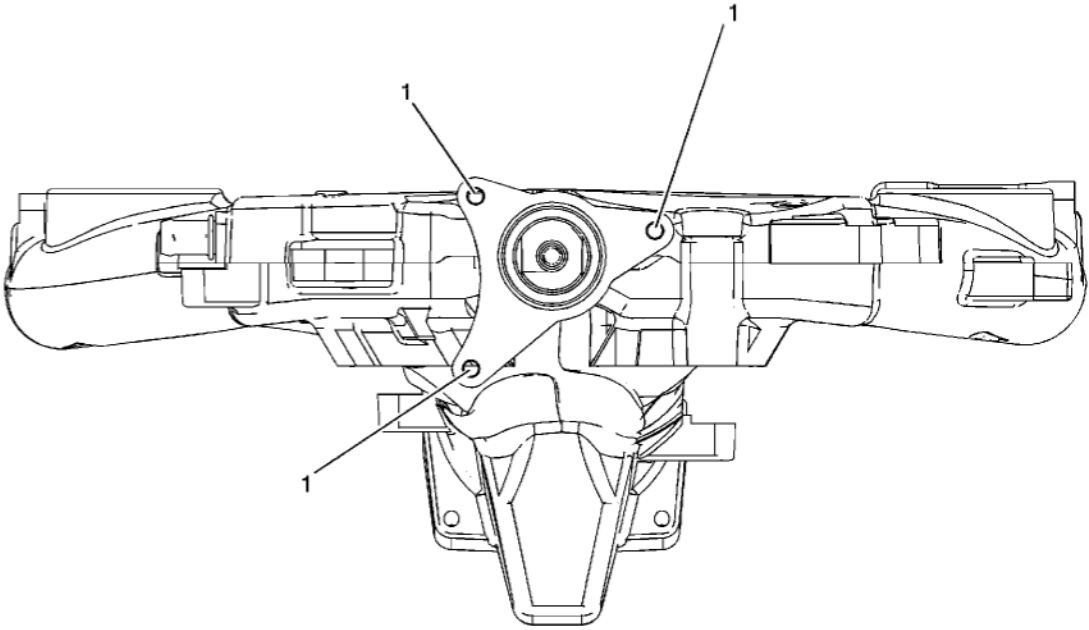
Upper Intake Manifold - Front



Upper Intake Manifold - Front

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	

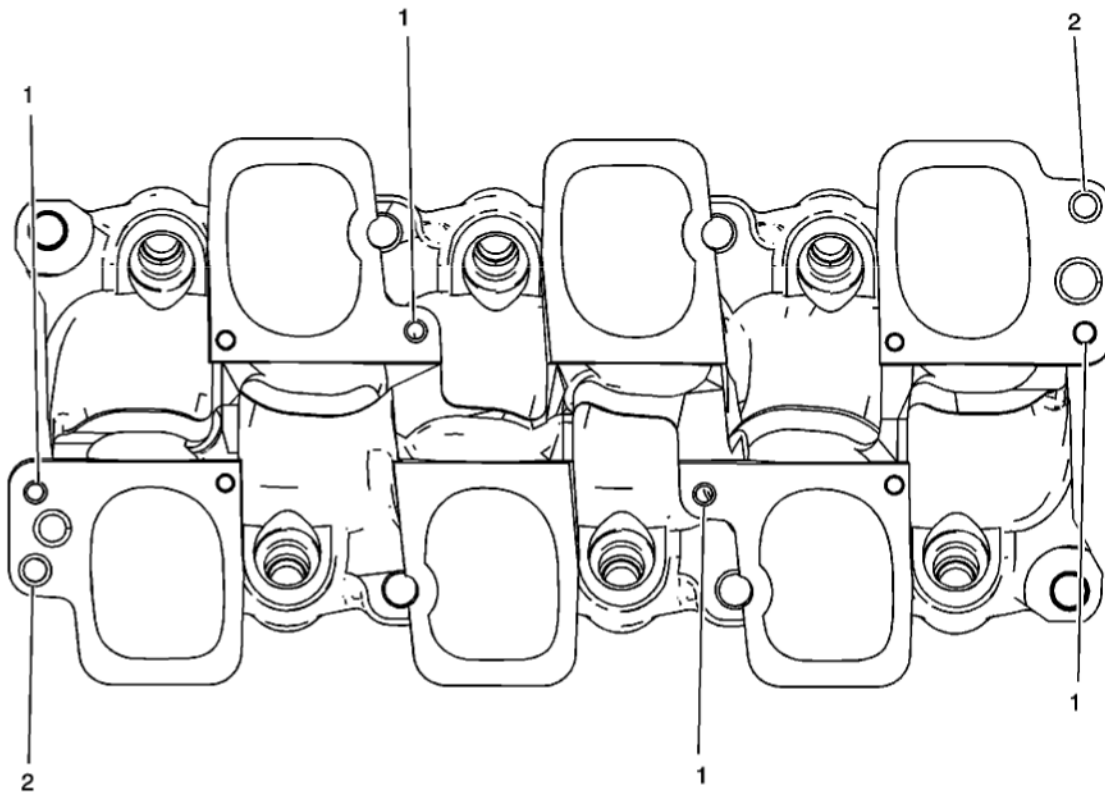
Upper Intake Manifold - Rear



Upper Intake Manifold - Rear

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	

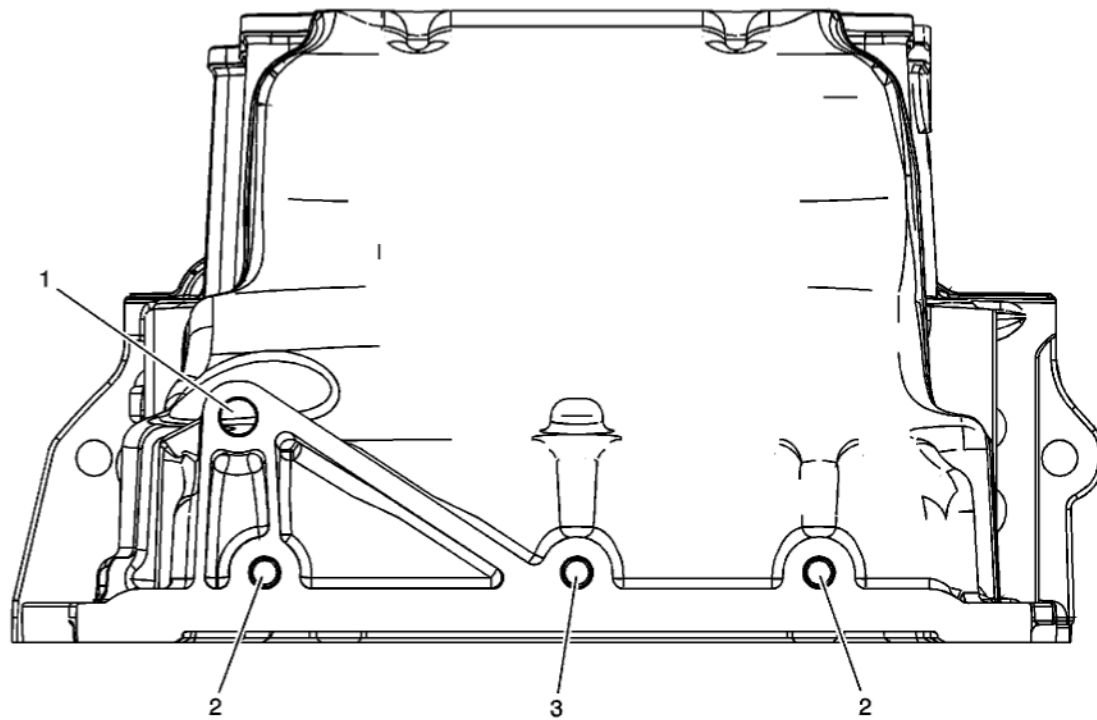
Lower Intake Manifold - Top



Lower Intake Manifold - Top

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	THRU		THRU	
2	M8 x 1.25	206	207	N/A	208	209	210	THRU		THRU	

