

ENGINE

Engine Mechanical - 3.6L (LFX) - Specifications - Canyon, Colorado

SPECIFICATIONS

FASTENER SPECIFICATIONS

Application	Specification	
	Metric	English
Automatic Transmission Flex Plate Bolt		
First Pass	30 N.m (1)	22 lb ft (1)
Final Pass	45 Degrees	
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
Close Out Cover Bolt	10 N.m	89 lb in
Clutch Pressure Plate Bolts	30 N.m	22 lb ft
Connecting Rod Bolt		
First Pass	25 N.m (1)	18 lb ft (1)
Final Pass	110 Degrees	
Coolant Drain Plug - M14	50 N.m	37 lb in
Coolant Drain Plug - M20	75 N.m	55 lb in
Coolant Outlet Bolt	10 N.m	89 lb in
Crankshaft Balancer Bolt		
First Pass	100 N.m (1)	74 lb ft (1)
Final Pass	150 Degrees	
Crankshaft Main Bearing Bolt - Inner		
First Pass	20 N.m (1)	15 lb ft (1)

Application	Specification	
	Metric	English
Final Pass	80 degrees	
Crankshaft Main Bearing Bolt - Outer		
First Pass	15 N.m (1)	11 lb ft (1)
Final Pass	110 Degrees	
Crankshaft Main Bearing Bolt - Side		
First Pass	30 N.m (1)	22 lb ft (1)
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 (1)	11 lb ft (1)
Final Pass	75 Degrees	
Cylinder Head Bolt - M11		
First Pass	30 N.m (1)	22 lb ft (1)
Final Pass	150 degrees	
Cylinder Head Core Hole Plug	75 N.m	55 lb ft
Drive Belt Tensioner Bolt	25 N.m	18 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, Manual Trans, Bolt	67 N.m (1)	49 lb ft (1)

Application	Specification	
	Metric	English
Engine Front Cover Studs	15 N.m	11 lb ft
Engine Front Cover Bolt - M6	15 N.m	11 lb ft
Engine Front Cover Bolt - M8		
• First Pass	20 N.m	14 lb ft
• Final Pass	60 Degrees	
Engine Front Cover Bolt - M12	65 N.m	48 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	44 lb ft
• Nut to Engine Mount Bracket	80 N.m	59 lb ft
• Nut to Frame	80 N.m	59 lb ft
Engine Oil Level Switch Bolt	10 N.m	89 lb in
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

Application	Specification	
	Metric	English
• 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
Evaporative (EVAP) Purge Valve Bolt	10 N.m	89 lb in
Fuel Injection Fuel Rail Fuel Pressure Sensor	33 N.m	25 lb ft
Fuel Feed Pipe Bolt	50	37 lb ft
Fuel Feed Pipe Nut	28	21 lb ft
Fuel Pump Bolts - High Pressure		
• First Pass:<!--Used for torque specification-->	15 N.m (1)	11 lb ft (1)
• Final Pass:<!--Used for torque specification-->	60 Degrees	
Fuel Rail Bolt	25 N.m	18 lb ft
Fuel Rail Crossover Pipe Fitting	28	21 lb ft
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 and Outlet Pipe Assembly Bolts - M6	10 N.m	89 lb in
Heater Inlet and Outlet Pipe Assembly Bolts - M8	22 N.m	16 lb ft
Idle Pulley Bolt	58	43 lb ft
Ignition Coil Bolt	10 N.m	89 lb in
Intake Manifold		
• Brace Bolt - Engine Front Cover M12	65 N.m	48 lb ft

Application	Specification	
	Metric	English
• Brace Bolt/Ball Stud - Intake Manifold M6	10 N.m	89 lb in
• Ball Stud to Cam Cover M6	5 N.m	44 lb in
• Sight Shield Ball Stud	10 N.m	89 lb in
• Tuning Valve Bolt	10 N.m	89 lb in
• Upper-to-Cylinder Head Bolt - Long	25 N.m	18 lb ft
• Upper-to-Cylinder Head Bolt - Short	25 N.m	18 lb ft
• Upper-to-Lower Intake Manifold Bolt	25 N.m	18 lb ft
Knock Sensor Bolt	25 N.m	18 lb ft
Manifold Absolute Pressure Sensor (MAP) Bolt	4	35 lb in
Oil Filter Cap	25 N.m	18 lb ft
Oil Filter Housing Adapter		
• Bolt - Cylinder Head M10	58 N.m	43 lb ft
• Bolt - Engine Block M8	25 N.m	18 lb ft
Oil Gallery Plug - M14	50 N.m	37 lb ft
Oil Gallery Plug - M20	75 N.m	55 lb ft
Oil Level Indicator Tube Bolt	10 N.m	89 lb in
Oil Pan Bolt- Block M8	25 N.m	18 lb ft
Oil Pan Bolt- Crankshaft Rear Oil Seal Housing M6	10 N.m	89 lb in
Oil Pan Drain Plug	25 N.m	18 lb ft
Oil Pan Windage Tray Bolt	10 N.m	89 lb in
Oil Pressure Sender	20 N.m	15 lb ft
Oil Pump Bolt	25 N.m	18 lb ft
Oxygen Sensor Pump Converter Pipe	42 N.m	31 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	58 N.m	43 lb ft

Application	Specification	
	Metric	English
• 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	25 N.m	18 lb ft
• Tensioner Bolt	25 N.m	18 lb ft
• Upper Guide Bolt	25 N.m	18 lb ft
Radiator Outlet Pipe		
• Bolt - Generator Bracket	25 N.m	18 lb ft
• Bolt - Right Cylinder Head Rear	58 N.m	43 lb ft
• Bolt - Thermostat Housing	25 N.m	18 lb ft
Secondary Air Injection (SAI) Check Valve Bolt	25 N.m	18 lb ft
Secondary Camshaft Drive Chain		
• Guide Bolt	25 N.m	18 lb ft
• Shoe Bolt	25 N.m	18 lb ft
• Tensioner Bolt	25 N.m	18 lb ft
Spark Plug	18 N.m	13 lb ft
Starter Motor		
• Bolt	58 N.m	43 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

Application	Specification	
	Metric	English
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		
• First Pass	10 N.m (1)	89 lb in (1)
• Second Pass	10 N.m	89 lb in
• Final Pass	45 Degrees	
Water Pump Pulley Bolt	10 N.m	89 lb in
1. Use NEW fastener.		

APPROXIMATE FLUID CAPACITIES

Application	Specification	
	Metric	English
3.0L (LFW) and 3.6L (LFX, LFR, and LLT)		
• Oil Capacity - with Filter	5.7 Liters	6.0 Quarts
• Oil Capacity - without Filter	5.2 Liters	5.5 Quarts

ENGINE MECHANICAL SPECIFICATIONS

Application	Specification	
	Metric	English
General		
• Engine Type	V-6	
• Displacement	3.6 Liter	220 cu in

Application	Specification	
	Metric	English
• RPO	LFX	
• VIN	3	
• Bore	94 mm	3.7008 in
• Stroke	85.6 mm	3.37 in
• Compression Ratio	11.5:1	
• Firing Order	1-2-3-4-5-6	
• Spark Plug Gap	0.95-1.10 mm	0.0375-0.0433 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.	0.026 mm	0.001 in
• Cylinder Bore Taper	0.020 mm	0.0008 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	0.072-0.490 mm	0.0028-0.0190 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

Application	Specification	
	Metric	English
• 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 Lift - Exhaust	42.425-42.725 mm	1.6703-1.6821 in
• Camshaft Lobe Lift - Intake	42.385-42.685 mm	1.6687-1.6805 in
• 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
• Valve Lift - Exhaust	10.8 mm	0.4252 in
• Valve Lift - Intake	10.8 mm	0.4252 in
Connecting Rod		
• Connecting Rod Bearing Clearance	0.010-0.070 mm	0.0004-0.0026 in
• Connecting Rod Bore Diameter - Bearing End	59.620-59.636 mm	2.3472-2.3479 in
• Connecting Rod Bore Diameter - Pin End - Production	24.009-24.019 mm	0.9452-0.9456 in
• Connecting Rod Bore Diameter - Pin End - Service Maximum	24.021 mm	0.9457 in
• Connecting Rod Length - Center to Center	152.400 mm	6.0000 in
• Connecting Rod Side Clearance	0.095-0.355 mm	0.00037-0.0140 in
• Connecting Rod Width - Bearing End		
• Production	21.775 mm	0.8573 in

Application	Specification	
	Metric	English
• 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	0.031-0.069 mm	0.0012-0.0027 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

Application	Specification	
	Metric	English
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		
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

Application	Specification	
	Metric	English
Valve Lifter Bore Diameter	12.008-12.030 mm	0.4728-0.4736 in
Lubrication System		
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
Piston Rings		
Piston Ring End Gap		
First Compression Ring - Nominal	0.150-0.250 mm	0.0059-0.0098 in
First Compression Ring - Maximum, Ring in Bore	0.290 mm	0.0114 in
Second Compression Ring - Nominal	0.300-0.450 mm	0.0118-0.0177 in
Second Compression Ring - Maximum, Ring in Bore	0.490 mm	0.0193 in
Oil Control Ring	0.150-0.350 mm	0.0059-0.0138 in
Piston Ring to Groove Clearance		
First Compression Ring	0.030-0.075 mm	0.0012-0.0030 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	0.975-0.990 mm	0.0384-0.0390 in

Application	Specification	
	Metric	English
Second Compression Ring	1.170-1.195 mm	0.0461-0.0470 in
Oil Control Ring	1.360-1.480 mm	0.0535-0.0583 in
Pistons and Pins		
Piston		
Piston Diameter - Measured Over Skirt Coating	93.976-94.014 mm	3.6998-3.7013 in
Piston Diameter - Service Limit Minimum w/more than 10K miles	93.926 mm	3.6979 in
Piston Pin Bore Diameter	24.004-24.009 mm	0.9450-0.9452 in
Piston Ring Groove Width - First Compression Ring	1.020-1.050 mm	0.0402-0.0413 in
Piston Ring Groove Width - Second Compression Ring	1.210-1.230 mm	0.0476-0.0484 in
Piston Ring Groove Width - Oil Control Ring	1.510-1.530 mm	0.0594-0.0602 in
Piston to Bore Clearance - Production; Measured at Skirt Coating	0.022-0.032 mm	0.0009-0.0013 in
Piston to Bore Clearance - Service Limit Maximum, w/more than 10k miles	0.050 mm	0.0020 in
Pin		
Piston Pin Clearance to Connecting Rod Bore - Production	0.009-0.022 mm	0.0004-0.0009 in
Piston Pin Clearance to Connecting Rod Bore - Service Maximum	0.030 mm	0.0012 in
Piston Pin Clearance to Piston Pin Bore - Production	0.004-0.012 mm	0.0002-0.0005 in

Application	Specification	
	Metric	English
Piston Pin Clearance to Piston Pin Bore - Service Maximum	0.015 mm	0.0006 in
Piston Pin Diameter	23.997-24.000 mm	0.9448-0.9449 in
Piston Pin Length	52.600-53.100 mm	2.0709-2.0906 in
Valve System		
Valves		
Valve Face Angle	44.25 degrees	
Valve Face Runout	0.0500 mm	0.0020 in
Valve Face Width - Exhaust	DO NOT GRIND, REPLACE VALVE	DO NOT GRIND, REPLACE VALVE
Valve Face Width - Intake	DO NOT GRIND, REPLACE VALVE	DO NOT GRIND, REPLACE VALVE
Valve Head Diameter - Exhaust	30.470-30.730 mm	1.1996-1.2098 in
Valve Head Diameter - Intake	38.170-38.430 mm	1.5028-1.5130 in
Valve Installed Height	35.23-36.69 mm	1.3870-1.4445 in
Valve Length - Exhaust	95.11 mm	3.74 in
Valve Length - Intake	100.630 mm	3.9618 in
Valve Seat Angle - Seating Surface	45 degrees	
Valve Seat Angle - Relief Surface	30 degrees	
Valve Seat Angle - Undercut Surface	60 degrees	

Application	Specification	
	Metric	English
• Valve Seat Roundness- Maximum	0.025 mm	0.0010 in
• Valve Seat Runout - Maximum	0.080 mm	0.0031 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	5.945-5.965 mm	0.2341-0.2348 in
• Valve Stem-to-Guide Clearance - Exhaust	0.035-0.075 mm	0.0014-0.0030 in
• Valve Stem-to-Guide Clearance - Intake	0.035-0.075 mm	0.0014-0.0030 in
• Valve Lifters - Stationary Hydraulic Lash Adjuster (SHLA)		
• Valve Lifter (SHLA) Diameter	11.989-12.000 mm	0.4720-0.4724 in
• Valve Lifter (SHLA)-to-Bore Clearance	0.008-0.041 mm	0.0003-0.0016 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		

Application	Type of Material	Specification Number	
		United States	Canada
• Valve Spring Coil Thickness		3.250 x 3.900 mm	0.1280 x 0.1535 in
• Valve Spring Diameter - Inside Top		12.200-12.700 mm	0.4803-0.5000 in
• Valve Spring Diameter - Outside Top		20.250 mm	0.7972 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		42.500-45.500 mm	1.6732-1.7913 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

