Fastener Tightening Specifications

Application	Specification	
	Metric	English
A/C Compressor Bolt	50 N·m	37 lb ft
Air Cleaner Outlet Duct Clamp	8 N·m	71 lb in
Air Conditioning Compressor/Power Steering Pump Bracket Bolt	46 N·m	34 lb ft
Air Inlet Tube Nut	25 N·m	18 lb ft
Battery Cable Bracket Bolt	12 N·m	106 lb in
Battery Cable Bracket Nut	8 N·m	71 lb in
Bypass Pipe Bolt	25 N·m	18 lb ft
Camshaft Gear Bolt	234 N·m	173 lb ft
Camshaft Position Sensor Bolt	10 N·m	89 lb in
Camshaft Position Sensor Exciter Ring Bolt	9 N·m	80 lb in
Camshaft Thrust Plate Bolt	22 N·m	16 lb ft
Charged Air Cooler Bolt	21 N·m	15 lb ft
Charged Air Cooler Clamp	8 N·m	71 lb in
Connecting Rod Cap Bolt - Angular Tightening Method	1st Step 64 N·m	1st Step 47 lb ft
	2nd Step 30 degrees	2nd Step 30 degrees
	3rd Step 30 degrees	3rd Step 30 degrees
Coolant Pipe Bolt and Nut	25 N·m	18 lb ft
Coolant Tube to Water Pump Nut	25 N·m	18 lb ft
Cooling Fan Pulley	41 N·m	30 lb ft
Crankshaft Balancer Bolt	1st Step 100 N·m	1st Step 74 lb ft
	2nd Step 105 degrees	2nd Step 105 degrees
Crankshaft Bearing Cap Bolt	1st Step 98 N·m	1st Step 72 lb ft
	2nd Step 132 N·m	2nd Step 97 lb ft
	3rd Step 30 degrees	3rd Step 30 degrees
Crankshaft Bearing Cap Bolt - Angular Tightening Method	1st Step 100 N·m	1st Step 74 lb ft
	2nd Step 90 degrees	2nd Step 90 degrees
Crankshaft Bearing Cap Side Bolt	70 N·m	52 lb ft
Crankshaft Position Sensor Bolt	10 N·m	89 lb in
Crankshaft Position Sensor Spacer Bolt	10 N·m	89 lb in
Crossmember Bolt	100 N·m	74 lb ft

Cylinder Head M12 Bolt - Angular Tightening Method	1st Step 50 N·m	1st Step 37 lb ft
	2nd Step 80 N·m	2nd Step 59 lb ft
	3rd Step 60 degrees	
	4th Step 60 degrees	
Cylinder Head M8 Bolt	25 N·m	18 lb ft
Drive Belt Tensioner Pulley Bolt	50 N·m	37 lb ft
EGR to EGR Cooler Bolt	25 N·m	18 lb ft
EGR Bracket	25 N·m	18 lb ft
EGR Bracket Bolt	25 N·m	18 lb ft
EGR Bracket to Cooler Bolt	25 N·m	18 lb ft
Electrical Harness Bracket Bolt	10 N·m	89 lb in
Engine Block Coolant Plug	18 N·m	13 lb ft
Engine Block Ground Bolt	34 N·m	25 lb ft
Engine Mount Through Bolt to Frame	75 N·m	55 lb ft
Engine Mount to Block Bolts	58 N·m	43 lb ft
Engine Mount to Frame Bolt	65 N·m	48 lb ft
Engine Shield Bolt	20 N·m	15 lb ft
Exhaust Heat Shield Nut	10 N·m	89 lb in
Exhaust Manifold Bolt/Nut	57 N·m	42 lb ft
Exhaust Manifold Heat Shield Bolts	10 N·m	89 lb in
Exhaust Outlet Clamp	15 N·m	11 lb ft
Exhaust Outlet Heat Shield Bolts	10 N·m	89 lb in
Exhaust Pipe Bracket Nut	53 N·m	39 lb ft
Exhaust Pipe Clamp	53 N·m	39 lb ft
Exhaust Pipe Heat Shield Bolts	10 N·m	89 lb in
Exhaust Pipe to EGR Cooler Nuts	26 N·m	19 lb ft
Fan Pulley Bracket Bolt	50 N·m	37 lb ft
Flywheel Bolt - Angular Tightening Method	1st Step 79 N·m	1st Step 58 lb ft
	2nd Step 60 degrees	2nd Step 60 degrees
	3rd Step 60 degrees	3rd Step 60 degrees
Flywheel Housing Bolt	80 N·m	60 lb ft
Flywheel Housing to Upper Oil Pan Bolt	50 N·m	37 lb ft
Front Engine Cover Bolt	25 N·m	18 lb ft
Fuel Filter Bracket Bolt	30 N·m	22 lb ft
Fuel Injection Pipe Nut	41 N·m	30 lb ft
Fuel Injector Bracket Bolt	30 N·m	22 lb ft
Fuel Inlet Pipe Bracket Bolt	21 N·m	15 lb ft
Fuel Injection Pump Assembly to Cylinder Block Bolt	25 N·m	18 lb ft
Fuel Injection Pump to Bracket Bolt	28 N·m	20 lb ft

Fuel Injection Pump Drive Gear Nut	70 N·m	52 lb ft
Fuel Line Bracket Nut	21 N·m	15 lb ft
Fuel Temperature Sensor	22 N·m	16 lb ft
Fuel Pipes Bracket Bolt	25 N·m	18 lb ft
Fuel Pressure Relief Valve	100 N·m	74 lb ft
Fuel Rail Assembly Bolt	25 N·m	18 lb ft
Fuel Rail Balance Pipe Bolt	21 N·m	15 lb ft
Generator Bracket Bolt and Nut	50 N·m	37 lb ft
Generator Positive Cable Nut	9 N·m	80 lb in
Glow Plug	18 N·m	13 lb ft
Glow Plug Controller Bolt	10 N·m	89 lb in
Glow Plug Harness Bracket Bolt	10 N·m	89 lb in
Glow Plug Nut	2 N·m	18 lb in
Glow Plug Power Feed Nut	15 N·m	11 lb ft
Glow Plug Relay Assembly Bolt	10 N·m	89 lb in
Heater Outlet Pipe Bolt	25 N·m	18 lb ft
Heater Pipe Bolt	25 N·m	18 lb ft
Hood Hinge Bolt	25 N·m	18 lb ft
Idle Pulley Bolt	50 N·m	37 lb ft
Injector Bracket Bolt	23 N·m	16 lb ft
Intake Manifold Bolts/Nuts	25 N·m	18 lb ft
Oil Cooler Adapter Bolts	25 N·m	18 lb ft
Oil Cooler Adapter Nuts	25 N·m	18 lb ft
Oil Cooler Assembly Bolts	25 N·m	18 lb ft
Oil Cooler Adapter Stud	10 N·m	89 lb in
Oil Drain Plug	84 N·m	62 lb ft
Oil Fill Tube Bolt	25 N·m	18 lb ft
Oil Filter	24 N·m	18 lb ft
Oil Gallery Plugs	53 N·m	39 lb ft
Oil Level Indicator Tube Bolt	21 N·m	15 lb ft
Oil Level Sensor Bolt	10 N·m	89 lb in
Oil Level Sensor Harness Bolt	40 N·m	29 lb ft
Oil Pan Bolts/Nuts - Lower	10 N·m	89 lb in
Oil Pan Bolt - Upper	20 N·m	15 lb ft
Oil Pan Skid Plate Bolt	20 N·m	15 lb ft
Oil Pressure Sensor Unit	49 N·m	36 lb ft
Oil Pressure Relief Valve	39 N·m	29 lb ft
Oil Pump Bolt	21 N·m	15 lb ft
Oil Pump Driven Gear Nut	100 N·m	74 lb ft
Oil Pump Gear Cover Bolt	21 N·m	15 lb ft

Oil Pump Pipe and Screen Assembly Bolts and Nuts	25 N·m	18 lb ft
Piston Cooling Nozzle Eye Bolt	21 N·m	15 lb ft
Positive Cable Junction Block Bracket to Power Steering Pump Bolt	9 N·m	80 lb in
Positive Crankcase Ventilation Cover Screws	4 N·m	35 lb in
Positive Crankcase Ventilation Oil Separator Bracket Nut	25 N·m	18 lb ft
Power Steering Pump Bracket Bolt	50 N·m	37 lb ft
Power Steering Pump Bolt	50 N·m	37 lb ft
Rocker Arm Shaft Bracket Bolt	41 N·m	30 lb ft
Starter Motor Bolt	78 N·m	58 lb ft
Transmission Fill Tube Nut	18 N·m	13 lb ft
Thermostat Housing Bolts/Nuts	25 N·m	18 lb ft
Thermostat Cover Bolt	25 N·m	18 lb ft
Torque Converter Bolt	60 N·m	44 lb ft
Transmission Oil Cooler Clip Nut	9 N·m	80 lb in
Turbocharger Bolt	108 N·m	80 lb ft
Turbocharger Coolant Outlet Pipe Bracket Nut	10 N·m	89 lb in
Turbocharger Heat Shield Bolts	10 N·m	89 lb in
Turbocharger Oil Return Pipe Stud	10 N·m	89 lb in
Turbocharger Oil Supply Hose Eye Bolt	26 N·m	19 lb ft
Turbocharger Oil Return Pipe Bolts/Nuts	25 N·m	18 lb ft
Upper Oil Pan to Flywheel Housing Bolts	20 N·m	15 lb ft
Valve Adjusting Nut	22 N·m	16 lb ft
Valve Lifter Holdown Bracket Bolt	11 N·m	97 lb in
Valve Rocker Arm Cover Bolt - Lower	10 N·m	89 lb in
Valve Rocker Arm Cover Bolt - Upper	8 N·m (Two Times)	71 lb in (Two Times)
Water Outlet Bolts	25 N·m	18 lb ft
Water Pump Bolt	25 N·m	18 lb ft
Water Pump Inlet Pipe Bolts	25 N·m	18 lb ft

Engine Mechanical Specifications

Application	Specification	
	Metric	English
General		
Engine Type	90 degree V-8	
Displacement	6.6 Liter	402 cu in
RPO	LMM	
Bore	103 mm	4.0551 in
Stroke	99 mm	3.8976 in
Compression Ratio	16.8:1	
Engine Compression Test - Minimum	2069 KPa	300 psi
Idle Speed	680 RPM	
Firing Order	1-2-7-8-4-5-6-3	
Block		
Cylinder Bore Diameter - Service Limits	103.11 mm	4.0594 in
Cylinder Bore Diameter - Production Value	103.0-103.014 mm	4.0551-4.0557 in
Cylinder Bore Out-of-Round - Production Value	0.015 mm	0.0006 in
Cylinder Bore Taper - Production Value	0.015 mm	0.0006 in
Camshaft		
Camshaft Bearing Inside Diameter - Service Limit	61.07 mm	2.4043 in
Camshaft Bearing Inside Diameter - Production Value	61.00-61.03 mm	2.4016-2.4028 in
Camshaft End Play - Service Limit	0.2 mm	0.0079 in
Camshaft Journal Diameter - Service Limit	60.92 mm	2.3984 in
Camshaft Journal Diameter - Production Value	60.932-60.962 mm	2.3990-2.4001 in
Camshaft Lobe Lift - Exhuast - Production Value	5.907 mm	0.2326 in
Camshaft Lobe Lift - Intake - Production Value	7.273 mm	0.2863 in
Camshaft Runout - Service Limit	0.05 mm	0.0020 in
Cooling System		
Capacity @ Engine RPM	270 L/min @ 3172 RPM	
Thermostat Full Open Temperature	110 degrees C	230 degrees F
Turbocharger Coolant Bypass Valve	60 degrees C	140 degrees F
Connecting Rod		
Connecting Rod Bearing Clearance - Service Limit	0.10 mm	0.0039 in
Connecting Rod Bearing Clearance - Production	0.036-0.077 mm	0.0014-0.0030 in