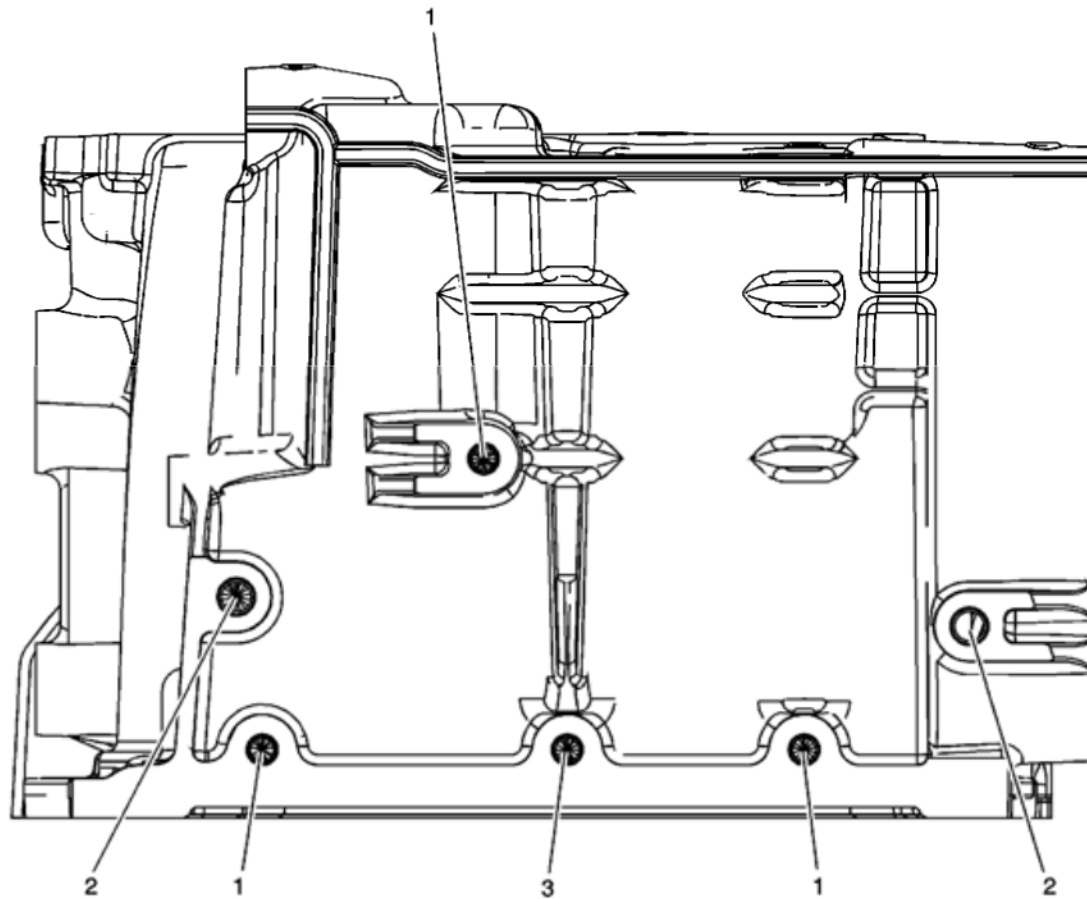
Oil Pan Front (RWD)



Oil Pan Front (RWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	420	33.5	1.3189	27.0	1.0630
2	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
3	M8 x 1.25	610	N/A	N/A	208	209	620	37.5	1.4764	32.0	1.2598

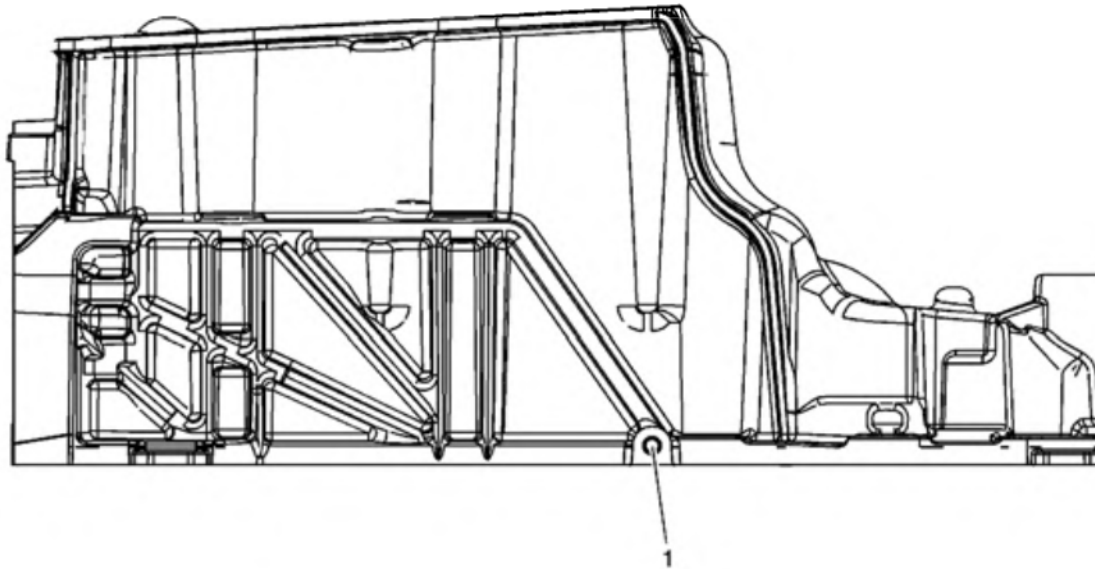
Oil Pan Front (AWD)



Oil Pan Front (AWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
2	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630
3	M8 x 1.25	610	N/A	N/A	208	209	620	37.5	1.4764	32.0	1.2598