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Application	Type of Material	GM Part Number	
		United States	Canada
Block Pan Rail *	Sealant	12378521	88901148
Camshaft Prelube	Lubricant	88862586	88862827
Coolant Drain Threaded Plug	Sealant	12346004	10953480
Coolant Expansion Plugs	Threadlocker	12345382	10953489
Coolant and Oil Plug Threads	Sealant	12346004	10953480
Crankshaft Bearing Surfaces	5W-30	19293000	19286321
Crankshaft Connecting Rod Bearing Journal	5W-30	19293000	19286321
Crankshaft Prelube	5W-30	19293000	19286321
Crankshaft Rear Oil Seal Housing *	Sealant	12378521	88901148
Engine Front Cover/Split Lines *	Sealant	12378521	88901148
Engine Oil	5W-30	19293000	19386321
Fuel Injection Fuel Rail Fuel Pressure Sensor Sealing Cone/Threads	5W-30	19293000	19286321
Fuel Rail Sealing Cone/Threads	5W-30	19293000	19286321

Application	Type of Material	GM Part Number	
		United States	Canada
Ignition Coils	Lubricant	19260901	19260902
Oil Gallery Threaded Plug	Sealant	12346004	10953480
Oil Pan, Engine Front Cover, Crankshaft Rear Oil Seal Housing *	Sealant	12378521 (150g cartridge)	88901148
		88861417 (75 gram squeeze tube)	88861418
Piston Pin Bores	5W-30	19293000	19286321
Positive Crankcase Ventilation (PCV) Orifice	Sealant	12378521	88901148
Stationary Hydraulic Lash Adjuster (SHLA)	5W-30	19293000	19286321
SHLA Bores in Cylinder Head	5W-30	19293000	19286321
SHLA Pivot Spheres	5W-30	19293000	19286321
Thread Repair	Cleaner	88862650	88901247
	Threadlocker	89021297	10953488
Thread Repair Cutting Oil	Lubricant	1052864	992881
Valve Stem/Guide ID	5W-30	19293000	19286321
* Ensure proper use of room temperature vulcanizing (RTV) sealant. Use of Room Temperature Vulcanizing (RTV) and Anaerobic Sealant			

THREAD REPAIR SPECIFICATIONS

Left Cylinder Head Camshaft Cover Face

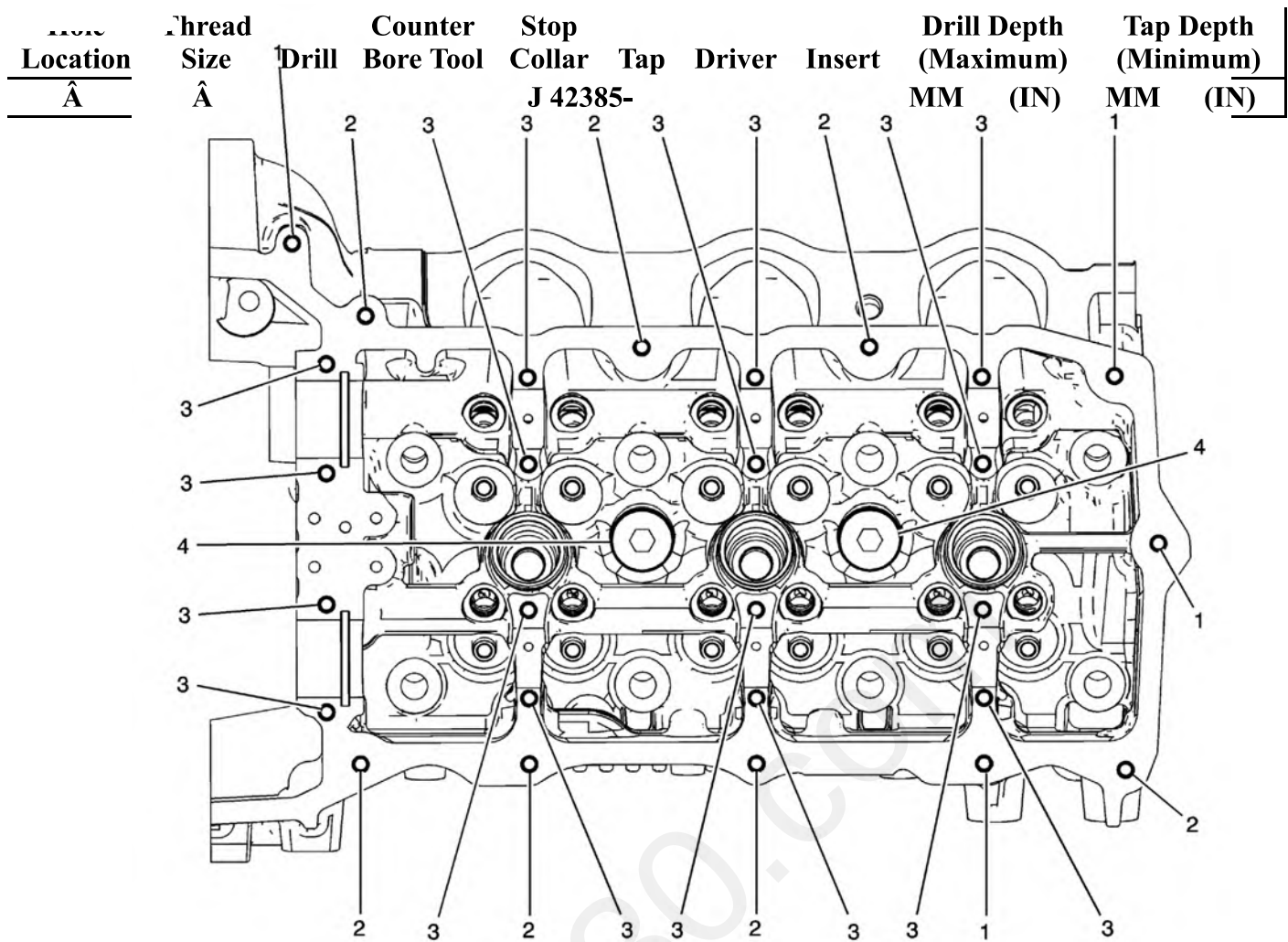


Fig. 1: Left Cylinder Head Camshaft Cover Face

Courtesy of GENERAL MOTORS COMPANY

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)	
A	A	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

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

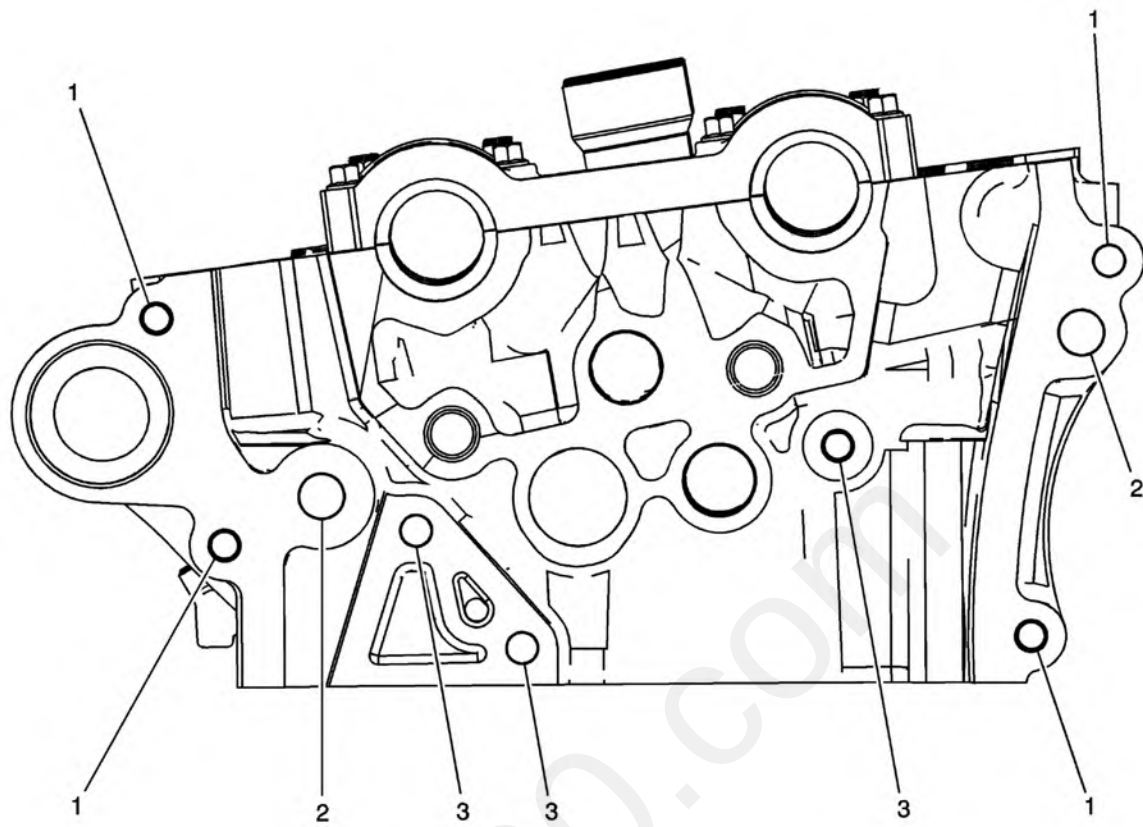


Fig. 2: Left Cylinder Head Front Face

Courtesy of GENERAL MOTORS COMPANY

Left Cylinder Head Front Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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

