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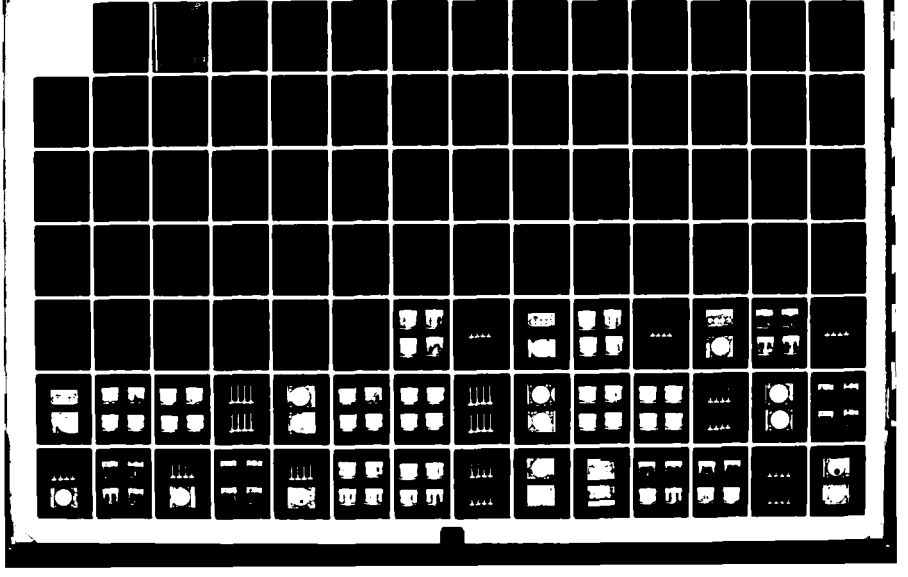

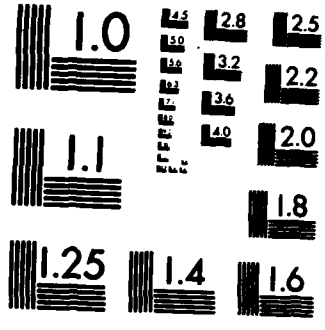

AFTER-TEST ENGINE INSPECTION OF U.S. ARMY ADMINISTRATIVE AND LIGHT-TACTICAL VEHICLES OPERATED ON GASOHOL AND UNLEADED GASOLINE

INTERIM REPORT
AFLRL No. 167

By
W. E. Butler, Jr.
E. A. Frame
E. C. Owens
U.S. Army Fuels and Lubricants Research Laboratory
Southwest Research Institute
San Antonio, Texas

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Gasohol	Unleaded Gasoline	Varnish
General-purpose Vehicles	Light-Tactical Vehicles	Sludge
Spark-ignition Engine	Engine Wear	Engine Deposits

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

Eighteen spark ignition engines from U.S. Army administrative and light-tactical vehicles, which were part of a fleet test to determine the effects of operating such engines with gasohol as a fuel, were shipped to the U.S. Army Fuels and Lubricants Research Laboratory (USAFLRL) for after-test inspections. Twelve of the engines were operated with gasohol as a fuel, and six of the engines were operated with unleaded gasoline. Each engine

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20. ABSTRACT (Cont'd)

was disassembled for inspections which included visual inspection, wear measurements of selected components, deposit ratings in accordance with CRC rating methods, and photographs of selected parts. No significant differences between engines operated with gasohol and those operated with unleaded gasoline could be determined by any of the inspection methods used. Consideration of the data generated from the inspections support the conclusion that gasohol may be successfully utilized in the U.S. Army's administrative and light-tactical vehicles.

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I. INTRODUCTION

The eighteen engines received by the U.S. Army Fuels and Lubricants Research Laboratory (USAFLRL) for after-test inspections were removed from administrative and light-tactical vehicles which had been operated as part of a fleet test conducted for approximately one year by the U.S. Army Mobility Equipment Research and Development Command (USAMERADCOM) (Currently Belvoir Research and Development Center) to determine the suitability for using gasohol in all gasoline-consuming military vehicles.(1)* Six engines each were shipped from Fort Belvoir, VA, Fort Lewis, WA, and Fort McCoy, WI for disassembly and inspection. Table 1 describes each engine received and, where possible, contains vehicle descriptions. The engines were enclosed in plastic wrappers and shipped in sealed containers lined with a plastic barrier material which adequately protected the engines.

II. TEST EQUIPMENT

A. Fuels

Two types of fuels were used in the fleet test. Gasohol, either commercially available or locally mixed, and commercially available unleaded gasoline which met specification VV-G-1690C. The locally mixed gasohol consisted of 10 vol% ethanol (197 minimum proof) and 90 vol% unleaded gasoline.(1) Two vehicles of each set of three were operated with the gasohol fuel, and the third vehicle of the set was operated using unleaded gasoline.

B. Vehicles

As shown in Table 1, the vehicles were a mix of commercial and light-tactical vehicles. The commercial vehicles from which engines were selected for after-test inspections were Ford station wagons and CJ5

*Underscored numbers in parentheses denote references listed at the end of the report.

TABLE 1. DESCRIPTION OF TEST VEHICLES AND ENGINES

Installation	Unit	Vehicle Type	Bumper Number	Engine				Fuel
				Make	Type	CID	SN	
Ft. Belvoir, VA	30th Engr.Bn.	M151A2	SVY-10	Johnson	4 cyl.	141.5	5001675	Unleaded Gasoline
Ft. Belvoir, VA	11th Engr. Bn.	M151A2	HQ-32	Johnson	4 cyl.	141.5	6003049	Gasohol
Ft. Belvoir, VA	30th Engr. Bn.	M151A2	HQ-6	Johnson	4 cyl.	141.5	500283	Gasohol
Ft. Belvoir, VA	30th Engr. Bn.	M890	HQ-90	Chrysler	V-8	318	03223146	Unleaded Gasoline
Ft. Belvoir, VA	11th Engr. Bn.	M880	A-4	Chrysler	V-8	318	07121303	Gasohol
Ft. Belvoir, VA	11th Engr. Bn.	M880	SPED-214	Chrysler	V-8	318	07090311	Gasohol
Ft. Lewis, WA	9th MP Co.	M151A2	UNK*	Ford	4 cyl.	141.5	235880	Unleaded Gasoline
Ft. Lewis, WA	9th MP Co.	M151A2	X-28	Ford	4 cyl.	141.5	251891	Gasohol
Ft. Lewis, WA	9th MP Co.	M151A2	X-29	Ford	4 cyl.	141.5	235875	Gasohol
Ft. Lewis, WA	9th Med. Bn.	M880	UNK	Dodge	V-8	318	01212997	Unleaded Gasoline
Ft. Lewis, WA	9th Med. Bn.	M880	UNK	Dodge	V-8	318	02260516	Gasohol
Ft. Lewis, WA	9th Med. Bn.	M880	UNK	Dodge	V-8	318	12110971	Gasohol
Ft. McCoy, WI	UNK	CJ5 Jeep	HQ-192	AMC	6 cyl.	232	CD0941**	Unleaded Gasoline
Ft. McCoy, WI	UNK	CJ5 Jeep	HQ-195	AMC	6 cyl.	232	CD0935**	Gasohol
Ft. McCoy, WI	UNK	CJ5 Jeep	HQ-190	AMC	6 cyl.	232	CD0939**	Gasohol
Ft. McCoy, WI	UNK	Sta.Wagon	E-020	Ford	V-8	400	CD7099**	Unleaded Gasoline
Ft. McCoy, WI	UNK	Sta.Wagon	E-018	Ford	V-8	400	CD7097**	Gasohol
Ft. McCoy, WI	UNK	Sta.Wagon	E-019	Ford	V-8	400	CD7098**	Gasohol

*UNK = Unknown

** = Serial numbers not on engines; vehicle numbers used instead

jeeps (1/4 ton, 4x4), while the light-tactical vehicles were in two configurations, pickups and M151A2 jeeps. The M880 series is a 5/4-ton pickup truck with 4-wheel drive. The M890 is a 5/4-ton pickup truck with a two-wheel drive. The M151A2 is a 1/4-ton vehicle with four-wheel drive.

III. TEST PROCEDURES

Test and control vehicles were to be operated for 1 year in order to experience a full cycle of seasonal changes. The location of test sites selected by MERADCOM ensured a wide range of climatic conditions in which the performance of the test and control vehicles might be evaluated. Vehicle operational data and performance problems are reported in Reference 1. The test and control vehicles were operated in accordance with normal mission requirements.

IV. DISCUSSION

The test and control engines were evaluated by (1) disassembly and visual inspections to determine if there were any signs of abnormal conditions or wear, (2) wear measurements of selected parts for comparison with manufacturers' specifications, (3) deposit ratings in accordance with CRC rating methods for both the engines and carburetors, and (4) photographs of selected engine components. Appendix A gives the wear measurements for each component measured. Tables 2, 3, and 4 show the summaries of wear measurements taken for each engine and show which wear measurements were outside the wear limits established by each manufacturer for a specific engine. The highest levels of wear appeared to be in the compression ring gaps for all vehicles and the camshaft lobe lift in the Ford and Chrysler V-8 engines. While main-bearing journals and connecting rod journals in the V-8 engines showed some wear, none could be specifically attributable to the type fuel used since the wear appeared to be the same for each engine in a given set of test and control engines. Valve spring force was another area in which a large number of

TABLE 2. A SUMMARY OF WEAR MEASUREMENT DATA FOR TEST ENGINES FROM FT. BELVOIR, VA[1]

Type Engine	Chrysler V-8, 318 CID				M151A2 Jeep, 4 Cylinder, 140 CID			
Vehicle Serial Number	07121303	07090311	03223146		500283	5003049	5001675	
AFLRL Number	1	3	2	Manufacturer's	6	5	4	Manufacturer's
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Specifications Service Limits	Gasohol	Gasohol	Unleaded Gasoline	Specifications Service Limits
Components								
Compression Ring Gaps								
Top	0.029 (0.74)	0.030 (0.76)	0.029 (0.74)	0.010-0.020 (0.25)-(0.51)	0.023 (0.58)	0.039 (0.99)	0.033 (0.84)	0.010-0.027 (0.25)-(0.69)
Bottom	0.033 (0.84)	0.031 (0.79)	0.027 (0.69)		0.027 (0.69)	0.045 (1.14)	0.032 (0.81)	
Cylinder Bore Diameter								
Top	3.9118 (99.360)	3.9112 (99.344)	3.9117 (99.357)	3.9100-3.9120 (99.314)-(99.365)	3.8763 (98.458)	3.8786 (98.516)	3.8768 (98.471)	3.8753-3.8777 (98.433)-(98.494)
Middle	3.9113 (99.347)	3.9107 (99.332)	3.9112 (99.344)	—	3.8761 (98.453)	3.8781 (98.504)	3.8766 (98.466)	
Bottom	3.9112 (99.344)	3.9108 (99.334)	3.9113 (99.347)	—	3.8763 (98.458)	3.8783 (98.509)	3.8766 (98.466)	
Cylinder Bore Out-of-Round								
Top	0.0005 (0.013)	0.0005 (0.013)	0.0008 (0.020)	0.0050 max (0.127)	0.0002 (0.005)	0.0005 (0.013)	0.0005 (0.013)	0.005 max (0.13)
Middle	0.0006 (0.015)	0.0009 (0.023)	0.0007 (0.018)	—	0.0004 (0.010)	0.0005 (0.013)	0.0003 (0.008)	—
Bottom	0.0005 (0.013)	0.0005 (0.013)	0.0004 (0.010)	—	0.0004 (0.010)	0.0003 (0.008)	0.0002 (0.005)	—
Taper of Cylinder Bore	0.0006 (0.015)	0.0006 (0.015)	0.0005 (0.013)	0.010 max (0.25)	0.0003 (0.008)	0.0003 (0.008)	0.0002 (0.005)	0.008 max (0.20)
Main Bearings								
Journal Diameter	2.4996 (63.490)	2.4994 (63.485)	2.4998 (63.495)	2.4995-2.5005 (63.487)-(63.513)	2.2484 (57.109)	2.2484 (57.109)	2.2483 (57.107)	2.2482-2.2490 (57.104)-(57.125)
Shell Diameter	2.5027 (63.569)	2.5029 (63.574)	2.5022 (63.556)	2.5000-2.5030 (63.500)-(63.576)	2.2511 (57.178)	2.2514 (57.186)	2.2526 (57.216)	2.2494-2.2512 (57.135)-(57.180)
Connecting Rod Bearings								
Journal Diameter	2.1239 (53.947)	2.1237 (53.942)	2.1235 (53.937)	2.1240-2.1250 (53.950)-(53.975)	1.9986 (50.764)	1.9985 (50.762)	1.9987 (50.767)	1.9982-1.9990 (50.754)-(50.775)
Shell Diameter	2.1262 (54.005)	2.1267 (54.018)	2.1265 (54.013)	2.1245-2.1275 (53.962)-(54.039)	2.0005 (50.813)	2.0008 (50.820)	1.9998 (50.795)	1.9992-2.0010 (50.780)-(50.825)
Piston Average Diameters (Middle and Bottom of Skirt)	3.9089 (99.286)	3.9089 (99.286)	3.9096 (99.304)	3.9085-3.9115 (99.276)-(99.3521)	3.8735 (98.387)	3.8745 (98.412)	3.8736 (98.389)	3.8741-3.8765 (98.402)-(98.463)
Valve Stem to Guide Clearance								
Intake	0.0023 (0.058)	0.0023 (0.058)	0.0024 (0.061)	0.001-0.017 (0.03)-(0.43)	0.0027 (0.069)	0.0027 (0.069)	0.0056 (0.140)	0.0010-0.0025 (0.025)-(0.064)
Exhaust	0.0023 (0.058)	0.0024 (0.061)	0.0024 (0.061)		0.0031 (0.079)	0.0027 (0.069)	0.0051 (0.130)	0.0010-0.0035 (0.025)-(0.089)
Valve Spring Force								
Intake	80 (356)	80 (356)	78 (347)	78-88 @ 1-11/16" (347)-(391)@ 42.86mm	110 (489)	107 (476)	108 (480)	132 lb @ 1.505" (587)(N-m) @ (38.23 mm)
Exhaust	80 (356)	79 (351)	78 (347)		110 (489)	109 (485)	109 (485)	Wear Limit-110 lbs
Camshaft Lobe Lift								
Intake	0.236[2] (5.99)	0.240 (6.10)	0.240 (6.10)	0.243-0.249[3] (6.17)-(6.32)	0.240 (6.10)	0.232 (5.89)	0.231 (5.87)	0.2369-0.2419 (6.017)-(6.144)
Exhaust	0.252 (6.40)	0.256 (6.35)	0.258 (6.55)	0.260-0.267 (6.60)-(6.78)	0.233 (5.92)	0.230 (5.84)	0.225 (5.72)	0.2330-0.2380 (5.918)-(6.043)

1. All measurements are averages expressed in inches and (mm) except Valve Spring Force [lb and (N-m)].
2. Camshaft lobe lift was computed using the valve lift in inches given by the manufacturer, multiplied by the ratio (1:1.5) determined by the distance traveled by the rocker arm (1½") when acted upon by the push rod rising one inch.
3. Wear limits were determined statistically by using the mean and standard deviation of the mean for intake and exhaust valve wear measurements respectively and using the formula: Range of $U = \bar{x} \pm (\sigma_{\bar{x}}/\sqrt{n})(t)$ where U = population mean, $\bar{x}$ = sample mean, $\sigma_{\bar{x}}$ = standard deviation of the mean, n = sample population elements, and t = the value from the t tables for a 95 percent certainty level.

TABLE 3. A SUMMARY WEAR MEASUREMENT DATA FOR TEST ENGINES FROM FT. LEWIS, WA[1]

Type Engine	Chrysler V-8, 318 CID				M151A2 Jeep, 4 Cylinder, 140 CID			
Serial Number	02260516	12110971	01212997		251891	235875	235880	
AFLRL Number	11	12	10	Manufacturer's	7	9	8	Manufacturer's
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Specifications Service Limits	Gasohol	Gasohol	Unleaded Gasoline	Specifications Service Limits
Components								
Compression Ring Gaps								
Top	0.030[2] (0.76)	0.034 (0.86)	0.028 (0.71)	0.010-0.020 (0.25)-(0.51)	0.051 (1.30)	0.054 (1.37)	0.052 (1.32)	0.010-0.027 (0.25)-(0.69)
Bottom	0.032[2] (0.81)	0.034 (0.86)	0.028 (0.71)		0.070 (1.78)	0.069 (1.75)	0.072 (1.83)	
Cylinder Bore Diameter								
Top	3.9115 (99.352)	3.9120 (99.365)	3.9108 (99.334)	3.9100-3.9120 (99.314)-(99.365)	3.8778 (98.496)	3.8776 (98.491)	3.8786 (98.516)	3.8753-3.8777 (98.433)-(98.494)
Middle	3.9112 (99.344)	3.9121 (99.367)	3.9105 (99.317)		3.8769 (98.473)	3.8770 (98.476)	3.8780 (98.501)	
Bottom	3.9112 (99.304)	3.9119 (99.362)	3.9104 (99.324)		3.8770 (98.476)	3.8763 (98.458)	3.8770 (98.476)	
Cylinder Bore Out-of-Round								
Top	0.0007 (0.018)	0.0005 (0.013)	0.0006 (0.015)	0.0050 max (0.127)	0.0007 (0.018)	0.0011 (0.028)	0.0015 (0.038)	0.005 (0.13) max
Middle	0.0010 (0.025)	0.0006 (0.015)	0.0005 (0.013)		0.0002 (0.005)	0.0004 (0.010)	0.0004 (0.010)	
Bottom	0.0004 (0.010)	0.0004 (0.010)	0.0004 (0.010)		0.0003 (0.008)	0.0004 (0.010)	0.0006 (0.015)	
Taper of Cylinder Bore	0.0006 (0.015)	0.0003 (0.008)	0.0004 (0.010)	0.010 max (0.25)	0.0008 (0.020)	0.0013 (0.033)	0.0016 (0.041)	0.008 (0.20) max
Main Bearings								
Journal Diameter	2.4998 (63.495)	2.4997 (63.492)	2.4995 (63.487)	2.4995-2.5005 (63.487)-(63.513)	2.2485 (57.112)	2.2483 (57.107)	2.2484 (57.109)	2.2482-2.2490 (57.104)-(57.125)
Shell Diameter	2.5022 (63.556)	2.5021 (63.553)	2.5026 (63.566)	2.5000-2.5030 (63.500)-(63.576)	2.2527 (57.219)	2.2527 (57.219)	2.2523 (57.208)	2.2494-2.2512 (57.135)-(57.180)
Connecting Rod Bearings								
Journal Diameter	2.1238 (53.945)	2.1242 (53.955)	2.1242 (53.955)	2.1240-2.1250 (53.950)-(53.975)	1.9987 (50.767)	1.9982 (50.754)	1.9987 (50.767)	1.9982-1.9990 (50.754)-(50.775)
Shell Diameter	2.1265 (54.013)	2.1265 (54.013)	2.1259 (53.998)	2.1245-2.1275 (53.962)-(54.039)	2.0016[3] (50.841)	2.0020[3] (50.851)	2.0020 (50.851)	1.9992-2.0010 (50.780)-(50.825)
Piston Average Diameters (Middle and Bottom of Skirt)	3.9074 (99.248)	3.9092 (99.294)	3.9095 (99.301)	3.9085-3.9115 (99.276)-(99.351)	3.8735 (98.387)	3.8730 (98.374)	3.8739 (98.397)	3.8741-3.8765 (98.402)-(98.463)
Valve Stem to Guide Clearance								
Intake	0.0056 (0.142)	0.0066 (0.168)	0.0055 (0.140)	0.001-0.017 (0.03)-(0.43)	0.0059 (0.150)	0.0067 (0.170)	0.0053 (0.135)	0.0010-0.0025 (0.025)-(0.064)
Exhaust	0.0065 (0.165)	0.0078 (0.198)	0.0073 (0.185)		0.0049 (0.124)	0.0085 (0.216)	0.0059 (0.150)	0.0020-0.0035 (0.051)-(0.089)
Valve Spring Force								
Intake	164 (730)	157 (698)	158 (703)	170 lb @ 1 5/16 in. (347)(N-m) @ 42.86 mm	107 (476)	105 (476)	108 (480)	132 lb @ 1.505 in. (587)(N-m) @ 38.23 mm
Exhaust	116 (516)	111 (494)	112 (498)		107 (476)	104 (463)	107 (476)	Wear Limit-110 lbs
Camshaft Lobe Lift								
Intake	0.239 (6.07)	0.238 (6.05)	0.238 (6.05)	0.243-0.249[4] (6.17)-(6.32)	0.242 (6.15)	0.238 (6.05)	0.225 (5.20)	0.2369-0.2419 (6.017)-(6.144)
Exhaust	0.254 (6.45)	0.252 (6.40)	0.260 (6.60)	0.269-0.267 (6.60)-(6.78)	0.235 (5.97)	0.233 (5.92)	0.234 (5.94)	0.2330-0.2380 (5.918)-(6.045)

1. All measurements are averages expressed in inches and (mm) except Valve Spring Force [lb and (N-m)].
2. Piston No. 6 compression rings broken.
3. All rod bearings worn through to copper plating.
4. See Note 3, Table 2.