Value		
Connecting Rod Bore Diameter - Bearing End - Production Value	62.958-62.979 mm	2.4789-2.4795 in
Connecting Rod Bore Diameter - Pin End - Service Limit	34.53 mm	1.3594 in
Connecting Rod Bore Diameter - Pin End - Production Value	34.512-34.522 mm	1.3587-1.3591 in
Connecting Rod Length	163.0 mm	6.42 in
Connecting Rod Side Clearance - Service Limit	0.54 mm	0.0213 in
Connecting Rod Side Clearance - Production Value	0.31-0.49 mm	0.0122-0.0193 in
Crankshaft		
Connecting Rod Journal Diameter - Service Limit	62.88 mm	2.4756 in
Connecting Rod Journal Diameter - Production Value	62.902-62.922 mm	2.4764-2.4772 in
Crankshaft End Play - Service Limit	0.54 mm	0.0213 in
Crankshaft End Play - Production Value	0.04-0.205 mm	0.0016-0.0081 in
Crankshaft Main Bearing Clearance - Service Limit	0.14 mm	0.0055 in
Crankshaft Main Bearing Clearance - Production Value	0.039-0.070 mm	0.0015-0.0028 in
Crankshaft Main Journal Diameter - Service Limit	79.89 mm	3.1453 in
Crankshaft Main Journal Diameter - Production Value	79.905-79.925 mm	3.1459-3.1466 in
Crankshaft Runout - Service Limit	0.44 mm	0.0173 in
Crankshaft Runout - Production Value	0.05 mm	0.0020 in
Cylinder Head		
Surface Flatness - Block Deck - Service Limit	0.2 mm	0.0079 in
Surface Flatness - Block Deck - Production Value	0.075 mm	0.0030 in
Surface Flatness - Exhaust Manifold Deck - Production Value	0.1 mm	0.0039 in
Surface Flatness - Intake Manifold Deck - Production Value	0.1 mm	0.0039 in
Exhaust Manifold		
Surface Flatness- Production Value	0.3 mm	0.0118 in
Intake Manifold		
Surface Flatness - Production Value	0.3 mm	0.0118 in
Lubrication System		
Oil Capacity - with Filter	10 qt	9.5 L
Oil Capacity - without Filter	9.2 qt	8.7 L
Oil Pressure - Minimum- Hot - at idle	98 KPa	14 psi
Oil Pressure - Minimum - 1800 RPM	294 KPa	42 psi
Oil Relief Valve Opening Pressure	441 KPa	64 psi

Piston Cooling Jet Valve Opening Pressure	196 KPa	29 psi
Oil Pump		
Gear Shaft Outside Diameter - Drive - Service Limit	19.86 mm	0.7819 in
Gear Shaft Outside Diameter - Drive - Production Value	19.947-19.960 mm	0.7853-0.7858 in
Gear Shaft Outside Diameter - Driven - Service Limit	19.86 mm	0.7819 in
Gear Shaft Outside Diameter - Driven - Production Value	19.947-19.960 mm	0.7853-0.7858 in
Gear Shaft-to-Bushing - Service Limit Clearance	0.14 mm	0.0055 in
Gear-to-Cover Clearance - Drive/Driven - Service Limit	0.109 mm	0.0043 in
Gear-to-Cover Clearance - Drive/Driven - Production Value	0.064-0.109 mm	0.0025-0.0043 in
Gear-to-Housing Clearance - Drive/Driven - Service Limit	0.22 mm	0.0087 in
Gear-to-Housing Clearance - Drive/Driven - Production Value	0.125-0.221 mm	0.0049-0.0087 in
Piston Rings		
Piston Ring End Gap-First Compression Ring - Service Limit	1.37 mm	0.0539 in
Piston Ring End Gap-First Compression Ring - Production Value	0.3-0.45 mm	0.0118-0.0177 in
Piston Ring End Gap-Second Compression Ring - Service Limit	1.35 mm	0.0531 in
Piston Ring End Gap-Second Compression Ring - Production Value	0.50-0.65 mm	0.0197-0.0256 in
Piston Ring End Gap-Oil Control Ring - Service Limit	1.20 mm	0.0472 in
Piston Ring End Gap-Oil Control Ring - Production Value	0.15-0.35 mm	0.0059-0.0138 in
Piston Ring to Groove Clearance-First Compression Ring - Service Limit	0.26 mm	0.0102 in
Piston Ring to Groove Clearance-First Compression Ring - Production Value	0.08-0.17 mm	0.0030-0.0067 in
Piston Ring to Groove Clearance-Second Compression Ring - Service Limit	0.10 mm	0.0039 in
Piston Ring to Groove Clearance-Second Compression Ring - Production Value	0.01-0.03 mm	0.0004-0.0012 in
Piston Ring to Groove Clearance-Oil Control Ring - Service Limit	0.12 mm	0.0047 in
Piston Ring to Groove Clearance-Oil Control Ring - Production Value	0.01-0.03 mm	0.0004-0.0012 in
Pistons and Pins		
Piston-Piston Diameter	102.948-	

	102.960 mm	4.0531-4.0535 in
Piston-Piston Pin Bore Diameter	34.504-34.512 mm	1.3584-1.3587 in
Pin-Piston Pin Clearance to Piston Pin Bore - Service Limit	0.017 mm	0.0007 in
Pin-Piston Pin Clearance to Piston Pin Bore - Production Value	0.004-0.017 mm	0.0002-0.0007 in
Pin-Piston Pin Diameter - Service Limit	34.45 mm	1.3563 in
Pin-Piston Pin Diameter - Production Value	34.495-34.5 mm	1.3581-1.3583 in
Starter		
Rated Output	3.5 KW	
Valve System		
Valves-Valve Face Angle - Production Value	45 degrees	
Valves-Valve Face Width - Service Limit	2.5 mm	0.0984 in
Valves-Valve Face Width - Production Value	2.1 mm	0.0827 in
Valves-Valve Head Diameter - Exhaust	31.0 mm	1.22 in
Valves-Valve Head Diameter - Intake	33.0 mm	1.30 in
Valves-Valve Seat Angle	45 degrees	
Valves-Valve Stem Diameter	7.0 mm	0.28 in
Valves-Valve Stem Oil Seal Installed Height	6.05 mm	0.2382 in
Valves-Valve Stem-to-Guide Clearance - Service Limit	0.20 mm	0.0079 in
Valves-Valve Stem-to-Guide Clearance - Exhaust - Production Value	0.038-0.071 mm	0.0015-0.0028 in
Valves-Valve Stem-to-Guide Clearance - Intake - Production Value	0.030-0.063 mm	0.0012-0.0025 in
Valves-Valve Stem-to-Guide Clearance	0.20 mm	0.0079 in
Valve Lifters/Push Rods-Push Rod Straightness	0.8 mm	0.0315 in
Rocker Arms-Valve Rocker Arm Bore Diameter	22.010-22.035 mm	0.8665-0.8675 in
Rocker Arms-Valve Rocker Arm Bore-to-Shaft Clearance - Service Limit	0.20 mm	0.0079 in
Rocker Arms-Valve Rocker Arm Bore-to-Shaft Clearance - Production Value	0.010-0.056 mm	0.0004-0.0022 in
Rocker Arms-Valve Rocker Arm Ratio - Exhaust	1.69:1	
Rocker Arms-Valve Rocker Arm Ratio - Intake	1.36:1	
Rocker Arms-Valve Rocker Arm Shaft Diameter - Service Limit	21.85 mm	0.8602 in
Rocker Arms-Valve Rocker Arm Shaft Diameter - Production Value	21.979-22.000 mm	0.8653-0.8661 in
Valve Springs-Valve Spring Free Length - Production Value	56.6 mm	2.2283 in
Valve Springs-Valve Spring Installed Height - Production Value	41 mm	1.6142 in

Valve Springs-Valve Spring Load - Exhaust - Service Limit	275 N at 41 mm	61.8 lb at 1.61 in
Valve Springs-Valve Spring load - Exhaust - Production Value	315-363 N at 41 mm	71-81.6 lb at 1.61 in
Valve Springs-Valve Spring Load - Intake - Service Limit	306 N at 41 mm	68.8 lb at 1.61 in
Valve Springs-Valve Spring Load - Intake - Production Value	315-363 N at 41 mm	71-81.6 lb at 1.61 in

Adhesives, Fluids, Lubricants, and Sealers

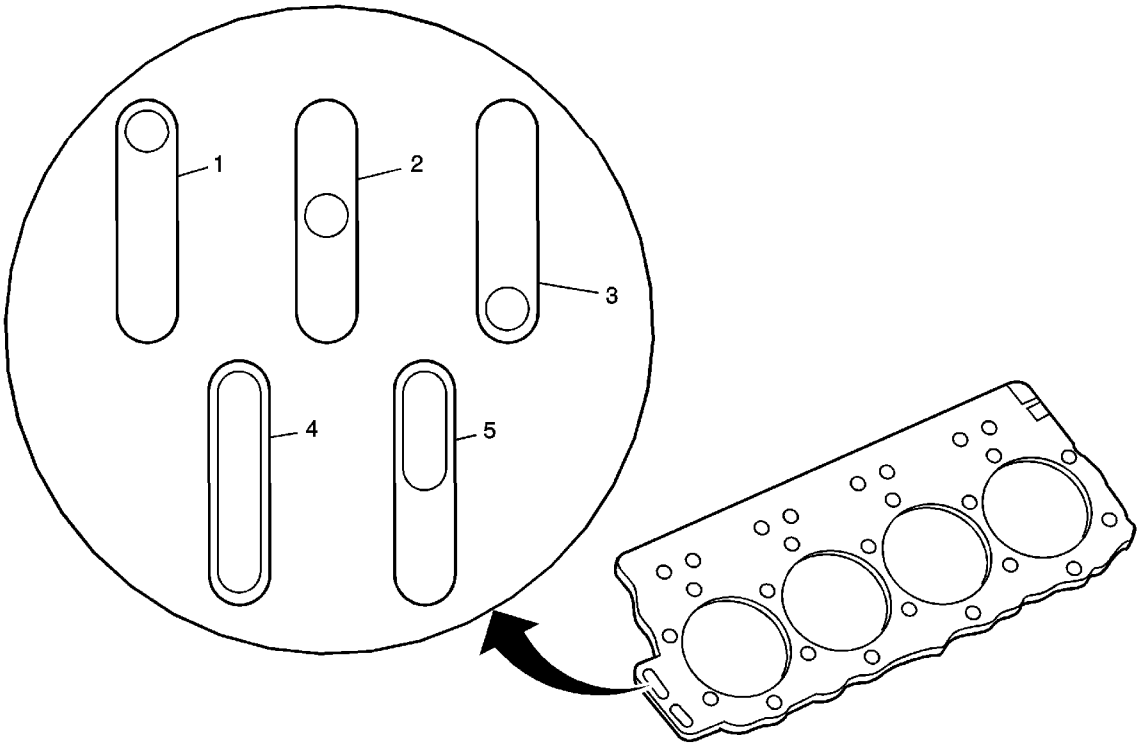
Application	Type of Material	GM Part Number	
		United States	Canada
Sealing Cup Plug	Locktite 272T or Equivalent	12345493	10953488
Upper Oil Pan to Cylinder Block	Sealant	12378521	88901148
Flywheel Housing to Cylinder Block	Sealant	12378521	88901148
Engine Front Cover to Cylinder Block	Sealant	12378521	88901148
Lower Oil Pan to Upper Oil Pan	Sealant	12378521	88901148
Crankshaft Bearing Side Cap Bolts	Sealant	12346004	10953480
Intake Manifold to Cylinder Head	Sealant	12378521	88901148
Camshaft Bearing	Engine Oil	12345634	993297
Rocker Arm Shaft	Engine Oil	12345634	993297
Valve Bridge Cap	Engine Oil	12345634	993297
Valve Stem Seal	Engine Oil	12345634	993297
Valve Lifter	Engine Oil	12345634	993297
Piston Ring	Engine Oil	12345634	993297
Crankshaft Bearing	Engine Oil	12345634	993297
Connecting Rod Bearing	Engine Oil	12345634	993297
Thrust Bearing	Engine Oil	12345634	993297
Camshaft Bearing	Engine Oil	12345634	993297
Camshaft	Engine Oil	12345634	993297
Connecting Rod Small End Bushing	Engine Oil	12345634	993297
Push Rod	Engine Oil	12345634	993297
Crankshaft Bearing Cap Bolt	Molybdenum Disulfide	1052948	992926
Lithium Grease	Lubricant	12346293	--
Parts Cleaner	Cleaner	12377981	10953463