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

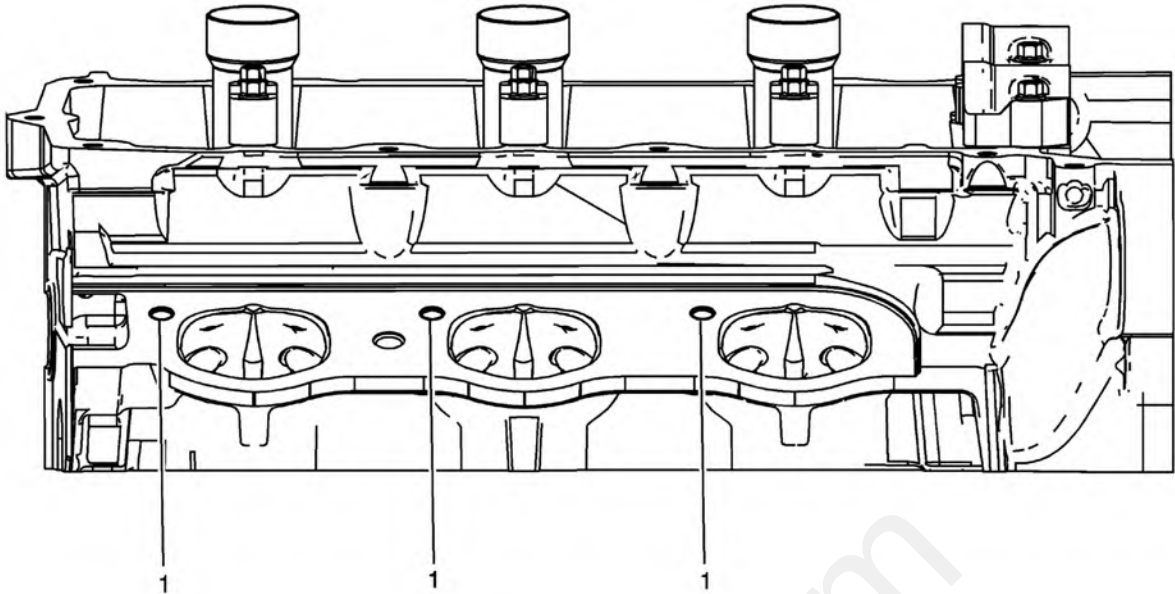


Fig. 3: Left Cylinder Head Intake Face
 Courtesy of GENERAL MOTORS COMPANY

Left Cylinder Head Intake Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

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

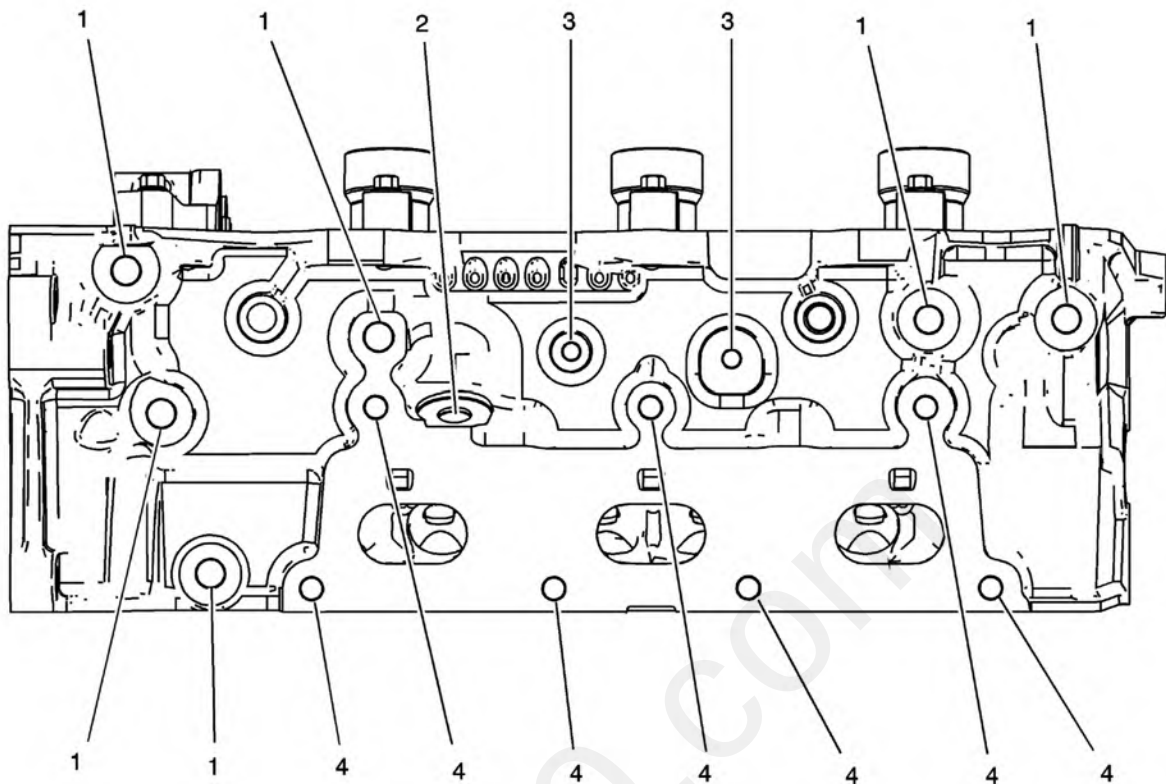


Fig. 4: Left Cylinder Head Exhaust Face
 Courtesy of GENERAL MOTORS COMPANY

Left Cylinder Head Exhaust Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

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

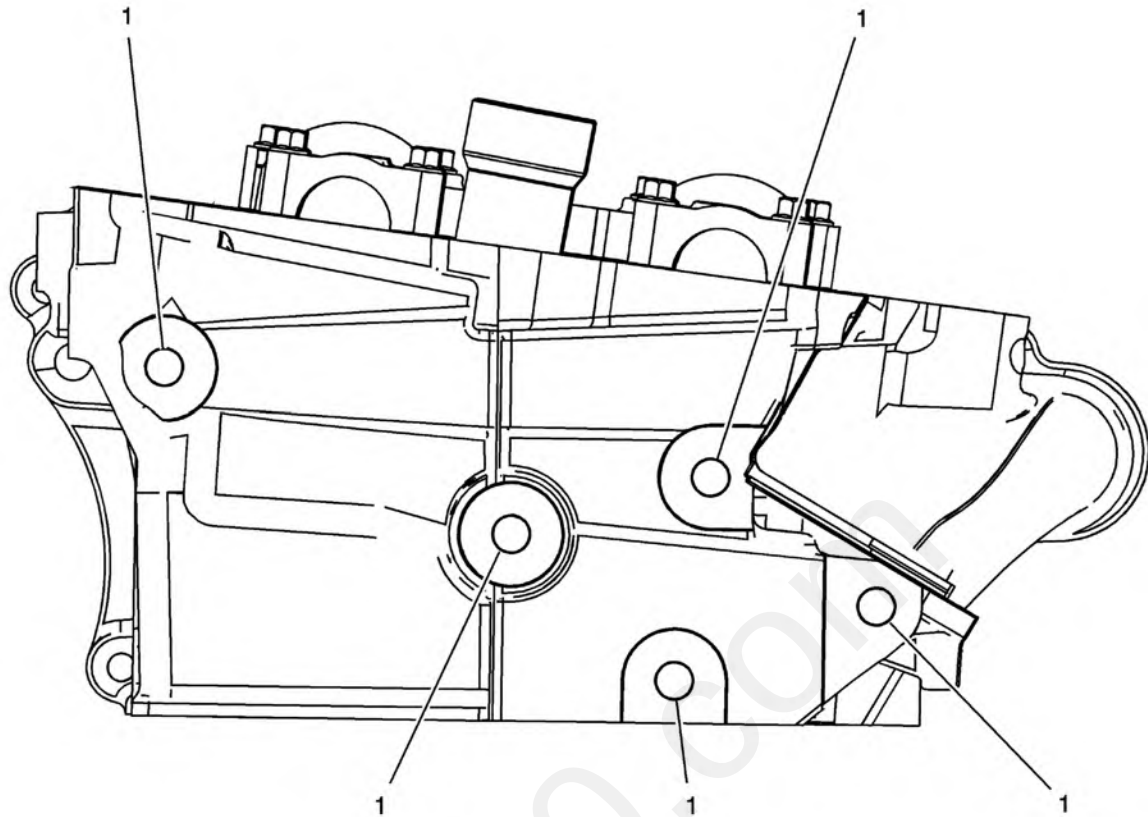


Fig. 5: Left Cylinder Head Rear Face

Courtesy of GENERAL MOTORS COMPANY

Left Cylinder Head Rear Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

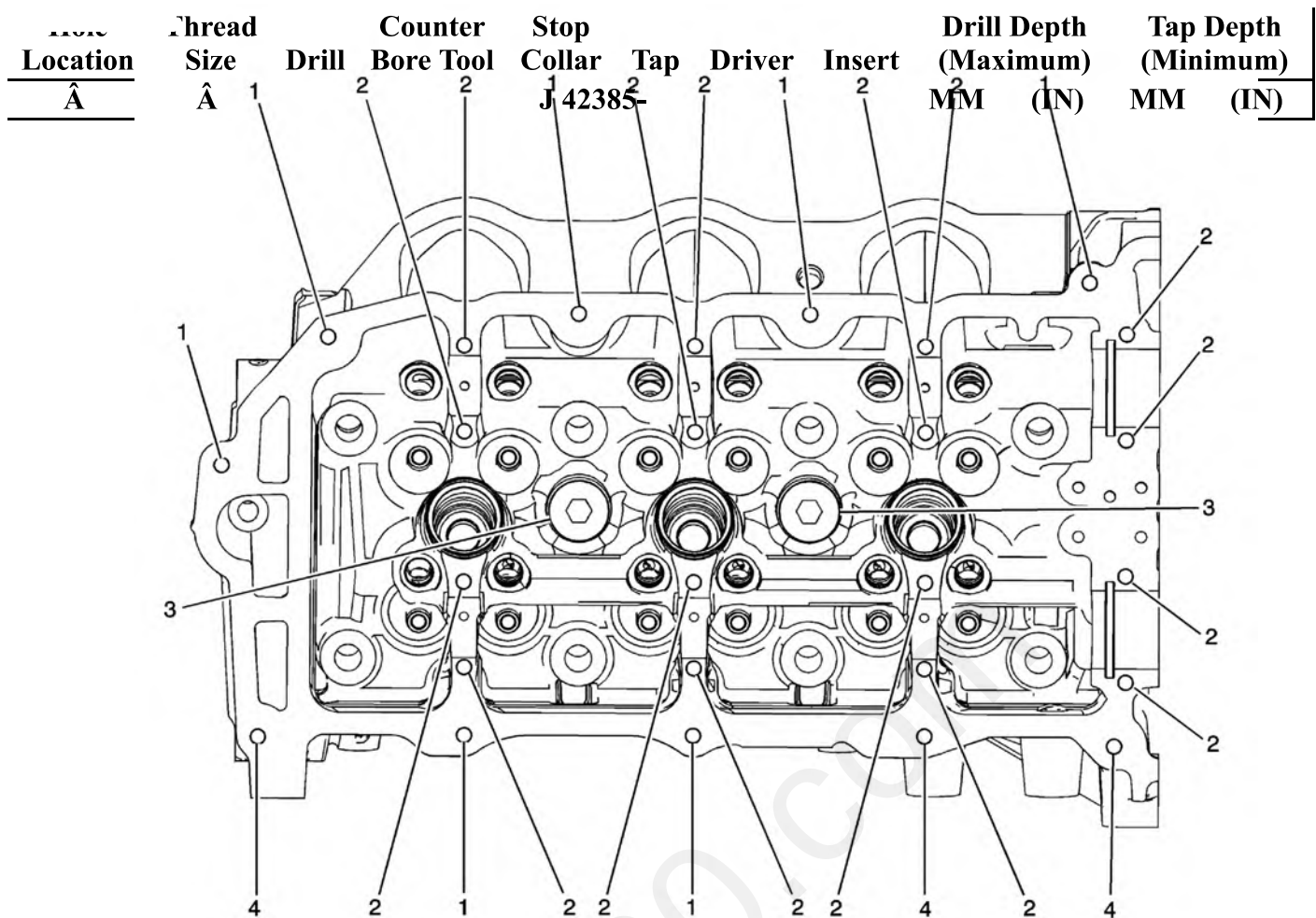


Fig. 6: Right Cylinder Head Camshaft Cover Face

Courtesy of GENERAL MOTORS COMPANY

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)	
Å	Å	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

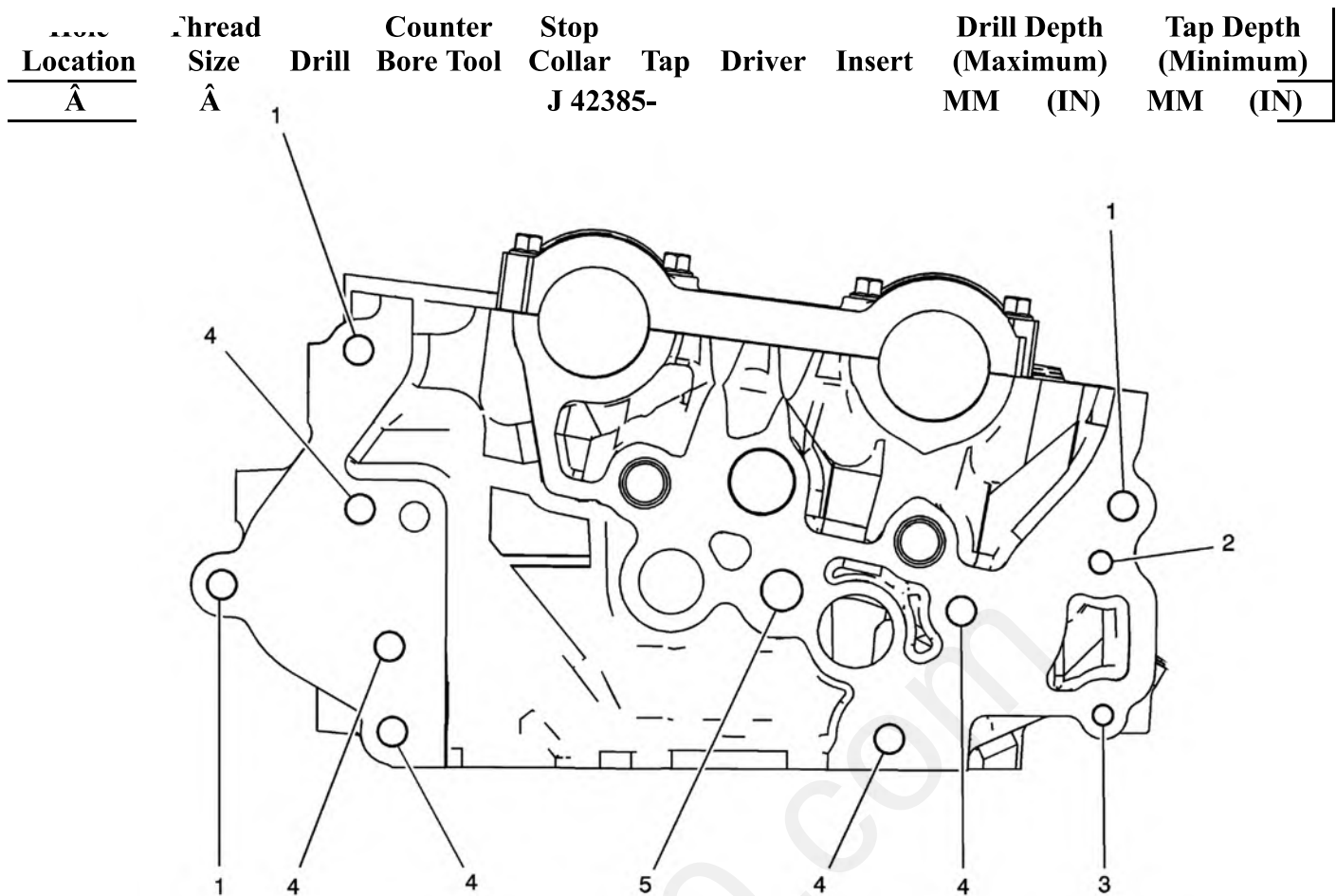


Fig. 7: Right Cylinder Head Front Face
 Courtesy of GENERAL MOTORS COMPANY

Right Cylinder Head Front Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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