TABLE 4. A SUMMARY OF WEAR MEASUREMENT DATA FOR TEST ENGINES FROM FT. MCCOY, WI[1]

Type Engine	Ford V-8, 400 CID				CJ5 Jeep AMC, 6 Cylinder, 232 CID			
Vehicle Serial Number	CD7097	CD7098	CD7099		CD0939	CD0935	CD0941	
AFLRL Number	13	14	15	Manufacturer's Specifications	16	18	17	Manufacturer's Specifications
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Service Limits	Gasohol	Gasohol	Unleaded Gasoline	Service Limits
Components								
Compression Ring Gaps								
Top	0.029 (0.74)	0.034 (0.86)	0.033 (0.84)	0.010-0.020 (0.25)-(0.51)	0.027 (0.69)	0.029 (0.74)	0.028 (0.71)	0.010-0.020 (0.25)-(0.51)
Bottom	0.040 (1.02)	0.056 (1.42)	0.039 (0.99)	0.010-0.020 (0.25)-(0.51)	0.035 (0.89)	0.033 (0.84)	0.034 (0.86)	0.010-0.020 (0.25)-(0.51)
Cylinder Bore Diameter								
Top	4.0037 (101.694)	4.0039 (101.699)	4.0041 (101.704)	4.000-4.0048 (101.600)-(101.722)	3.7541 (95.354)	3.7520 (95.301)	3.7517 (95.293)	3.7501-3.7533 (95.253)-(95.334)
Middle	4.0030 (101.676)	4.0031 (101.679)	4.0032 (101.681)	--	3.7519 (95.298)	3.7515 (95.288)	3.7511 (95.278)	--
Bottom	4.0031 (101.679)	4.0032 (101.681)	4.0032 (101.681)	--	3.7520 (95.301)	3.7517 (95.293)	3.7512 (95.280)	--
Cylinder Bore Out-of-Round								
Top	0.0008 (0.020)	0.0003 (0.008)	0.0006 (0.015)	0.0015 max (0.038)	0.0007 (0.018)	0.0006 (0.015)	0.0006 (0.015)	0.003 (0.08)
Middle	0.0011 (0.028)	0.0004 (0.010)	0.0010 (0.025)		0.0003 (0.008)	0.0004 (0.010)	0.0003 (0.008)	max
Bottom	0.0008 (0.020)	0.0006 (0.015)	0.0007 (0.018)		0.0002 (0.005)	0.0001 (0.003)	0.0003 (0.008)	
Taper of Cylinder Bore	0.0007 (0.018)	0.0007 (0.018)	0.0009 (0.023)	0.010 max (0.25)	0.0021 (0.053)	0.0006 (0.015)	0.0006 (0.015)	0.005 max (0.13)
Main Bearings								
Journal Diameter	2.9991 (76.177)	2.9898 (75.941)	2.9993 (76.182)	2.9994-3.0002 (76.185)-(76.205)	2.4989 (63.472)	2.4989 (63.472)	2.4989 (63.472)	2.4986-2.5001 (63.464)-(63.503)
Shell Diameter	3.0036 (76.291)	2.9954 (76.083)	3.0019 (76.248)	3.0002-3.0028 (76.205)-(76.271)	2.5020 (63.551)	2.5012 (63.530)	2.5015 (63.538)	2.4996-2.5021 (63.490)-(63.553)
Connecting Rod Bearings								
Journal Diameter	2.3104 (58.684)	2.3107 (58.692)	2.3101 (58.677)	2.3103-2.3111 (58.682)-(58.702)	2.0940 (53.188)	2.0943 (53.195)	2.0945 (53.200)	2.0934-2.0955 (53.172)-(53.226)
Shell Diameter	2.3120 (58.725)	2.3124 (58.732)	2.3129 (58.748)	2.3111-2.3136 (58.702)-(58.765)	2.0966 (53.254)	2.0975 (53.277)	2.0981 (53.292)	2.0944-2.0975 (53.198)-(53.277)
Piston Average Diameters (Middle and Bottom of Skirt)	3.9994 (101.585)	3.9997 (101.592)	3.9997 (101.592)	Coded Blue 3.9994-4.0000 (101.585)-(101.600)	3.7497 (95.242)	3.7495 (95.237)	3.7494 (95.235)	3.7483-3.7491 (95.207)-(95.227)
Valve Stem to Guide Clearance				Service Clearance				
Intake	0.0032 (0.081)	0.0032 (0.081)	0.0042 (0.107)	0.005 (0.127)	0.0023 (0.058)	0.0021 (0.053)	0.0027 (0.069)	0.001-0.003 (0.03)-(0.08)
Exhaust	0.0048 (0.122)	0.0039 (0.099)	0.0048 (0.122)	0.005 (0.127)	0.0026 (0.066)	0.0030 (0.076)	0.0030 (0.076)	0.001-0.003 (0.03)-(0.08)
Valve Spring Force								
Intake	174.0 (774)	71 (316)	220.3 (980)	76-84 @ 1.82 (338)-(374)@(46.23) 215-237 @ 1.39 (956)-(1054)@ (35.31)	88 (391)	85 (378)	81 (360)	95-105 @ 1 13/16" (423)-(467)@(46.04)
Exhaust	177.4 (789)	69 (307)	219.4 (976)	79-87 @ 1.68 (351)-(387)@42.67) 215-237 @ 1.39 (956)-(1054)@ (35.31)	88 (391)	87 (387)	85 (378)	95-105 @ 1 13/16" (423)-(467)@(46.04)
Camshaft Lobe Lift								
Intake	0.188 (4.78)	0.235 (5.97)	0.233 (5.92)	0.245-0.250 (6.22)-(6.35)	0.230 (5.84)	0.227 (5.77)	0.228 (5.79)	0.227-0.2320 (5.77)-(5.892)
Exhaust	0.210 (5.33)	0.231 (5.87)	0.231 (5.87)		0.229 (5.82)	0.219 (5.56)	0.230 (5.84)	0.227-0.2332 (5.77)-(5.923)

Note:
All measurements are averages expressed in inches and (mm) except Valve Spring Force [lb and (N-m)].

measurements indicated variation from standards, particularly in the jeep, four-cylinder engines. The results could not be attributed to the fuels used, but appeared to have been affected by normal engine wear and local maintenance procedures and practices. Table 5 shows the percentage of wear measurements outside manufacturers' specifications. This table supports the general observation that there are no significant differences between the fuels used, although some slight differences exist between averages for different test sites.

Tables 6, 7, and 8 show the results of the CRC deposit ratings for each test and control vehicle. None of the engines showed any real distress whether gasohol or unleaded gasoline was used. The sludge merit ratings were very good for all engines, while varnish ratings ranged from fair to very good. All the engines in a particular set of three displayed similar results regardless of fuel used. The differences that existed were between test sites rather than fuels used. This could be attributed to the use of different lubricants at each test site or different operating conditions and maintenance procedures.

Tables 9, 10, and 11 show the results of CRC deposit ratings made for the carburetors. This rating system was a CRC demerit system which differs from the CRC ratings made for the engines. For the engines, a merit rating of 10 was best with 0 being the worst condition. For the carburetors, the demerit scale was used with 0 (no buildup) as the best rating and 10 as the worst situation. The percentage of area covered by a specific degree of lacquer buildup was multiplied by a weighting factor as explained in the footnotes for Table 12. While some differences can be noted, they are not attributable to the type of fuel used but again differ by test site.

Appendix B contains the photographs taken of selected areas and components for each test and control engine. The photographs reveal no significant differences between engines whether operated on gasohol or unleaded gasoline. They tend to support the ratings in Tables 6, 7, and 8. While some components of some engines are definitely cleaner than others, the same general trend of differences between test sites rather than fuels is consistent.

TABLE 5. PERCENTAGE OF WEAR MEASUREMENTS OUTSIDE MANUFACTURERS' SPECIFICATIONS

Engine Type/Serial No.	No. Outside Mfg. Specs	No. of Elements per Veh.	% Outside Limits		Station
			Gasohol	Unleaded Gasoline	
Chrysler V-8, 318 CID					
07121303	5	16	31	--	Ft. Belvoir
07090311	6	16	38	--	Ft. Belvoir
03223146	5	16	--	31	Ft. Belvoir
02260516	6	16	38	--	Ft. Lewis
12110971	4	16	25	--	Ft. Lewis
01212997	3	16	--	19	Ft. Lewis
		Average	33	25	
Jeep, 4 Cylinder, 140 CID					
500283	2	16	13	--	Ft. Belvoir
5003049	9	16	56	--	Ft. Belvoir
5001675	10	16	--	63	Ft. Belvoir
251891	9	16	56	--	Ft. Lewis
235875	9	16	56	--	Ft. Lewis
235880	11	16	--	69	Ft. Lewis
		Average	45	66	
Ford V-8, 400 CID					
CD7097	8	16	50	--	Ft. McCoy
CD7098	8	16	50	--	Ft. McCoy
CD7099	6	16	--	38	Ft. McCoy
		Average	50	38	
AMC, 6 Cylinder, 232 CID					
CD0939	5	16	31	--	Ft. McCoy
CD0935	6	16	38	--	Ft. McCoy
CD0941	6	16	--	38	Ft. McCoy
		Average	35	38	
		Overall Average	41	42	

TABLE 6. CRC RATINGS FOR TEST ENGINES FROM FT. BELVOIR, VA

Type Engine	Chrysler V-8, 318 CID			Jeep, 4 Cylinder, 140 CID		
Serial Number	07121303	07090311	03223146	500283	5003049	5001675
AFLRL Number	1	3	2	6	5	4
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Gasohol	Gasohol	Unleaded Gasoline
Sludge Merit Ratings*						
Left Rocker Arm Cover	8.40	7.18	8.30			
Right Rocker Arm Cover	8.25	7.34	8.65			
Rocker Arm Cover				9.30	8.40	9.75
Underside of Intake Manifold	9.00	6.20	8.88			
Front Seal Housing				9.75	9.15	9.75
Oil Pan	8.97	8.30	8.80	9.25	9.05	9.22
Left Valve Deck	7.90	7.30	9.00			
Right Valve Deck	7.70	6.35	9.00			
Valve Deck				9.75	9.00	9.75
Underside of Block				9.75	9.00	9.75
Pushrod Chamber	**	7.90	7.80			
Timing Gear Cover	9.00	8.30	9.15			
Average	8.46	7.36	8.70	9.56	8.92	9.64
Varnish Ratings*						
Piston Skirts	7.07	7.04	6.39	9.09	7.69	8.30
Rocker Arm Covers	5.75	3.08	6.18	7.68	6.43	6.40***
Valve Lifter Bodies	4.44	2.50	7.41			
Valve Lifter Plungers	9.75	10.00	10.00			
Cylinder Walls	6.36	6.14	6.98	8.06	8.09	9.80
Oil Pan	6.95	5.05	6.38	6.93	7.70	7.55
Average	6.72	5.64	7.22	7.94	7.48	8.01
Other Ratings						
Oil Screen % Clogging	20	1.00	<1	<1	0.0	0.0
Intake Valve Deposits*	6.73	6.63	8.21	7.95	6.45	8.55
Oil Rings, % Clogging	5.00	1.00	1.00	<1	1	<1
Pistons, % Scuffing (Avg)	3.75	0.0	0.0	0.0	0.0	0.0
Cylinder, % Scuffing	0.0	0.0	0.0	0.0	0.0	0.0

* 10 = most clean; 0 = least clean
** This part was rinsed with solvent before rating and could not be rated
*** Some of these deposits could be rust

TABLE 7. CRC RATINGS FOR TEST ENGINES FROM FT. LEWIS, WA

Type Engine	Chrysler V-8, 318 CID			Jeep, 4 Cylinder, 140 CID		
Serial Number	02260516	12110971	01212997	251891	235875	235880
AFLRL Number	11	12	10	7	9	8
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Gasohol	Gasohol	Unleaded Gasoline
Sludge Merit Ratings*						
Left Rocker Arm Cover	9.40	9.40	9.61			
Right Rocker Arm Cover	9.50	9.34	9.51			
Rocker Arm Cover				9.75	9.29	7.50
Underside of Intake Manifold	9.62	9.63	9.48			
Front Seal Housing				9.60	9.75	9.15
Oil Pan	9.26	9.23	7.32	9.50	9.47	9.40
Left Valve Deck	9.75	9.75	9.75			
Right Valve Deck	9.75	9.75	9.75			
Valve Deck				9.75	9.75	9.50
Underside of Block				9.75	9.75	9.50
Pushrod Chamber	9.50	9.75	8.84			
Timing Gear Cover	9.64	9.60	9.73			
Average	9.55	9.56	9.23	9.67	9.60	9.01
Varnish Ratings*						
Piston Skirts	8.02	7.98	7.91	7.60**	9.14	7.68
Rocker Arm Covers	7.76	7.65	7.65	7.85	4.88	5.03
Valve Lifter Bodies	6.31	8.98	6.45			
Valve Lifter Plungers	10.00	10.00	10.00			
Cylinder Walls	9.39	9.27	9.22	6.84	8.19	6.97
Oil Pan	7.70	7.40	7.55	6.85	7.00	7.78
Average	8.20	8.55	8.13	7.29	7.30	6.87
Other Ratings						
Oil Screen Clogging	0.0	0.0	0.0	0.0	0.0	0.0
Intake Valve Deposits*	7.74	8.56	7.09	6.93	7.10	6.93
Oil Rings, % Clogging	0.0	0.0	0.0	1	1	1
Pistons, % Scuffing (Avg)	10.6	0.0	5.0	0.0	0.0	0.0
Cylinder, % Scuffing	No. 6-100					

* 10 = most clean; 0 = least clean

** Some of these deposits could be rust

TABLE 8. CRC RATINGS FOR TEST ENGINES FROM FT. MCCOY, WI

Type Engine	Ford V-8, 400 CID			AMC, 6-Cylinder, 232 CID		
Vehicle Serial Number	CD-7097	CD-7098	CD-7099	CD-0935	CD-0939	CD-0941
AFLRL Number	13	14	15	18	16	17
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Gasohol	Gasohol	Unleaded Gasoline
Sludge Merit Ratings*						
Left Rocker Arm Cover	9.18	8.57	9.25			
Right Rocker Arm Cover	8.89	8.85	9.22			
Rocker Arm Cover				9.75	5.75	9.65
Underside of Intake Manifold	8.99	9.15	9.15			
Oil Pan	9.34	9.40	9.54	9.60	9.60	9.17
Left Valve Deck	5.35	9.40	9.75			
Right Valve Deck	7.38	9.40	9.75			
Valve Deck				9.75	9.75	9.75
Pushrod Chamber	2.20	8.90	6.50			
Timing Gear Cover	9.60	9.00	9.40	9.65	9.75	9.67
Average	7.62	9.08	9.07	9.69	8.71	9.56
Varnish Ratings*						
Piston Skirts	5.78++	7.26	5.74	9.71	9.625	8.05
Rocker Arm Covers	6.65@	6.80	6.89	8.50	4.05	2.00
Valve Lifter Bodies	2.91@	2.80@	3.06	8.92	9.80	9.50
Valve Lifter Plungers	3.00	4.00	7.50	10.00	10.00	10.00
Cylinder Walls	4.67	5.26	4.69	8.29	7.9875	6.583
Oil Pan	5.23	6.08	5.50	6.48	6.975	3.675
Timing Gear Cover				8.00	9.50	2.60
Average	4.71	5.37	5.56	8.56	8.28	6.06
Other Ratings						
Oil Screen % Clogging	0.0	0.0	0.0	<1	0.0	<1
Intake Valve Deposits*	6.20	7.13	7.13	6.90	7.5	7.08
Oil Rings, % Clogging	1	1	1	<1	<1	<1
Pistons, % Scuffing (Avg)	+++	+++	+++	+	0.0	**
Cylinder, % Scuffing	0.0	0.0	0.0	0.0	0.0	0.0

* 10 = most clean; 0 = least clean
** Slight scuffing, pistons 2,3,5.
+ Slight scuffing, pistons 3,5
++ Sludge deposits had hardened; difficult to wipe off to rate for varnish (possibly engine had been sitting for a long period of time)
+++ Slight scuffing pistons 1 through 8; oil rings (installed?) with gaps lined up.
@ All lifters dished.

TABLE 9. CARBURETOR RATINGS (PERCENT AREA)
FOR FT. BELVOIR, VA

M151A2 Jeep, 4-Cylinder, 140 CID Engines

AFLRL Carburetor Number	Top Plate					Top Venturi					Bottom Plate					Bottom Venturi				
	VLAL	LAL	AL	DBRL	BL*	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL
4***				10	90			5	5	90		100				25	20		15	40
5**			15		85			30	40	30		10	30	60		10		5	60	25
6**			10	60	30				10	90		20	40	40			10	20	30	40

Chrysler V-8, 318 CID Engines

AFLRL Carburetor Number	Top Plate					Top Venturi					Bottom Plate					Bottom Venturi				
	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL
1**	75	25					25	35	20	20	50	20	25	5		10	10	10	30	40
2***		20	50	30				10	20	70	95	5				20	30		30	20
3**	10	10		10	70				5	95	90		6		4	10		10	10	70

*CRC Rating Scale (Demerit)
VLAL = Very light amber lacquer
LAL = Light amber lacquer
AL = Amber lacquer
DBRL = Dark brown lacquer
BL = Black lacquer
** = Gasohol
*** = Unleaded gasoline

TABLE 10. CARBURETOR RATINGS (PERCENT AREA)
FOR FT. LEWIS, WA

M151A2 Jeep, 4-Cylinder, 140 CID Engines

AFLRL Carburetor Number	Top Plate					Top Venturi					Bottom Plate					Bottom Venturi				
	VLAL	LAL	AL	DBRL	BL*	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL
7	10		70	10	10	5			10	85	5		5	10	80			20	30	50
8 (Control)	90	10				100					100					50	50			
9	20	75		5		5	10	85			80	18		2		20	75	5		

Chrysler V-8, 318 CID Engines

AFLRL Carburetor Number	Top Plate					Top Venturi					Bottom Plate					Bottom Venturi				
	VLAL	LAL	AL	DBRL	BL*	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL
10 (Control)				15	85		20	50	15	15	15	10	25	25	25	20	40		10	30
11	Did not accompany engine																			
12				20	80		10	10	10	70		20	20	30	30		15	25	40	20

*CRC Rating Scale (Demerit)
VLAL = Very light amber lacquer
LAL = Light amber lacquer
AL = Amber lacquer
DBRL = Dark brown lacquer
BL = Black lacquer

TABLE 11. CARBURETOR RATINGS (PERCENT AREA)
FOR FT. MCCOY, WI

AMC, 6-Cylinder, 232 CID Engines

AFLRL Carburetor Number	Top Plate					Top Venturi					Bottom Plate					Bottom Venturi				
	VLAL	LAL	AL	DBRL	BL*	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL
16**		20		80					10	90	Could not rate; Very heavy rust					Could not rate; Very heavy corrosion				
17***	30	20		30	20				60	40	5		90		5	60	10		10	20
18	Not with engine																			

Ford V-8, 400 CID Engines

AFLRL Carburetor Number	Top Plate					Top Venturi					Bottom Plate					Bottom Venturi				
	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL	VLAL	LAL	AL	DBRL	BL
13**				10	90				20	80	100					30	30	20	10	10
14**		40	40	20					30	70		30	50	20				20	20	60
15	Not with engine																			

*CRC Rating Scale (Demerit)
VLAL = Very light amber lacquer
LAL = Light amber lacquer
AL = Amber lacquer
DBRL = Dark brown lacquer
BL = Black lacquer
** = Gasohol
*** = Unleaded gasoline

TABLE 12. CRC WEIGHTED DEPOSIT RATINGS FOR CARBURETOR LACQUER BUILD-UP*

Engine Type/Station AFLRL Engine No.	Top Plate	Top Venturi	Bottom Plate	Bottom Venturi	WTD Gasohol	WTD Unleaded Gasoline
Chrysler V-8/Ft. Belvoir						
1	5.000	6.500	5.125	7.750	24	--
2 (C)**	5.750	9.000	5.000	6.750	--	27
3	8.750	9.875	5.200	8.750	33	--
Chrysler V-8/Ft. Lewis						
10 (C)	9.625	6.125	6.875	6.750	--	29
11 - No Carburetor with Engine						
12	9.000	8.750	7.250	7.000	32	--
Jeep, 4 Cyl./Ft. Belvoir						
4 (C)	9.750	9.625	5.000	7.375	--	32
5	9.250	7.500	8.750	7.750	33	--
6	8.000	7.250	8.000	7.750	31	--
Jeep, 4 Cyl./Ft. Lewis						
7	5.750	9.500	9.250	8.250	33	--
8 (C)	5.000	5.000	5.000	5.000	--	20
9	5.125	5.000	5.050	5.000	20	--
Ford V-8/Ft. McCoy						
13	9.750	9.500	5.000	5.750	30	--
14	5.500	9.250	7.250	8.500	31	--
15 (C) No Carburetor with Engine						
AMC, 6 Cyl./Ft. McCoy						
16	7.000	9.750	+	++	--	--
17 (C)	6.750	8.500	5.125	6.250	--	27
18 - No Carburetor with Engine						
			Average WTD		30	27

*To achieve the values computed as Weighted Total Deposits (WTD), the Brown Deposit Scale on page 36 of the CRC Diesel Engine Rating Manual (CRC Manual No. 5) dated September 1958 and revised November 1959 were grouped as follows:

Brown Deposit Scale	Color Factors	Combined As	Weighting Factor
RL, VLAL, LAL and AL	1 through 5	AL	0.050
BrL and DBrL	6 and 7	D Br L	0.075
VDBrL to BL	8 through 10	BL	0.100

*0=Best rating (no lacquer); 10= Worst rating (Black lacquer)
**(C)=Control engine operated with unleaded gasoline
+=Could not rate because of very heavy rust
++=Could not rate because of very heavy corrosion

V. CONCLUSIONS

After consideration of the data generated, examined, and analyzed for this portion of the gasohol test only, the following conclusions are made:

- There were no significant differences between engines and carburetors operated with gasohol and those operated with unleaded gasoline in the examined areas of wear or deposit ratings for any individual test site.
- There were significant differences in the examined areas of wear or deposit ratings when comparing test results for engines and carburetors from different bases. This is attributed to variations in operating and maintenance procedures.
- Tests conducted under similar circumstances for longer periods of time are needed to generate enough data for a definitive comparison of the long-term effects of the two test fuels.