Connecting Rod Bearings Selection Specifications

Connecting Rod Bearing Grade

Connecting Rod Grade (Stamped on Connecting Rod)	Use This Bearing Color	Bearing Thickness		Oil Clearance	
		Metric (mm)	English (in)	Metric (mm)	English (in)
A	Green	2.007 - 2.013	0.0790 - 0.0793	0.037 - 0.076	0.0015 - 0.0030
B	Yellow	2.011 - 2.017	0.0792 - 0.0794	0.037 - 0.076	0.0015 - 0.0030

Cylinder Head Gasket Selection Specifications



(1) Grade A
(2) Grade B
(3) Grade C
(4) Block Over-Bored
(5) Block Over-Bored and Deck Milled

Cylinder Head Gasket Grade	Ti Max (Piston Projection)		Compressed Gasket Thickness	
	Metric (mm)	English (in)	Metric (mm)	English (in)
Grade A	0.223 - 0.274	0.0088 - 0.0108	0.90-1.00	0.0354-0.0394
Grade B	0.274-0.325	0.0108-0.0128	0.95-1.05	0.0374-0.0413
Grade C	0.325-0.376	0.0128-0.0148	1.00-1.10	0.0394-0.0433
Block Over-Bored 0.010-0.030 in (0.254-0.762 mm)	0.223-0.376	0.0088-0.0148	1.00-1.10	0.0394-0.0433
Block Over-Bored 0.010-0.030 in (0.254-0.762 mm) and Deck Milled 0.008 in	0.4257-0.5777	0.0168-0.0228	1.25-1.35	0.0492-0.0532


(0.203 mm)

Crankshaft Bearing Selection Specifications

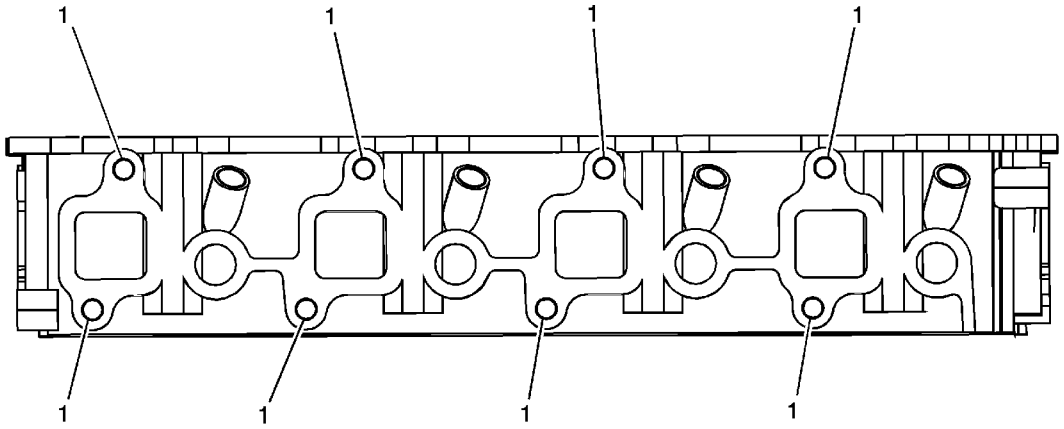
Cylinder Block Grade	Crankshaft Journal Grade	Identification Bearing Color	Oil Clearance	
			Metric (mm)	English (in)
1	1	Black	0.041-0.068	0.0016-0.0027
1	2	Brown	0.039-0.065	0.0015-0.0026
2	1	Blue	0.043-0.070	0.0017-0.0028
2	2	Black	0.041-0.067	0.0016-0.0027

Valve Clearance Adjustment Specifications

Cylinder		Adjust at No 1 Compression Stroke TDC		Adjust at No 1 Exhaust Stroke TDC	
Left Bank	Right Bank	Intake	Exhaust	Intake	Exhaust
--	1	X	X	--	--
2	--	--	X	X	--
--	3	X	--	--	X
4	--	--	--	X	X
--	5	X	--	--	X
6	--	X	--	--	X
--	7	--	X	X	--
8	--	--	X	X	--

Thread Repair Specifications

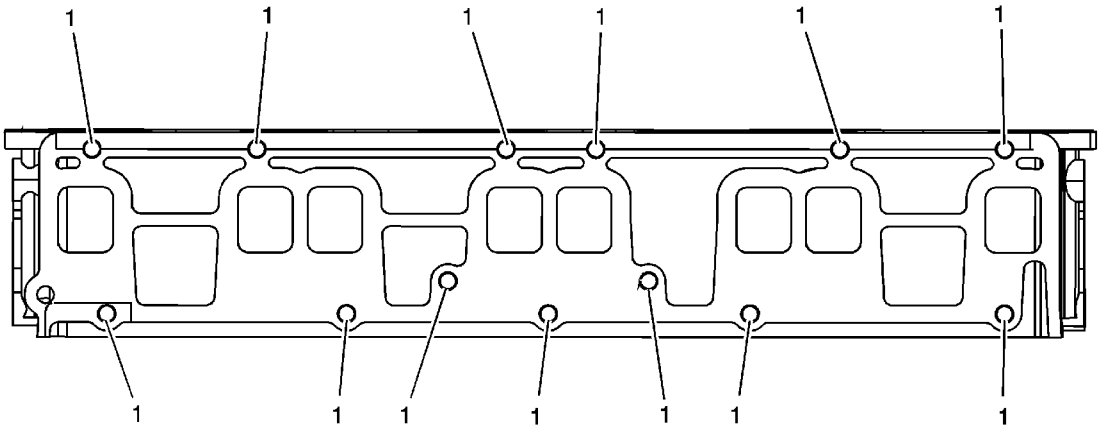
Cylinder Head - Exhaust View



Cylinder Head - Exhaust View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 10 x 1.5	-211	-212	N/A	-213	-214	-215	25	0.985	21	0.827

Cylinder Head - Intake View

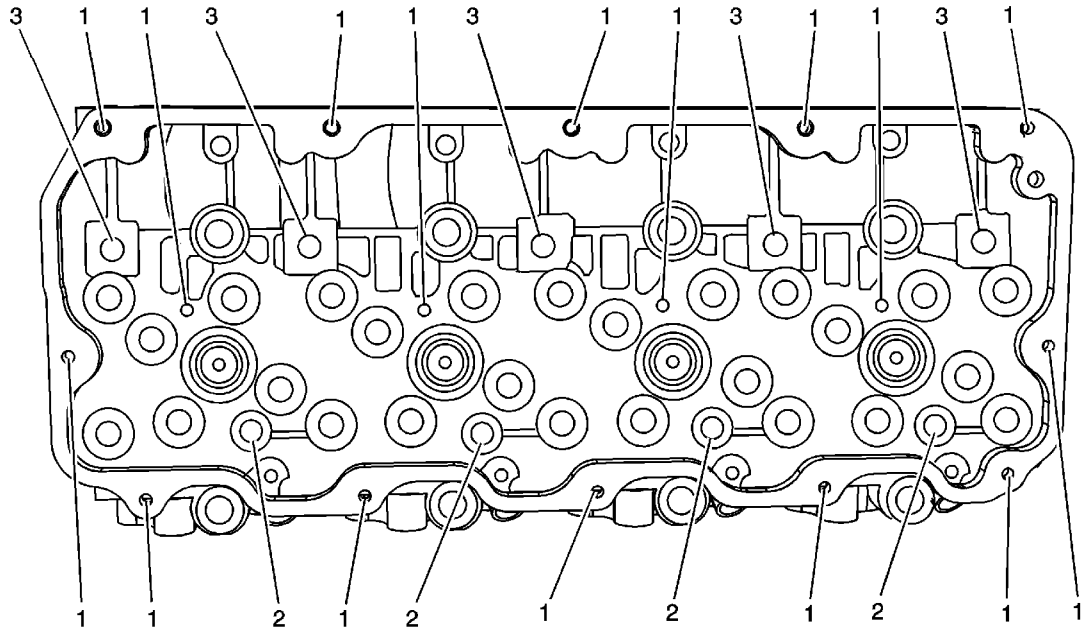


Cylinder Head - Intake View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)

1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	21	0.827	17	0.669

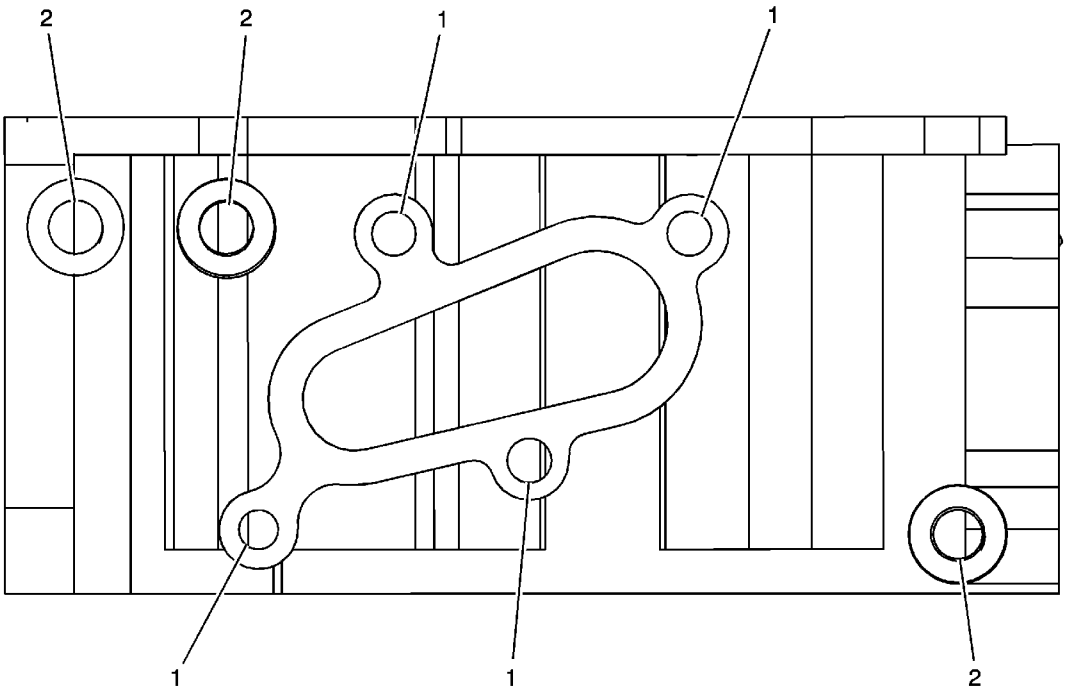
Cylinder Head - Top View



Cylinder Head - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	17	0.669	13	0.512
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	26	1.024	20	0.788
3	M 10 x 1.5	-211	-212	N/A	-213	-214	-215	26	1.024	20	0.788