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

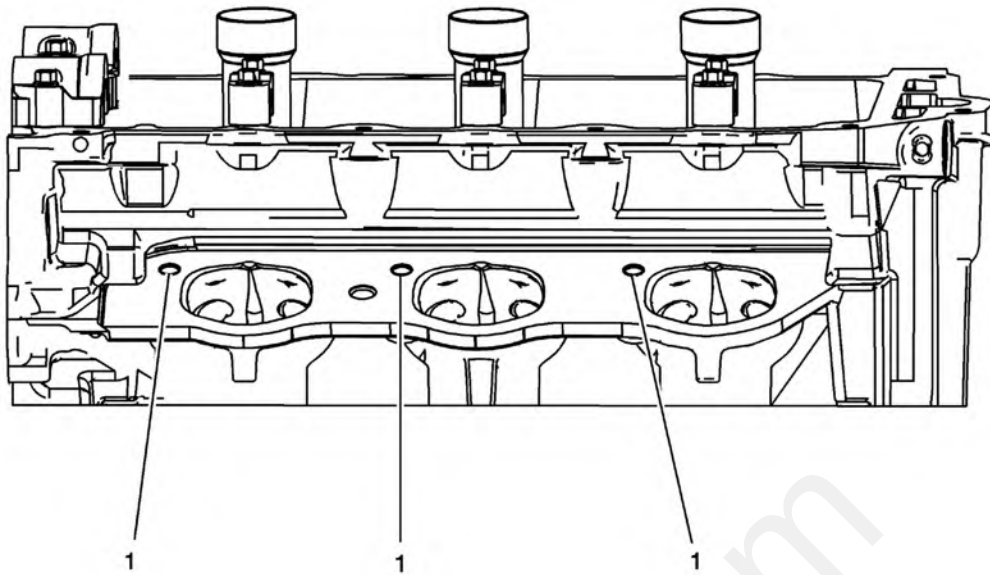


Fig. 8: Right Cylinder Head Intake Face
 Courtesy of GENERAL MOTORS COMPANY

Right Cylinder Head Intake Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

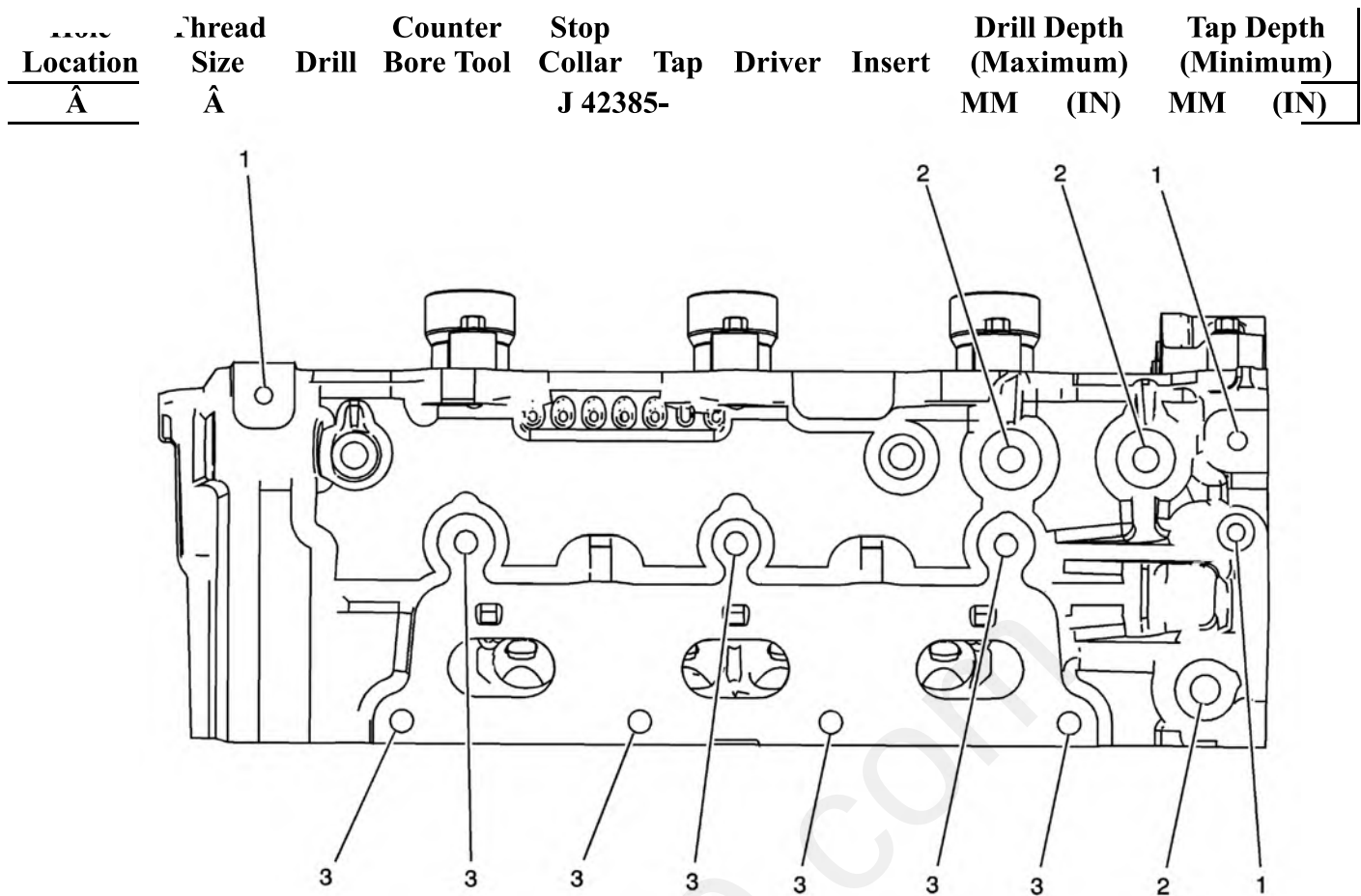


Fig. 9: Right Cylinder Head Exhaust Face

Courtesy of GENERAL MOTORS COMPANY

Right Cylinder Head Exhaust Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

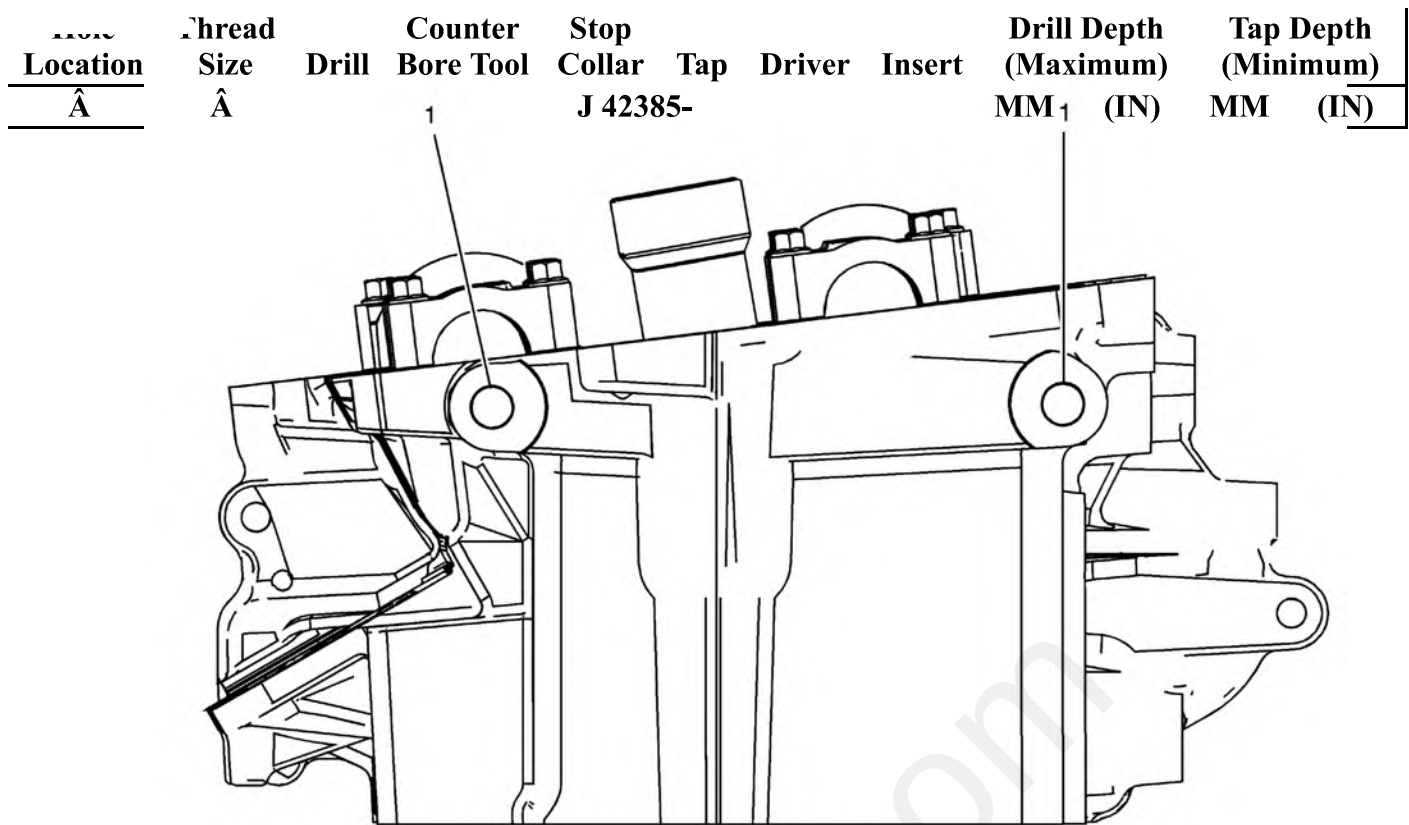


Fig. 10: Right Cylinder Head Rear Face
 Courtesy of GENERAL MOTORS COMPANY

Right Cylinder Head Rear Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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