VI. LIST OF REFERENCES

1. Tosh, J.D., et al., "Evaluation of Gasohol in U.S. Army Administrative and Tactical Vehicles, Report No. SwRI 573911, November 1982.

2. CRC Manual No. 8, "CRC Varnish Rating Manual for Non-Rubbing Parts" dated March 1964.

3. CRC Varnish Rating Manual (CRC Manual No. 9) dated June 1971.

4. CRC Manual No. 10: Sludge Rating Manual dated May 1966, Revised January 1969.

5. Techniques for Valve Rating (CRC Manual No. 4), Table 12, dated January 1958, Revised July 1969.

APPENDIX A

WEAR MEASUREMENTS

ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 5001675 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.041		0.030		0.030		0.030	
Bottom	0.037		0.030		0.030		0.030	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.8774	3.8763	3.8767	3.8767	3.8768	3.8764	3.8772	3.8766
Middle	3.8767	3.8771	3.8764	3.8763	3.8764	3.8761	3.8769	3.8765
Bottom	3.8767	3.8764	3.8765	3.8767	3.8765	3.8765	3.8770	3.8766
Out-of-round	0.0011		0.0000		0.0004		0.0006	
Taper	0.0007		0.0002		0.0003		0.0002	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	1.9987	1.9988	1.9989	1.9989	1.9986	1.9985	1.9984	1.9985
Shell Diameter	F	B	F	B	F	B	F	B
	1.9994	1.9996	2.0002	2.0001	1.9995	1.9993	2.0002	1.9998
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	0.234	0.222	0.230	0.215	0.237	0.232	0.222	0.229
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.0061	0.0040	0.0060	0.0054	0.0044	0.0056	0.0058	0.0055
Valve Spring Force (lb)	I	E	I	E	I	E	I	E
	107	110	109	106	108	110	109	108
Piston Avg. Diameter								
Middle and bottom of skirt	3.8736		3.8739		3.8737		3.8733	
Main Bearings	No. 1		No. 2		No. 3			
Journal Diameter	H	V	H	V	H	V		
	2.2480	2.2480	2.2484	2.2484	2.2484	2.2484		
Shell Diameter	F	B	F	B	F	B		
	2.2526	2.2529	2.2525	2.2522	2.2528	2.2524		

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	3.8741-3.8765
Top	0.010-0.027	Intake	0.2369	Main Bearings	
Bottom		*Exhaust*	*0.2330*	*Journal Diameter*	*2.2482-2.2490*
Cylinder Bore Diameter	3.8753-3.8777	Valve Stem to Guide Clearance		Shell Diameter	2.2494-2.2512
Out-of-round	0.005 max	Intake	0.0010-0.0025		
Taper	0.008 max	Exhaust	0.0010-0.0035		
Connecting Rod Bearings		Valve Spring Force (lb)	132 at 1.505"		
Journal Diameter	1.9982-1.9990		wear limit-110		
Shell Diameter	1.9992-2.0010				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 5001675 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	1.04+		0.76		0.76		0.76	
Bottom	0.94		0.76		0.76		0.76	
Cylinder Bore Diameter	L	T	L	T	L	T	L	T
Top	98.486	98.458	98.468	98.468	98.471	98.461	98.481	98.466
Middle	98.468	98.478	98.461	98.458	98.461	98.453	98.473	98.463
Bottom	98.468	98.461	98.463	98.468	98.463	98.463	98.476	98.466
Out-of-round	0.028		0.000		0.010		0.015	
Taper	0.018		0.005		0.008		0.005	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	50.767	50.770	50.772	50.772	50.764	50.762	50.759	50.762
Shell Diameter	F	B	F	B	F	B	F	B
	50.785	50.790	50.805	50.803	50.787	50.782	50.805	50.795
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	5.94	5.64	5.84	5.46	6.02	5.89	5.64	5.82
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.155	0.102	0.152	0.137	0.112	0.142	0.147	0.140
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E
	476	489	485	472	480	489	485	480
Piston Avg. Diameter								
Middle and bottom of skirt	98.389		98.397		98.392		98.382	

Main Bearings	No. 1		No. 2		No. 3	
Journal Diameter	H	V	H	V	H	V
	57.100	57.100	57.109	57.109	57.109	57.109
Shell Diameter	F	B	F	B	F	B
	57.216	57.224	57.214	57.206	57.221	57.211

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	98.402-98.463
Top	0.25-0.69	Intake	6.017	Main Bearings	
Bottom		Exhaust	5.918	Journal Diameter	57.104-57.125
Cylinder Bore Diameter	98.433-98.494	Valve Stem to Guide Clearance		Shell Diameter	57.135-57.180
Out-of-round	0.13 max	Intake	0.025-0.064		
Taper	0.20 max	Exhaust	0.025-0.089		
Connecting Rod Bearings		Valve Spring Force (N-m)	587 at 38.23 mm		
Journal Diameter	50.754-50.775		Wear limit 489		
Shell Diameter	50.780-50.825				

L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
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ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 6003049 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.039		0.041		0.038		0.037	
Bottom	0.050		0.044		0.042		0.044	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.8787	3.8795	3.8789	3.8794	3.8774	3.8775	3.8783	3.8788
Middle	3.8778	3.8789	3.8784	3.8787	3.8777	3.8774	3.8780	3.8782
Bottom	3.8782	3.8790	3.8788	3.8787	3.8774	3.8777	3.8782	3.8783
Out-of-round	0.0008		0.0005		0.0001		0.0005	
Taper	0.0005		0.0001		0.0000		0.0001	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	1.9985	1.9985	1.9986	1.9987	1.9985	1.9985	1.9984	1.9984
Shell Diameter	F	B	F	B	F	B	F	B
	2.0006	2.0010	2.0010	2.0008	2.0010	2.0010	2.0004	2.0008
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	0.230	0.230	0.230	0.233	0.236	0.230	0.230	0.228
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.0028	0.0027	0.0026	0.0022	0.0028	0.0029	0.0025	0.0029
Valve Spring Force (lb)	I	E	I	E	I	E	I	E
	107	108	107	110	106	108	108	108
Piston Avg. Diameter								
Middle and bottom of skirt	3.8745		3.8745		3.8746		3.8742	

Main Bearings	No. 1		No. 2		No. 3	
Journal Diameter	H	V	H	V	H	V
	2.2485	2.2480	2.2485	2.2484	2.2486	2.2486
Shell Diameter	F	B	F	B	F	B
	2.2512	2.2515	2.2510	2.2509	2.2518	2.2520

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	3.8741-3.8765
Top	0.010-0.027	Intake	0.2369	Main Bearings	
Bottom		Exhaust	0.2330	Journal Diameter	2.2482-2.2490
Cylinder Bore Diameter	3.8753-3.8777	Valve Stem to Guide Clearance		Shell Diameter	2.2494-2.2512
Out-of-round	0.005 max	Intake	0.0010-0.0025		
Taper	0.008 max	Exhaust	0.0010-0.0035		
Connecting Rod Bearings		Valve Spring Force (lb)	132 at 1.505"		
Journal Diameter	1.9982-1.9990		wear limit-110		
Shell Diameter	1.9992-2.0010				

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ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 6003049 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.99+		1.04		0.97		0.94	
Bottom	1.27		1.12		1.07		1.12	
Cylinder Bore Diameter	L	T	L	T	L	T	L	T
Top	98.519	98.539	98.524	98.537	98.486	98.489	98.509	98.522
Middle	98.496	98.524	98.511	98.519	98.494	98.486	98.501	98.506
Bottom	98.506	98.527	98.522	98.519	98.486	98.494	98.506	98.509
Out-of-round	0.020		0.013		0.003		0.013	
Taper	0.013		0.002		0.000		0.003	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	50.762	50.762	50.764	50.767	50.762	50.762	50.759	50.759
Shell Diameter	F	B	F	B	F	B	F	B
	50.815	50.825	50.825	50.820	50.825	50.825	50.810	50.820
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	5.84	5.84	5.84	5.92	5.99	5.84	5.84	5.79
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.071	0.069	0.066	0.056	0.071	0.074	0.064	0.074
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E
	476	480	476	489	472	480	480	480
Piston Avg. Diameter								
Middle and bottom of skirt	98.412		98.412		98.415		98.405	

Main Bearings	No. 1		No. 2		No. 3	
Journal Diameter	H	V	H	V	H	V
	57.112	57.100	57.112	57.109	57.144	57.144
Shell Diameter	F	B	F	B	F	B
	57.180	57.188	57.175	57.173	57.196	57.201

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	98.402-98.463
Top	0.25-0.69	Intake	6.017	Main Bearings	
Bottom		Exhaust	5.918	Journal Diameter	57.106-57.125
Cylinder Bore Diameter	98.433-98.494	Valve Stem to Guide Clearance		Shell Diameter	57.135-57.180
Out-of-round	0.13 max	Intake	0.025-0.064		
Taper	0.20 max	Exhaust	0.025-0.089		
Connecting Rod Bearings		Valve Spring Force (N-m)	587 at 38.23 mm		
Journal Diameter	50.754-50.775		Wear limit 489		
Shell Diameter	50.780-50.825				

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ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 500283 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.022		0.023		0.021		0.025	
Bottom	0.028		0.028		0.024		0.027	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.8765	3.8762	3.8766	3.8764	3.8765	3.8762	3.8758	3.8759
Middle	3.8768	3.8757	3.8764	3.8762	3.8762	3.8761	3.8756	3.8756
Bottom	3.8769	3.8757	3.8767	3.8768	3.8765	3.8765	3.8759	3.8757
Out-of-round	0.0003		0.0002		0.0003		0.0001	
Taper	0.0004		0.0001		0.0000		0.0001	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	1.9987	1.9987	1.9986	1.9986	1.9986	1.9985	1.9986	1.9986
Shell Diameter	F	B	F	B	F	B	F	B
	2.0005	2.0008	2.0004	2.0001	2.0006	2.0002	2.0005	2.0008
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	0.242	0.237	0.241	0.231	0.237	0.231	0.241	0.234
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.0028	0.0033	0.0025	0.0030	0.0028	0.0029	0.0028	0.0031
Valve Spring Force (lb)	I	E	I	E	I	E	I	E
	111	109	109	110	110	109	109	111
Piston Avg. Diameter								
Middle and bottom of skirt	3.8736		3.8736		3.8740		3.8727	

Main Bearings	No. 1		No. 2		No. 3	
Journal Diameter	H	V	H	V	H	V
	2.2486	2.2484	2.2484	2.2485	2.2484	2.2483
Shell Diameter	F	B	F	B	F	B
	2.2512	2.2511	2.2508	2.2509	2.2512	2.2511

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	3.8741-3.8765
Top	0.010-0.027	Intake	0.2369	**Main Bearings**	
Bottom		Exhaust	0.2330	Journal Diameter	2.2482-2.2490
Cylinder Bore Diameter	3.8753-3.8777	**Valve Stem to Guide Clearance**		Shell Diameter	2.2494-2.2512
Out-of-round	0.005 max	Intake	0.0010-0.0025		
Taper	0.008 max	Exhaust	0.0010-0.0035		
Connecting Rod Bearings		**Valve Spring Force (lb)**	132 at 1.505"		
Journal Diameter	1.9982-1.9990		wear limit-110		
Shell Diameter	1.9992-2.0010				

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F = Forward, B = Back, I = Intake, E = Exhaust
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ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 500283 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.56 +		0.58		0.53		0.64	
Bottom	0.71		0.71		0.61		0.69	
Cylinder Bore Diameter	L	T	L	T	L	T	L	T
Top	98.463	98.455	98.466	98.461	98.463	98.455	98.445	98.448
Middle	98.471	98.443	98.461	98.455	98.455	98.453	98.440	98.440
Bottom	98.473	98.443	98.468	98.471	98.463	98.463	98.448	98.443
Out-of-round	0.008		0.005		0.008		0.003	
Taper	0.010		0.002		0.000		0.003	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	50.767	50.767	50.764	50.764	50.764	50.762	50.764	50.764
Shell Diameter	F	B	F	B	F	B	F	B
	50.813	50.820	50.810	50.803	50.815	50.805	50.813	50.820
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	6.15	6.02	6.12	5.87	6.02	5.87	6.12	5.94
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.071	0.084	0.064	0.076	01071	0.074	0.071	0.079
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E
	494	485	485	489	489	485	485	494
Piston Avg. Diameter								
Middle and bottom of skirt	98.389		98.389		98.400		98.367	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6	
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V
	57.114	57.109	57.109	57.112	57.109	57.106						
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B
	57.180	57.178	57.170	57.173	57.180	57.178						

Manufacturer's Service Limits, mm

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	98.402-98.463
Top	0.25-0.69	Intake	6.017	**Main Bearings**	
Bottom		Exhaust	5.918	Journal Diameter	57.104-57.125
Cylinder Bore Diameter	98.433-98.494	**Valve Stem to Guide Clearance**		Shell Diameter	57.135-57.180
Out-of-round	0.13 max	Intake	0.025-0.064		
Taper	0.20 max	Exhaust	0.025-0.089		
Connecting Rod Bearings		**Valve Spring Force (N-m)**	587 at 38.23 mm		
Journal Diameter	50.754-50.775		Wear limit 489		
Shell Diameter	50.780-50.825				

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ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NO. 03223146 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.030		0.029		0.028		0.032		0.029		0.028		0.026		0.026	
Bottom	0.028		0.027		0.026		0.028		0.025		0.028		0.025		0.028	
Cylinder Bore																
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	3.9114	3.9120	3.9114	3.9118	3.9118	3.9108	3.9121	3.9110	3.9118	3.9107	3.9122	3.9110	3.9126	3.9114	3.9124	3.9123
Middle	3.9111	3.9112	3.9114	3.9110	3.9113	3.9107	3.9110	3.9106	3.9115	3.9106	3.9118	3.9106	3.9122	3.9105	3.9119	3.9116
Bottom	3.9110	3.9114	3.9115	3.9112	3.9111	3.9111	3.9112	3.9112	3.9114	3.9113	3.9115	3.9113	3.9123	3.9104	3.9118	3.9118
Out-of-round	0.0006		0.0004		0.0010		0.0011		0.0011		0.0012		0.0012		0.0001	
Taper	0.0004		0.0001		0.0007		0.0009		0.0004		0.0007		0.0003		0.0006	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.1237	2.1236	2.1234	2.1232	2.1235	2.1238	2.1233	2.1236	2.1233	2.1235	2.1234	2.1236	2.1233	2.1236	2.1237	2.1235
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.1265	2.1263	2.1265	2.1261	2.1269	2.1267	2.1268	2.1268	2.1262	2.1266	2.1268	2.1266	2.1263	2.1262	2.1262	2.1265
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.242	0.258	0.241	0.259	0.243	0.259	0.239	0.263	0.242	0.256	0.236	0.258	0.238	0.259	0.242	0.254
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0026	0.0020	0.0021	0.0024	0.0024	0.0025	0.0023	0.0026	0.0024	0.0021	0.0020	0.0025	0.0026	0.0022	0.0024	0.0025
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	78	80	80	78	80	74	78	76	76	80	74	80	78	80	80	78
Piston Avg.Diameter Middle & bottom of skirt	3.9105		3.9105		3.9097		3.9102		3.9088		3.9086		3.9096		3.9086	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.5000	2.4998	2.5004	2.5000	2.4998	2.4999	2.4994	2.4995	2.4996	2.4999
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	2.5022	2.5019	2.5015	2.5023	2.5017	2.5026	2.5023	2.5023	2.5025	2.5027

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	3.9085-3.9115
Top	0.010-0.020	Intake	0.249	**Main Bearings**	
Bottom		Exhaust	0.267	Journal Diameter	2.4995-2.5005
Cylinder Bore Diameter	3.9100-3.9120	**Valve Stem to Guide Clearance**		Shell Diameter	2.5000-2.5030
Out-of-round	0.0050 max	Intake	0.001-0.017		
Taper	0.010 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (lb)**	78-88 lb at 1-11/16"		
Journal Diameter	2.1240-2.1250				
Shell Diameter	2.1245-2.1275				

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ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 03223146 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.76+		0.74		0.71		0.81		0.74		0.71		0.66		0.66	
Bottom	0.71		0.69		0.66		0.71		0.64		0.71		0.64		0.71	
Cylinder Bore																
Diameter	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	99.350	99.365	99.350	99.360	99.360	99.334	99.367	99.339	99.360	99.332	99.370	99.339	99.380	99.350	99.375	99.372
Middle	99.342	99.344	99.350	99.339	99.347	99.332	99.339	99.329	99.352	99.329	99.360	99.329	99.370	99.327	99.362	99.355
Bottom	99.339	99.350	99.352	99.344	99.342	99.342	99.344	99.344	99.350	99.347	99.352	99.347	99.372	99.324	99.360	99.360
Out-of-round	0.015		0.010		0.026		0.028		0.028		0.031		0.030		0.003	
Taper	0.011		0.002		0.018		0.023		0.010		0.018		0.008		0.015	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	53.942	53.939	53.934	53.929	53.937	53.945	53.932	53.939	53.932	53.937	53.934	53.939	53.932	53.939	53.942	53.937
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	54.013	54.008	54.013	54.003	54.023	54.018	54.021	54.021	54.005	54.016	54.021	54.016	54.008	54.005	54.005	54.013
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	6.15	6.55	6.12	6.58	6.17	6.58	6.07	6.68	6.15	6.50	5.99	6.55	6.05	6.58	6.15	6.45
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.066	0.051	0.053	0.061	0.061	0.064	0.058	0.066	0.061	0.053	0.051	0.064	0.066	0.056	0.061	0.064
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	347	356	356	347	356	329	347	338	338	356	329	356	347	356	356	347
Piston Avg. Diameter Middle and bottom of skirt	99.327		99.327		99.306		99.319		99.284		99.278		99.304		99.278	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	63.500	63.495	63.510	63.500	63.495	63.497	63.485	63.487	63.490	63.497
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	63.556	63.548	63.538	63.558	63.543	63.566	63.558	63.558	63.564	63.569