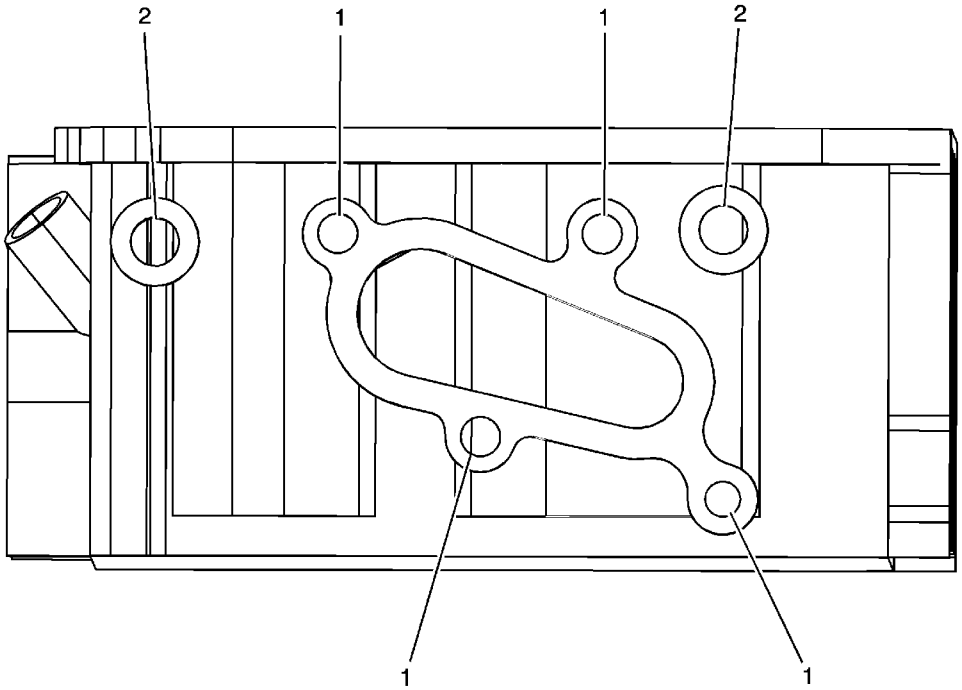
Cylinder Head - Rear View



Cylinder Head - Rear View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	17	0.669	13	0.512
2	M 10 x 1.5	-211	-212	N/A	-213	-214	-216	20	0.788	16	0.630

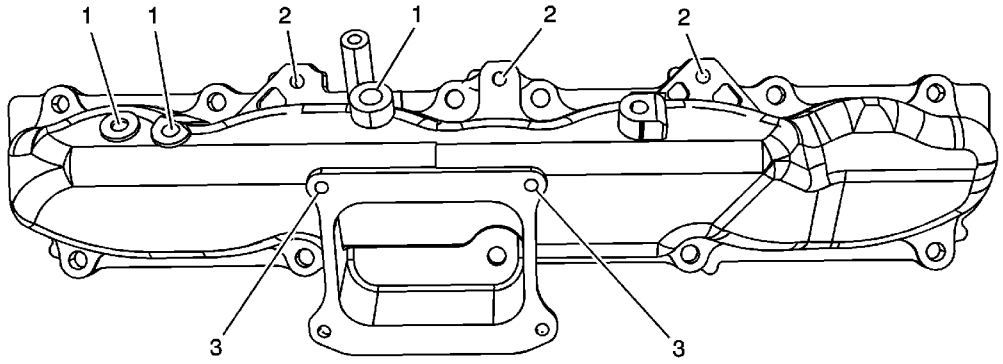
Cylinder Head - Front View



Cylinder Head - Front View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	17	0.669	13	0.512
2	M 10 x 1.5	-211	-212	N/A	-213	-214	-216	20	0.788	16	0.630

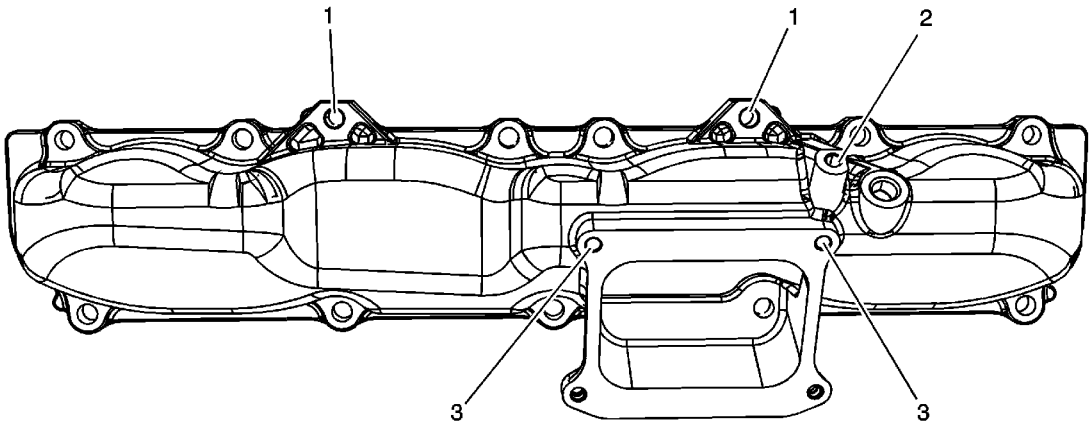
Intake Manifold - Right Side View



Intake Manifold - Right Side View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-415	16	0.630	13	0.512
2	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-210	THRU		THRU	
3	M 6 x 1.0	- 201	-202	N/A	- 203	-204	-205	16	0.0630	12	0.472

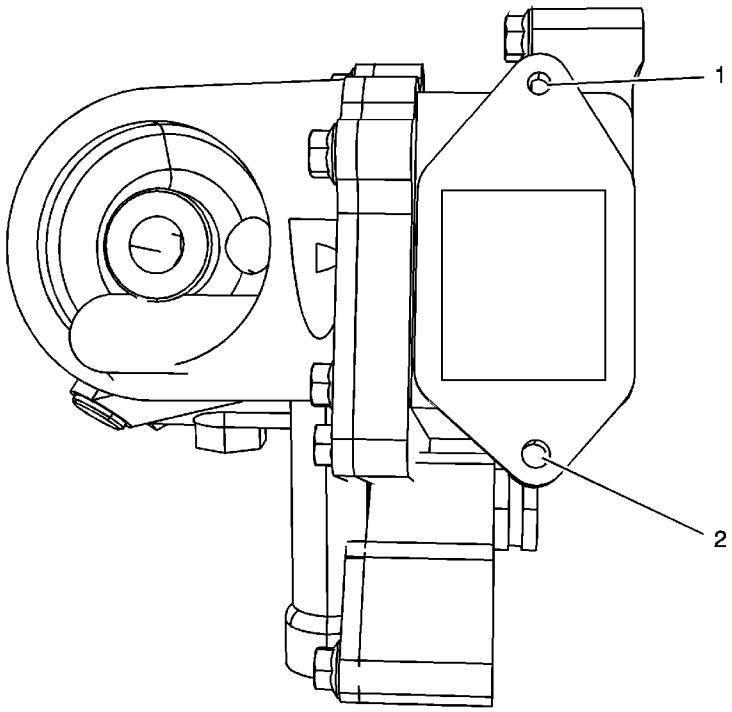
Intake Manifold - Left Side View



Intake Manifold - Left Side View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	THRU		THRU	
2	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	14	0.551	11	0.433
3	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	16	0.630	12	0.472

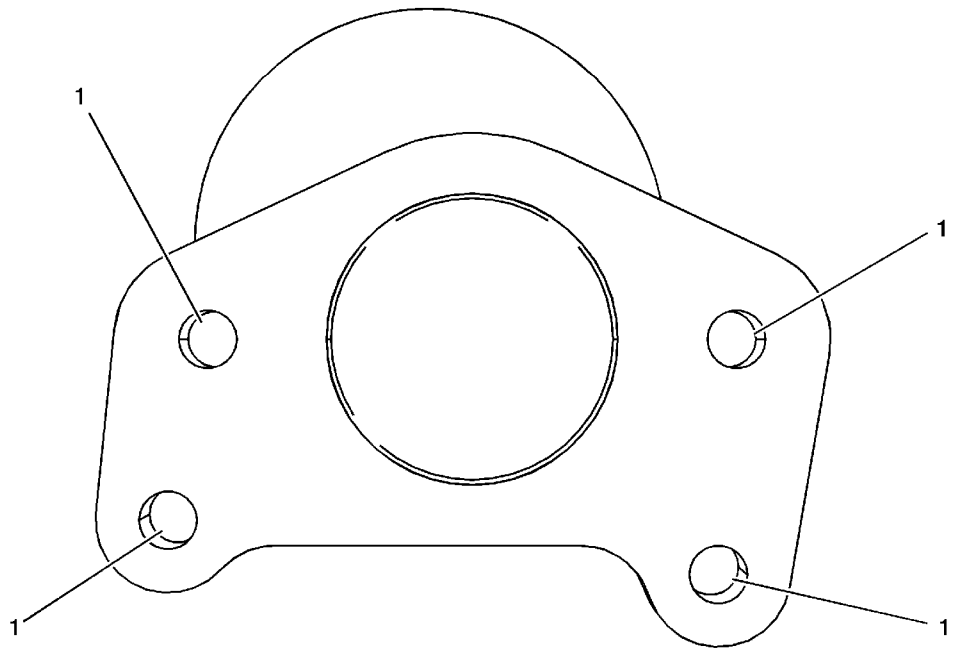
Oil Cooler



Oil Cooler

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	21	0.827	17	0.669
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	THRU		THRU	

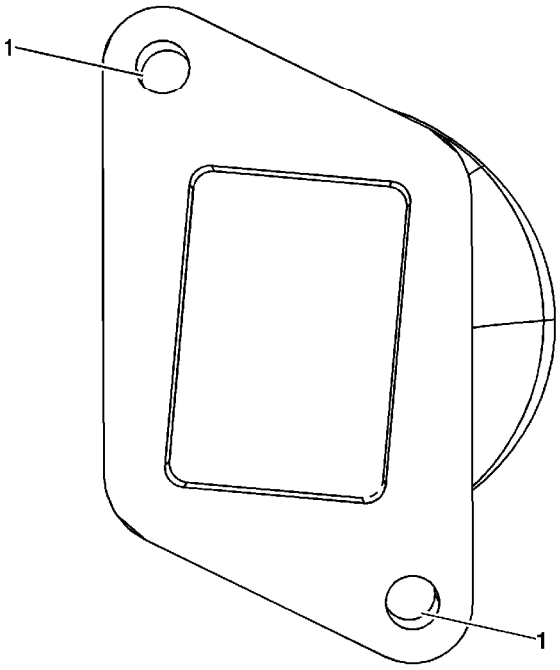
EGR Cooler - Rear View



EGR Cooler - Rear View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	THRU		THRU	