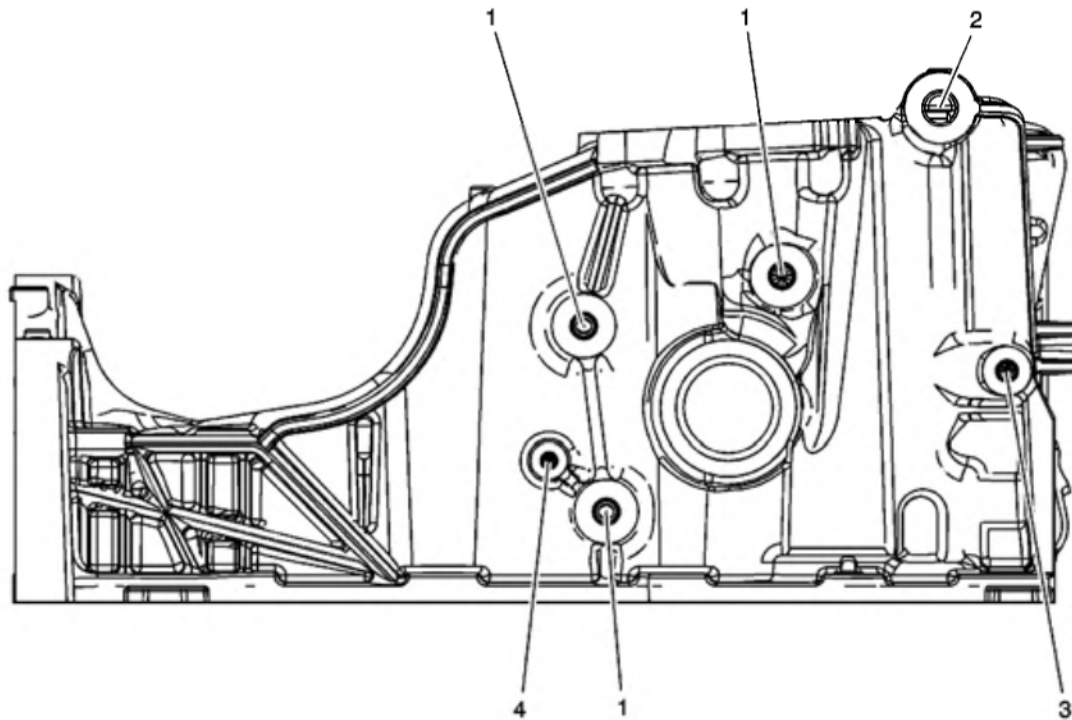
Oil Pan Left Side (RWD)



Oil Pan Left Side (RWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087

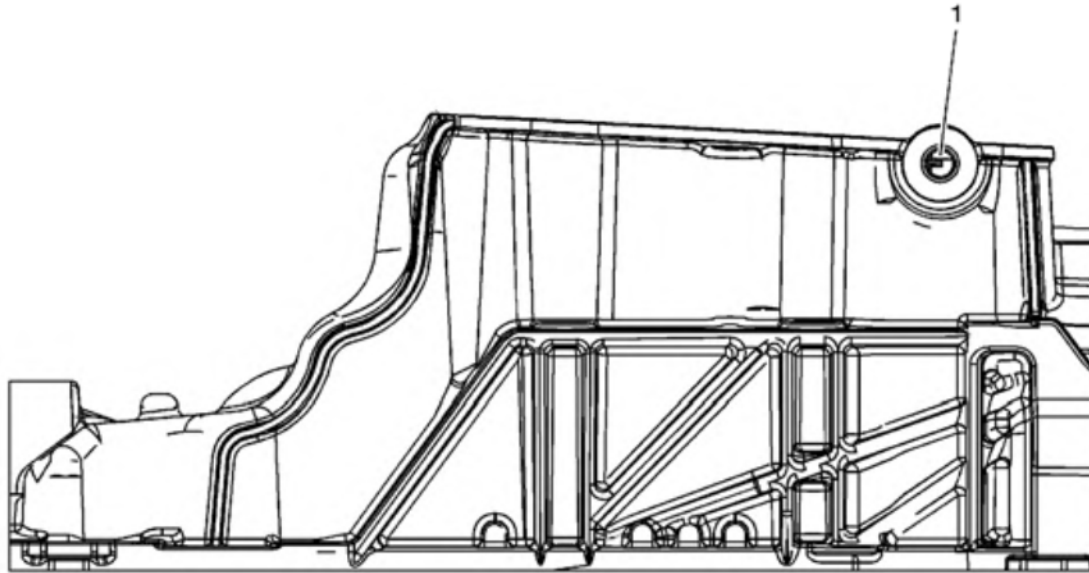
Oil Pan Left Side (AWD)



Oil Pan Left Side (AWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	420	33.5	1.3189	27.0	1.0630
2	M12 x 1.75	856	857	N/A	858	859	415	THRU		THRU	
3	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
4	M6 x 1.0	201	202	N/A	203	204	205	22.5	0.8858	18.0	0.7087

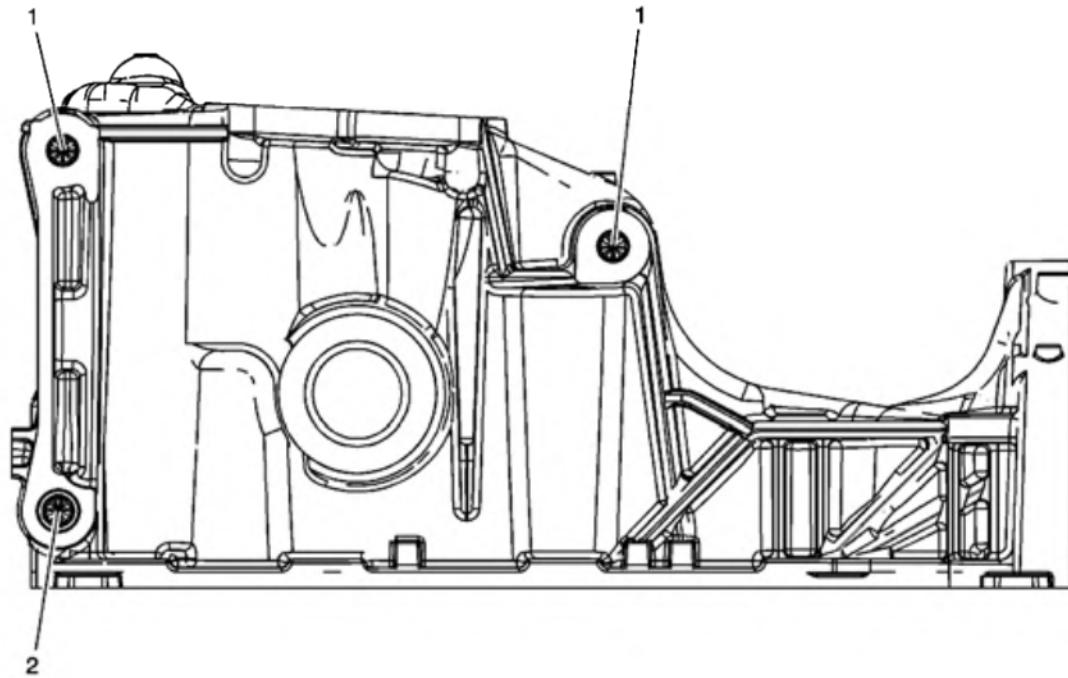
Oil Pan Right Side (RWD)