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	99.276-99.352
Top	0.25-0.51	Intake	6.325	Main Bearings	
Bottom		Exhaust	6.782	Journal Diameter	63.487-63.513
Cylinder Bore Diameter	99.314-99.365	Valve Stem to Guide Clearance		Shell Diameter	63.500-63.576
Out-of-round	0.13 max	Intake	0.03-0.43		
Taper	0.25 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (N-m)	347-391 @ 42.86 mm		
Journal Diameter	53.950-53.975				
Shell Diameter	53.962-54.039				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 07121303 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.028		0.028		0.030		0.032		0.028		0.028		0.028		0.028	
Bottom	0.032		0.035		0.035		0.032		0.030		0.032		0.035		0.035	
Cylinder Bore																
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	3.9116	3.9113	3.9123	3.9124	3.9119	3.9118	3.9122	3.9113	3.9116	3.9110	3.9123	3.9116	3.9121	3.9111	3.9120	3.9123
Middle	3.9110	3.9111	3.9122	3.9113	3.9112	3.9112	3.9117	3.9109	3.9111	3.9104	3.9119	3.9112	3.9118	3.9102	3.9114	3.9116
Bottom	3.9108	3.9110	3.9121	3.9115	3.9108	3.9110	3.9112	3.9115	3.9108	3.9109	3.9115	3.9117	3.9117	3.9101	3.9113	3.9117
Out-of-round	0.0003		0.0001		0.0001		0.0009		0.0006		0.0007		0.0010		0.0003	
Taper	0.0008		0.0002		0.0011		0.0010		0.0008		0.0008		0.0004		0.0007	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.1237	2.1237	2.1236	2.1237	2.1239	2.1240	2.1240	2.1240	2.1238	2.1241	2.1239	2.1238	2.1238	2.1238	2.1239	2.1239
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.1262	2.1258	2.1261	2.1261	2.1258	2.1258	2.1267	2.1261	2.1260	2.1260	2.1264	2.1260	2.1269	2.1269	2.1263	2.1262
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.240	0.254	0.236	0.256	0.238	0.250	0.233	0.239	0.239	0.255	0.236	0.257	0.235	0.246	0.237	0.255
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0022	0.0026	0.0026	0.0020	0.0025	0.0021	0.0026	0.0024	0.0020	0.0023	0.0022	0.0026	0.0024	0.0021	0.0022	0.0023
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	80	78	84	78	80	80	75	82	82	84	78	80	81	77	78	80
Piston Avg. Diameter Middle & bottom of skirt	3.9092		3.9091		3.9081		3.9090		3.9083		3.9084		3.9095		3.9093	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.5000	2.5003	2.4996	2.4994	2.4992	2.4994	2.4994	2.4995	2.4995	2.4996
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	2.5022	2.5023	2.5023	2.5022	2.5037	2.5022	2.5034	2.5035	2.5025	2.5028

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	3.9085-3.9115
Top	0.010-0.020	Intake	0.249	**Main Bearings**	
Bottom		Exhaust	0.267	Journal Diameter	2.4995-2.5005
Cylinder Bore Diameter	3.9100-3.9120	**Valve Stem to Guide Clearance**		Shell Diameter	2.5000-2.5030
Out-of-round	0.0050 max	Intake	0.001-0.017		
Taper	0.010 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (lb)**	78-88 lb at 1-11/16"		
Journal Diameter	2.1240-2.1250				
Shell Diameter	2.1245-2.1275				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 07121303 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.71♦		0.71		0.76		0.81		0.71		0.71		0.71		0.71	
Bottom	0.81		0.89		0.89		0.81		0.76		0.81		0.89		0.89	
Cylinder Bore Diameter	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	99.355	99.347	99.372	99.375	99.362	99.360	99.370	99.347	99.355	99.339	99.372	99.355	99.367	99.342	99.365	99.372
Middle	99.339	99.342	99.370	99.347	99.344	99.344	99.357	99.337	99.342	99.324	99.362	99.344	99.360	99.319	99.350	99.355
Bottom	99.334	99.339	99.367	99.352	99.334	99.340	99.344	99.352	99.334	99.337	99.352	99.357	99.357	99.317	99.347	99.357
Out-of-round	0.008		0.003		0.002		0.023		0.016		0.017		0.025		0.007	
Taper	0.021		0.005		0.028		0.026		0.021		0.020		0.010		0.018	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	53.942	53.942	53.939	53.942	53.947	53.950	53.950	53.950	53.945	53.952	53.947	53.945	53.945	53.945	53.947	53.947
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	54.005	53.995	54.003	54.003	53.995	53.995	54.018	54.003	54.000	54.000	54.011	54.000	54.023	54.023	54.008	54.005
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	6.10	6.45	5.99	6.50	6.05	6.35	5.66	6.07	6.07	6.48	5.99	6.53	5.97	6.25	6.02	6.48
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.056	0.066	0.066	0.051	0.064	0.053	0.066	0.061	0.051	0.058	0.056	0.066	0.061	0.053	0.056	0.058
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	356	347	374	347	356	356	334	365	365	374	347	356	360	343	347	356
Piston Avg.Diameter Middle & bottom of skirt	99.294		99.291		99.266		99.289		99.271		99.273		99.301		99.296	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	63.500	63.508	63.490	63.485	63.480	63.485	63.485	63.487	63.487	63.490
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	63.556	63.558	63.558	63.556	63.594	63.556	63.586	63.589	63.564	63.571

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	99.276-99.352
Top	0.25-0.51	Intake	6.325	Main Bearings	
Bottom		Exhaust	6.782	Journal Diameter	63.487-63.513
Cylinder Bore Diameter	99.314-99.365	Valve Stem to Guide Clearance		Shell Diameter	63.500-63.576
Out-of-round	0.13 max	Intake	0.03-0.43		
Taper	0.25 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (N-m)	347-391 @ 42.86 mm		
Journal Diameter	53.950-53.975				
Shell Diameter	53.962-54.039				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
♦ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 07090311 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.039		0.032		0.024		0.027		0.022		0.023		0.024		0.031	
Bottom	0.033		0.028		0.035		0.031		0.026		0.028		0.035		0.028	
Cylinder Bore																
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	3.9119	3.9127	3.9109	3.9106	3.9119	3.9105	3.9115	3.9104	3.9118	3.9107	3.9117	3.9107	3.9119	3.9103	3.9116	3.9106
Middle	3.9107	3.9111	3.9108	3.9102	3.9113	3.9100	3.9110	3.9101	3.9112	3.9102	3.9112	3.9100	3.9115	3.9105	3.9108	3.9100
Bottom	3.9107	3.9110	3.9107	3.9102	3.9110	3.9105	3.9108	3.9106	3.9108	3.9111	3.9111	3.9107	3.9111	3.9102	3.9108	3.9114
Out-of-round	0.0008		0.0003		0.0014		0.0011		0.0011		0.0010		0.0016		0.0010	
Taper	*0.0012*		*0.0002*		*0.0009*		*0.0007*		*0.0010*		*0.0006*		*0.0008*		*0.0008*	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.1238	2.1239	2.1237	2.1235	2.1237	2.1238	2.1235	2.1236	2.1237	2.1238	2.1237	2.1236	2.1237	2.1237	2.1235	2.1235
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.1267	2.1266	2.1270	2.1272	2.1261	2.1262	2.1265	2.1268	2.1276	2.1270	2.1268	2.1260	2.1266	2.1267	2.1262	2.1265
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.240	0.262	0.242	0.262	0.241	0.251	0.244	0.264	0.239	0.247	0.236	0.263	0.241	0.258	0.239	0.237
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0022	0.0021	0.0023	0.0020	0.0023	0.0024	0.0024	0.0026	0.0023	0.0025	0.0020	0.0024	0.0021	0.0021	0.0026	0.0028
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	83	78	80	78	84	80	75	78	78	78	80	84	79	78	80	81
Piston Avg. Diameter Middle & bottom of skirt	3.9091		3.9092		3.9083		3.9082		3.9086		3.9094		3.9095		3.9091	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.4992	2.4955	2.4994	2.4994	2.4995	2.4995	2.4995	2.4997	2.4994	2.4992
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	2.5022	2.5026	2.5028	2.5027	2.5047	2.5045	2.5024	2.5024	2.5026	2.5023

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	3.9085-3.9115
Top	0.010-0.020	Intake	0.249	**Main Bearings**	
Bottom		Exhaust	0.267	Journal Diameter	2.4995-2.5005
Cylinder Bore Diameter	3.9100-3.9120	**Valve Stem to Guide Clearance**		Shell Diameter	2.5000-2.5030
Out-of-round	0.0050 max	Intake	0.001-0.017		
Taper	0.010 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (lb)**	78-88 lb at 1-11/16"		
Journal Diameter	2.1240-2.1250				
Shell Diameter	2.1245-2.1275				

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F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. BELVOIR, VA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 07090311 TYPE FUEL: GASOHOL

Component	Cylinder No. 1	2	3	4	5	6	7	8
Compression Ring								
Gaps								
Top	1.50+	0.81	0.61	0.69	0.56	0.58	0.61	0.79
Bottom	0.84	0.71	0.89	0.79	0.66	0.71	0.89	0.71
Cylinder Bore								
Diameter	L / T	L / T	L / T	L / T	L / T	L / T	L / T	L / T
Top	99.362 / 99.383	99.337 / 99.329	99.362 / 99.327	99.352 / 99.324	99.360 / 99.332	99.357 / 99.332	99.362 / 99.322	99.355 / 99.329
Middle	99.332 / 99.342	99.334 / 99.319	99.347 / 99.314	99.339 / 99.317	99.344 / 99.319	99.344 / 99.314	99.352 / 99.327	99.334 / 99.314
Bottom	99.332 / 99.339	99.332 / 99.319	99.339 / 99.327	99.334 / 99.329	99.334 / 99.342	99.342 / 99.332	99.342 / 99.319	99.334 / 99.350
Out-of-round	0.021	0.008	0.035	0.028	0.028	0.025	0.040	0.026
Taper	0.030	0.005	0.023	0.018	0.026	0.015	0.020	0.021
Connecting Rod Bearings								
Journal Diameter	H / V	H / V	H / V	H / V	H / V	H / V	H / V	H / V
	53.945 / 53.947	53.942 / 53.937	53.942 / 53.945	53.937 / 53.939	53.942 / 53.945	53.942 / 53.939	53.942 / 53.942	53.937 / 53.937
Shell Diameter	F / B	F / B	F / B	F / B	F / B	F / B	F / B	F / B
	54.018 / 54.016	54.026 / 54.031	54.003 / 54.005	54.013 / 54.021	54.041 / 54.026	54.021 / 54.000	54.016 / 54.018	54.005 / 54.013
Camshaft Lobe Lift	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	6.10 / 6.65	6.15 / 6.65	6.12 / 6.38	6.20 / 6.71	6.07 / 6.27	5.99 / 6.68	6.12 / 6.55	6.07 / 6.02
Valve Stem to Guide Clearance	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	0.056 / 0.053	0.058 / 0.051	0.058 / 0.061	0.061 / 0.066	0.058 / 0.064	0.051 / 0.061	0.053 / 0.053	0.066 / 0.071
Valve Spring Force (N-m)	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	369 / 347	356 / 347	374 / 356	334 / 347	347 / 347	356 / 374	351 / 347	356 / 360
Piston Avg. Diameter								
Middle & bottom of skirt	99.291	99.294	99.271	99.268	99.278	99.299	99.301	99.291

Main Bearings	No. 1	No. 2	No. 3	No. 4	No. 5
Journal Diameter	H / V	H / V	H / V	H / V	H / V
	63.480 / 63.386	63.485 / 63.485	63.487 / 63.487	63.487 / 63.492	63.485 / 63.480
Shell Diameter	F / B	F / B	F / B	F / B	F / B
	63.556 / 63.566	63.571 / 63.569	63.619 / 63.614	63.561 / 63.561	63.566 / 63.588

Manufacturer's Service Limits, mm

Compression Ring *Gaps*		Camshaft Lobe Lift		Piston Diameter	99.276-99.352
Top	0.25-0.51	Intake	6.325	Main Bearings	
Bottom		Exhaust	6.782	Journal Diameter	63.487-63.513
Cylinder Bore Diameter	99.314-99.365	Valve Stem to Guide Clearance		Shell Diameter	63.500-63.576
Out-of-round	0.13 max	Intake	0.03-0.43		
Taper	0.25 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (N-m)	347-391 @ at 42.86 mm		
Journal Diameter	53.950-53.975				
Shell Diameter	53.962-54.039				

+L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 235880 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.039		0.056		0.058		0.056	
Bottom	0.071		0.074		0.074		0.070	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.8784	3.8794	3.8783	3.8803	3.8783	3.8768	3.8779	3.8793
Middle	3.8776	3.8781	3.8785	3.8785	3.8778	3.8777	3.8774	3.8782
Bottom	3.8763	3.8773	3.8769	3.8775	3.8770	3.8769	3.8767	3.8773
Out-of-round	0.0010		0.0020		0.0015		0.0014	
Taper	0.0021		0.0014		0.0013		0.0012	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	1.9987	1.9988	1.9987	1.9987	1.9987	1.9987	1.9887	1.9988
Shell Diameter	F	B	F	B	F	B	F	B
	2.0022	2.0018	2.0018	2.0021	2.0020	2.0021	2.0018	2.0019
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	0.204	0.235	0.225	0.232	0.232	0.236	0.239	0.234
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.0053	0.0059	0.0051	0.0058	0.0053	0.0058	0.0053	0.0060
Valve Spring Force (lb)	I	E	I	E	I	E	I	E
	108	104	107	107	108	108	110	107
Piston Avg. Diameter								
Middle and bottom of skirt	3.8740		3.8738		3.8742		3.8737	
Main Bearings	No. 1		No. 2		No. 3			
Journal Diameter	H	V	H	V	H	V		
	2.2484	2.2485	2.2484	2.2485	2.2484	2.2484		
Shell Diameter	F	B	F	B	F	B		
	2.2513	2.2511	2.2534	2.2530	2.2525	2.2524		

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift	
Top	0.010-0.027	Intake	0.2369
Bottom		Exhaust	0.2330
Cylinder Bore Diameter	3.8753-3.8777	Valve Stem to Guide Clearance	
Out-of-round	0.005 max	Intake	0.0010-0.0025
Taper	0.008 max	Exhaust	0.0010-0.0035
Connecting Rod Bearings		Valve Spring Force (lb)	132 at 1.505" wear limit-110
Journal Diameter	1.9982-1.9990		
Shell Diameter	1.9992-2.0010		

Piston Diameter	3.8741-3.8765
Main Bearings	
Journal Diameter	2.2482-2.2490
Shell Diameter	2.2494-2.2512

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+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 235880 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.99+		1.42		1.47		1.42	
Bottom	1.80		1.88		1.88		1.78	
Cylinder Bore Diameter	L	T	L	T	L	T	L	T
Top	98.511	98.537	98.509	98.560	98.509	98.471	98.499	98.534
Middle	98.491	98.504	98.514	98.514	98.496	98.494	98.486	98.506
Bottom	98.458	98.483	98.473	98.489	98.476	98.473	98.468	98.483
Out-of-round	0.026		0.051		0.038		0.035	
Taper	0.053		0.036		0.033		0.031	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	50.767	50.770	50.767	50.767	50.767	50.767	50.767	50.770
Shell Diameter	F	B	F	B	F	B	F	B
	50.856	50.846	50.846	50.853	50.851	50.853	50.846	50.848
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	5.18	5.97	5.72	5.89	5.89	5.99	6.07	5.94
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.135	0.150	0.130	0.147	0.135	0.147	0.135	0.152
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E
	480	463	476	476	480	480	489	476
Piston Avg. Diameter								
Middle and bottom of skirt	98.400		98.395		98.405		98.392	

Main Bearings	No. 1		No. 2		No. 3	
Journal Diameter	H	V	H	V	H	V
	57.109	57.112	57.109	57.112	57.109	57.109
Shell Diameter	F	B	F	B	F	B
	57.183	57.178	57.236	57.226	57.214	57.211

Manufacturer's Service Limits, mm

Compression Ring Gaps	
Top	0.25-0.69
Bottom	
Cylinder Bore Diameter	98.433-98.494
Out-of-round	0.13 max
Taper	0.20 max
Connecting Rod Bearings	
Journal Diameter	50.754-50.775
Shell Diameter	50.780-50.825

Camshaft Lobe Lift	
Intake	6.017
Exhaust	5.918
Valve Stem to Guide Clearance	
Intake	0.025-0.064
Exhaust	0.025-0.089
Valve Spring Force (N-m)	587 at 38.23 mm Wear limit 489

Piston Diameter	98.402-98.463
Main Bearings	
Journal Diameter	57.104-57.125
Shell Diameter	57.135-57.180

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 251891 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		Cylinder No. 2		Cylinder No. 3		Cylinder No. 4	
Compression Ring Gaps								
Top	0.048		0.054		0.051		0.049	
Bottom	0.067		0.072		0.071		0.068	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.8782	3.8793	3.8777	3.8784	3.8768	3.8774	3.8770	3.8774
Middle	3.8773	3.8778	3.8771	3.8771	3.8763	3.8765	3.8765	3.8767
Bottom	3.8771	2.8776	3.8774	3.8773	3.8765	3.8767	3.8766	3.8769
Out-of-round	0.0011		0.0007		0.0006		0.0004	
Taper	0.0011		0.0003		0.0003		0.0004	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	1.9988	1.9987	1.9987	1.9987	1.9988	1.9987	1.9987	1.9987
Shell Diameter	F	B	F	B	F	B	F	B
	2.0013	2.0016	2.0012	2.0020	2.0004	2.0012	2.0025	2.0024
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	0.244	0.236	0.242	0.239	0.241	0.229	0.240	0.235
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.0063	0.0045	0.0052	0.0046	0.0054	0.0050	0.0067	0.0054
Valve Spring Force (lb)	I	E	I	E	I	E	I	E
	109	110	106	105	108	106	106	108
Piston Avg. Diameter								
Middle and bottom of skirt	3.8738		3.8738		3.8735		3.8730	
Main Bearings	No. 1		No. 2		No. 3			
Journal Diameter	H	V	H	V	H	V		
	2.2485	2.2486	2.2485	2.2485	2.2485	2.2484		
Shell Diameter	F	B	F	B	F	B		
	2.2523	2.2522	2.2531	2.2528	2.2528	2.2532		

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	3.8741-3.8765
Top	0.010-0.027	Intake	0.2369	Main Bearings	
Bottom		Exhaust	0.2330	Journal Diameter	2.2482-2.2490
Cylinder Bore Diameter	3.8753-3.8777	Valve Stem to Guide Clearance		Shell Diameter	2.2494-2.2512
Out-of-round	0.005 max	Intake	0.0010-0.0025		
Taper	0.008 max	Exhaust	0.0010-0.0035		
Connecting Rod Bearings		Valve Spring Force (lb)	132 at 1.505"		
Journal Diameter	1.9982-1.9990		wear limit-110		
Shell Diameter	1.9992-2.0010				

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F = Forward, B = Back, I = Intake, E = Exhaust
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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 251891 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5	6
Compression Ring Gaps										
Top	1.22+		1.37		1.30		1.24			
Bottom	1.70		1.83		1.80		1.73			
Cylinder Bore Diameter	L	T	L	T	L	T	L	T		
Top	98.506	98.534	98.494	98.511	98.471	98.486	98.476	98.486		
Middle	98.483	98.496	98.478	98.478	98.458	98.463	98.463	98.468		
Bottom	98.478	98.491	98.486	98.483	98.463	98.468	98.466	98.473		
Out-of-round	0.028		0.017		0.015		0.010			
Taper	0.028		0.008		0.008		0.010			
Connecting Rod Bearings										
Journal Diameter	H	V	H	V	H	V	H	V		
	50.770	50.767	50.767	50.767	50.770	50.767	50.767	50.767		
Shell Diameter	F	B	F	B	F	B	F	B		
	50.833	50.841	50.830	50.851	50.810	50.830	50.864	50.861		
Camshaft Lobe Lift	I	E	I	E	I	E	I	E		
	6.20	5.99	6.15	6.07	6.12	5.82	6.10	5.97		
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E		
	0.160	0.114	0.132	0.117	0.137	0.127	0.170	0.137		
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E		
	485	485	472	467	480	472	472	480		
Piston Avg. Diameter										
Middle and bottom of skirt	98.395		98.395		98.387		98.374			

Main Bearings	No. 1		No. 2		No. 3	
Journal Diameter	H	V	H	V	H	V
	57.112	57.114	57.112	57.112	57.112	57.109
Shell Diameter	F	B	F	B	F	B
	57.208	57.206	57.229	57.221	57.221	57.231

Manufacturer's Service Limits, mm

Compression Ring Gaps	
Top	0.25-0.69
Bottom	
Cylinder Bore Diameter	98.433-98.494
Out-of-round	0.13 max
Taper	0.20 max
Connecting Rod Bearings	
Journal Diameter	50.754-50.775
Shell Diameter	50.780-50.825