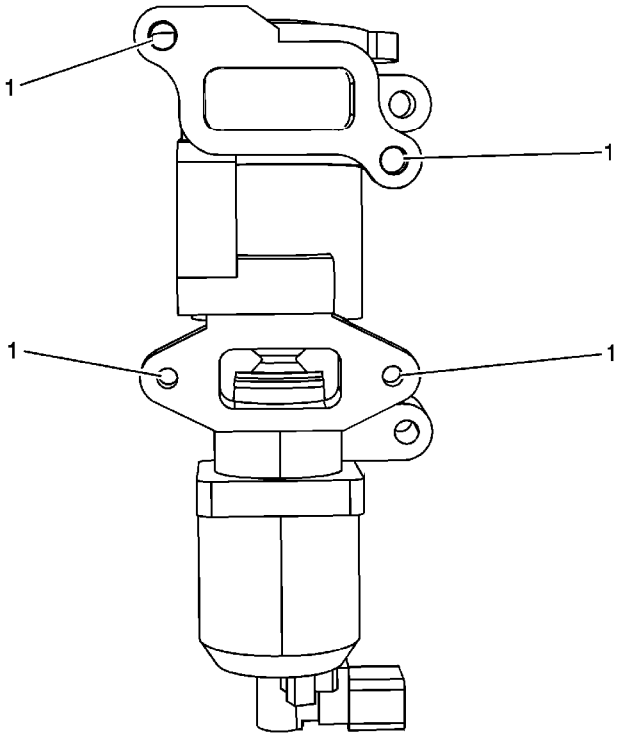
EGR Cooler - Front View



EGR Cooler - Front View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	THRU		THRU	

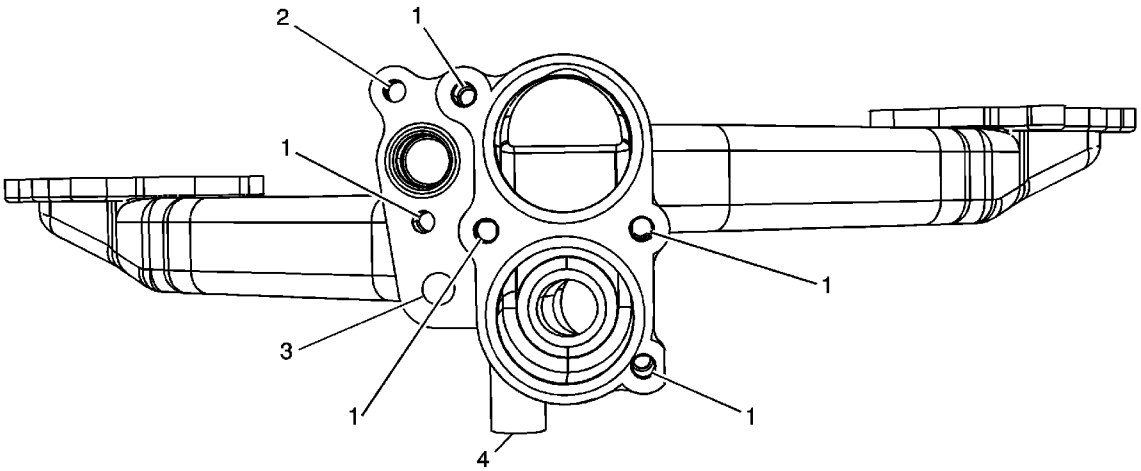
EGR - Top View



EGR - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	THRU		THRU	

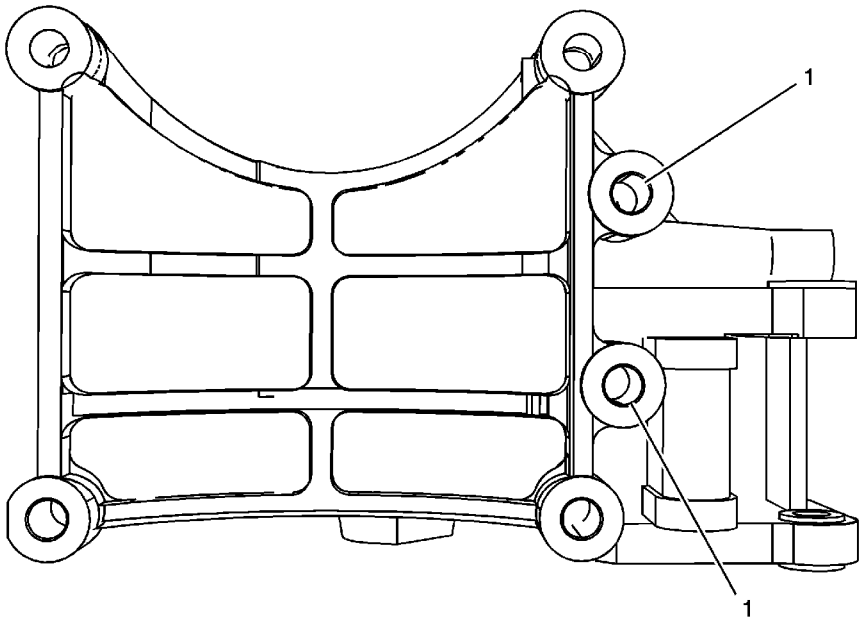
Thermostat Housing - Top View



Thermostat Housing - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	21	0.827	17	0.669
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	THRU		THRU	
3	NPT 3/8	-2013	N/A	N/A	-294	-2015	-2016	THRU		THRU	
4	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	19	0.748	15	0.591

AC Bracket

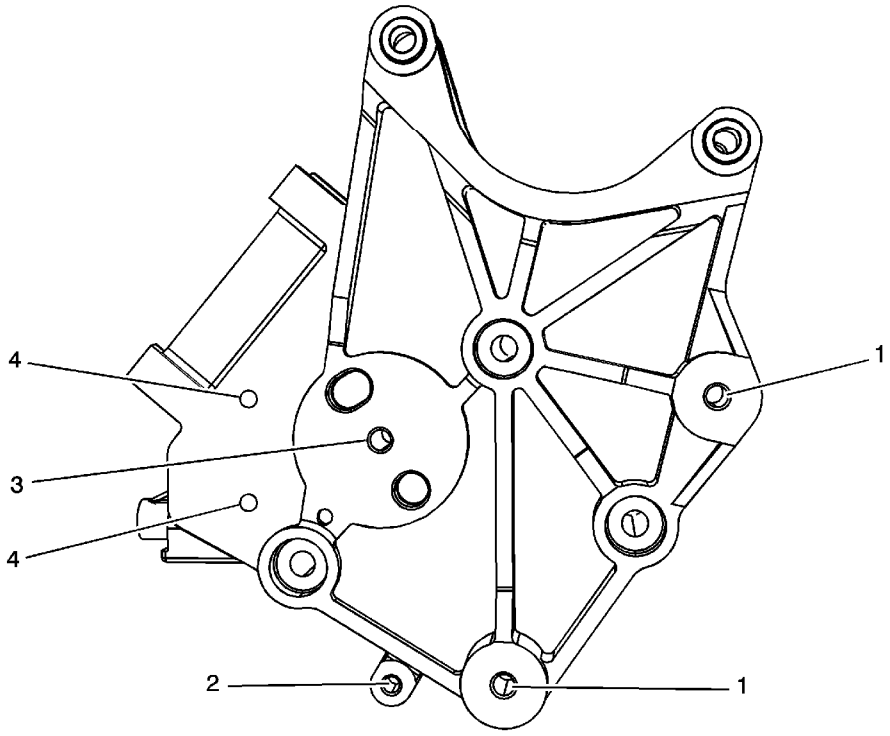


AC Bracket

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)

1	M 10 x 1.5	-211	-212	N/A	-213	-214	-420	30	1.182	25	0.985

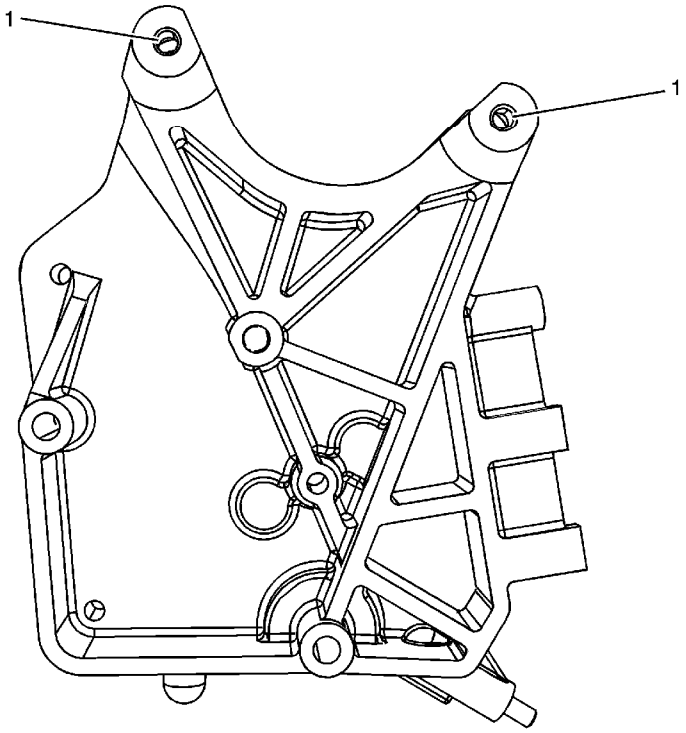
Generator Bracket - Front View



Generator Bracket - Front View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 10 x 1.5	-211	-212	N/A	-213	-214	-215	THRU		THRU	
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-415	17	0.669	12	0.472
3	M 10 x 1.5	-211	-212	N/A	-213	-214	-420	THRU		25	0.985
4	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	22	0.866	17	0.669

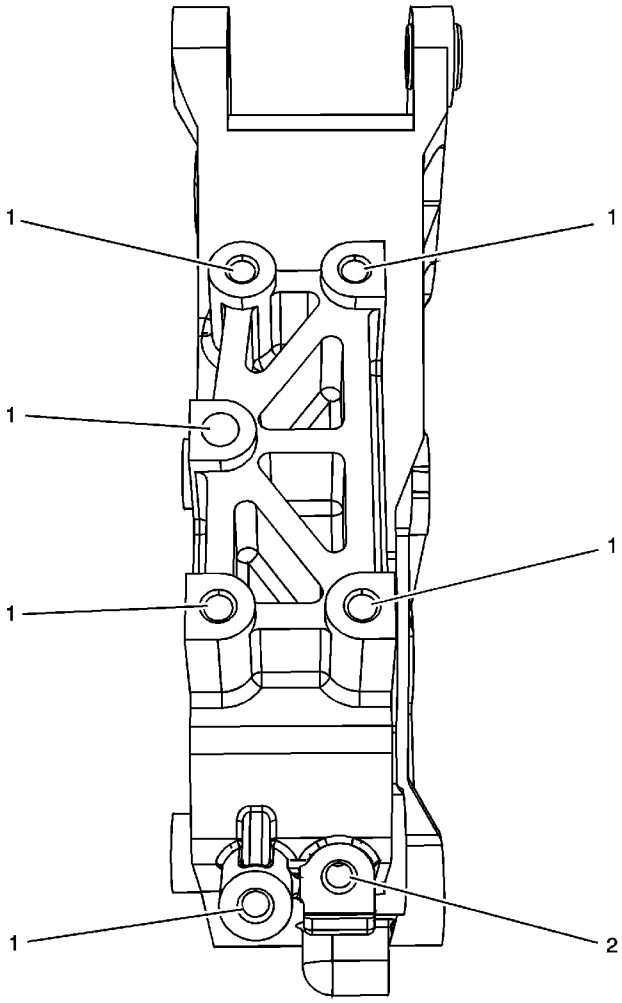
Generator Bracket - Rear View



Generator Bracket - Rear View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 10 x 1.5	-211	-212	N/A	-213	-214	-215	THRU		THRU	