Oil Pan Right Side (RWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M12 x 1.75	856	857	N/A	858	859	416	THRU		THRU	

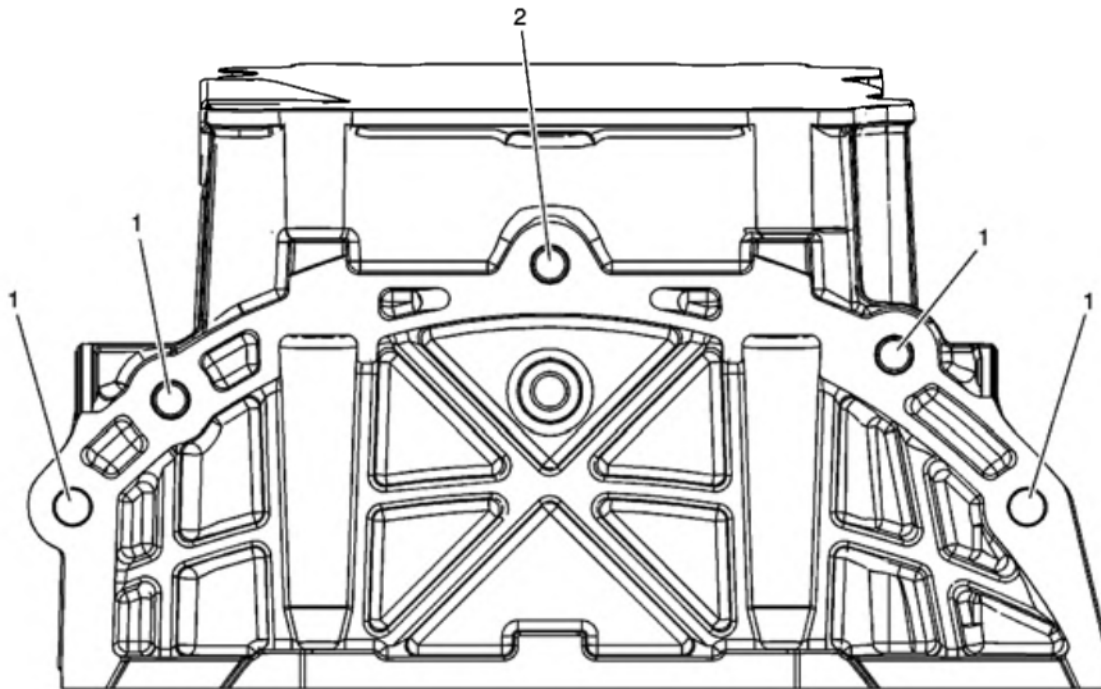
Oil Pan Right Side (AWD)



Oil Pan Right Side (AWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M12 x 1.75	856	857	N/A	858	859	855	39.5	1.5551	32.0	1.2598
2	M12 x 1.75	856	N/A	N/A	858	859	855	39.5	1.5551	32.0	1.2598

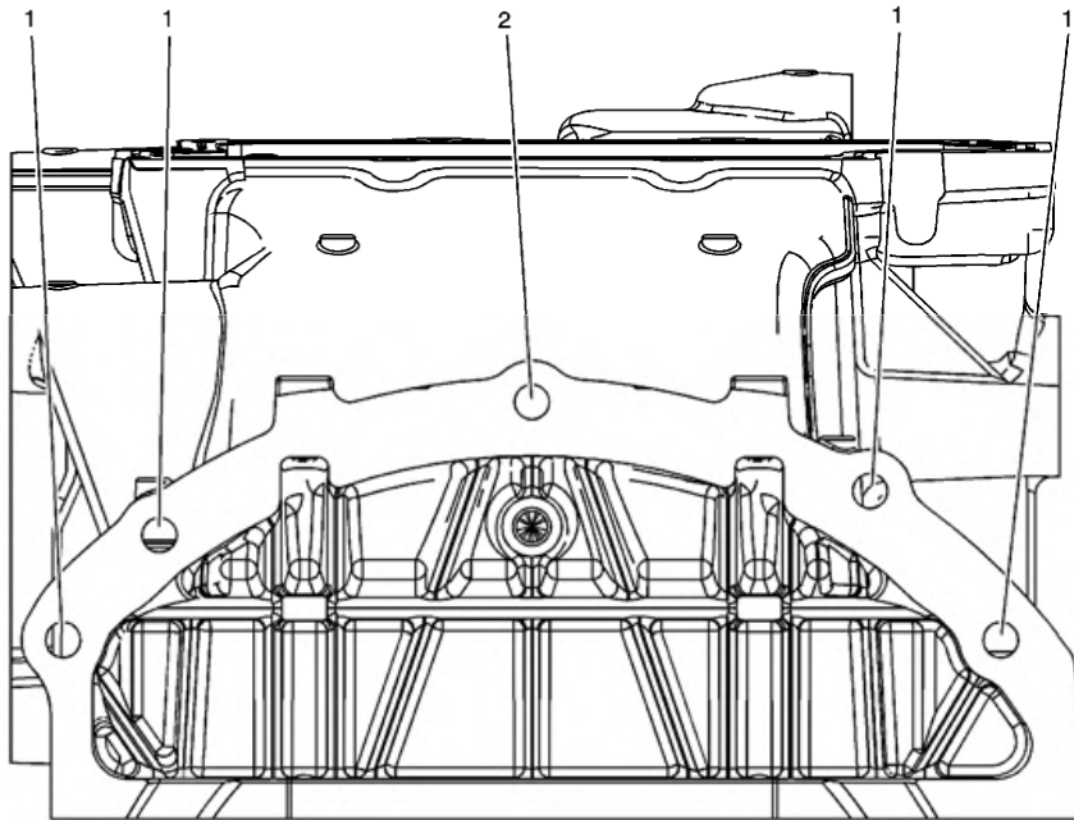
Oil Pan Rear (RWD)



Oil Pan Rear (RWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	215	THRU		THRU	
2	M10 x 1.5	211	212	N/A	213	214	215	33.5	1.3189	27.0	1.0630