Camshaft Lobe Lift	
Intake	6.017
Exhaust	5.918
Valve Stem to Guide Clearance	
Intake	0.025-0.064
Exhaust	0.025-0.089
Valve Spring Force (N-m)	587 at 38.23 mm Wear limit 489

Piston Diameter	98.402-98.463
Main Bearings	
Journal Diameter	57.104-57.125
Shell Diameter	57.135-57.180

[a] L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical, F = Forward, B = Back, I = Intake, E = Exhaust

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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 235875 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	0.052		0.056		0.055		0.054	
Bottom	0.072		0.079		0.060		0.064	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T
Top	3.8767	3.8775	3.8777	3.8789	3.8768	3.8779	3.8770	3.8784
Middle	3.8762	3.8768	3.8772	3.8770	3.8765	3.8770	3.8773	3.8777
Bottom	3.8757	3.8764	3.8763	3.8764	3.8762	3.8765	3.8763	3.8768
Out-of-round	0.0008		0.0012		0.0011		0.0014	
Taper	0.0010		0.0014		0.0006		0.0007	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	1.9981	1.9980	1.9981	1.9982	1.9982	1.9982	1.9982	1.9982
Shell Diameter	F	B	F	B	F	B	F	B
	2.0035	2.0034	2.0010	2.0014	2.0014	2.0020	2.0018	2.0018
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	0.239	0.236	0.240	0.235	0.235	0.226	0.239	0.234
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.0072	0.0100	0.0065	0.0074	0.0067	0.0097	0.0062	0.0067
Valve Spring Force (lb)	I	E	I	E	I	E	I	E
	104	102	106	103	107	104	104	105
Piston Avg. Diameter								
Middle and bottom of skirt	3.8734		3.8732		3.8721		3.8731	
Main Bearings	No. 1		No. 2		No. 3			
Journal Diameter	H	V	H	V	H	V		
	2.2483	2.2484	2.2484	2.2483	2.2481	2.2480		
Shell Diameter	F	B	F	B	F	B		
	2.2526	2.2524	2.2527	2.2524	2.2529	2.2531		

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	3.8741-3.8765
Top	0.010-0.027	Intake	0.2369	Main Bearings	
Bottom		Exhaust	0.2330	Journal Diameter	2.2482-2.2490
Cylinder Bore Diameter	3.8753-3.8777	Valve Stem to Guide Clearance		Shell Diameter	2.2494-2.2512
Out-of-round	0.005 max	Intake	0.0010-0.0025		
Taper	0.008 max	Exhaust	0.0010-0.0035		
Connecting Rod Bearings		Valve Spring Force (lb)	132 at 1.505"		
Journal Diameter	1.9982-1.9990		wear limit-110		
Shell Diameter	1.9992-2.0010				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: JEEP, 4 CYLINDER, 140 CID
ENGINE NUMBER: 235875 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4	
Compression Ring Gaps								
Top	1.32+		1.42		1.40		1.37	
Bottom	1.83		2.01		1.52		1.63	
Cylinder Bore Diameter	L	T	L	T	L	T	L	T
Top	98.468	98.489	98.494	98.524	98.471	98.499	98.476	98.511
Middle	98.455	98.471	98.481	98.476	98.463	98.476	98.483	98.494
Bottom	98.443	98.461	98.458	98.461	98.455	98.463	98.458	98.471
Out-of-round	0.021		0.030		0.028		0.035	
Taper	0.025		0.036		0.016		0.018	
Connecting Rod Bearings								
Journal Diameter	H	V	H	V	H	V	H	V
	50.752	50.749	50.752	50.754	50.754	50.754	50.754	50.754
Shell Diameter	F	B	F	B	F	B	F	B
	50.889	50.886	50.825	50.836	50.836	50.851	50.846	50.846
Camshaft Lobe Lift	I	E	I	E	I	E	I	E
	6.07	5.99	6.10	5.97	5.97	5.74	6.07	5.94
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E
	0.183	0.254	0.165	0.188	0.170	0.246	0.157	0.170
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E
	463	454	472	458	476	463	463	467
Piston Avg. Diameter								
Middle and bottom of skirt	98.384		98.379		98.351		98.377	
Main Bearings	No. 1		No. 2		No. 3			
Journal Diameter	H	V	H	V	H	V		
	57.107	57.109	57.109	57.107	57.102	57.099		
Shell Diameter	F	B	F	B	F	B		
	57.216	57.211	57.219	57.211	57.224	57.229		

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	98.402-98.463
Top	0.25-0.69	Intake	6.017	Main Bearings	
Bottom		Exhaust	5.918	Journal Diameter	57.104-57.125
Cylinder Bore Diameter	98.433-98.494	Valve Stem to Guide Clearance		Shell Diameter	57.135-57.180
Out-of-round	0.13 max	Intake	0.025-0.064		
Taper	0.20 max	Exhaust	0.025-0.089		
Connecting Rod Bearings		Valve Spring Force (N-m)	587 at 38.23 mm		
Journal Diameter	50.754-50.775		Wear limit 489		
Shell Diameter	50.780-50.825				

[a] L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 6M318-01212997 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.032		0.030		0.030		0.030		0.023		0.032		0.025		0.025	
Bottom	0.034		0.032		0.028		0.026		0.022		0.026		0.027		0.030	
Cylinder Bore																
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	3.9109	3.9107	3.9113	3.9108	3.9105	3.9107	3.9104	3.9108	3.9106	3.9114	3.9101	3.9109	3.9105	3.9118	3.9105	3.9109
Middle	3.9103	3.9105	3.9103	3.9107	3.9107	3.9104	3.9108	3.9103	3.9102	3.9113	3.9104	3.9106	3.9102	3.9115	3.9101	3.9104
Bottom	3.9103	3.9106	3.9102	3.9107	3.9101	3.9101	3.9102	3.9102	3.9110	3.9112	3.9100	3.9103	3.9100	3.9115	3.9102	3.9101
Out-of-round	0.0002		0.0005		0.0002		0.0004		0.0008		0.0008		0.0013		0.0004	
Taper	0.0006		0.0011		0.0004		0.0002		0.0004		0.0001		0.0005		0.0003	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.1241	2.1240	2.1243	2.1243	2.1243	2.1242	2.1243	2.1243	2.1242	2.1242	2.1242	2.1242	2.1242	2.1242	2.1242	2.1242
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.1255	2.1263	2.1250	2.1257	2.1261	2.1266	2.1254	2.1256	2.1266	2.1264	2.1256	2.1259	2.1262	2.1261	21260	2.1258
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.244	0.259	0.229	0.261	0.233	0.264	0.242	0.264	0.225	0.264	0.246	0.263	0.242	0.249	0.242	0.259
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0053	0.0067	0.0063	0.0077	0.0037	0.0070	0.0058	0.0067	0.0059	0.0074	0.0054	0.0084	0.0053	0.0081	0.0064	0.0070
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	162	110	157	114	156	112	158	111	155	115	159	113	158	112	159	111
Piston Avg. Diameter Middle & bottom of skirt	3.9098		3.9093		3.9092		3.9093		3.9099		3.9092		3.9098		3.9095	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.4996	2.4994	2.4992	2.4993	2.4994	2.4996	2.4996	2.4997	2.4995	2.4995
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	2.5027	2.5024	2.5019	2.5021	2.5039	2.5041	2.5016	2.5020	2.5028	2.5029

Manufacturer's Service Limits, Inches

Compression Ring Gaps	
Top	0.010-0.020
Bottom	
Cylinder Bore Diameter	3.9100-3.9120
Out-of-round	0.0050 max
Taper	0.010 max
Connecting Rod Bearings	
Journal Diameter	2.1240-2.1250
Shell Diameter	2.1245-2.1275

Camshaft Lobe Lift	
Intake	0.249
Exhaust	0.267
Valve Stem to Guide Clearance	
Intake	0.001-0.017
Exhaust	
Valve Spring Force (lb)	78-88 lb at 1-11/16"
	170-184 lb at 1-5/16"

Piston Diameter	3.9085-3.911
Main Bearings	
Journal Diameter	2.4995-2.500
Shell Diameter	2.5000-2.503

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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 6M318-01212997 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.81+		0.76		0.76		0.76		0.58		0.81		0.64		0.64	
Bottom	0.86		0.81		0.71		0.66		0.56		0.66		0.69		0.76	
Cylinder Bore																
Diameter	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	99.337	99.332	99.347	99.334	99.327	99.332	99.324	99.334	99.329	99.350	99.317	99.337	99.327	99.360	99.327	99.337
Middle	99.322	99.327	99.322	99.332	99.332	99.324	99.334	99.322	99.319	99.347	99.324	99.329	99.319	99.352	99.317	99.324
Bottom	99.322	99.329	99.319	99.332	99.317	99.317	99.319	99.319	99.339	99.344	99.314	99.322	99.314	99.352	99.319	99.317
Out-of-round	0.005		0.013		0.005		0.010		0.021		0.020		0.033		0.010	
Taper	0.015		0.028		0.010		0.005		0.010		0.003		0.013		0.008	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	53.952	53.950	53.957	53.957	53.957	53.955	53.957	53.957	53.955	53.955	53.955	53.955	53.955	53.955	53.955	53.955
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	53.988	54.008	53.975	53.993	54.003	54.016	53.985	53.990	54.016	54.011	53.990	53.998	54.005	54.003	54.000	53.995
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	6.20	6.58	5.82	6.63	5.92	6.71	6.15	6.71	5.72	6.71	6.25	6.68	6.15	6.32	6.15	6.58
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.135	0.170	0.160	0.196	0.094	0.178	0.147	0.170	0.150	0.188	0.137	0.213	0.135	0.206	0.163	0.178
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	721	489	698	507	694	498	703	494	689	512	707	503	703	498	707	494
Piston Avg.Diameter Middle & bottom of skirt	99.309		99.296		99.294		99.296		99.311		99.294		99.309		99.301	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	63.490	63.485	63.480	63.482	63.485	63.490	63.490	63.492	63.487	63.487
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	63.569	63.561	63.548	63.553	63.599	63.604	63.541	63.551	63.571	63.574

Manufacturer's Service Limits, mm

Compression Ring Gaps	
Top	0.25-0.51
Bottom	
Cylinder Bore Diameter	99.314-99.365
Out-of-round	0.13 max
Taper	0.25 max
Connecting Rod Bearings	
Journal Diameter	53.950-53.975
Shell Diameter	53.962-54.039

Camshaft Lobe Lift	
Intake	6.325
Exhaust	6.782
Valve Stem to Guide Clearance	
Intake	0.03-0.43
Exhaust	
Valve Spring Force (N-m)	756-818 @ at 33.34 mm

Piston Diameter	99.276-99.35
Main Bearings	
Journal Diameter	63.487-63.51
Shell Diameter	63.500-63.57

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ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 6M318-02260516 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.028		0.035		0.032		0.030		0.030		Broken		0.030		0.028	
Bottom	0.030		0.033		0.032		0.030		0.031		Broken		0.034		0.031	
Cylinder Bore																
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	3.9118	3.9114	3.9120	3.9118	3.9110	3.9120	3.9113	3.9124	3.9113	3.9122	3.9108	3.9122	3.9109	3.9103	3.9115	3.9116
Middle	3.9111	3.9108	3.9111	3.9115	3.9106	3.9116	3.9106	3.9122	3.9106	3.9115	3.9107	3.9122	3.9101	3.9119	3.9109	3.9112
Bottom	3.9111	3.9108	3.9111	3.9114	3.9111	3.9112	3.9112	3.9117	3.9113	3.9111	3.9113	3.9110	3.9102	3.9118	3.9112	3.9111
Out-of-round	0.0004		0.0002		0.0010		0.0011		0.0009		0.0014		0.0006		0.0001	
Taper	0.0007		0.0009		0.0001		0.0001		0.0000		0.0005		0.0007		0.0003	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.1242	2.1211	2.1240	2.1241	2.1240	2.1238	2.1239	2.1238	2.1240	2.1241	2.1241	2.1242	2.1239	2.1238	2.1241	2.1241
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.1262	2.1268	2.1266	2.1265	2.1258	2.1259	2.1267	2.1266	2.1263	2.1265	2.1268	2.1266	2.1267	2.1265	2.1264	2.1265
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.247	0.256	0.246	0.251	0.246	0.260	0.221	0.262	0.234	0.264	0.240	0.231	0.235	0.250	0.240	0.261
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0052	0.0063	0.0057	0.0068	0.0061	0.0059	0.0048	0.0068	0.0056	0.0066	0.0060	0.0071	0.0055	0.0058	0.0059	0.0066
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	165	116	163	116	163	114	163	118	165	116	165	117	160	116	164	113
Piston Avg. Diameter Middle & bottom of skirt	3.9080		3.9082		3.9070		3.9079		3.9075		3.9061		3.9084		3.9061	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.4998	2.4997	2.5000	2.4998	2.5000	2.4999	2.4999	2.5000	2.4996	2.4996
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	2.5022	2.5025	2.5021	2.5018	2.5023	2.5025	2.5019	2.5015	2.5023	2.5028

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	3.9085-3.9115
Top	0.010-0.020	Intake	0.249	Main Bearings	
Bottom		Exhaust	0.267	Journal Diameter	2.4995-2.5005
Cylinder Bore Diameter	3.9100-3.9120	Valve Stem to Guide Clearance		Shell Diameter	2.5000-2.5030
Out-of-round	0.0050 max	Intake	0.001-0.017		
Taper	0.010 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (lb)	78-88 lb at 1-11/16"		
Journal Diameter	2.1240-2.1250		170-184 lb at 1-5/16"		
Shell Diameter	2.1245-2.1275				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
* = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 6M318-02260516 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.71*		0.89		0.81		0.76		0.76		Broken		0.76		0.71	
Bottom	0.76		0.84		0.81		0.76		0.84		Broken		0.86		0.79	
Cylinder Bore																
Diameter	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	99.360	99.350	99.365	99.360	99.339	99.365	99.347	99.375	99.347	99.370	99.334	99.370	99.337	99.322	99.352	99.355
Middle	99.342	99.334	99.342	99.352	99.329	99.355	99.329	99.370	99.329	99.352	99.332	99.370	99.317	99.362	99.337	99.344
Bottom	99.342	99.334	99.342	99.350	99.342	99.344	99.344	99.357	99.347	99.342	99.347	99.339	99.319	99.360	99.344	99.342
Out-of-round	0.010		0.005		0.026		0.028		0.023		0.036		0.015		0.003	
Taper	0.018		0.023		0.003		0.003		0.000		0.013		0.018		0.008	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	53.955	53.876	53.950	53.952	53.950	53.945	53.947	53.945	53.950	53.952	53.952	53.955	53.947	53.945	53.952	53.952
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	54.005	54.021	54.016	54.013	53.995	53.998	54.018	54.016	54.008	54.013	54.021	54.016	54.018	54.013	54.011	54.008
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	6.27	6.50	6.25	6.38	6.25	6.60	5.61	6.65	5.94	6.71	6.10	5.87	5.97	6.35	6.10	6.63
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.132	0.160	0.145	0.173	0.155	0.150	0.122	0.173	0.142	0.168	0.152	0.180	0.140	0.147	0.150	0.168
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	734	516	725	516	725	507	725	525	734	516	734	520	712	516	730	503
Piston Avg.Diameter Middle & bottom of skirt	99.263		99.268		99.238		99.261		99.251		99.215		99.273		99.215	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	63.495	63.492	63.500	63.495	63.500	63.497	63.497	63.500	63.490	63.490
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	63.556	63.564	63.553	63.546	63.558	63.564	63.548	63.538	63.558	63.571

Manufacturer's Service Limits, mm

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	99.276-99.352
Top	0.25-0.51	Intake	6.325	**Main Bearings**	
Bottom		Exhaust	6.782	Journal Diameter	63.487-63.513
Cylinder Bore Diameter	99.314-99.365	**Valve Stem to Guide Clearance**		Shell Diameter	63.500-63.576
Out-of-round	0.13 max	Intake	0.03-0.43		
Taper	0.25 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (N-m)**	347-391 at 42.86 mm		
Journal Diameter	53.950-53.975		756-818 at 33.34 mm		
Shell Diameter	53.962-54.039				

*L = Longitudinal, T = Transvereal, H = Horizontal, V = Vertical,
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* = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 6M318-12110971 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.032		0.035		0.038		0.034		0.036		0.032		0.035		0.030	
Bottom	0.031		0.033		0.036		0.036		0.032		0.035		0.033		0.033	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	3.9117	3.9110	3.9124	3.9122	3.9138	3.9142	3.9118	3.9125	3.9117	3.9123	3.9110	3.9119	3.9119	3.9117	3.9114	3.9110
Middle	3.9116	3.9114	3.9122	3.9125	3.9136	3.9141	3.9117	3.9126	3.9116	3.9126	3.9112	3.9123	3.9121	3.9123	3.9112	3.9110
Bottom	3.9111	3.9113	3.9120	3.9124	3.9136	3.9139	3.9117	3.9120	3.9115	3.9122	3.9111	3.9117	3.9114	3.9120	3.9109	3.9108
Out-of-round	0.0007		0.0002		0.0004		0.0007		0.0006		0.0009		0.0002		0.0004	
Taper	0.0006		0.0004		0.0002		0.0001		0.0002		0.0001		0.0005		0.0005	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.1242	2.1242	2.1242	2.1240	2.1242	2.1242	2.1242	2.1242	2.1241	2.1241	2.1242	2.1242	2.1243	2.1242	2.1243	2.1243
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.1285	2.1284	2.1268	2.1269	2.1270	2.1269	2.1254	2.1256	2.1260	2.1262	2.1261	2.1260	2.1259	2.1256	2.1262	2.1262
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.249	0.264	0.237	0.251	0.244	0.250	0.241	0.253	0.241	0.267	0.233	0.216	0.222	0.252	0.238	0.261
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0067	0.0080	0.0066	0.0067	0.0066	0.0078	0.0060	0.0078	0.0053	0.0070	0.0073	0.0082	0.0069	0.0085	0.0072	0.0082
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	158	112	157	110	157	113	154	110	154	109	154	110	161	112	159	110
Piston Avg.Diameter Middle & bottom of skirt	3.9091		3.9094		3.9092		3.9090		3.9101		3.9089		3.9089		3.9091	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.4994	2.4995	2.4997	2.4996	2.4998	2.4998	2.4998	2.4998	2.4998	2.4997
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	2.5022	2.5025	2.5018	2.5015	2.5028	2.5025	2.5010	2.5015	2.5024	2.5025

Manufacturer's Service Limits, Inches

Compression Ring Gaps		Camshaft Lobe Lift		*Piston Diameter*	3.9085-3.911
Top	0.010-0.020	Intake	0.249	Main Bearings	
Bottom		Exhaust	0.267	Journal Diameter	2.4995-2.500
Cylinder Bore Diameter	3.9100-3.9120	Valve Stem to Guide Clearance		Shell Diameter	2.5000-2.503
Out-of-round	0.0050 max	Intake	0.001-0.017		
Taper	0.010 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (lb)	78-88 lb at 1-11/16"		
Journal Diameter	2.1240-2.1250		170-184 lb at 1-5/16"		
Shell Diameter	2.1245-2.1275				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. LEWIS, WA
ENGINE TYPE: CHRYSLER V-8, 318 CID
ENGINE NUMBER: 6M318-12110971 TYPE FUEL: GASOHOL

Component	Cylinder No. 1	2	3	4	5	6	7	8
Compression Ring								
Gaps								
Top	0.81*	0.89	0.97	0.86	0.86	0.81	0.89	0.76
Bottom	0.79	0.84	0.91	0.91	0.81	0.89	0.84	0.84
Cylinder Bore								
Diameter	L / T	L / T	L / T	L / T	L / T	L / T	L / T	L / T
Top	99.357 / 99.339	99.375 / 99.370	99.411 / 99.421	99.360 / 99.378	99.357 / 99.372	99.339 / 99.362	99.362 / 99.357	99.350 / 99.339
Middle	99.355 / 99.350	99.370 / 99.378	99.405 / 99.418	99.357 / 99.380	99.355 / 99.380	99.344 / 99.372	99.367 / 99.372	99.344 / 99.339
Bottom	99.342 / 99.347	99.365 / 99.375	99.405 / 99.413	99.357 / 99.365	99.352 / 99.370	99.342 / 99.357	99.350 / 99.365	99.337 / 99.334
Out-of-round	0.018	0.005	0.010	0.018	0.015	0.023	0.005	0.011
Taper	0.015	0.010	0.006	0.003	0.005	0.003	0.012	0.013
Connecting Rod								
Bearings								
Journal Diameter	H / V	H / V	H / V	H / V	H / V	H / V	H / V	H / V
	53.955 / 53.955	53.955 / 53.950	53.955 / 53.955	53.955 / 53.955	53.952 / 53.952	53.955 / 53.955	53.957 / 53.955	53.957 / 53.957
Shell Diameter	F / B	F / B	F / B	F / B	F / B	F / B	F / B	F / B
	54.064 / 54.061	54.021 / 54.023	54.026 / 54.023	53.985 / 53.990	54.000 / 54.005	54.003 / 54.000	53.998 / 53.990	54.005 / 54.005
Camshaft Lobe								
Lift	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	6.32 / 6.71	6.02 / 6.38	6.20 / 6.35	6.12 / 6.43	6.12 / 6.78	5.92 / 5.49	5.64 / 6.40	6.05 / 6.63
Valve Stem to								
Guide Clearance	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	0.170 / 0.203	0.168 / 0.170	0.168 / 0.198	0.152 / 0.198	0.135 / 0.178	0.185 / 0.208	0.175 / 0.216	0.183 / 0.208
Valve Spring								
Force (N-m)	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	703 / 498	698 / 489	698 / 503	685 / 489	685 / 485	685 / 489	716 / 498	707 / 489
Piston Avg.Diameter								
Middle & bottom of skirt	99.291	99.299	99.294	99.289	99.317	99.286	99.286	99.291