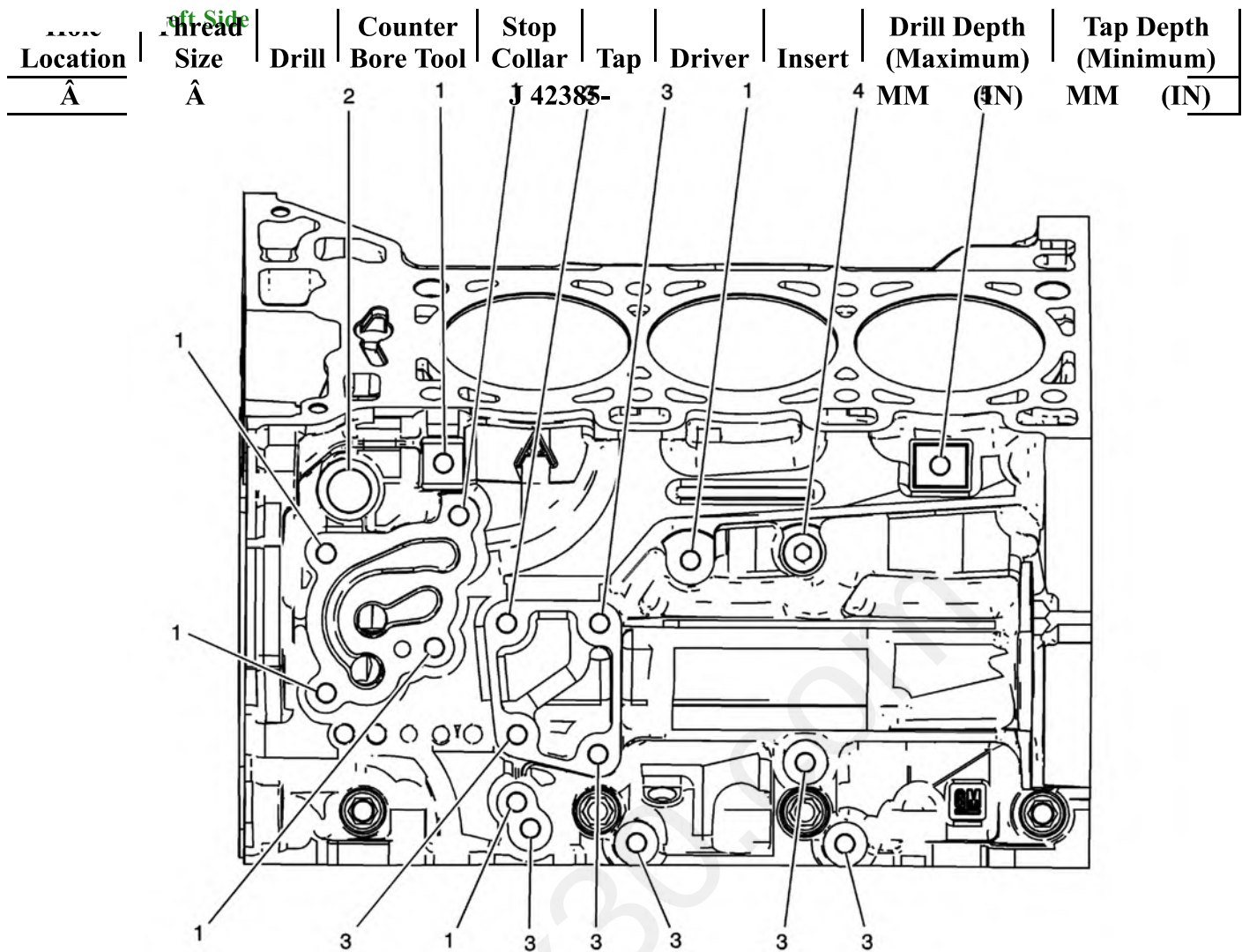


Fig. 12: Engine Block Left Side
 Courtesy of GENERAL MOTORS COMPANY

Engine Block Left Side

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

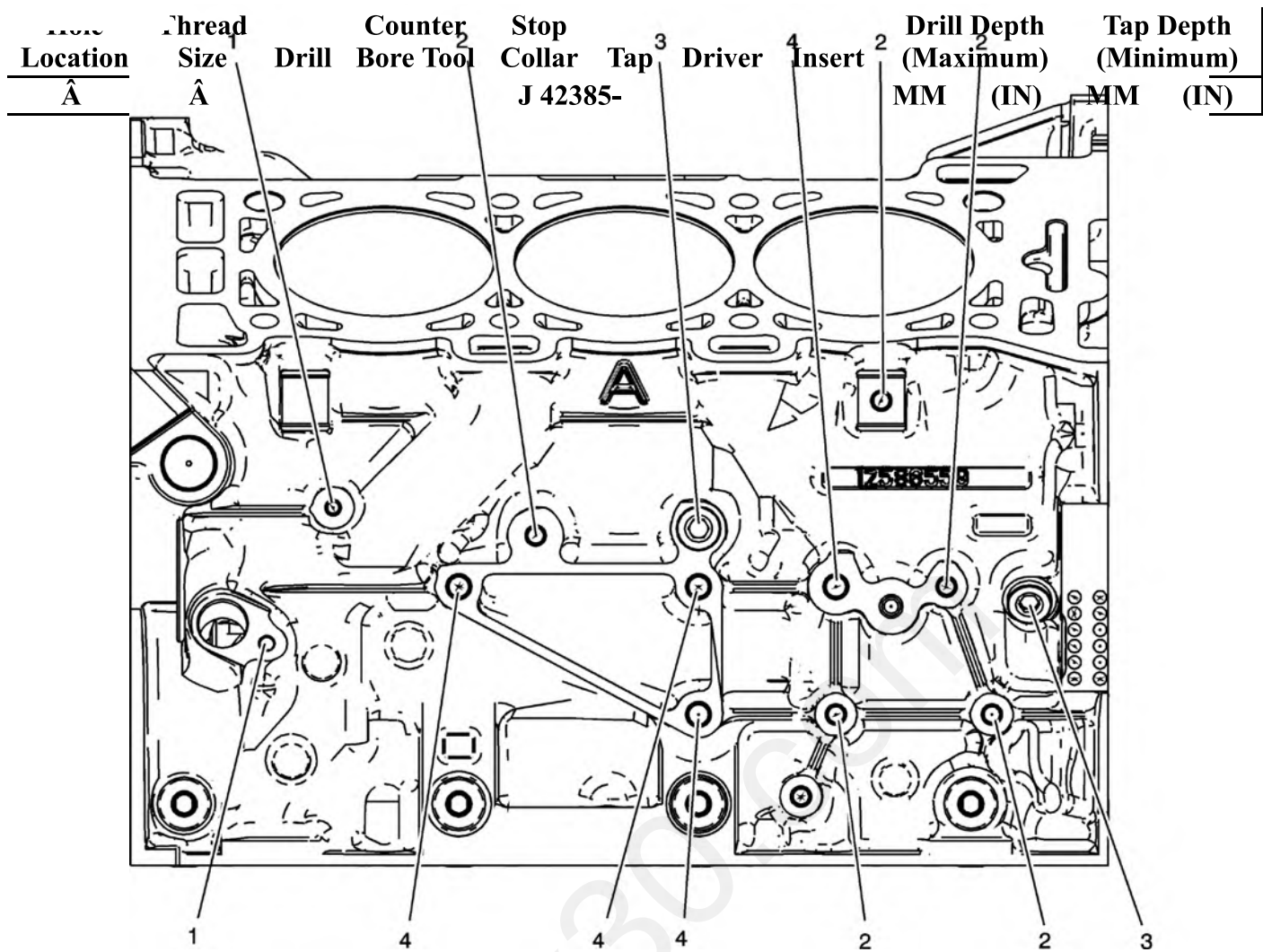


Fig. 13: View Of Engine Block Right Side
 Courtesy of GENERAL MOTORS COMPANY

Engine Block Right Side

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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