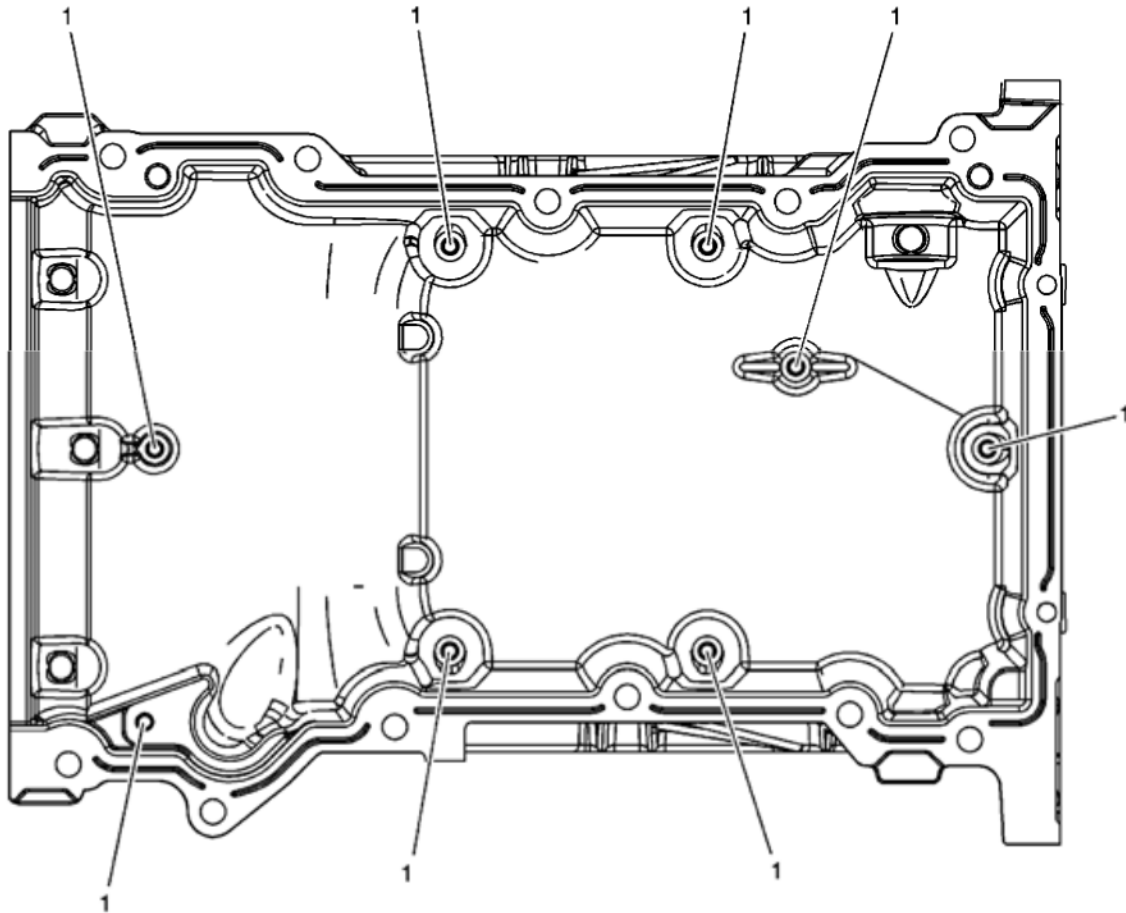
Oil Pan Rear (AWD)



Oil Pan Rear (AWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M10 x 1.5	211	212	N/A	213	214	420	33.5	1.3189	27.0	1.0630
2	M10 x 1.5	211	212	N/A	213	214	420	THRU		THRU	

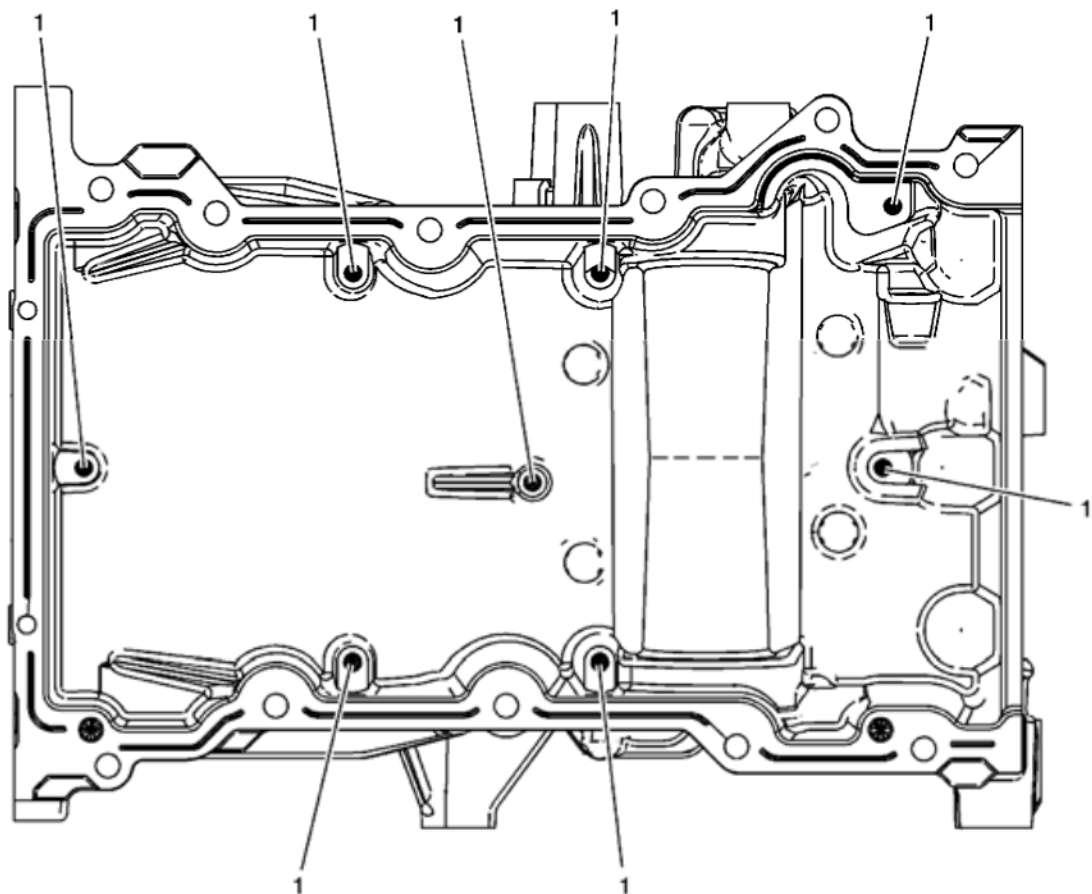
Oil Pan Top (RWD)



Oil Pan Top (RWD)

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	701	N/A	N/A	203	204	205	28.0	1.1024	23.5	0.9252