Main Bearings	No. 1	No. 2	No. 3	No. 4	No. 5
Journal Diameter	H / V	H / V	H / V	H / V	H / V
	63.485 / 63.487	63.492 / 63.490	63.495 / 63.495	63.495 / 63.495	63.495 / 63.492
Shell Diameter	F / B	F / B	F / B	F / B	F / B
	63.556 / 63.564	63.546 / 63.538	63.571 / 63.564	63.525 / 63.538	63.561 / 63.564

Manufacturer's Service Limits, mm

Compression Ring Gaps	
Top	0.25-0.51
Bottom	
Cylinder Bore Diameter	99.314-99.365
Out-of-round	0.13 max
Taper	0.25 max
Connecting Rod Bearings	
Journal Diameter	53.950-53.975
Shell Diameter	53.962-54.039

Camshaft Lobe Lift	
Intake	6.325
Exhaust	6.782
Valve Stem to Guide Clearance	
Intake	0.03-0.43
Exhaust	
Valve Spring Force (N-m)	347-391 at 42.86 mm
	756-818 at 33.34 mm

Piston Diameter	99.276-99.352
Main Bearings	
Journal Diameter	63.487-63.513
Shell Diameter	63.500-63.576

L = Longitudinal, T = Transvereal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
* = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: AMC 6 CYLINDER, 232 CID
ENGINE NUMBER: CD0941 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6	
Compression Ring												
Gaps												
Top	0.030		0.029		0.027		0.027		0.027		0.026	
Bottom	0.037		0.034		0.030		0.034		0.030		0.040	
Cylinder Bore												
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.7527	3.7507	3.7527	3.7515	3.7524	3.7507	3.7522	3.7514	3.7517	3.7508	3.7519	3.7519
Middle	3.7517	3.7501	3.7515	3.7511	3.7512	3.7505	3.7515	3.7512	3.7513	3.7509	3.7512	3.7514
Bottom	3.7514	3.7504	3.7514	3.7514	3.7510	3.7509	3.7515	3.7514	3.7513	3.7511	3.7511	3.7516
Out-of-round	0.0020		0.0012		0.0017		0.0008		0.0009		0.0000	
Taper	0.0013		0.0013		0.0014		0.0007		0.0004		0.0008	
Connecting Rod												
Bearings												
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V
	2.0943	2.0943	2.0945	2.0946	2.0945	2.0945	2.0945	2.0946	2.0944	2.0945	2.0947	2.0945
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B
	2.0976	2.0981	2.0981	2.0981	2.0986	2.0987	2.0981	2.0982	2.0982	2.0982	2.0979	2.0975
Camshaft Lobe												
Lift	I	E	I	E	I	E	I	E	I	E	I	E
	0.231	0.226	0.230	0.230	0.230	0.232	0.229	0.231	0.224	0.229	0.225	0.230
Valve Stem to												
Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E
	0.0024	0.0029	0.0030	0.0029	0.0026	0.0034	0.0023	0.0030	0.0027	0.0026	0.0030	0.0033
Valve Spring												
Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E
	85	86	83	85	77	84	82	86	79	84	82	85
Piston Avg.Diameter												
Middle & bottom of skirt	3.7493		3.7498		3.7493		3.7495		3.7493		3.7493	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7	
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.4988	2.4988	2.4988	2.4988	2.4990	2.4990	2.4987	2.4989	2.4991	2.4990	2.4987	2.4987	2.4988	2.4988
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.5015	2.5008	2.5017	2.5014	2.5017	2.5013	2.5015	2.5017	2.5015	2.5015	2.5013	2.5016	2.5015	2.5013

Manufacturer's Service Limits, Inches

Compression Ring Gaps	
Top	0.010-0.020
Bottom	
Cylinder Bore Diameter	3.7500
Out-of-round	0.005 max
Taper	0.005 max
Connecting Rod Bearings	
Journal Diameter	2.0934-2.0955
Shell Diameter	2.0944-2.0975
Camshaft Lobe Lift	
Intake	0.232
Exhaust	
Valve Stem to Guide Clearance	
Intake	0.001-0.003
Exhaust	
Valve Spring Force (lb)	95-105 at 1 13/16"
Piston Diameter	3.7483-3.7491
Main Bearings	
Journal Diameter	2.4986-2.5001
Shell Diameter	2.4996-2.5021

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+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: AMC 6 CYLINDER, 232 CID
ENGINE NUMBER: CD0941 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6	
Compression Ring												
Gaps												
Top	0.76+		0.74		0.69		0.69		0.69		0.66	
Bottom	0.94		0.86		0.76		0.86		0.76		1.02	
Cylinder Bore												
Diameter	L	T	L	T	L	T	L	T	L	T	L	T
Top	95.319	95.268	95.319	95.288	95.311	95.268	95.306	95.286	95.293	95.270	95.298	95.298
Middle	95.293	95.253	95.288	95.278	95.280	95.263	95.288	95.280	95.283	95.273	95.280	95.286
Bottom	95.286	95.260	95.286	95.286	95.275	95.273	95.288	95.286	95.283	95.278	95.278	95.291
Out-of-round	0.051		0.031		0.043		0.020		0.023		0.000	
Taper	0.033		0.033		0.036		0.018		0.010		0.020	
Connecting Rod												
Bearings												
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V
	53.195	53.195	53.200	53.203	53.200	53.200	53.200	53.203	53.198	53.200	53.205	53.200
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B
	53.279	53.292	53.292	53.292	53.304	53.307	53.292	53.294	53.294	53.294	53.287	53.277
Camshaft Lobe												
Lift	I	E	I	E	I	E	I	E	I	E	I	E
	5.87	5.74	5.84	5.84	5.84	5.89	5.82	5.87	5.69	5.82	5.72	5.84
Valve Stem to												
Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E
	0.061	0.074	0.076	0.074	0.066	0.086	0.058	0.076	0.069	0.066	0.076	0.084
Valve Spring												
Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E
	378	383	369	378	343	374	365	383	351	374	365	378
Piston Avg.Diameter												
Middle & bottom of skirt	95.232		95.245		95.232		95.237		95.232		95.232	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7	
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	63.470	63.470	63.470	63.470	63.475	63.475	63.467	63.472	63.477	63.475	63.467	63.467	63.470	63.470
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	63.538	63.520	63.543	63.536	63.543	63.533	63.538	63.543	63.538	63.538	63.533	63.541	63.538	63.533

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	95.207-95.227
Top	0.25-0.51	Intake	5.89	Main Bearings	
Bottom		Exhaust		Journal Diameter	63.464-63.503
Cylinder Bore Diameter	95.250	Valve Stem to Guide Clearance		Shell Diameter	63.490-63.553
Out-of-round	0.13 max	Intake	0.03-0.08		
Taper	0.13 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (N-m) 423-467 at 46.04 mm			
Journal Diameter	53.172-53.226				
Shell Diameter	53.198-53.277				

L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: AMC 6 CYLINDER, 232 CID
ENGINE NUMBER: CD0935 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.029		0.030		0.028		0.027		0.029		0.029	
Bottom	0.034		0.033		0.034		0.032		0.031		0.031	
Cylinder Bore												
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.7533	3.7506	3.7529	3.7517	3.7529	3.7513	3.7526	3.7515	3.7518	3.7511	3.7520	3.7521
Middle	3.7522	3.7503	3.7521	3.7517	3.7521	3.7511	3.7520	3.7512	3.7517	3.7510	3.7515	3.7516
Bottom	3.7517	3.7514	3.7520	3.7519	3.7517	3.7517	3.7519	3.7516	3.7518	3.7513	3.7514	3.7518
Out-of-round	0.0027		0.0012		0.0016		0.0011		0.0007		0.0001	
Taper	0.0016		0.0009		0.0012		0.0007		0.0000		0.0006	
Connecting Rod Bearings												
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V
	2.0942	2.0940	2.0943	2.0944	2.0944	2.0944	2.0945	2.0944	2.0943	2.0943	2.0942	2.0943
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B
	2.0970	2.0972	2.0977	2.0978	2.0972	2.0977	2.0972	2.0976	2.0973	2.0971	2.0979	2.0979
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E
	0.228	0.232	0.229	0.232	0.233	0.228	0.228	0.229	0.225	0.227	0.218	0.167
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E
	0.0019	0.0032	0.0016	0.0030	0.0017	0.0031	0.0019	0.0028	0.0020	0.0029	0.0032	0.0032
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E
	84	87	88	85	85	88	84	87	82	85	86	87
Piston Avg.Diameter Middle & bottom of skirt	3.7496		3.7496		3.7499		3.7498		3.7491		3.7490	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7	
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.4990	2.4988	2.4989	2.4990	2.4992	2.4993	2.4989	2.4989	2.4989	2.4990	2.4988	2.4989	2.4987	2.4986
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.5009	2.5019	2.5012	2.5011	2.5015	2.5004	2.5017	2.5018	2.5009	2.5011	2.5010	2.5011	2.5011	2.5017

Manufacturer's Service Limits, Inches

Compression Ring Gaps	
Top	0.010-0.020
Bottom	
Cylinder Bore Diameter	3.7500
Out-of-round	0.005 max
Taper	0.005 max
Connecting Rod Bearings	
Journal Diameter	2.0934-2.0955
Shell Diameter	2.0944-2.0975
Camshaft Lobe Lift	
Intake	0.232
Exhaust	
Valve Stem to Guide Clearance	
Intake	0.001-0.003
Exhaust	
Valve Spring Force (lb) 95-105 at 1 13/16"	
Piston Diameter	3.7483-3.7491
Main Bearings	
Journal Diameter	2.4986-2.5001
Shell Diameter	2,4996-2.5021

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
◆ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: AMC 6 CYLINDER, 232 CID
ENGINE NUMBER: CD0935 TYPE FUEL: GASOHOL

Component	Cylinder No. 1	2	3	4	5	6
Compression Ring						
Gaps						
Top	0.74+	0.76	0.71	0.69	0.74	0.74
Bottom	0.86	0.84	0.86	0.81	0.79	0.79
Cylinder Bore						
Diameter	L / T	L / T	L / T	L / T	L / T	L / T
Top	95.334 / 95.265	95.324 / 95.293	95.324 / 95.283	95.316 / 95.288	95.296 / 95.278	95.301 / 95.303
Middle	95.306 / 95.258	95.303 / 95.293	95.303 / 95.378	95.301 / 95.280	95.293 / 95.275	95.288 / 95.291
Bottom	95.293 / 95.286	95.301 / 95.298	95.293 / 95.293	95.298 / 95.291	95.296 / 95.283	95.286 / 95.296
Out-of-round	0.069	0.031	0.041	0.028	0.018	0.002
Taper	0.041	0.023	0.031	0.018	0.000	0.015
Connecting Rod						
Bearings						
Journal Diameter	H / V	H / V	H / V	H / V	H / V	H / V
	53.193 / 53.188	53.195 / 53.198	53.198 / 53.198	53.200 / 53.198	53.195 / 53.195	53.193 / 53.195
Shell Diameter	F / B	F / B	F / B	F / B	F / B	F / B
	53.264 / 53.269	53.282 / 53.284	53.269 / 53.282	53.269 / 53.279	53.271 / 53.266	53.287 / 53.287
Camshaft Lobe						
Lift	I / E	I / E	I / E	I / E	I / E	I / E
	5.79 / 5.89	5.82 / 5.89	5.92 / 5.79	5.79 / 5.82	5.72 / 5.77	5.54 / 4.24
Valve Stem to						
Guide Clearance	I / E	I / E	I / E	I / E	I / E	I / E
	0.048 / 0.081	0.04 / 0.08	0.043 / 0.079	0.048 / 0.071	0.051 / 0.074	0.081 / 0.081
Valve Spring						
Force (N-m)	I / E	I / E	I / E	I / E	I / E	I / E
	374 / 387	391 / 378	378 / 391	374 / 387	365 / 378	383 / 387
Piston Avg.Diameter						
Middle & bottom of skirt	95.240	95.240	95.247	95.245	95.227	95.225

Main Bearings	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6	No. 7
Journal Diameter	H / V	H / V	H / V	H / V	H / V	H / V	H / V
	63.475 / 63.470	63.472 / 63.475	63.480 / 63.482	63.472 / 63.472	63.472 / 63.475	63.470 / 63.472	63.467 / 63.464
Shell Diameter	F / B	F / B	F / B	F / B	F / B	F / B	F / B
	63.523 / 63.548	63.530 / 63.528	63.538 / 63.510	63.543 / 63.546	63.523 / 63.528	63.525 / 63.528	63.528 / 63.543

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	95.207-95.227
Top	0.25-0.51	Intake	5.89	Main Bearings	
Bottom		Exhaust		Journal Diameter	63.464-63.503
Cylinder Bore Diameter	95.250	Valve Stem to Guide Clearance		Shell Diameter	63.490-63.553
Out-of-round	0.13 max	Intake	0.03-0.08		
Taper	0.13 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (N-m) 423-467 at 46.04 mm			
Journal Diameter	53.172-53.226				
Shell Diameter	53.198-53.277				

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ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: AMC 6 CYLINDER, 232 CID
ENGINE NUMBER: CD0939 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.030		0.028		0.027		0.027		0.026		0.025	
Bottom	0.036		0.035		0.035		0.036		0.037		0.032	
Cylinder Bore												
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T
Top	3.7553	3.7524	3.7552	3.7527	3.7544	3.7541	3.7549	3.7536	3.7540	3.7527	3.7546	3.7548
Middle	3.7527	3.7509	3.7515	3.7511	3.7518	3.7515	3.7519	3.7516	3.7521	3.7519	3.7524	3.7529
Bottom	3.7521	3.7517	3.7516	3.7513	3.7516	3.7519	3.7518	3.7520	3.7521	3.7523	3.7522	3.7533
Out-of-round	0.0029		0.0025		0.0003		0.0013		0.0013		0.0002	
Taper	0.0032		0.0036		0.0028		0.0031		0.0019		0.0024	
Connecting Rod Bearings												
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V
	2.0940	2.0940	2.0940	2.0940	2.0940	2.0940	2.0940	2.0940	2.0940	2.0940	2.0940	2.0941
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B
	2.0965	2.0965	2.0971	2.0966	2.0967	2.0959	2.0967	2.0966	2.0965	2.0964	2.0967	2.0966
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E
	0.230	0.230	0.230	0.225	0.230	0.230	0.230	0.231	0.230	0.230	0.230	0.230
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E
	0.0022	0.0026	0.0022	0.0024	0.0022	0.0030	0.0024	0.0026	0.0022	0.0028	0.0023	0.0024
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E
	89	88	88	89	87	88	89	88	87	88	87	88
Piston Avg.Diameter Middle & bottom of skirt	3.7489		3.7494		3.7499		3.7490		3.7501		3.7507	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7	
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.4988	2.4988	2.4988	2.4988	2.4992	2.4991	2.4990	2.4989	2.4990	2.4987	2.4988	2.4988	2.4987	2.4987
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.5021	2.5023	2.5022	2.5019	2.5018	2.5024	2.5021	2.5019	2.5015	2.5020	2.5017	2.5018	2.5021	2.5018

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	3.7483-3.7491
Top	0.010-0.020	Intake	0.232	**Main Bearings**	
Bottom		Exhaust		Journal Diameter	2.4986-2.5001
Cylinder Bore Diameter	3.7500	**Valve Stem to Guide Clearance**		Shell Diameter	2.4996-2.5021
Out-of-round	0.005 max	Intake	0.001-0.003		
Taper	0.005 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (lb)**	95-105 at 1 13/16"		
Journal Diameter	2.0934-2.0955				
Shell Diameter	2.0944-2.0975				

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ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: AMC 6 CYLINDER, 232 CID
ENGINE NUMBER: CD0939 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6	
Compression Ring Gaps												
Top	0.76*		0.71		0.69		0.69		0.66		0.64	
Bottom	0.91		0.89		0.89		0.91		0.94		0.81	
Cylinder Bore												
Diameter	L	T	L	T	L	T	L	T	L	T	L	T
Top	95.385	95.311	95.382	95.319	95.362	95.354	95.374	95.341	95.352	95.319	95.367	95.372
Middle	95.319	95.273	95.288	95.278	95.296	95.288	95.298	95.291	95.303	95.298	95.311	95.324
Bottom	95.303	95.293	95.291	95.283	95.291	95.298	95.296	95.301	95.303	95.308	95.306	95.334
Out-of-round	0.074		0.063		0.008		0.033		0.033		0.005	
Taper	0.082		0.091		0.071		0.078		0.049		0.061	
Connecting Rod Bearings												
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V
	53.188	53.188	53.188	53.188	53.188	53.188	53.188	53.188	53.188	53.188	53.188	53.190
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B
	53.251	53.251	53.266	53.254	53.256	53.236	53.256	53.254	53.251	53.249	53.256	53.254
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E
	5.84	5.84	5.84	5.72	5.84	5.84	5.84	5.87	5.84	5.84	5.84	5.84
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E
	0.0056	0.066	0.056	0.061	0.056	0.076	0.061	0.066	0.056	0.071	0.058	0.061
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E
	396	391	391	396	387	391	396	391	387	391	387	391
Piston Avg.Diameter Middle & bottom of skirt	95.222		95.235		95.247		95.225		95.253		95.268	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5		No. 6		No. 7	
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	63.470	63.470	63.470	63.470	63.480	63.477	63.475	63.472	63.475	63.467	63.470	63.470	63.467	63.467
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	63.553	63.558	63.556	63.548	63.546	63.561	63.553	63.548	63.538	63.551	63.543	63.546	63.553	63.546

Manufacturer's Service Limits, mm

Compression Ring Gaps		Camshaft Lobe Lift		Piston Diameter	95.207-95.227
Top	0.25-0.51	Intake	5.89	Main Bearings	
Bottom		Exhaust		Journal Diameter	63.464-63.503
Cylinder Bore Diameter	95.250	Valve Stem to Guide Clearance		Shell Diameter	63.490-63.553
Out-of-round	0.13 max	Intake	0.03-0.08		
Taper	0.13 max	Exhaust			
Connecting Rod Bearings		Valve Spring Force (N-m) 423-467 at 46.04 mm			
Journal Diameter	53.172-53.226				
Shell Diameter	53.198-53.277				

*L = Longitudinal, T = Transeversal, H = Horizontal, V = Vertical,
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+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: CD7099 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.035		0.033		0.032		0.038		0.031		0.031		0.033		0.031	
Bottom	0.040		0.038		0.039		0.040		0.040		0.039		0.039		0.039	
Cylinder Bore																
Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	4.0037	4.0043	4.0042	4.0044	4.0040	4.0039	4.0039	4.0047	4.0036	4.0046	4.0040	4.0036	4.0044	4.0042	4.0033	4.0045
Middle	4.0024	4.0040	4.0030	4.0038	4.0027	4.0036	4.0029	4.0042	4.0022	4.0035	4.0029	4.0029	4.0030	4.0036	4.0023	4.0040
Bottom	4.0028	4.0040	4.0034	4.0035	4.0031	4.0034	4.0031	4.0041	4.0024	4.0033	4.0031	4.0026	4.0033	4.0033	4.0025	4.0038
Out-of-round	0.0006		0.0002		0.0001		0.0008		0.0012		0.0004		0.0002		0.0012	
Taper	0.0009		0.0008		0.0009		0.0008		0.0010		0.0009		0.0011		0.0008	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.3103	2.3100	2.3100	2.3100	2.3100	2.3101	2.3101	2.3100	2.3101	2.3100	2.3100	2.3101	2.3101	2.3101	2.3100	2.3101
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.3130	2.3133	2.3135	2.3128	2.3126	2.3130	2.3130	2.3130	2.3128	2.3130	2.3128	2.3129	2.3126	2.3125	2.3129	2.3130
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.231	0.225	0.237	0.227	0.233	0.236	0.231	0.232	0.233	0.231	0.228	0.229	0.233	0.230	0.235	0.239
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0044	0.0040	0.0041	0.0039	0.0041	0.0054	0.0043	0.0047	0.0040	0.0047	0.0045	0.0055	0.0039	0.0047	0.0044	0.0051
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	224	220	223	219	223	221	220	217	219	219	221	220	218	221	214	218
Piston Avg.Diameter Middle & bottom of skirt	4.0000		3.9994		3.9995		4.0000		3.9998		3.9995		3.9999		3.9996	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	2.9994	2.9994	2.9992	2.9992	2.9990	2.9991	2.9993	2.9993	2.9994	2.9995
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	3.0024	3.0020	3.0015	3.0022	3.0012	3.0020	3.0001	3.0020	3.0020	3.0021