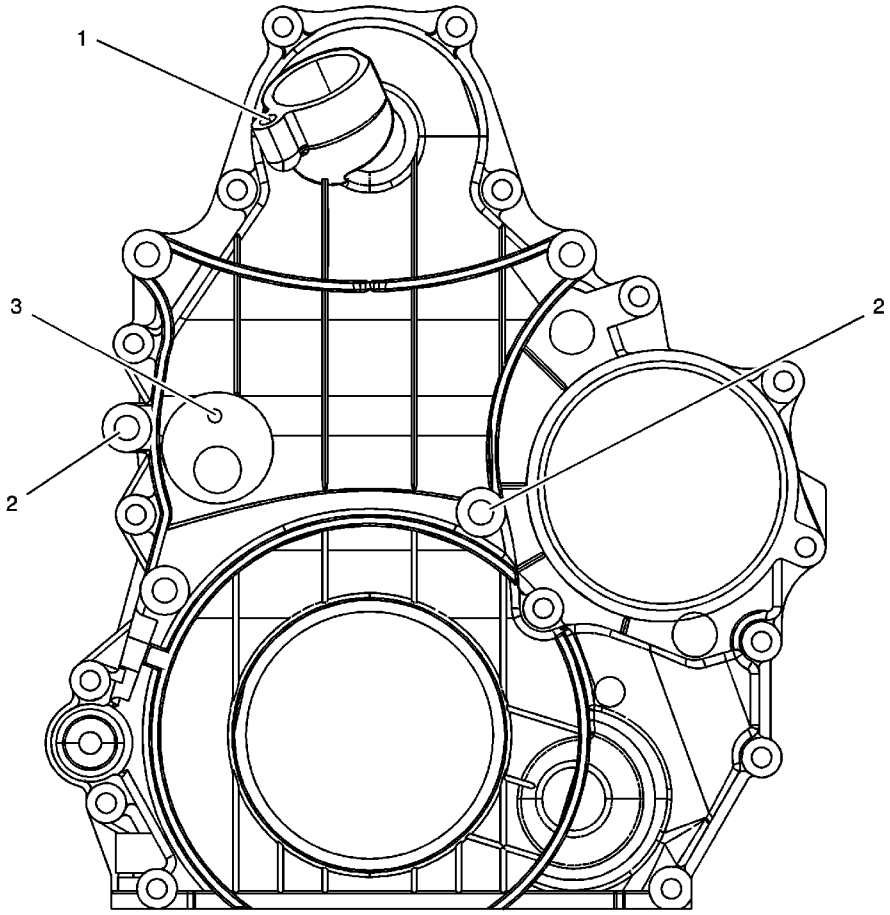
Generator Bracket - Side View



Generator Bracket - Side View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	22	0.866	17	0.669
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	17	0.669	12	0.472

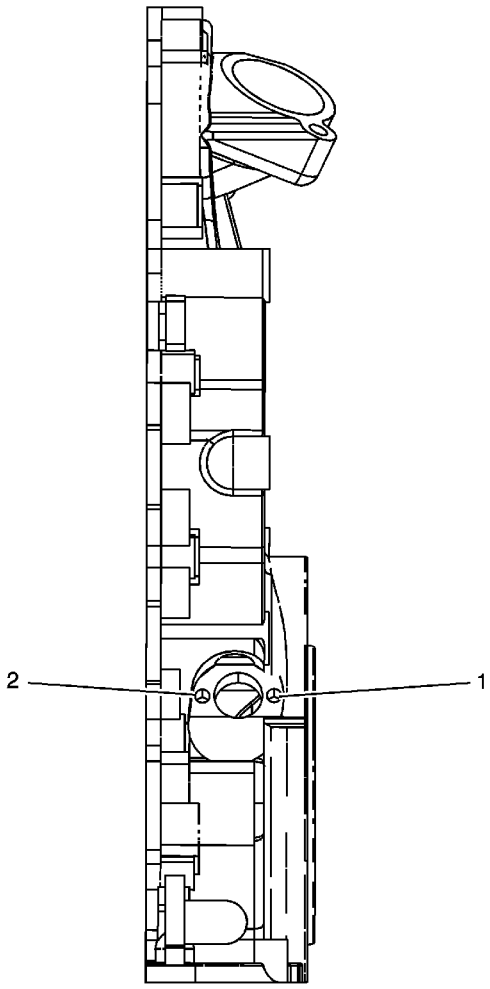
Engine Front Cover - Front View



Engine Front Cover - Front View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	19	0.748	15	0.591
2	M 10 x 1.5	-211	-212	N/A	-213	-214	-216	20	0.788	16	0.630
3	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	14	0.551	10	0.394

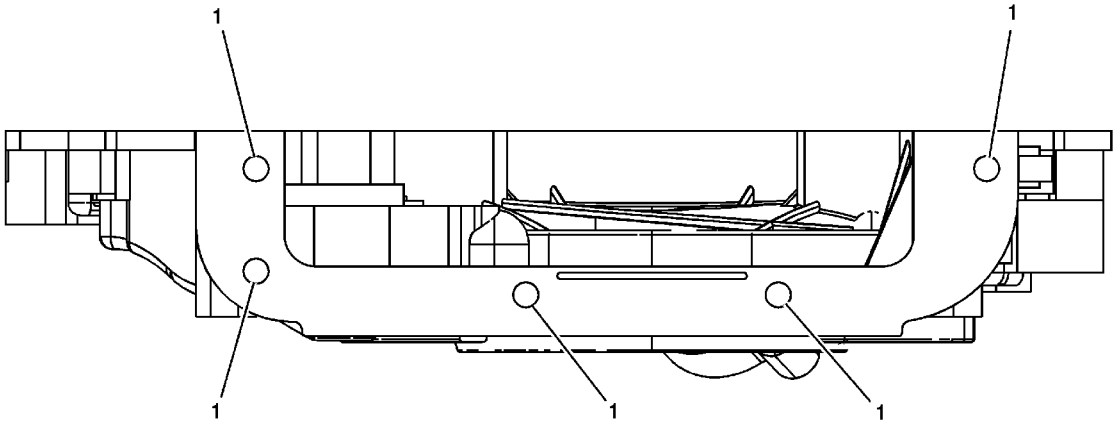
Engine Front Cover - Side View



Engine Front Cover - Side View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	14	0.551	10	0.394
2	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	THRU		10	0.394

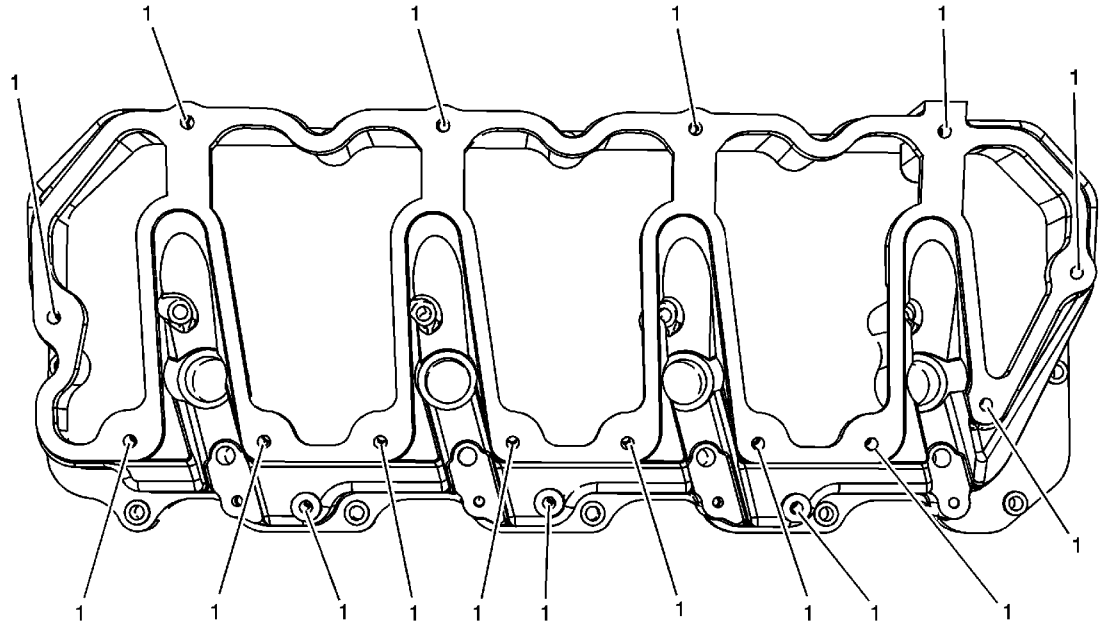
Engine Front Cover - Bottom View



Engine Front Cover - Bottom View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-210	17	0.669	13	0.512

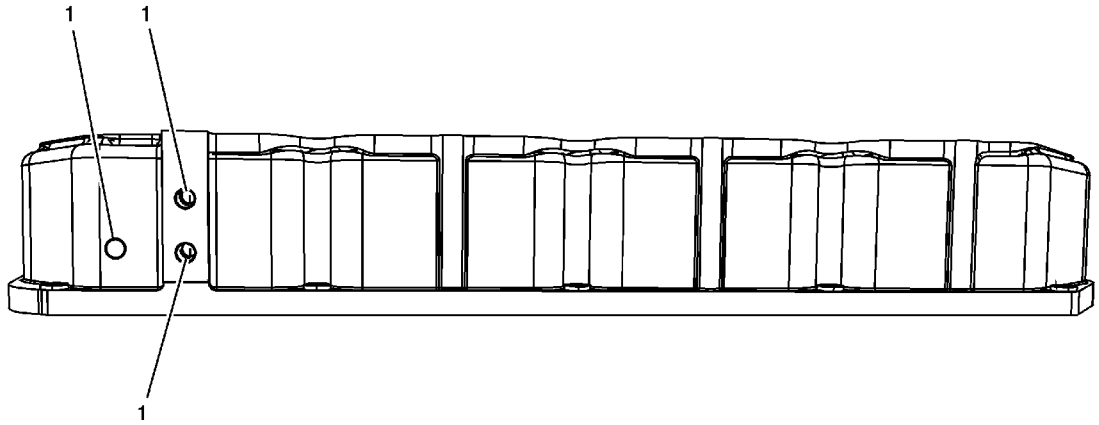
Lower Rocker Arm Cover - Top View



Lower Rocker Arm Cover - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	18	0.709	15	0.591

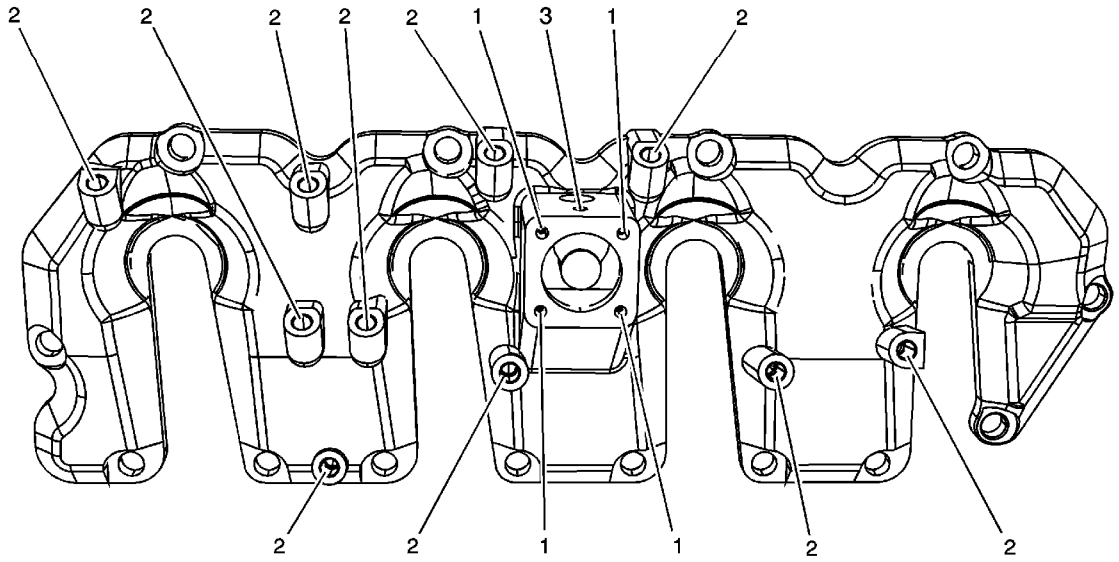
Lower Rocker Arm Cover - Side View



Lower Rocker Arm Cover - Side View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	21	0.827	17	0.669