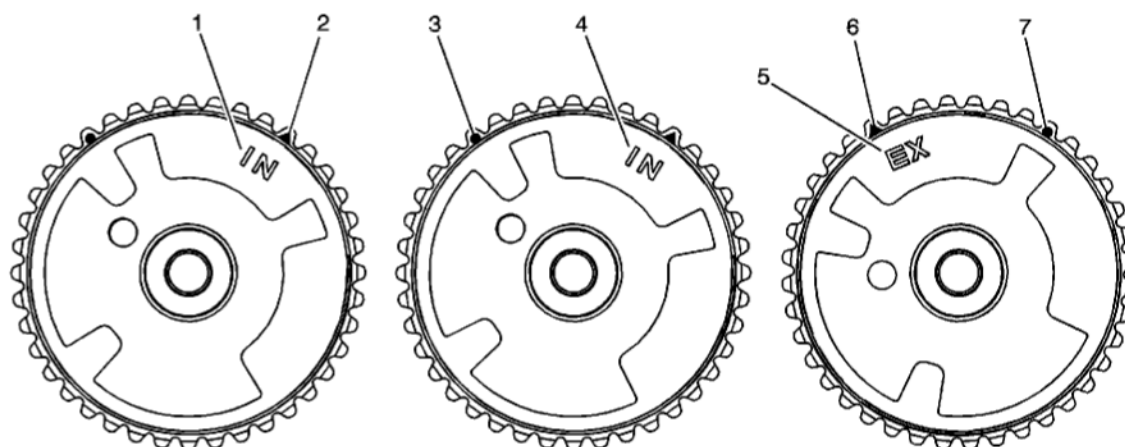
Oil Pan Top (AWD)



Oil Pan Top (AWD)

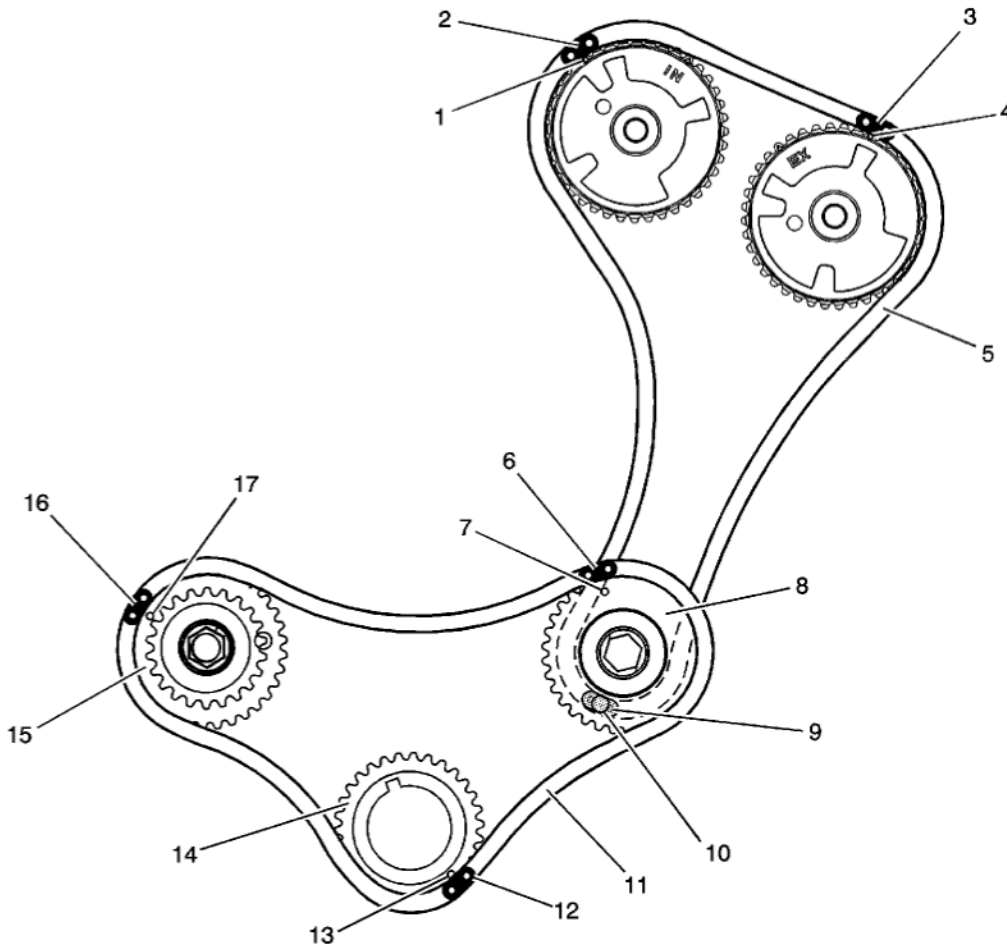
Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
		J 42385-						MM	(IN)	MM	(IN)
1	M6 x 1.0	701	N/A	N/A	203	204	205	28.0	1.1024	23.5	0.9252

Camshaft Position Actuator Timing Marks



- (1) Right Intake Camshaft Position Actuator Identifier
- (2) Right Intake Camshaft Position Actuator Right Side Timing Mark - Triangle
- (3) Left Intake Camshaft Position Actuator Left Side Timing Mark - Circle
- (4) Left Intake Camshaft Position Actuator Identifier
- (5) Exhaust Camshaft Position Actuator Identifier
- (6) Exhaust Camshaft Position Actuator Right Side Timing Mark - Triangle
- (7) Exhaust Camshaft Position Actuator Left Side Timing Mark - Circle