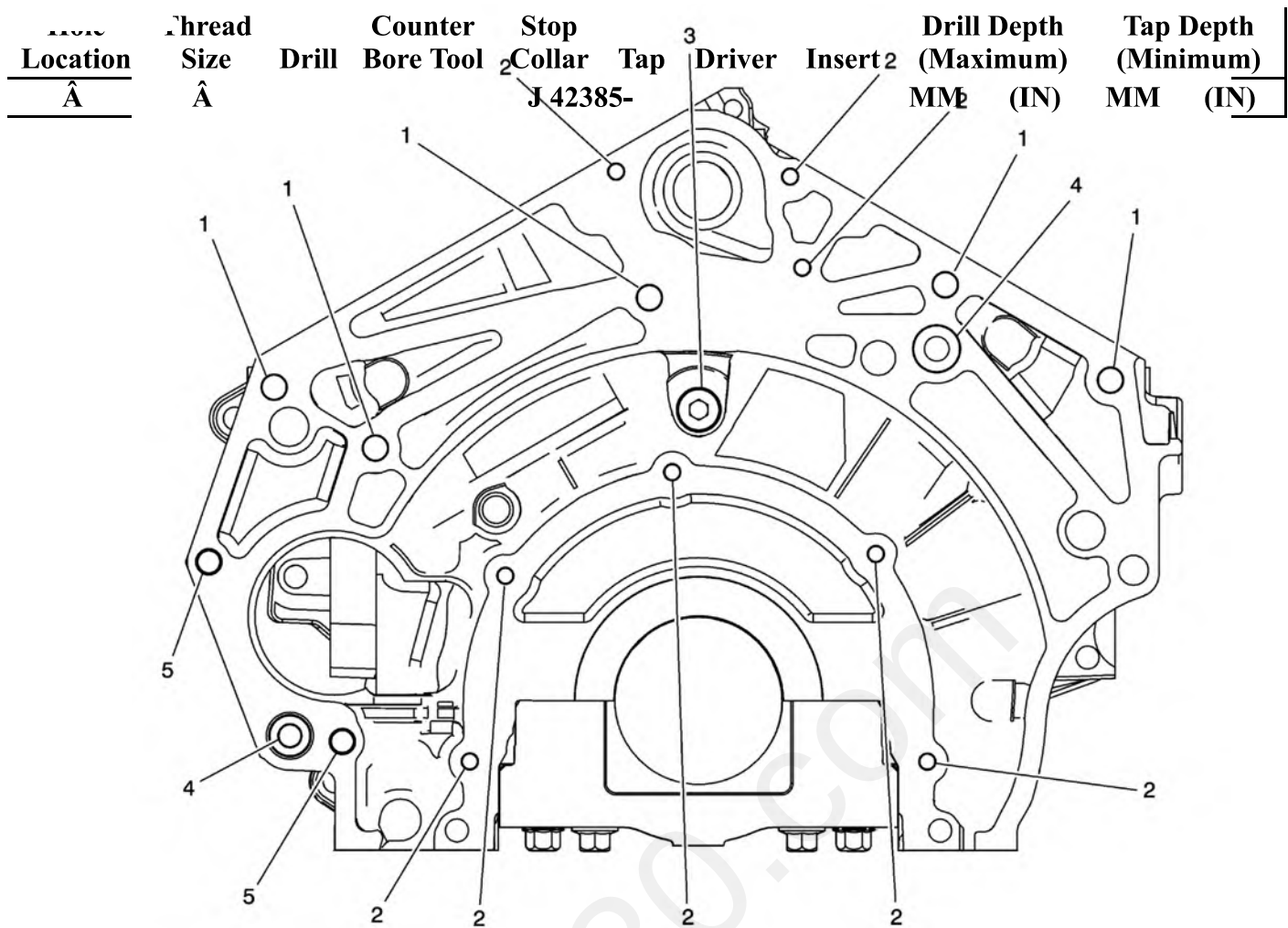


Fig. 14: Engine Block Rear

Courtesy of GENERAL MOTORS COMPANY

Engine Block Rear

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

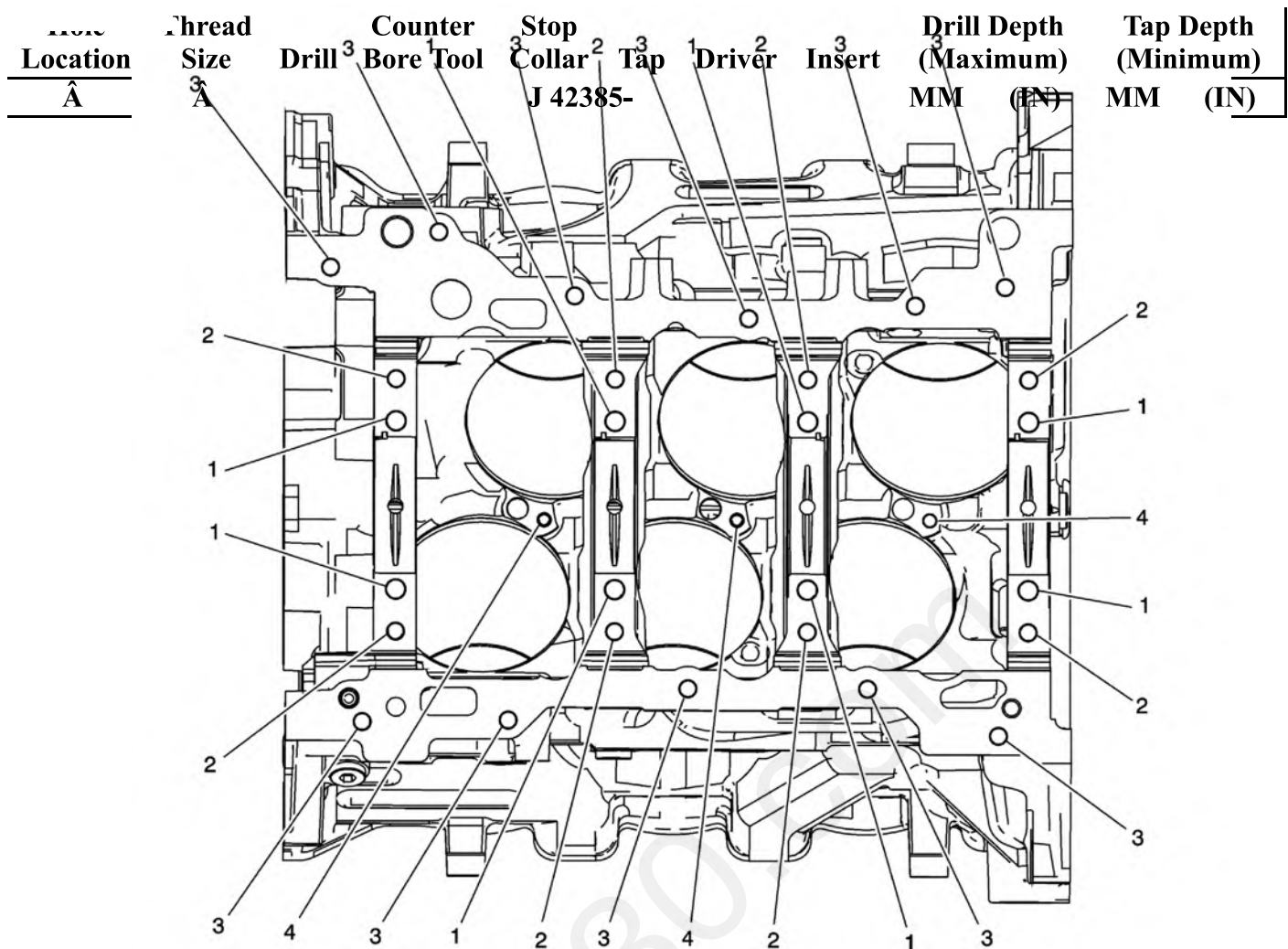


Fig. 15: Engine Block Bottom

Courtesy of GENERAL MOTORS COMPANY

Engine Block Bottom

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

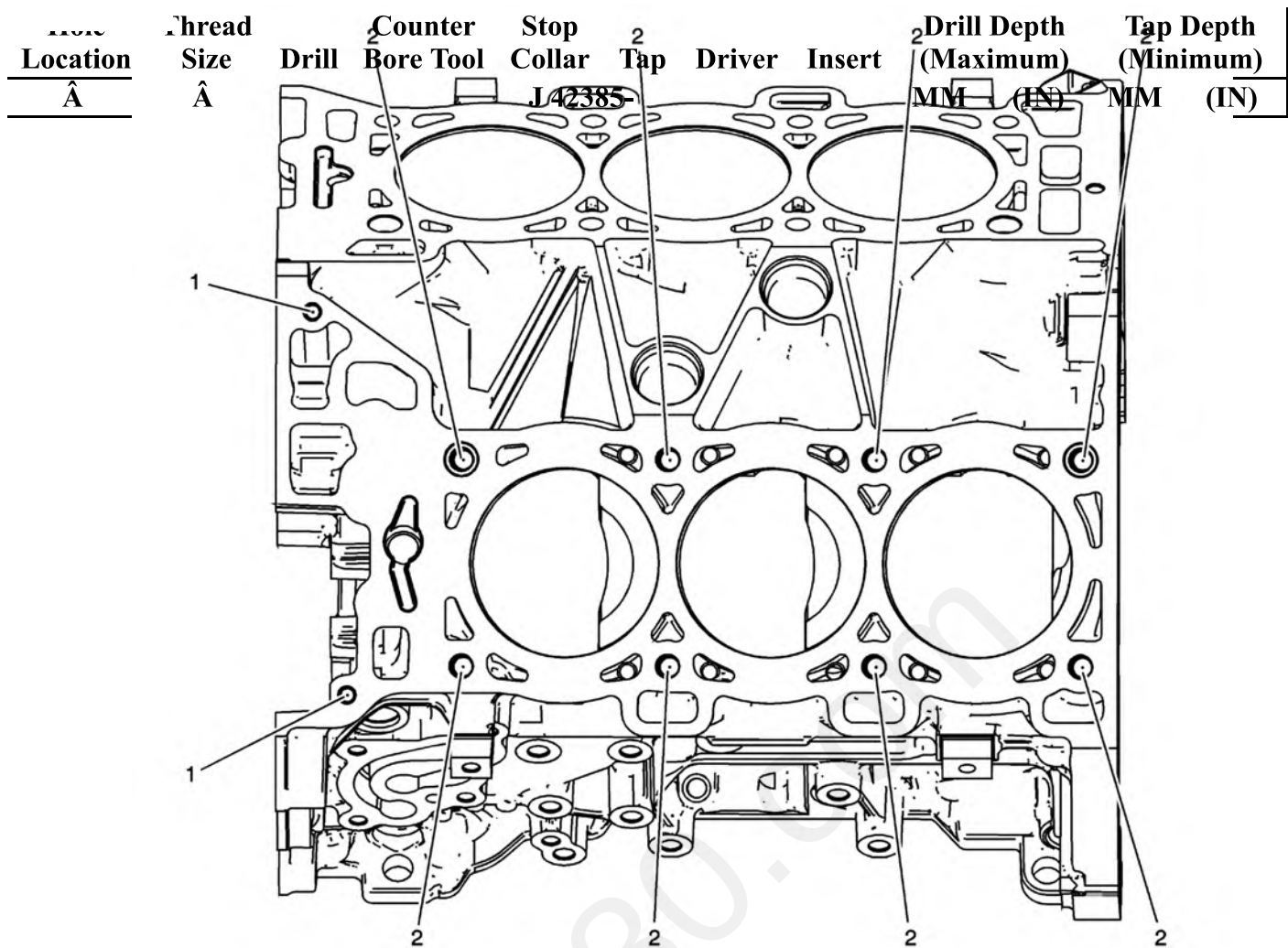


Fig. 16: Engine Block Left Deck Face
 Courtesy of GENERAL MOTORS COMPANY

Engine Block Left Deck Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

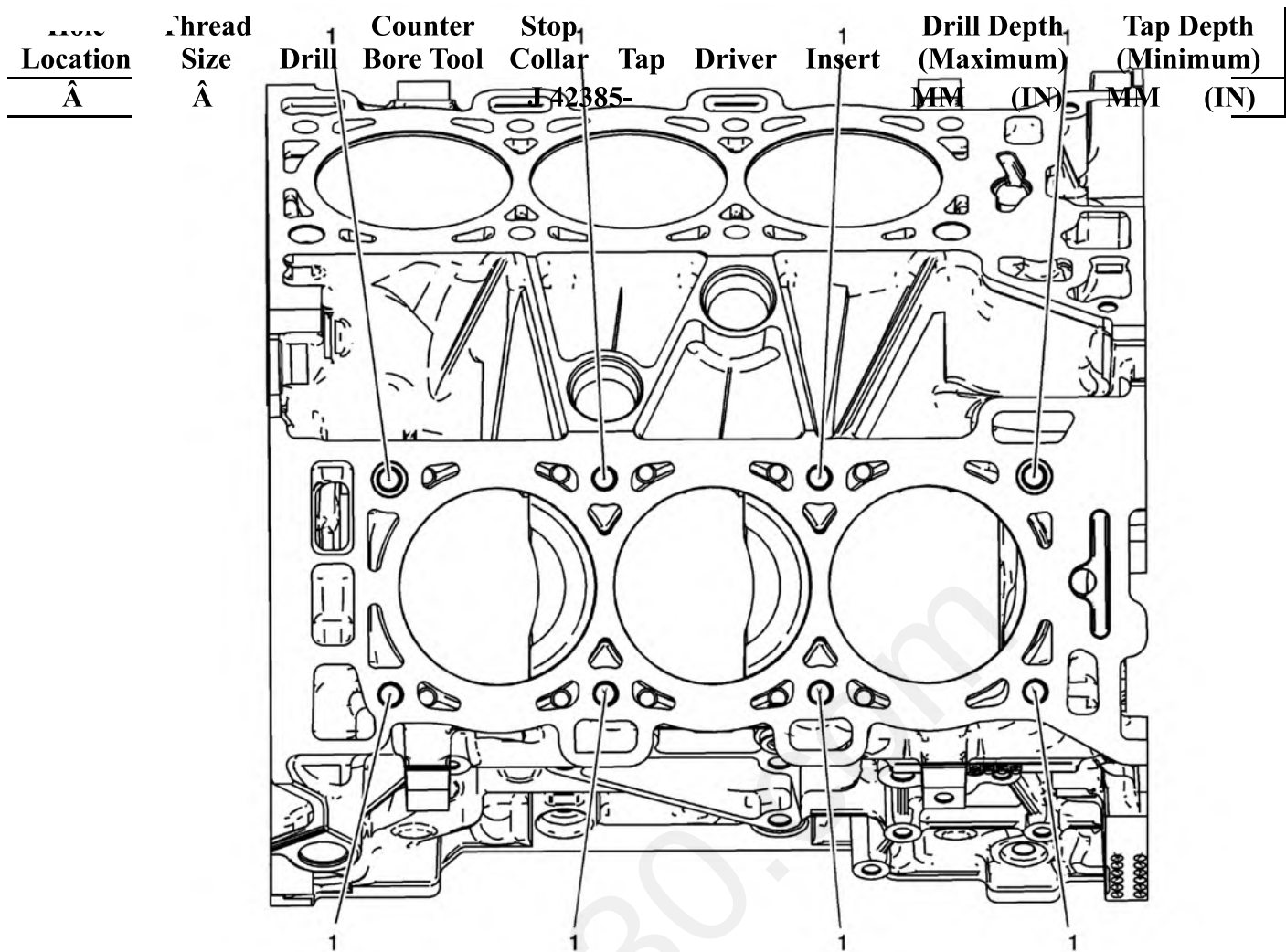


Fig. 17: View Of Engine Block Right Deck Face
 Courtesy of GENERAL MOTORS COMPANY

Engine Block Right Deck Face

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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 Front Cover