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**	0.250	**Piston Diameter**	3.9994-4.0000
Top	0.010-0.020	Intake		**Main Bearings**	
Bottom		Exhaust		Journal Diameter	2.9996-3.0002
Cylinder Bore Diameter	4.0000-4.0048	**Valve Stem to Guide Clearance**		Shell Diameter	3.0002-3.0028
Out-of-round	0.0015 max	Intake	0.005		
Taper	0.010 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (lb)**			
Journal Diameter	2.3103-2.3111	Intake	76-84 at 1.82"		
Shell Diameter	2.3111-2.3136		215-237 at 1.39"		
		Exhaust	79-87 at 1.68"		
			215-237 at 1.39"		

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
* = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: CD7099 TYPE FUEL: UNLEADED GASOLINE

Component	Cylinder No. 1	2	3	4	5	6	7	8
Compression Ring Gaps								
Top	0.89+	0.84	0.81	0.97	0.79	0.79	0.84	0.79
Bottom	1.02	0.97	0.99	1.02	1.02	0.99	0.99	0.99
Cylinder Bore Diameter								
	L / T	L / T	L / T	L / T	L / T	L / T	L / T	L / T
Top	101.694 / 101.709	101.707 / 101.712	101.702 / 101.699	101.699 / 101.719	101.691 / 101.717	101.702 / 101.691	101.712 / 101.707	101.684 / 101.714
Middle	101.661 / 101.702	101.676 / 101.697	101.669 / 101.691	101.674 / 101.707	101.656 / 101.689	101.674 / 101.674	101.676 / 101.691	101.658 / 101.702
Bottom	101.671 / 101.702	101.686 / 101.689	101.679 / 101.686	101.679 / 101.704	101.661 / 101.684	101.679 / 101.666	101.684 / 101.684	101.664 / 101.697
Out-of-round	0.015	0.005	0.003	0.020	0.026	0.011	0.005	0.030
Taper	0.023	0.021	0.023	0.020	0.030	0.023	0.028	0.020
Connecting Rod Bearings								
Journal Diameter	H / V	H / V	H / V	H / V	H / V	H / V	H / V	H / V
	58.682 / 58.674	58.674 / 58.674	58.674 / 58.677	58.677 / 58.674	58.677 / 58.674	58.674 / 58.677	58.677 / 58.677	58.674 / 58.677
Shell Diameter	F / B	F / B	F / B	F / B	F / B	F / B	F / B	F / B
	58.750 / 58.758	58.763 / 58.745	58.740 / 58.750	58.750 / 58.750	58.745 / 58.750	58.745 / 58.748	58.740 / 58.738	58.748 / 58.750
Camshaft Lobe Lift	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	5.87 / 5.72	6.02 / 5.77	5.92 / 5.99	5.87 / 5.89	5.92 / 5.87	5.79 / 5.82	5.92 / 5.84	5.97 / 6.07
Valve Stem to Guide Clearance	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	0.112 / 0.102	0.104 / 0.099	0.104 / 0.137	0.109 / 0.119	0.102 / 0.119	0.114 / 0.140	0.099 / 0.119	0.112 / 0.130
Valve Spring Force (N-m)	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	956 / 979	992 / 974	992 / 983	979 / 965	974 / 974	983 / 979	970 / 983	952 / 970
Piston Avg. Diameter Middle & bottom of skirt	101.600	101.585	101.587	101.600	101.595	202.587	101.597	101.590

Main Bearings	No. 1	No. 2	No. 3	No. 4	No. 5
Journal Diameter	H / V	H / V	H / V	H / V	H / V
	76.185 / 76.185	76.180 / 76.180	76.175 / 76.177	76.182 / 76.182	76.185 / 76.187
Shell Diameter	F / B	F / B	F / B	F / B	F / B
	76.261 / 76.251	76.238 / 76.256	76.230 / 76.251	76.203 / 76.251	76.251 / 76.253

Manufacturer's Service Limits, mm

Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	101.585-101.600
Top	0.25-0.51	Intake	6.35	**Main Bearings**	
Bottom		Exhaust		Journal Diameter	76.185-76.203
Cylinder Bore Diameter	101.600-101.722	**Valve Stem to Guide Clearance**		Shell Diameter	76.205-76.271
Out-of-round	0.038 max	Intake	0.13		
Taper	0.25 max	Exhaust			
Connecting Rod Bearings		**Valve Spring Force (N-m)**	338-374 at 46.23 mm 956-1054 at 35.31 mm 351-387 at 42.67 mm 956-1054 at 35.31 mm		
Journal Diameter	58.682-58.702				
Shell Diameter	58.702-58.765				

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: CD7097 TYPE FUEL: GASOHOL

Component	Cylinder No. 1	2	3	4	5	6	7	8
Compression Ring Gaps								
Top	0.030	0.028	0.030	0.029	0.029	0.030	0.029	0.029
Bottom	0.041	0.039	0.038	0.041	0.041	0.041	0.042	0.039
Cylinder Bore								
Diameter	L* T	L T	L T	L T	L T	L T	L T	L T
Top	4.0034 4.0043	4.0028 4.0033	4.0037 4.0035	4.0031 4.0036	4.0028 4.0039	4.0040 4.0036	4.0036 4.0044	4.0035 4.0055
Middle	4.0024 4.0039	4.0024 4.0030	4.0026 4.0032	4.0021 4.0031	4.0019 4.0037	4.0028 4.0032	4.0026 4.0038	4.0027 4.0045
Bottom	4.0024 4.0042	4.0035 4.0028	4.0028 4.0031	4.0023 4.0031	4.0023 4.0035	4.0029 4.0030	4.0032 4.0035	4.0029 4.0044
Out-of-round	*0.0009*	*0.0005*	*0.0002*	*0.0005*	*0.0011*	*0.0004*	*0.0008*	*0.0020*
Taper	0.0010	0.0007	0.0009	0.0008	0.0005	0.0011	0.0004	0.0006
Connecting Rod Bearings								
Journal Diameter	H V	H V	H V	H V	H V	H V	H V	H V
	2.3104 2.3106	2.3104 2.3105	2.3105 2.3104	2.3105 2.3103	2.3103 2.3105	2.3105 2.3104	2.3105 2.3105	2.3105 2.3103
Shell Diameter	F B	F B	F B	F B	F B	F B	F B	F B
	2.3120 2.3120	2.3118 2.3119	2.3121 2.3120	2.3122 2.3122	2.3119 2.3118	2.3120 2.3121	2.3122 2.3122	2.3120 2.3121
Camshaft Lobe Lift	I E	I E	I E	I E	I E	I E	I E	I E
	0.106 0.212	0.186 0.217	0.210 0.230	0.221 0.236	0.116 0.109	0.217 0.209	0.218 0.226	0.230 0.242
Valve Stem to Guide Clearance	I E	I E	I E	I E	I E	I E	I E	I E
	0.0035 0.0028	*0.0025 0.0046*	*0.0039 0.0045*	*0.0029 0.0060*	*0.0030 0.0067*	*0.0027 0.0033*	*0.0032 0.0046*	*0.0036 0.0042*
Valve Spring Force (lb)	I E	I E	I E	I E	I E	I E	I E	I E
	176 177	173 177	175 179	175 175	176 178	171 179	172 177	172 177
Piston Avg. Diameter Middle & bottom of skirt	3.9996	3.9992	3.9994	3.9995	3.9996	3.9998	3.9987	3.9991

Main Bearings	No. 1	No. 2	No. 3	No. 4	No. 5
Journal Diameter	H V	H V	H V	H V	H V
	2.9992 2.9993	2.9990 2.9990	2.9990 2.9990	2.9990 2.9992	2.9991 2.9993
Shell Diameter	F B	F B	F B	F B	F B
	3.0037 3.0035	3.0027 3.0045	3.0042 3.0038	3.0038 3.0037	3.0028 3.0030

Manufacturer's Service Limits, Inches

Compression Ring Gaps		**Camshaft Lobe Lift**	0.250
Top	*0.010-0.020*	Intake	
Bottom		Exhaust	
Cylinder Bore Diameter	4.0000-4.0048	**Valve Stem to Guide Clearance**	
Out-of-round	0.0015 max	Intake	0.005
Taper	0.010 max	Exhaust	
Connecting Rod Bearings		**Valve Spring Force (lb)**	
Journal Diameter	2.3103-2.3111	Intake	76-84 at 1.82"
Shell Diameter	2.3111-2.3136		215-237 at 1.39"
		Exhaust	79-87 at 1.68"
			215-237 at 1.39"

Piston Diameter	3.9994-4.0000
Main Bearings	
Journal Diameter	2.9994-3.0002
Shell Diameter	3.0002-3.0028

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ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: 75161-CD7097 TYPE FUEL: GASOHOL

Component	Cylinder No. 1	2	3	4	5	6	7	8
Compression Ring Gaps								
Top	0.76+	0.71	0.76	0.74	0.74	0.76	0.74	0.74
Bottom	1.04	0.99	0.97	1.04	1.04	1.04	1.07	0.99
Cylinder Bore	L / T	L / T	L / T	L / T	L / T	L / T	L / T	L / T
Top	101.686 / 101.709	101.671 / 101.684	101.694 / 101.689	101.679 / 101.691	101.671 / 101.699	101.702 / 101.691	101.691 / 101.712	101.689 / 101.740
Middle	101.661 / 101.699	101.661 / 101.674	101.666 / 101.681	101.653 / 101.679	101.648 / 101.694	101.671 / 101.681	101.666 / 101.697	101.669 / 101.714
Bottom	101.661 / 101.707	101.689 / 101.671	101.671 / 101.679	101.658 / 101.679	101.658 / 101.689	101.674 / 101.676	101.681 / 101.689	101.674 / 101.712
Out-of-round	0.023	0.013	0.005	0.012	0.028	0.011	0.021	0.051
Taper	0.025	0.018	0.023	0.021	0.013	0.028	0.010	0.015
Connecting Rod Bearings								
Journal Diameter	H / V	H / V	H / V	H / V	H / V	H / V	H / V	H / V
	58.684 / 58.689	58.684 / 58.687	58.687 / 58.684	58.687 / 58.682	58.682 / 58.687	58.687 / 58.684	58.687 / 58.687	58.687 / 58.682
Shell Diameter	F / B	F / B	F / B	F / B	F / B	F / B	F / B	F / B
	58.725 / 58.725	58.720 / 58.722	58.727 / 58.725	58.730 / 58.730	58.722 / 58.720	58.725 / 58.727	58.730 / 58.730	58.725 / 58.727
Camshaft Lobe Lift	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	2.69 / 5.38	4.72 / 5.51	5.33 / 5.84	5.61 / 5.99	2.95 / 2.77	5.51 / 5.31	5.54 / 5.74	5.84 / 6.15
Valve Stem to Guide Clearance	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	0.069 / 0.071	0.064 / 0.117	0.099 / 0.114	0.074 / 0.152	0.076 / 0.170	0.069 / 0.084	0.081 / 0.168	0.091 / 0.107
Valve Spring Force (N-m)	I / E	I / E	I / E	I / E	I / E	I / E	I / E	I / E
	783 / 787	770 / 787	778 / 796	778 / 778	783 / 792	761 / 796	765 / 787	765 / 787
Piston Avg. Diameter Middle & bottom of skirt	101.590	101.580	101.585	101.587	101.590	101.595	101.567	101.577

Main Bearings	No. 1	No. 2	No. 3	No. 4	No. 5
Journal Diameter	H / V	H / V	H / V	H / V	H / V
	76.180 / 76.182	76.175 / 76.175	76.175 / 76.175	76.175 / 76.180	76.177 / 76.182
Shell Diameter	F / B	F / B	F / B	F / B	F / B
	76.294 / 76.289	76.269 / 76.314	76.307 / 76.297	76.297 / 76.294	76.271 / 76.276

Manufacturer's Service Limits, mm

Compression Ring Gaps	
Top	0.25-0.51
Bottom	
Cylinder Bore Diameter	101.600-101.722
Out-of-round	0.038 max
Taper	0.25 max
Connecting Rod Bearings	
Journal Diameter	58.682-58.702
Shell Diameter	58.702-58.765
Camshaft Lobe Lift	
Intake	6.35
Exhaust	
Valve Stem to Guide Clearance	
Intake	0.13
Exhaust	
Valve Spring Force (N-m)	338-374 at 46.23 mm 956-1054 at 35.31 mm 351-387 at 42.67 mm 956-1054 at 35.31 mm
Piston Diameter	101.585-101.600
Main Bearings	
Journal Diameter	76.185-76.205
Shell Diameter	76.205-76.271

L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: CD7098 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gap																
Top	0.035		0.035		0.033		0.034		0.033		0.033		0.033		0.033	
Bottom	0.057		0.049		0.051		0.054		0.058		0.058		0.059		0.059	
Cylinder Bore Diameter	L*	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	4.0039	4.0038	4.0037	4.0039	4.0037	4.0043	4.0038	4.0039	4.0035	4.0030	4.0042	4.0046	4.0041	4.0039	4.0034	4.0037
Middle	4.0036	4.0025	4.0031	4.0029	4.0033	4.0034	4.0034	4.0030	4.0030	4.0020	4.0037	4.0038	4.0032	4.0028	4.0031	4.0029
Bottom	4.0037	4.0026	4.0028	4.0031	4.0032	4.0037	4.0035	4.0029	4.0030	4.0021	4.0036	4.0041	4.0032	4.0028	4.0034	4.0031
Out-of-round	0.0001		0.0002		0.0008		0.0001		0.0005		0.0004		0.0002		0.0003	
Taper	0.0002		0.0009		0.0005		0.0003		0.0005		0.0006		0.0009		0.0000	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	2.3105	2.3106	2.3108	2.3111	2.3108	2.3105	2.3106	2.3108	2.3106	2.3106	2.3106	2.3106	2.3107	2.3106	2.3107	2.3107
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	2.3120	2.3123	2.3120	2.3123	2.3120	2.3119	2.3122	2.3122	2.3125	2.3123	2.3128	2.3128	2.3128	2.3129	2.3128	2.3129
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.235	0.216	0.233	0.243	0.235	0.233	0.238	0.233	0.242	0.223	0.233	0.233	0.232	0.235	0.231	0.231
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.0030	0.0030	0.0030	0.0055	0.0042	0.0043	0.0035	0.0033	0.0034	0.0030	0.0028	0.0040	0.0032	0.0040	0.0025	0.0040
Valve Spring Force (lb)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	78	75	78	75	77	75	76	75	61	62	65	63	64	66	65	63
Piston Avg.Diameter Middle & bottom of skirt	3.9996		3.9997		3.9997		3.9995		4.0004		4.0003		3.9986		3.9996	
Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5							
Journal Diameter	H	V	H	V	H	V	H	V	H	V						
	2.9895	2.9899	2.9898	2.9899	2.9898	2.9899	2.9899	2.9899	2.9899	2.9899						
Shell Diameter	F	B	F	B	F	B	F	B	F	B						
	2.9958	2.9958	2.9948	2.9948	2.9958	2.9950	2.9955	2.9950	2.9956	2.9956						

Manufacturer's Service Limits, Inches

Compression Ring Gap		**Camshaft Lobe Lift**	0.250
Top	0.010-0.020	Intake	
Bottom		Exhaust	
Cylinder Bore Diameter	4.0000-4.0048	**Valve Stem to Guide Clearance**	
Out-of-round	0.0015 max	Intake	0.005
Taper	0.010 max	Exhaust	
Connecting Rod Bearings		**Valve Spring Force (lb)**	
Journal Diameter	2.3103-2.3111	Intake	76-84 at 1.82"
Shell Diameter	2.3111-2.3136		215-237 at 1.39"
		Exhaust	79-87 at 1.68"
			215-237 at 1.39"
Piston Diameter	3.9994-4.0000		
Main Bearings			
Journal Diameter	2.9994-3.0002		
Shell Diameter	3.0002-3.0028		

*L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
+ = Measurements are in mm

ENGINE COMPONENTS MEASUREMENTS
FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: CD7098 TYPE FUEL: GASOHOL

Component	Cylinder No. 1		2		3		4		5		6		7		8	
Compression Ring Gaps																
Top	0.89+		0.89		0.84		0.86		0.84		0.84		0.84		0.84	
Bottom	1.45		1.24		1.30		1.37		1.47		1.47		1.50		1.50	
Cylinder Bore																
Diameter	L	T	L	T	L	T	L	T	L	T	L	T	L	T	L	T
Top	101.699	101.697	101.694	101.699	101.694	101.714	101.697	101.699	101.689	101.676	101.707	101.717	101.704	101.699	101.686	101.694
Middle	101.691	101.664	101.679	101.674	101.684	101.686	101.686	101.676	101.676	101.651	101.694	101.697	101.681	101.671	101.679	101.674
Bottom	101.694	101.666	101.671	101.679	101.681	101.694	101.689	101.674	101.676	101.653	101.691	101.704	101.681	101.671	101.686	101.679
Out-of-round	0.002		0.005		0.020		0.002		0.013		0.010		0.005		0.008	
Taper	0.005		0.023		0.013		0.008		0.013		0.016		0.023		0.000	
Connecting Rod Bearings																
Journal Diameter	H	V	H	V	H	V	H	V	H	V	H	V	H	V	H	V
	58.687	58.689	58.694	58.702	58.694	58.687	58.689	58.694	58.689	58.689	58.689	58.689	58.692	58.689	58.692	58.692
Shell Diameter	F	B	F	B	F	B	F	B	F	B	F	B	F	B	F	B
	58.725	58.732	58.725	58.732	58.725	58.722	58.730	58.730	58.738	58.732	58.745	58.745	58.745	58.748	58.745	58.748
Camshaft Lobe Lift	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	5.97	5.49	5.92	6.17	5.97	5.92	6.05	5.92	6.15	5.66	5.92	5.92	5.89	5.97	5.87	5.87
Valve Stem to Guide Clearance	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	0.076	0.076	0.076	0.140	0.107	0.109	0.089	0.076	0.086	0.076	0.071	0.102	0.081	0.102	0.064	0.102
Valve Spring Force (N-m)	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E
	347	334	347	334	343	334	338	334	271	276	289	280	285	294	289	280
Piston Avg.Diameter Middle & bottom of skirt	101.590		101.592		101.592		101.587		101.610		101.608		101.564		101.590	

Main Bearings	No. 1		No. 2		No. 3		No. 4		No. 5	
Journal Diameter	H	V	H	V	H	V	H	V	H	V
	75.933	75.943	75.941	75.943	75.941	75.943	75.943	75.943	75.943	75.943
Shell Diameter	F	B	F	B	F	B	F	B	F	B
	76.093	76.093	76.068	76.068	76.093	76.073	76.086	76.073	76.088	76.088

Manufacturer's Service Limits, mm

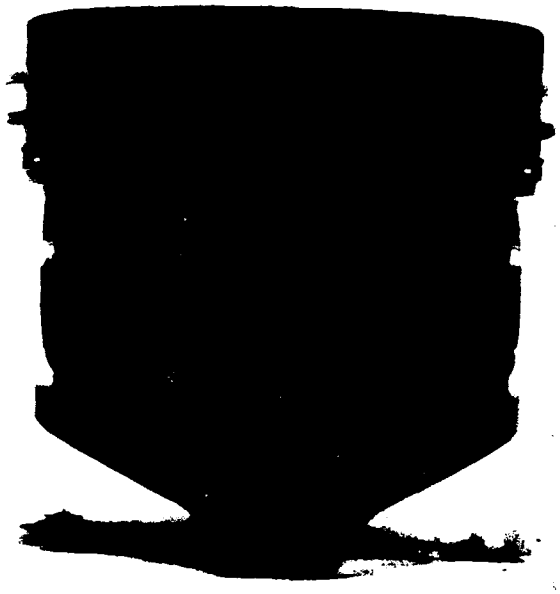
Compression Ring Gaps		**Camshaft Lobe Lift**		**Piston Diameter**	101.585-101.600	
Top	0.25-0.51	Intake	0.250	**Main Bearings**		
Bottom		Exhaust	6.35	Journal Diameter	76.185-76.205	
Cylinder Bore Diameter	101.600-101.722	**Valve Stem to Guide Clearance**		Shell Diameter	76.205-76.271	
Out-of-round	0.038 max	Intake	0.13			
Taper	0.25 max	Exhaust				
Connecting Rod Bearings		**Valve Spring Force (N-m)**	338-374 at 46.23 mm			
Journal Diameter	58.682-58.702		956-1054 at 35.31 mm			
Shell Diameter	58.702-58.765		351-387 at 42.67 mm			
			956-1054 at 35.31 mm			