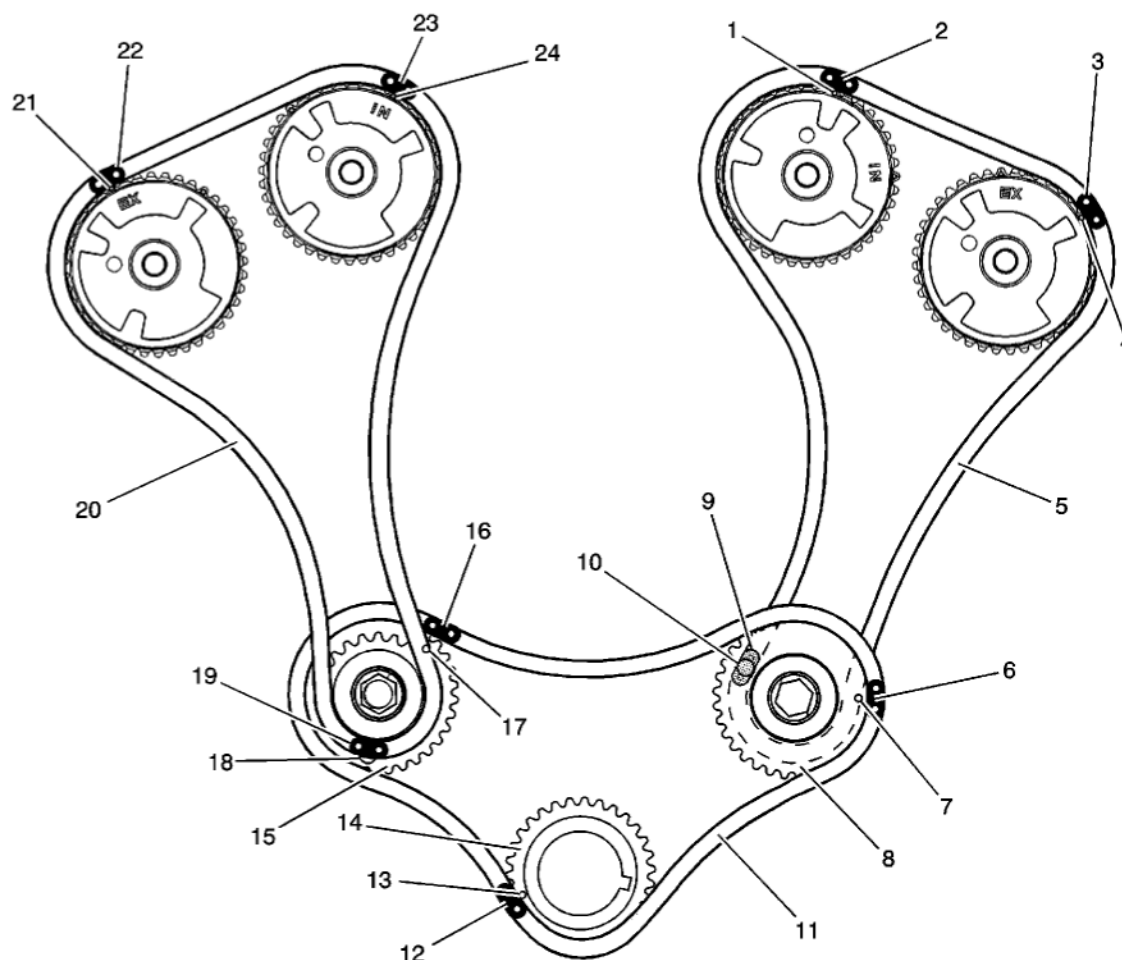
Stage One



- (1) Left Intake Camshaft Position (CMP) Actuator Timing Mark - Circle
- (2) Left Intake Secondary Camshaft Timing Drive Chain Timing Link
- (3) Left Exhaust Secondary Camshaft Timing Drive Chain Timing Link
- (4) Left Exhaust Camshaft Position (CMP) Actuator Timing Mark - Circle
- (5) Left Secondary Camshaft Timing Drive Chain
- (6) Primary Camshaft Drive Chain Timing Link for the Left Primary Camshaft Intermediate Drive Chain Sprocket
- (7) Left Primary Camshaft Intermediate Drive Chain Sprocket Timing Mark for the Primary Camshaft Drive Chain
- (8) Left Primary Camshaft Intermediate Drive Chain Sprocket
- (9) Left Secondary Camshaft Timing Drive Chain Timing Link for the Left Primary Camshaft Intermediate Drive Chain Sprocket. behind hole in sprocket

- (10) Left Primary Camshaft Intermediate Drive Chain Sprocket Timing Window for the Left Secondary Camshaft Timing Drive Chain Timing Link
- (11) Primary Camshaft Drive Chain
- (12) Primary Camshaft Drive Chain Timing Link for the Crankshaft Sprocket
- (13) Crankshaft Sprocket Timing Mark
- (14) Crankshaft Sprocket
- (15) Right Primary Camshaft Intermediate Drive Chain Sprocket
- (16) Primary Camshaft Drive Chain Timing Link for the Right Primary Camshaft Intermediate Drive Chain Sprocket
- (17) Right Primary Camshaft Intermediate Drive Chain Sprocket Timing Mark

Stage Two



- (1) Left Intake Camshaft Position (CMP) Actuator Timing Mark - Circle
- (2) Left Intake Secondary Camshaft Timing Drive Chain Timing Link
- (3) Left Exhaust Secondary Camshaft Timing Drive Chain Timing Link
- (4) Left Exhaust Camshaft Position (CMP) Actuator Timing Mark - Circle
- (5) Left Secondary Camshaft Timing Drive Chain
- (6) Primary Camshaft Drive Chain Timing Link for the Left Primary Camshaft Intermediate Drive Chain Sprocket
- (7) Left Primary Camshaft Intermediate Drive Chain Sprocket Timing Mark for the Primary Camshaft Drive Chain
- (8) Left Primary Camshaft Intermediate Drive Chain Sprocket
- (9) Left Secondary Camshaft Timing Drive Chain Timing Link for the Left Primary Camshaft Intermediate Drive Chain Sprocket. behind hole in sprocket

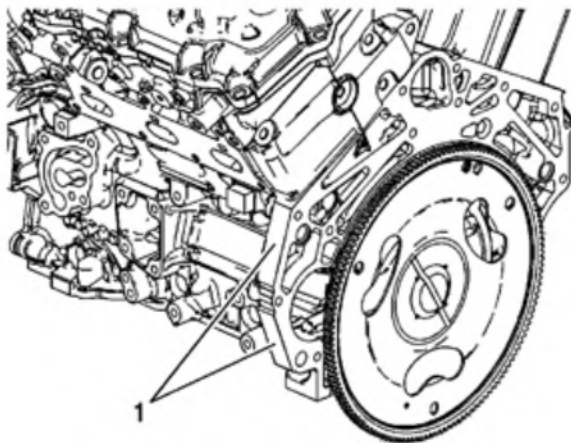
- (10) Left Primary Camshaft Intermediate Drive Chain Sprocket Timing Window
- (11) Primary Camshaft Drive Chain
- (12) Primary Camshaft Drive Chain Timing Link for the Crankshaft Sprocket
- (13) Crankshaft Sprocket Timing Mark
- (14) Crankshaft Sprocket
- (15) Right Primary Camshaft Intermediate Drive Chain Sprocket
- (16) Primary Camshaft Drive Chain Timing Link for the Right Primary Camshaft Intermediate Drive Chain Sprocket
- (17) Right Primary Camshaft Intermediate Drive Chain Sprocket Timing Mark for the Primary Camshaft Drive Chain
- (18) Right Primary Camshaft Intermediate Drive Chain Sprocket Timing Mark/Window for the Right Secondary Camshaft Timing Drive Chain
- (19) Right Secondary Camshaft Timing Drive Chain Timing Link for the Right Primary Camshaft Intermediate Drive Chain Sprocket
- (20) Right Secondary Camshaft Timing Drive Chain
- (21) Right Exhaust Camshaft Position (CMP) Actuator Timing Mark - Triangle
- (22) Right Exhaust Secondary Camshaft Timing Drive Chain Timing Link
- (23) Right Intake Secondary Camshaft Timing Drive Chain Timing Link
- (24) Right Intake Camshaft Position (CMP) Actuator Timing Mark - Triangle