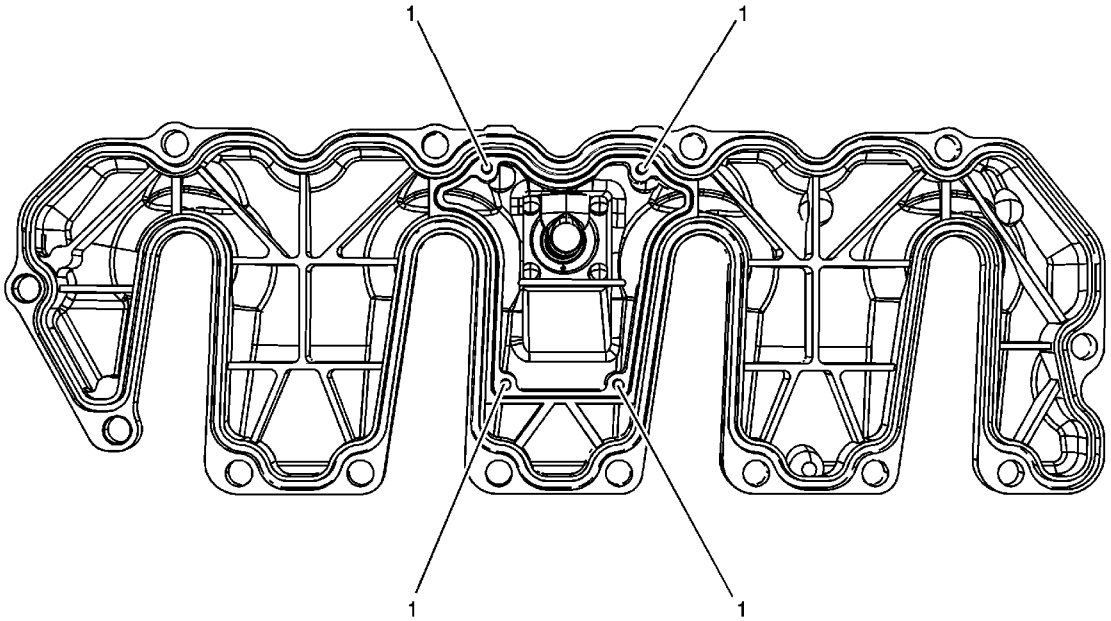
Upper Rocker Arm Cover - Top View



Upper Rocker Arm Cover - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 5 x 0.8	N/A	N/A	N/A	N/A	N/A	N.A	13	0.512	10	0.394
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	21	0.827	17	0.669
3	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	16	0.630	12	0.472

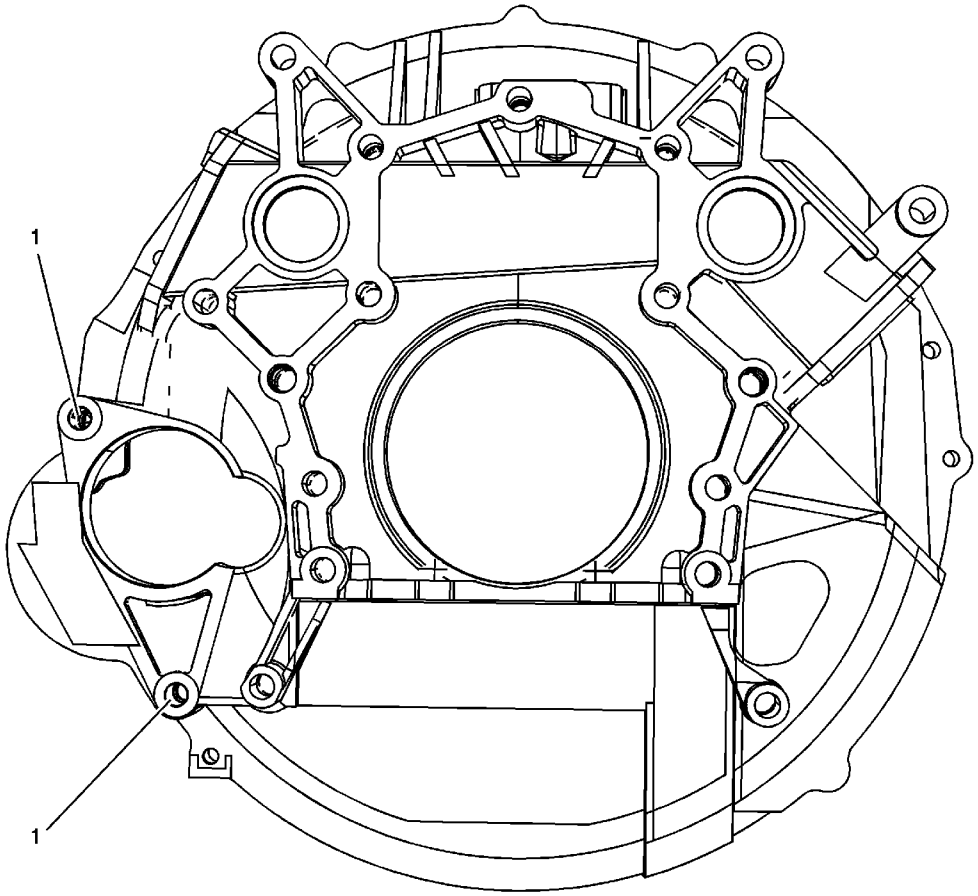
Upper Rocker Arm Cover - Bottom View



Upper Rocker Arm Cover - Bottom View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 5 x 0.8	N/A	N/A	N/A	N/A	N/A	N/A	13	0.512	10	0.394

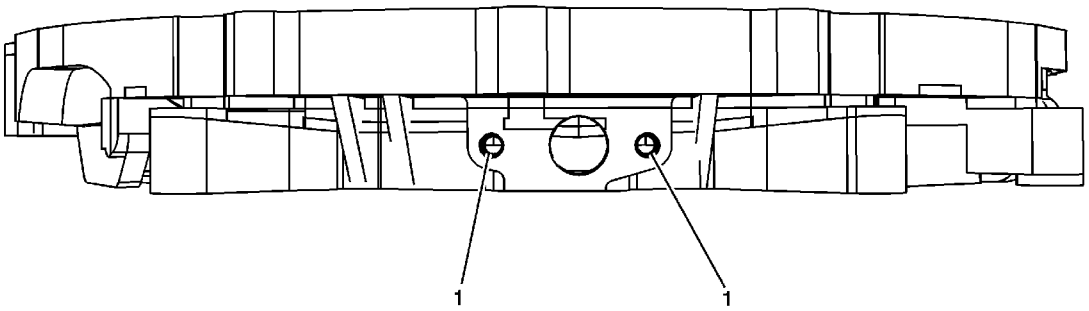
Flywheel Housing - Rear View



Flywheel Housing - Rear View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 12 x 1.75	-856	-857	N/A	-858	-859	-855	28	1.103	23	0.906

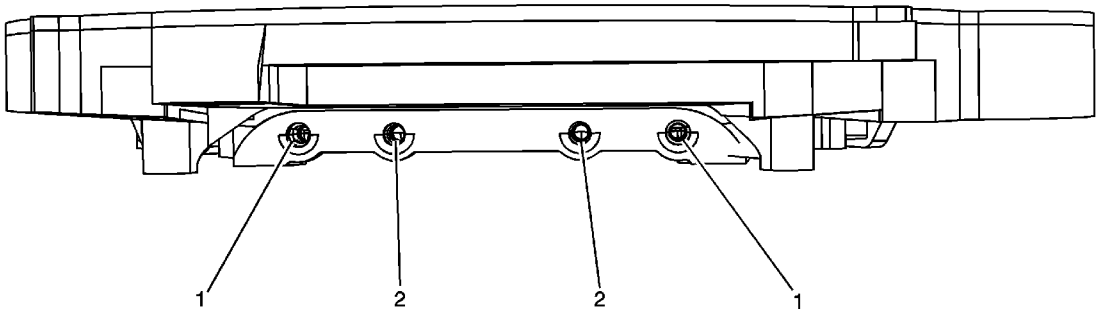
Flywheel Housing - Top View



Flywheel Housing - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-210	17	0.669	13	0.512

Flywheel Housing - Bottom View

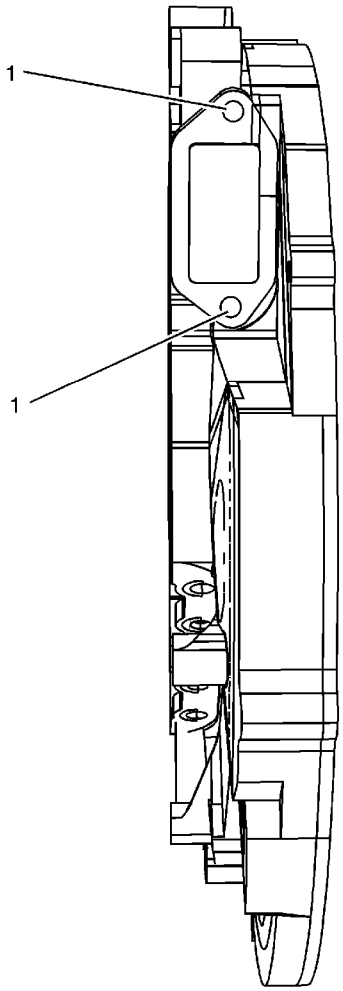


Flywheel Housing - Bottom View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)

1	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-210	21	0.827	18	0.709
2	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-210	17	0.669	14	0.551

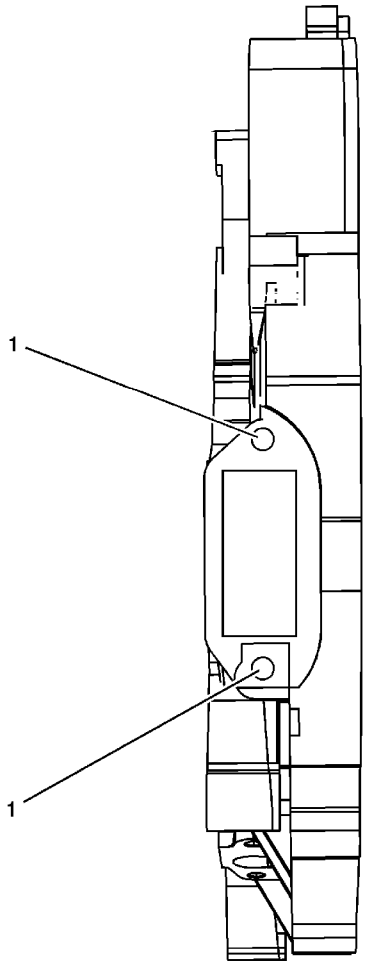
Flywheel Housing - Right View



Flywheel Housing - Right View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	- 206	-207	N/A	- 208	-209	-210	17	0.669	13	0.512