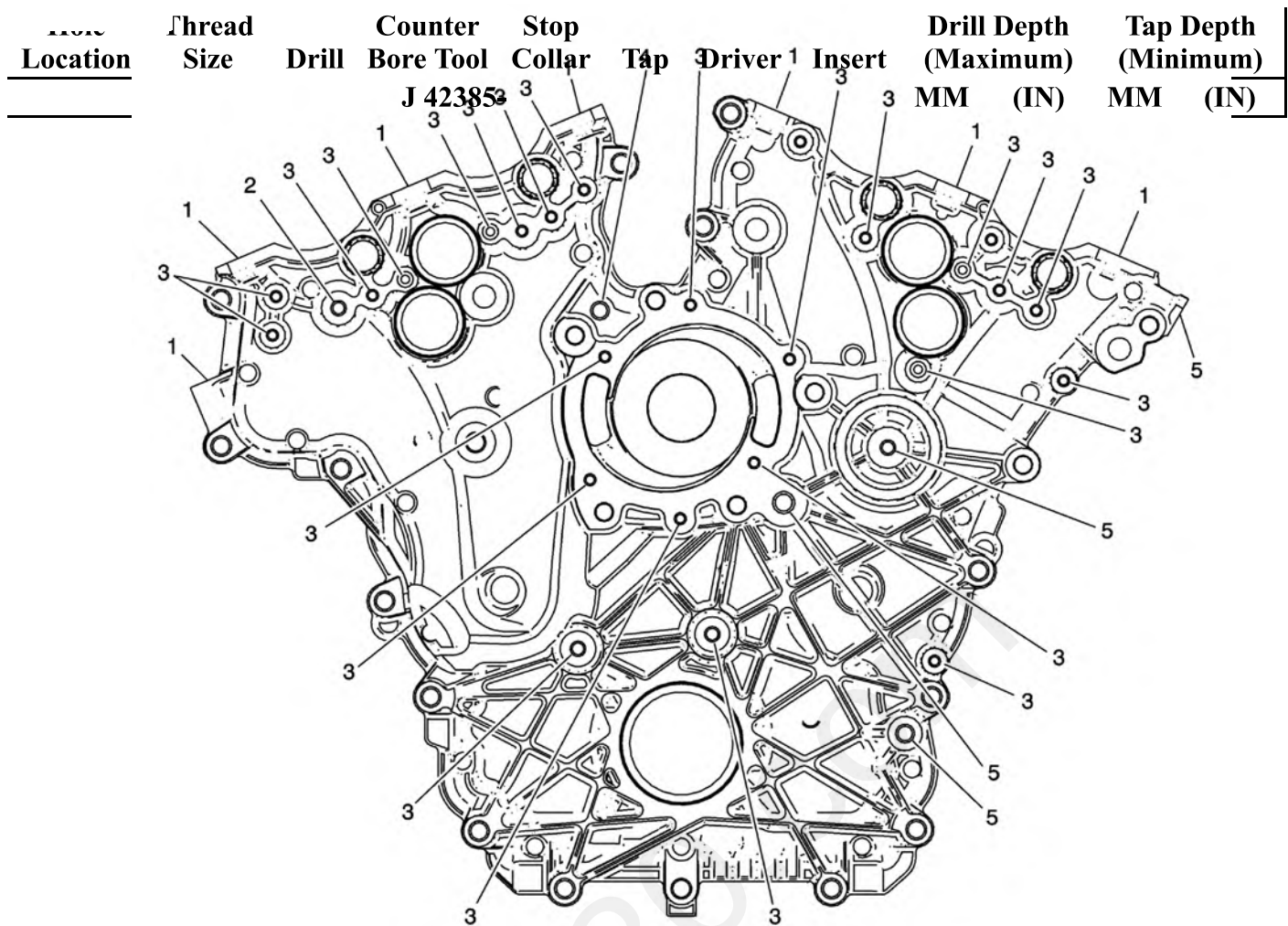


Fig. 18: Engine Front Cover
 Courtesy of GENERAL MOTORS COMPANY

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

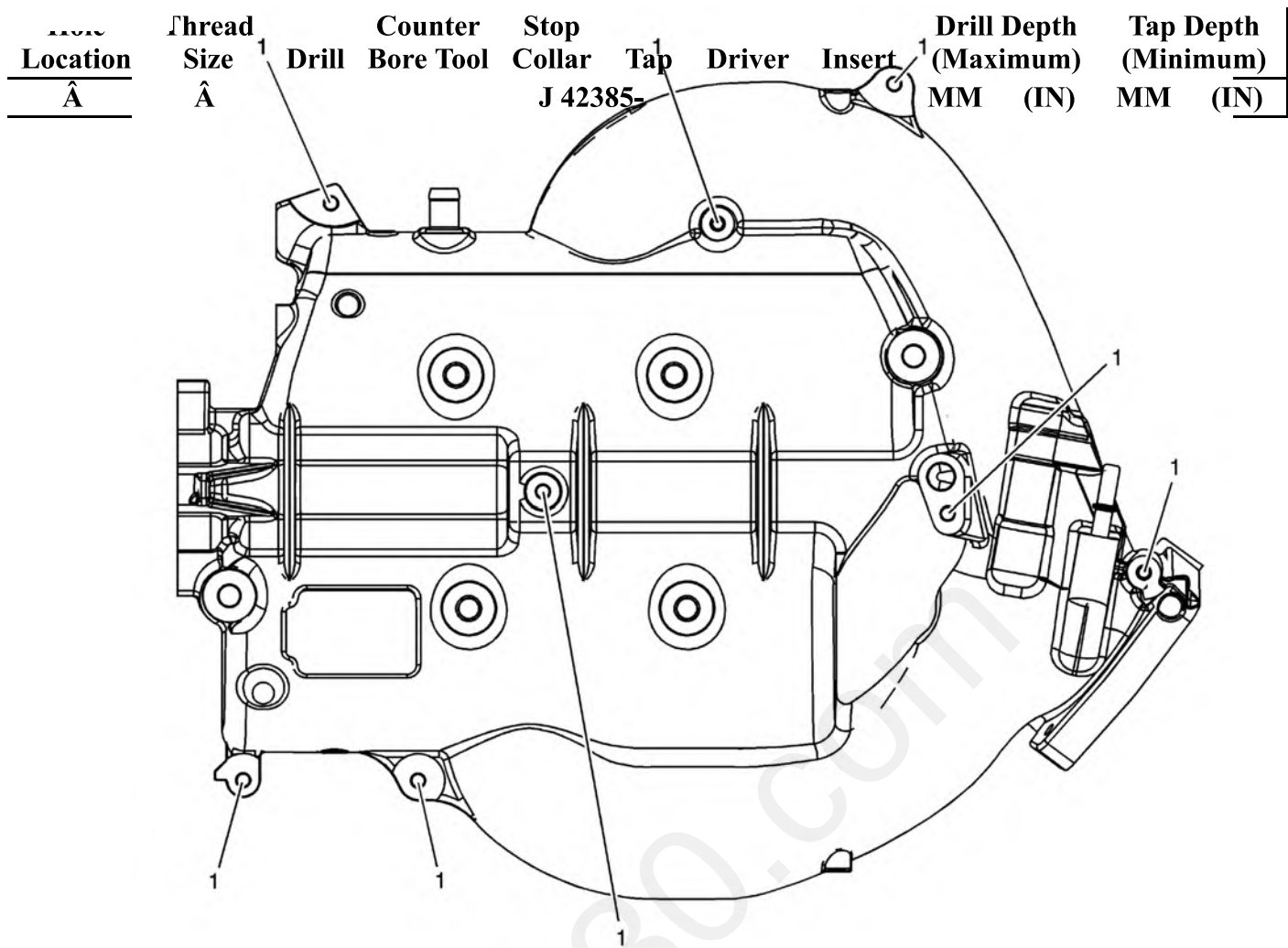


Fig. 19: View Of Upper Intake Manifold - Top
 Courtesy of GENERAL MOTORS COMPANY

Upper Intake Manifold - Top

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

Upper Intake Manifold - Front

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

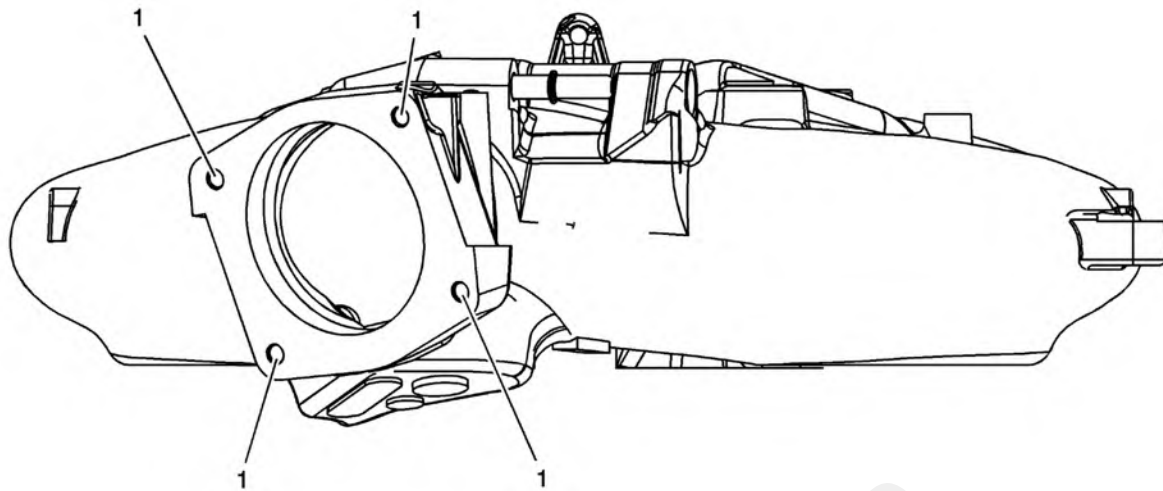


Fig. 20: View Of Upper Intake Manifold - Front

Courtesy of GENERAL MOTORS COMPANY

Upper Intake Manifold - Front

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

Upper Intake Manifold - Rear

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

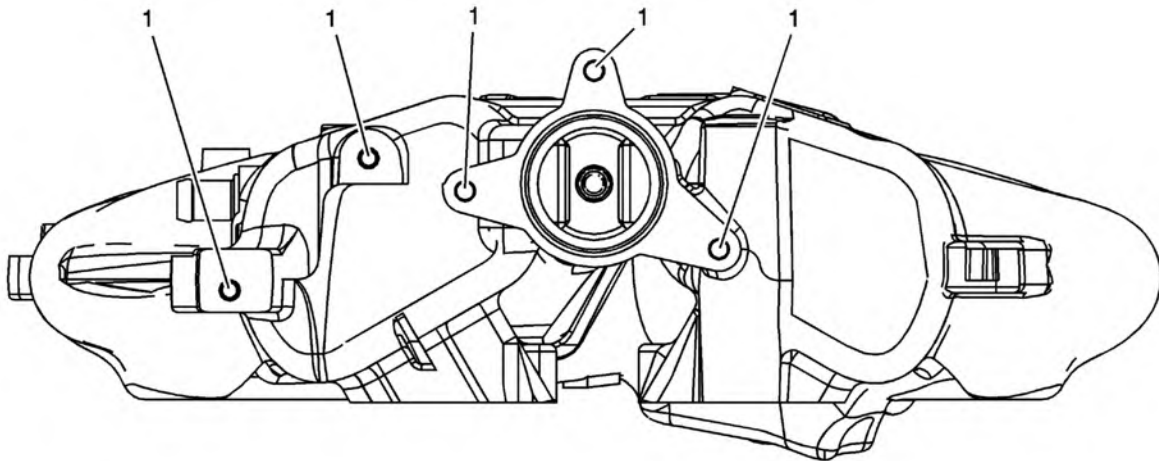


Fig. 21: View Of Upper Intake Manifold - Rear
 Courtesy of GENERAL MOTORS COMPANY

Upper Intake Manifold - Rear

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

Lower Intake Manifold - Top

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

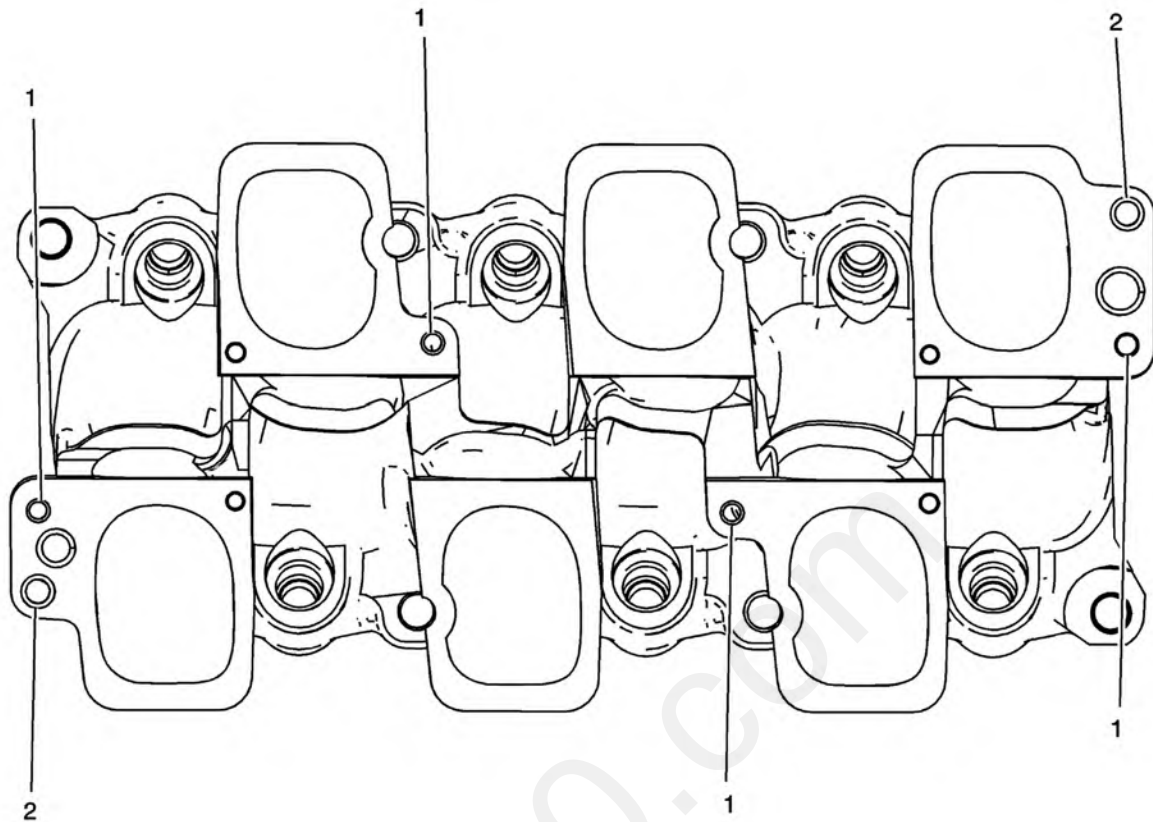


Fig. 22: Lower Intake Manifold - Top
Courtesy of GENERAL MOTORS COMPANY

Lower Intake Manifold - Top

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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

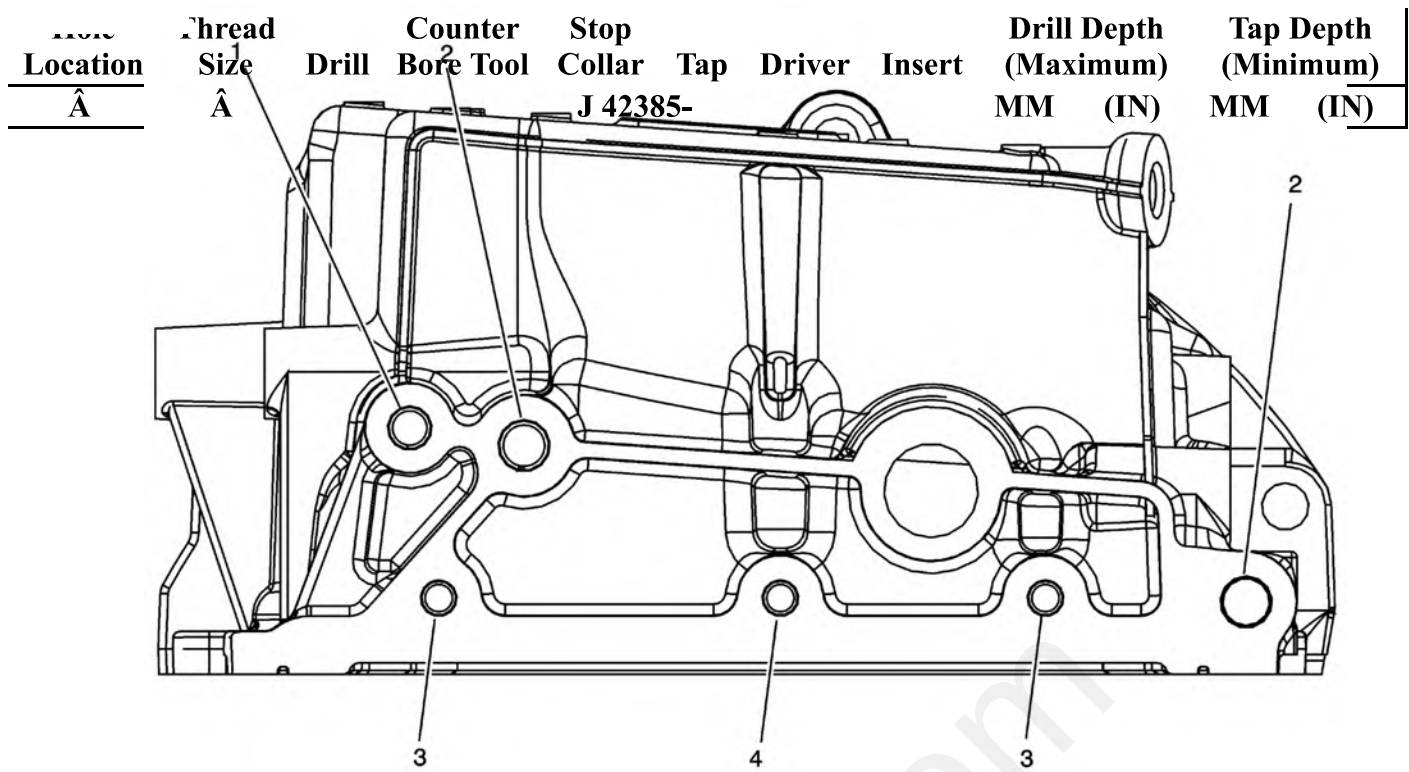


Fig. 23: Oil Pan Front

Courtesy of GENERAL MOTORS COMPANY

Oil Pan Front

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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	416	39.5	1.5551	32.0	1.2598
3	M8 x 1.25	206	207	N/A	208	209	210	28.5	1.1220	23.0	0.9055
4	M8 x 1.25	610	N/A	N/A	208	209	620	37.5	1.4764	32.0	1.2598