Engine Identification

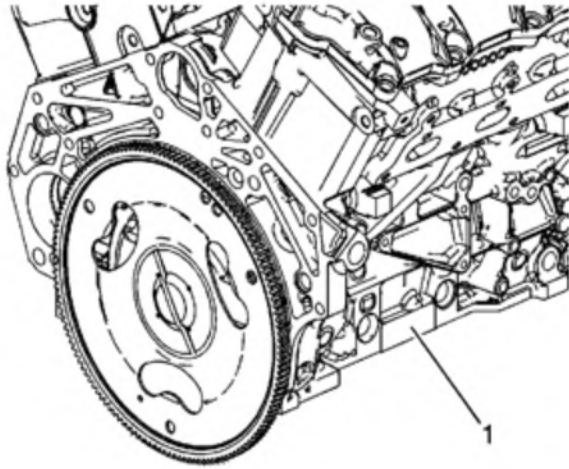
Vehicle Identification Number

The Vehicle Identification Number (VIN) Derivative is located in two places on the engine and is a nine digit number stamped or laser etched onto the block at the vehicle assembly plant. If reading the identification number the following information can be obtained:

- The first digit identifies the vehicle division.
- The second digit is the model year.
- The third digit identifies the assembly plant.
- The fourth through ninth digits are the last six digits of the Vehicle Identification Number (VIN).



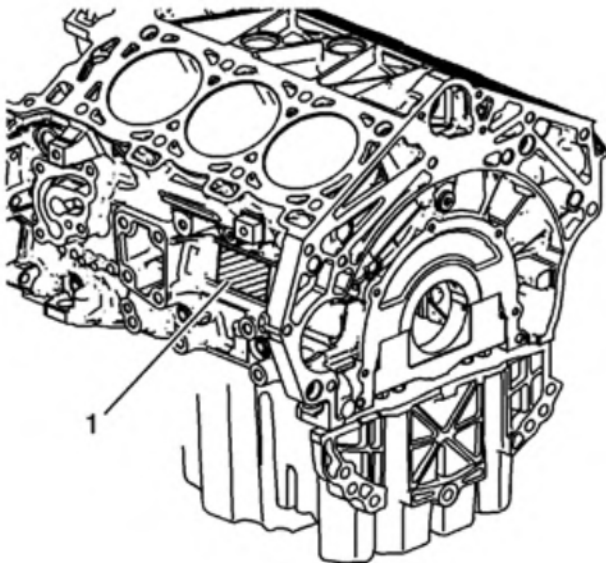
The engine block is marked with the VIN on a pad area on the left rear side (1).



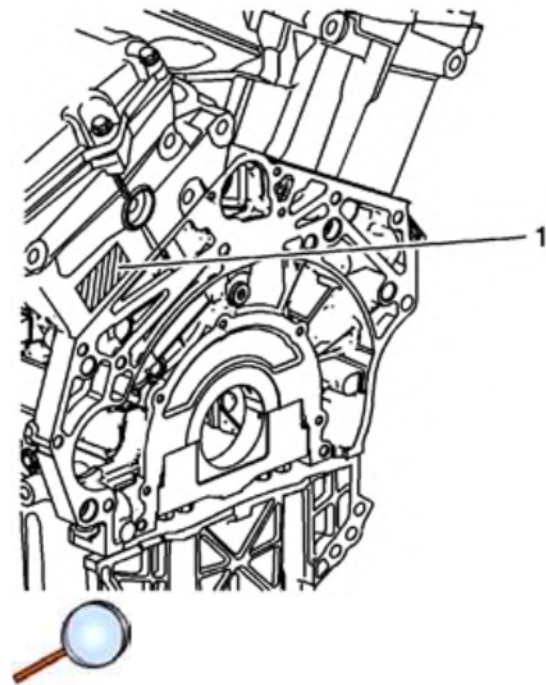
The engine block is marked with the VIN on a pad area on the center lower right side (1).

Engine Traceability Label

The engine traceability label is located in two places on the engine and consists of the broadcast code, bar code and sequence number.



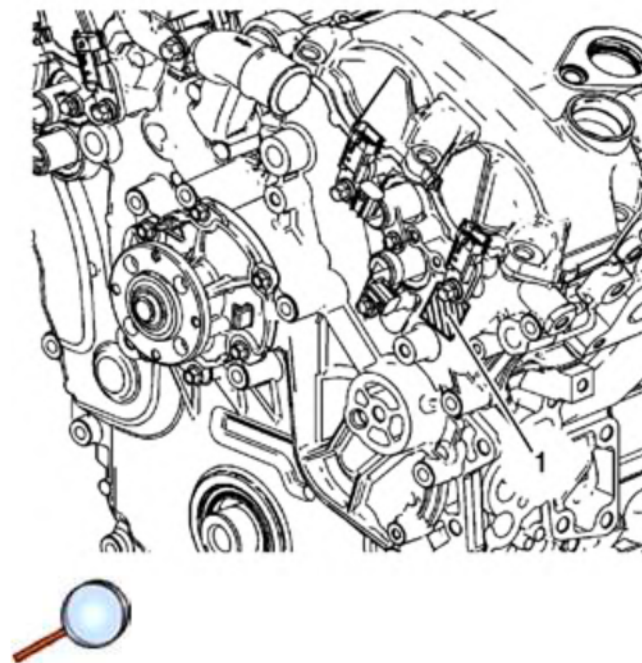
One engine traceability label (1) is located on the left rear side of the engine block.



Another engine traceability label (1) is located on the rear of the left cylinder head.

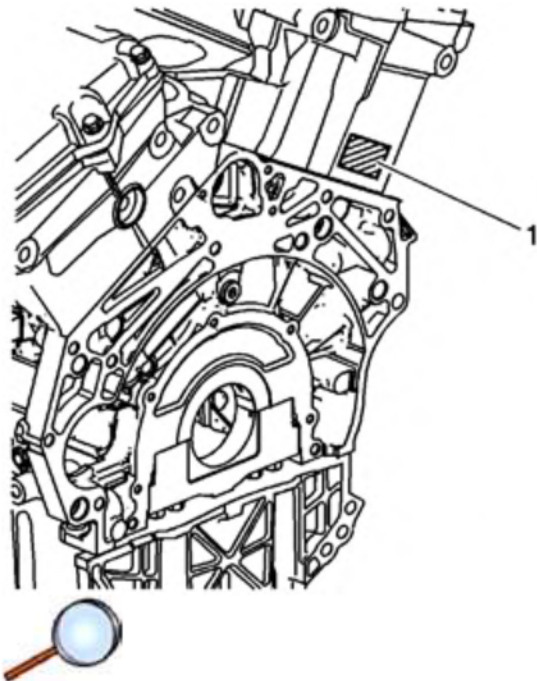
Engine Verification Label

The engine verification label is located in two places on the engine and consists of the broadcast code and bar code.



One engine verification label (1) is located on the left side of the engine front cover below the

exhaust camshaft position sensor.



Another engine verification label (1) is located on the rear of the right cylinder head.