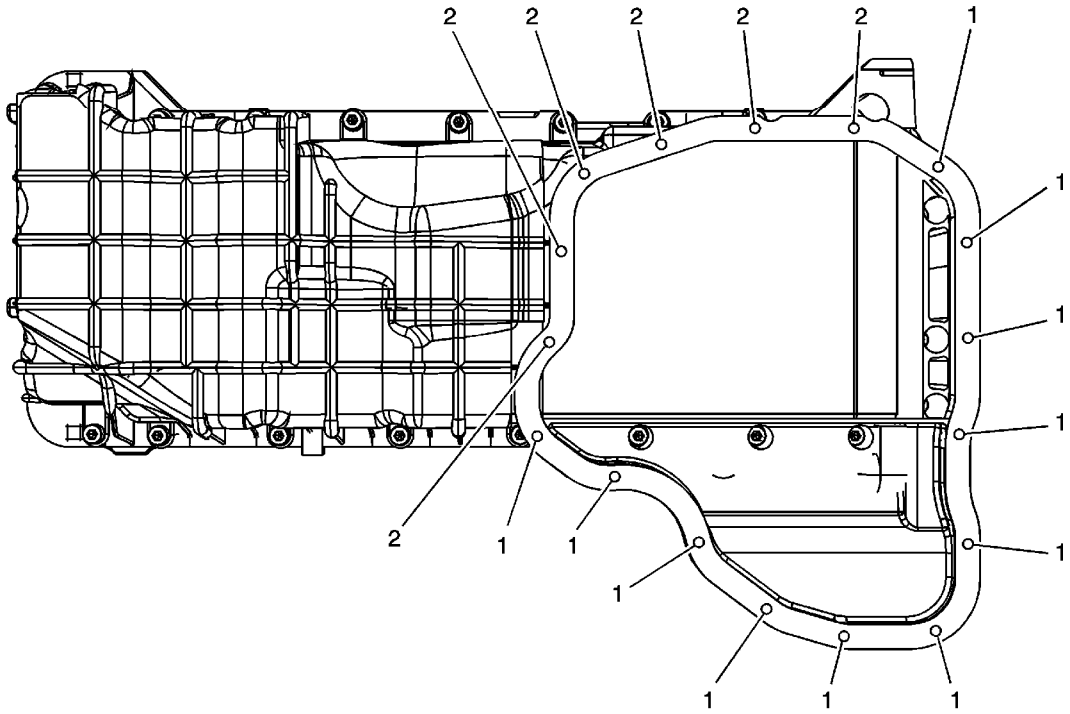
Flywheel Housing - Left View



Flywheel Housing - Left View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	17	0.669	13	0.512

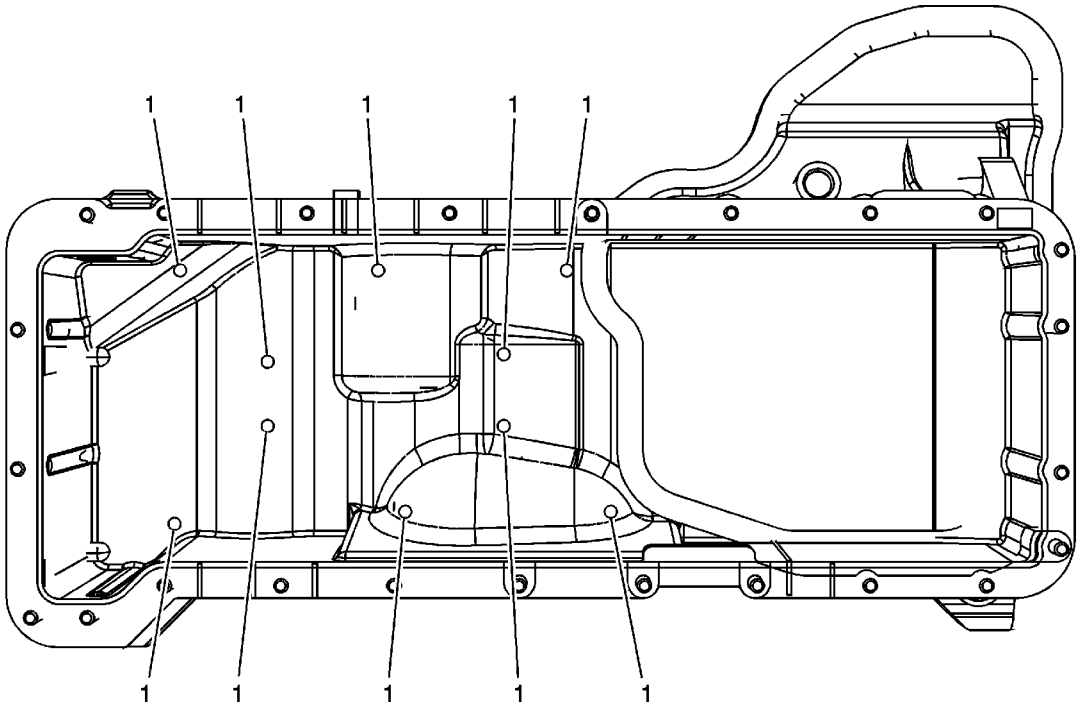
Upper Oil Pan - Bottom View



Upper Oil Pan - Bottom View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	THRU		THRU	
2	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	17	0.669	13	0.512

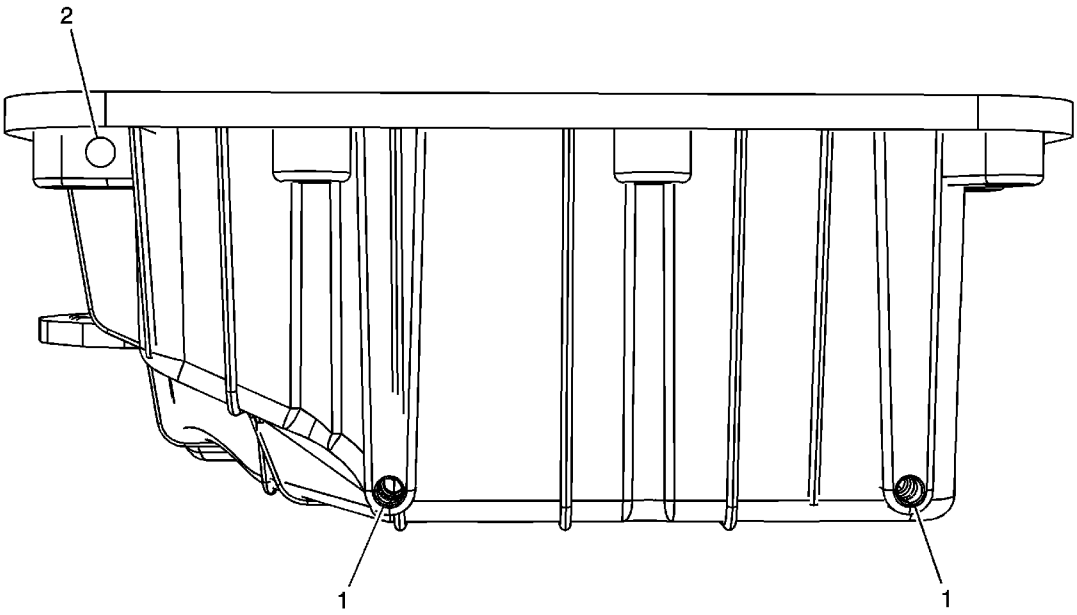
Upper Oil Pan - Top View



Upper Oil Pan - Top View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	17	0.669	13	0.512

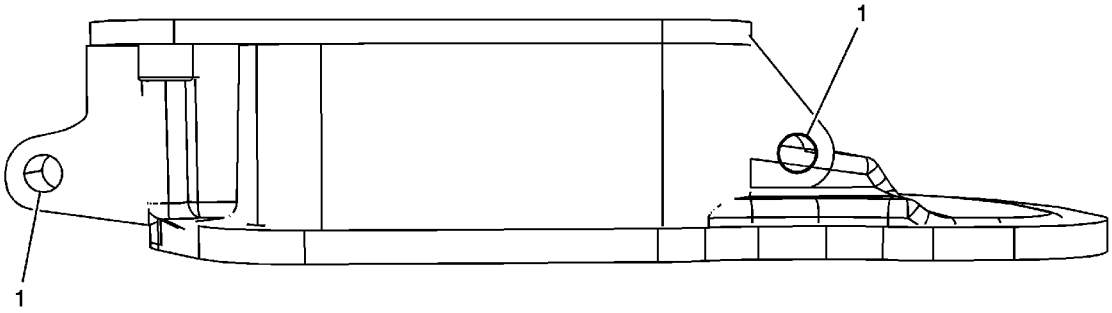
Upper Oil Pan - Front View



Upper Oil Pan - Front View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	17	0.669	13	0.512
2	M 8 x 1.25	-206	-207	N/A	-208	-209	-210	21	0.827	17	0.669

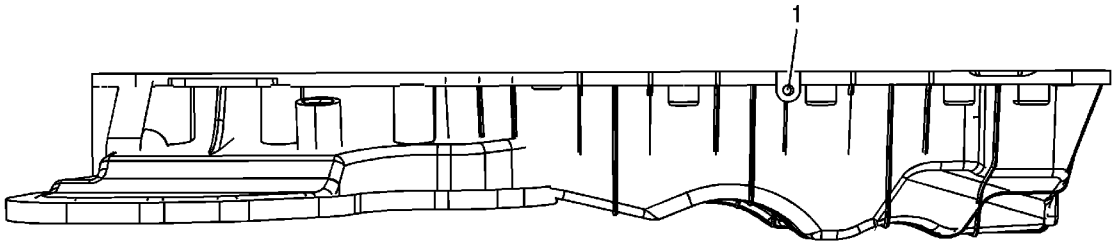
Upper Oil Pan - Rear View



Upper Oil Pan - Rear View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)
1	M 12 x 1.75	-856	-857	N/A	-858	-859	-855	22	0.866	16	0.630

Upper Oil Pan - Side View

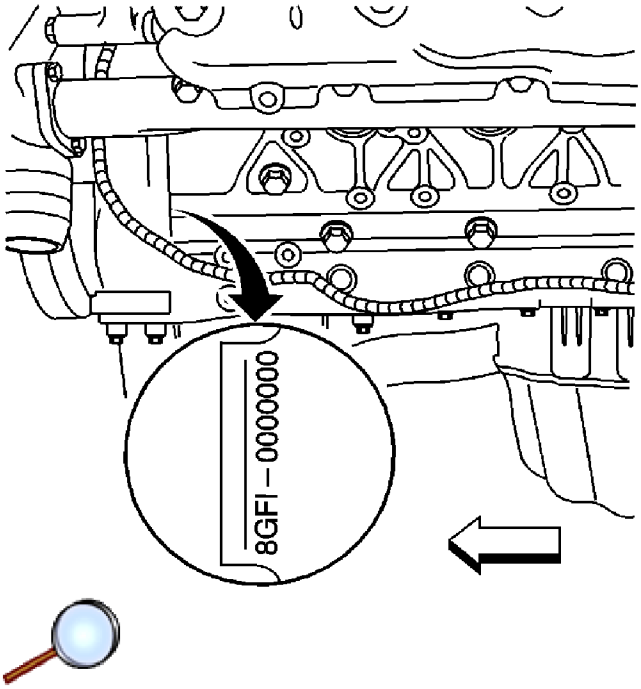


Upper Oil Pan - Side View

Service Hole Location	Thread Size	Drill	Counterbore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Max)		Tap Depth (Min)	
								mm	(in)	mm	(in)

1	M 6 x 1.0	-201	-202	N/A	-203	-204	-205	17	0.669	13	0.512

Engine Identification



The engine identification tag is located on the left side of the block. It is on the front edge of the block.