Oil Pan Left Side

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

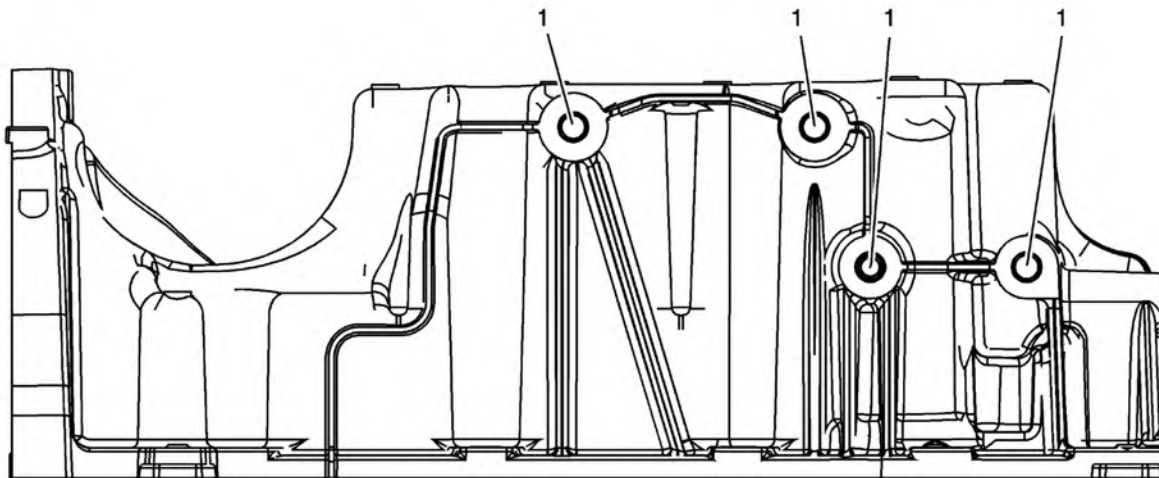


Fig. 24: Oil Pan Left Side

Courtesy of GENERAL MOTORS COMPANY

Oil Pan Left Side

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

Oil Pan Right Side

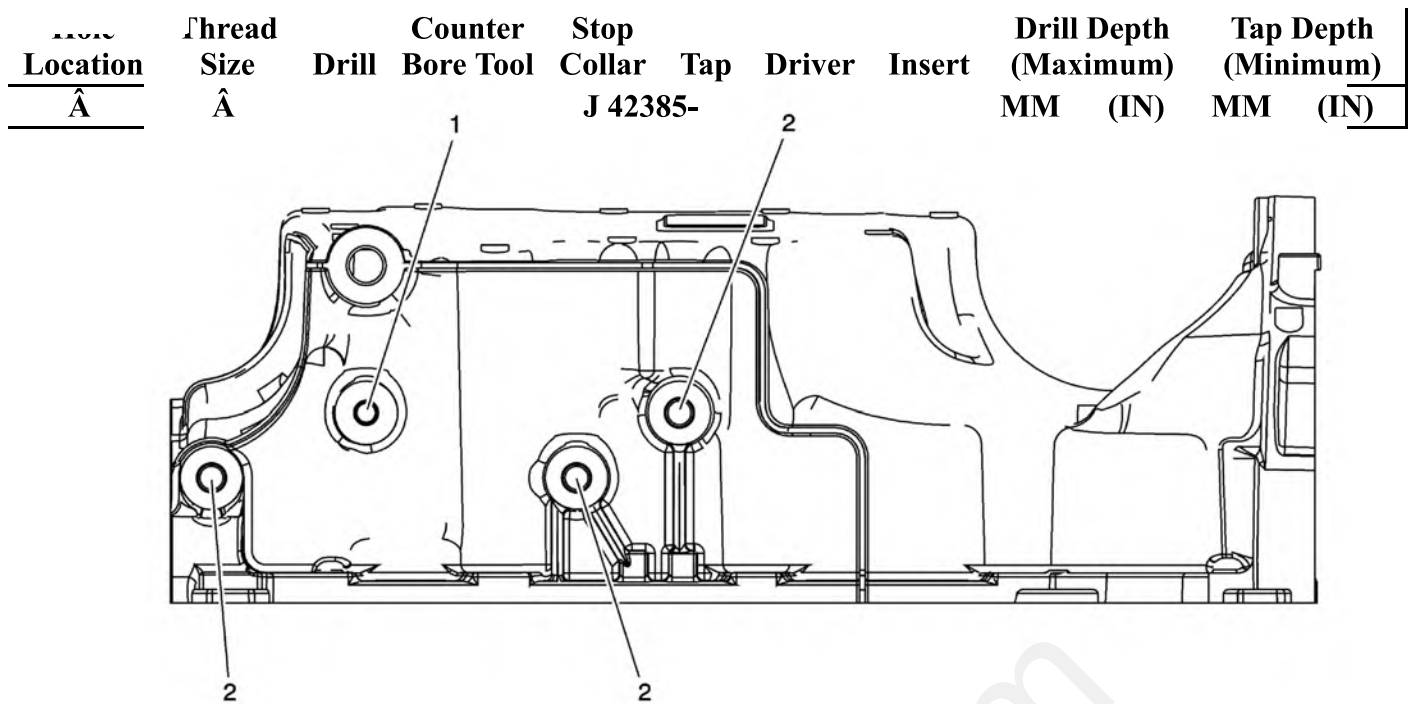


Fig. 25: View Of Oil Pan Right Side

Courtesy of GENERAL MOTORS COMPANY

Oil Pan Right Side

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Â	Â	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	420	33.5	1.3189	27.0	1.0630

Oil Pan Rear

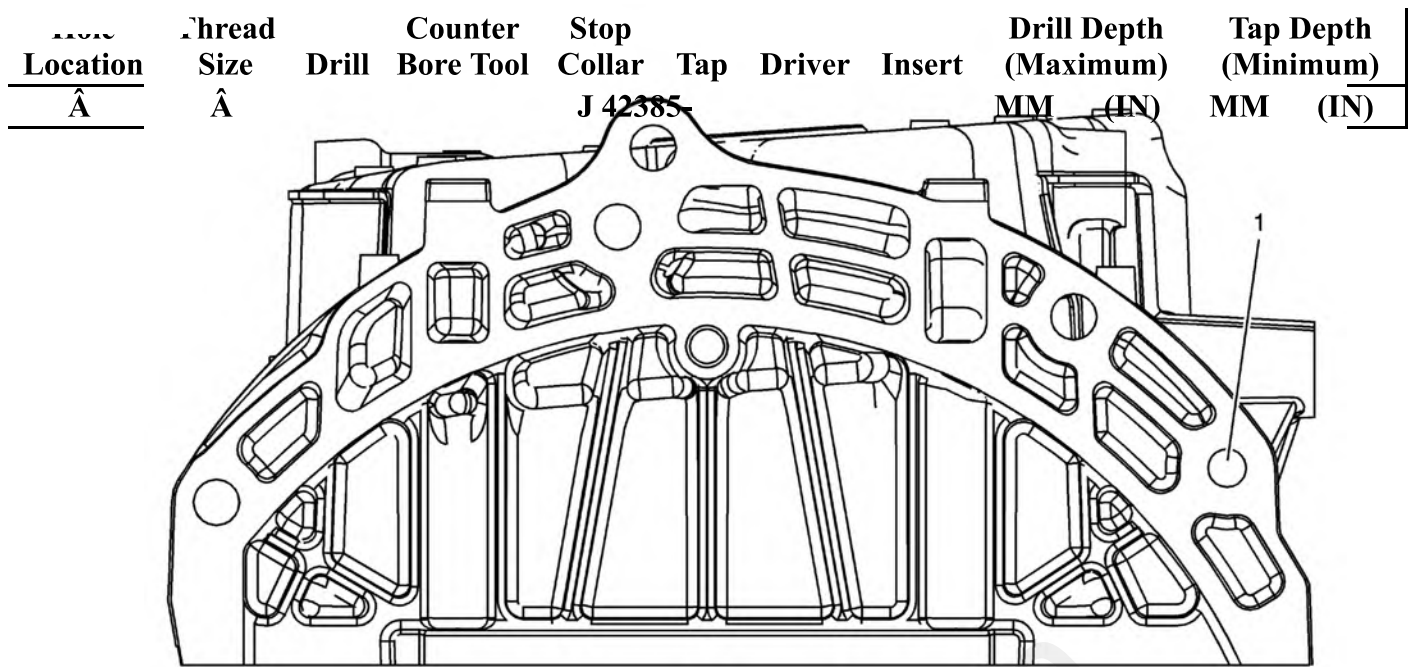


Fig. 26: View Of Oil Pan Rear
 Courtesy of GENERAL MOTORS COMPANY

Oil Pan Rear

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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

Oil Pan Top

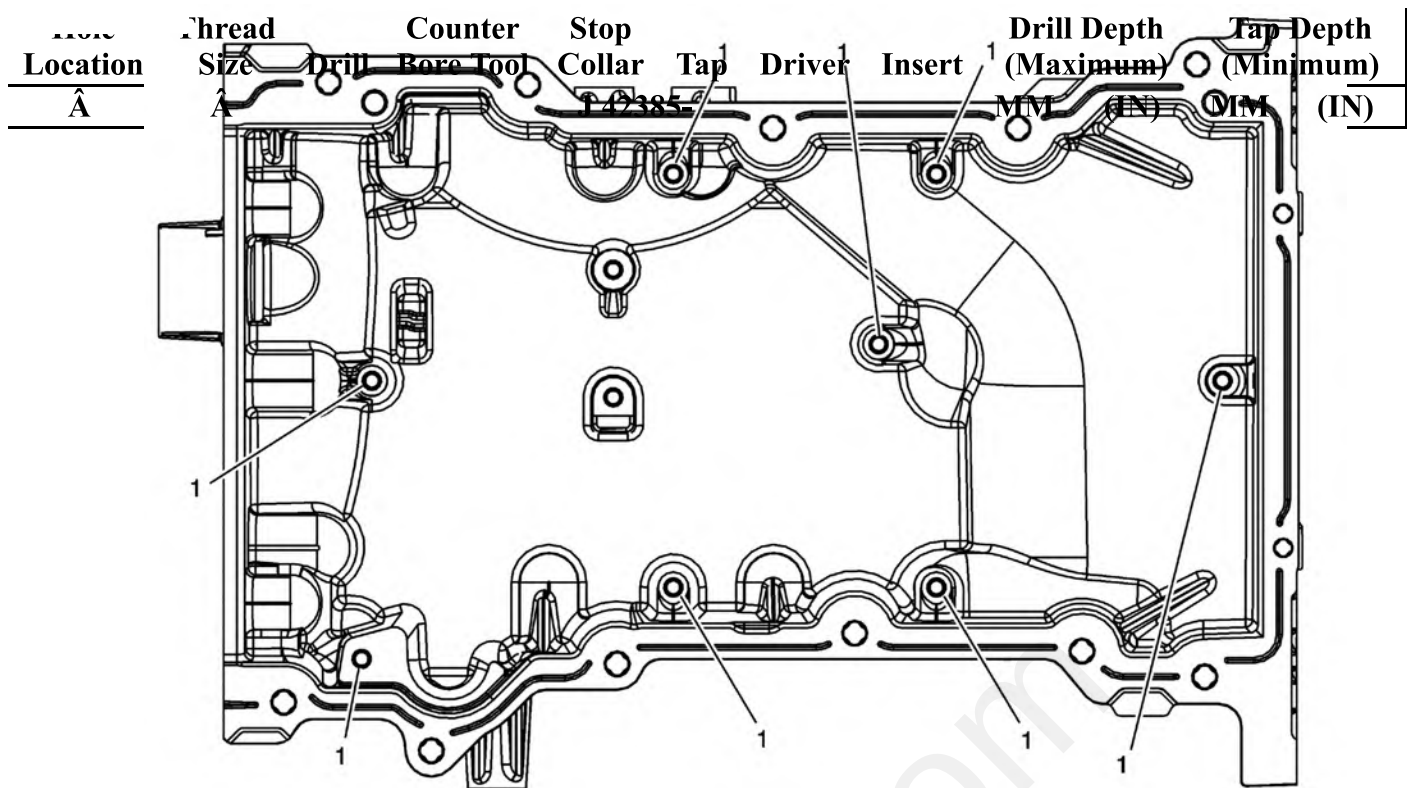


Fig. 27: Oil Pan Top

Courtesy of GENERAL MOTORS COMPANY

Oil Pan Top

Hole Location	Thread Size	Drill	Counter Bore Tool	Stop Collar	Tap	Driver	Insert	Drill Depth (Maximum)		Tap Depth (Minimum)	
Å	Å	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