+L = Longitudinal, T = Transversal, H = Horizontal, V = Vertical,
F = Forward, B = Back, I = Intake, E = Exhaust
\+ = Measurements are in mm

APPENDIX B

PHOTOGRAPHS

FT. BELVOIR, VA
ENGINE NO: 5001675 FUEL: UNLEADED GASOLINE



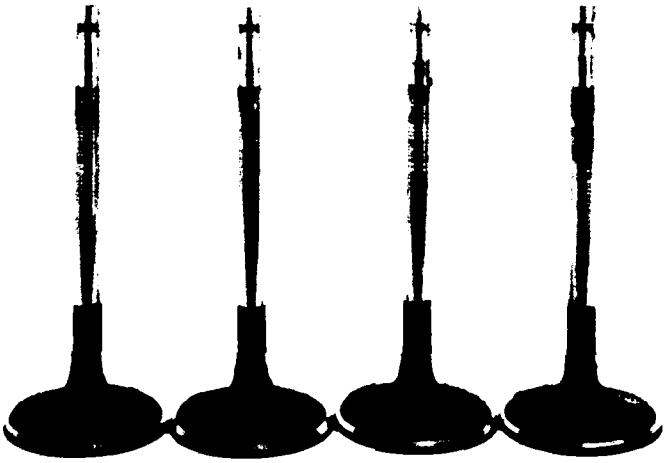
PISTON NO. 1 THRUST SIDE

PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE

PISTON NO. 3 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 5011675 FUEL: UNLEADED GASOLINE



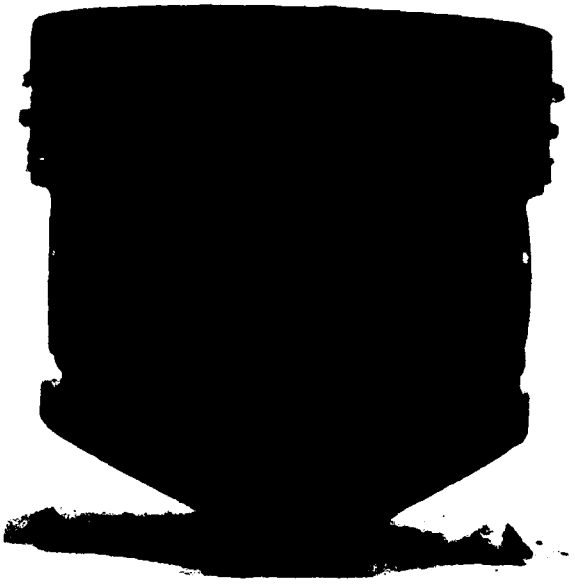
INTAKE VALVES 1-4

FT. BELVOIR, VA
ENGINE NO. 5001675 FUEL: UNLEADED GASOLINE

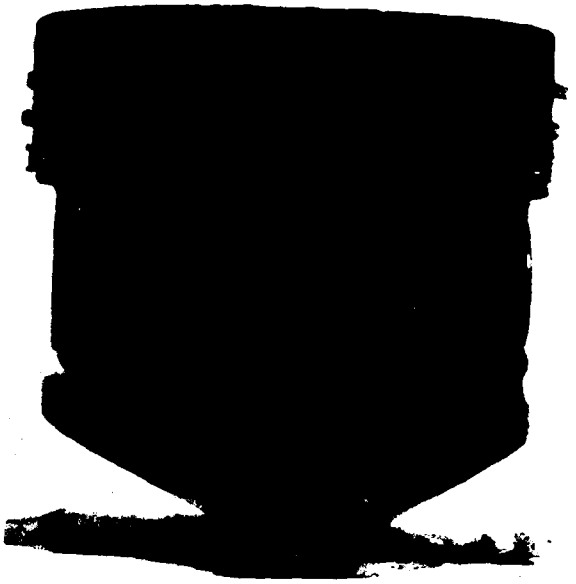
CYLINDER HEAD

CYLINDER HEAD COMBUSTION CHAMBER NO. 2

FT. BELVOIR, VA
ENGINE NO. 6003049 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE

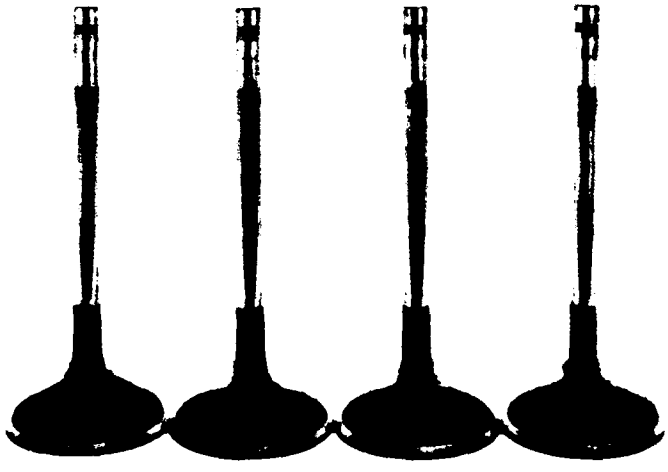


PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE

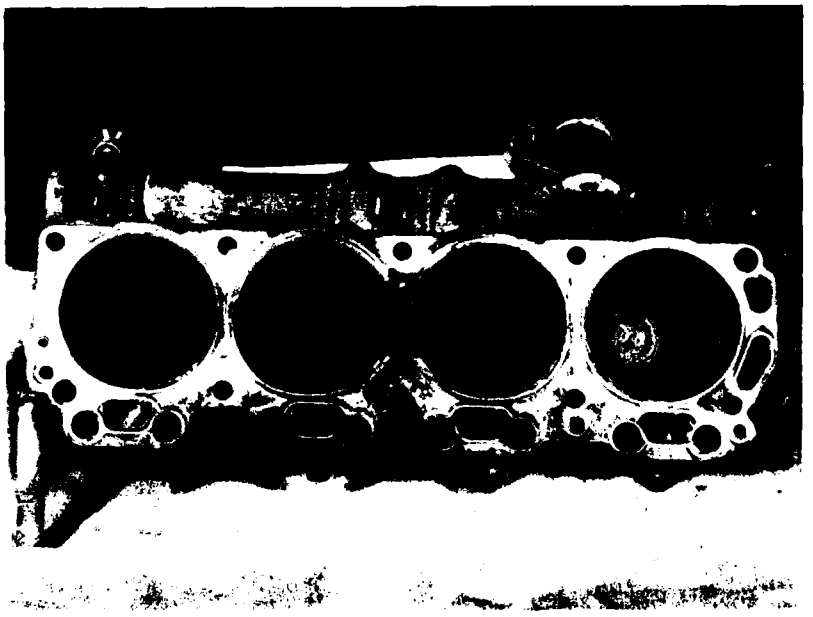
PISTON NO. 3 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 6003049 FUEL: GASOHOL

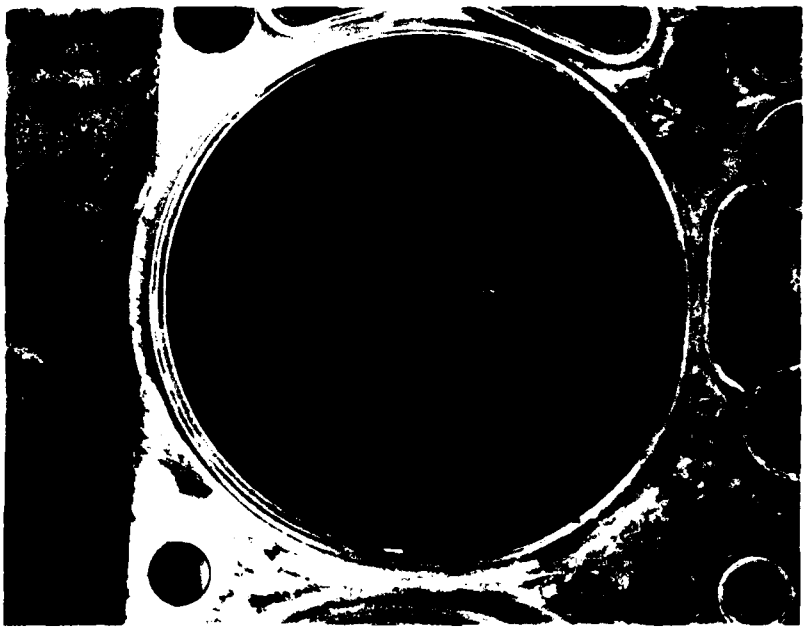


INTAKE VALVES 1-4

FT. BELVOIR, VA
ENGINE NO: 6003049 FUEL: GASOHOL



CYLINDER HEAD



CYLINDER HEAD COMBUSTION CHAMBER NO. 4

FT. BELVOIR, VA
ENGINE NO: 500283 FUEL: GASOHOL

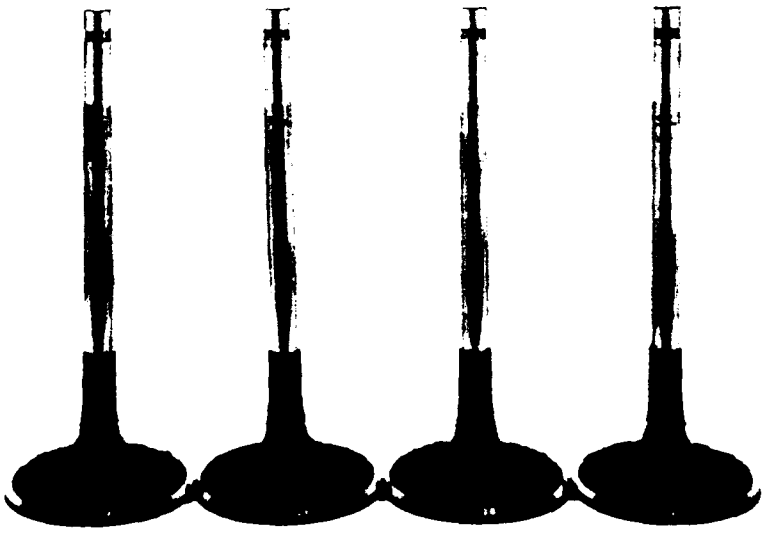
PISTON NO. 1 THRUST SIDE

PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE

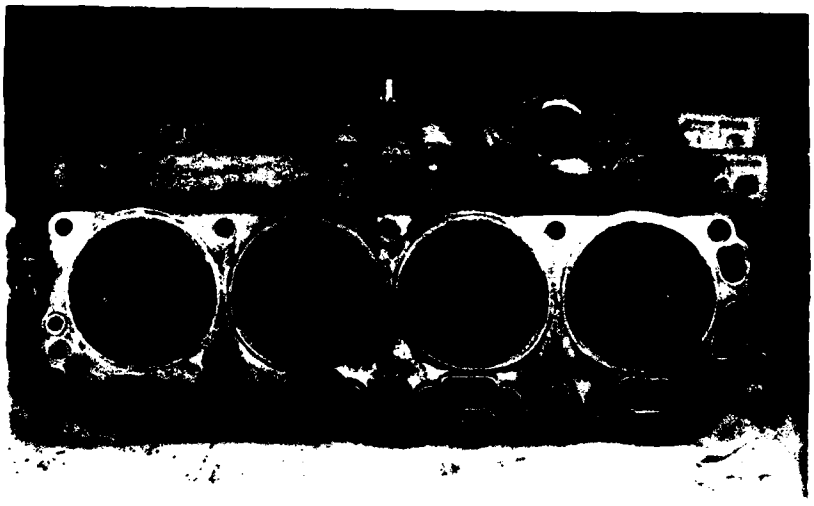
PISTON NO. 3 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 500283 FUEL: GASOHOL



INTAKE VALVES 1-4

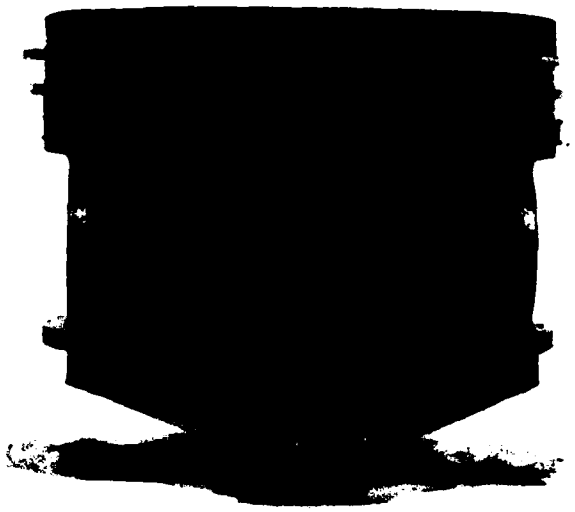
FT. BELVOIR, VA
ENGINE NO: 500283 FUEL: GASOHOL



CYLINDER HEAD

CYLINDER HEAD COMBUSTION CHAMBER NO. 2

FT. BELVOIR, VA
ENGINE NO: 03223146 FUEL: UNLEADED GASOLINE



PISTON NO. 1 THRUST SIDE

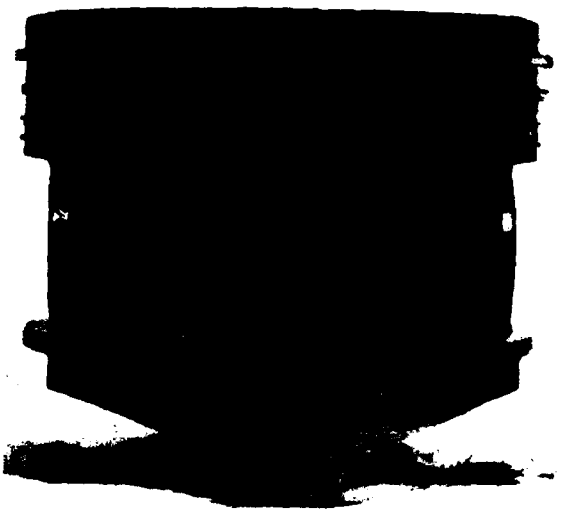
PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE

PISTON NO. 3 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 03223146 FUEL: UNLEADED GASOLINE

PISTON NO. 2 THRUST SIDE

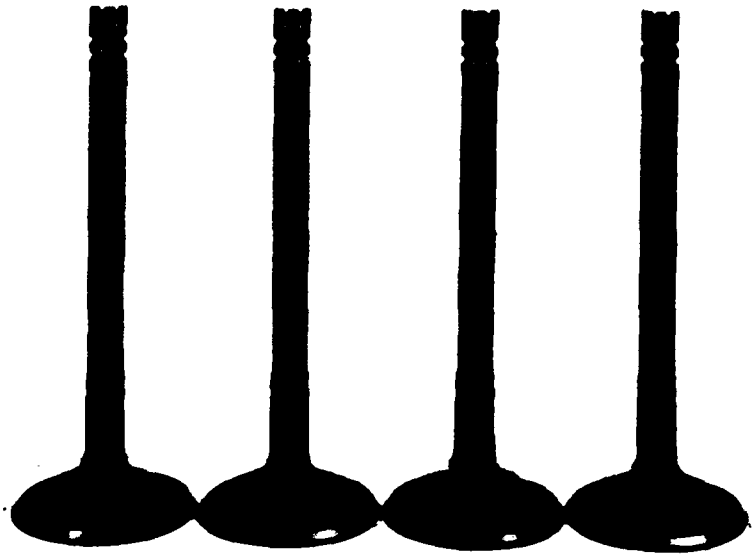


PISTON NO. 2 ANTI-THRUST SIDE

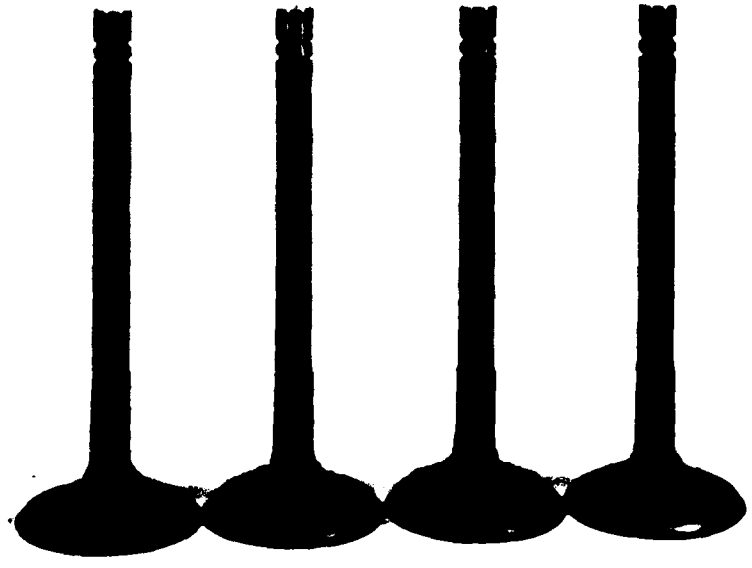
PISTON NO. 4 THRUST SIDE

PISTON NO. 4 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 03223146 FUEL: UNLEADED GASOLINE

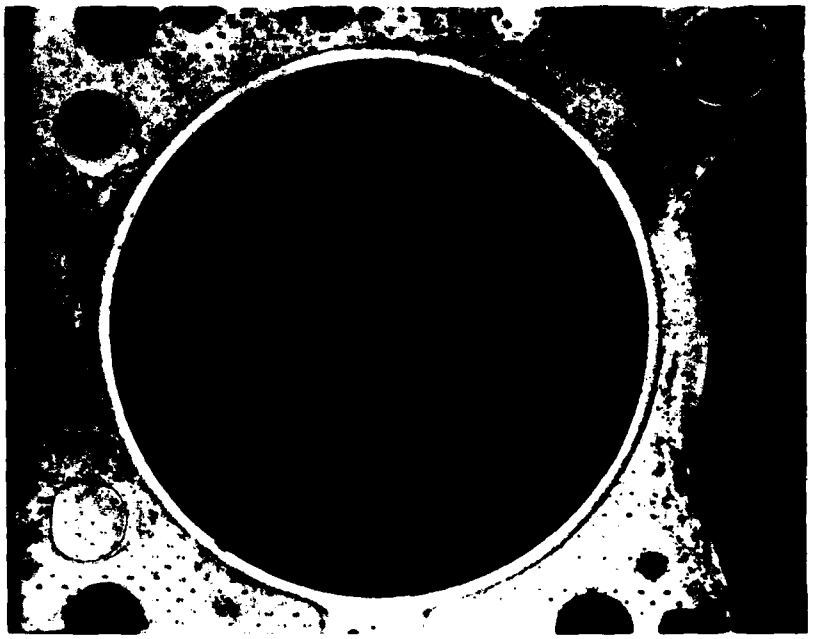


INTAKE VALVES 1-4 LEFT



INTAKE VALVES 1-4 RIGHT

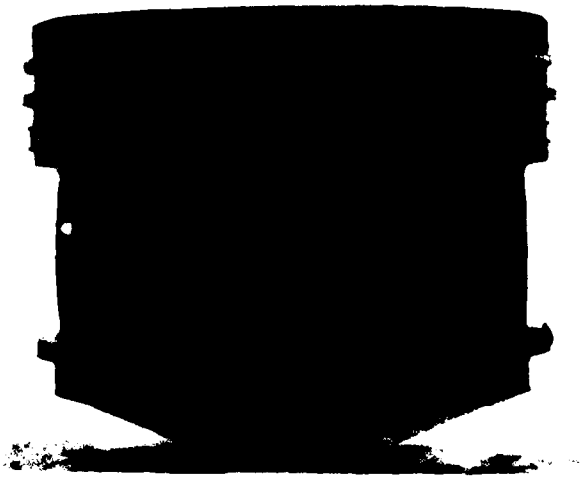
FT. BELVOIR, VA
ENGINE NO: 03223146 FUEL: UNLEADED GASOLINE



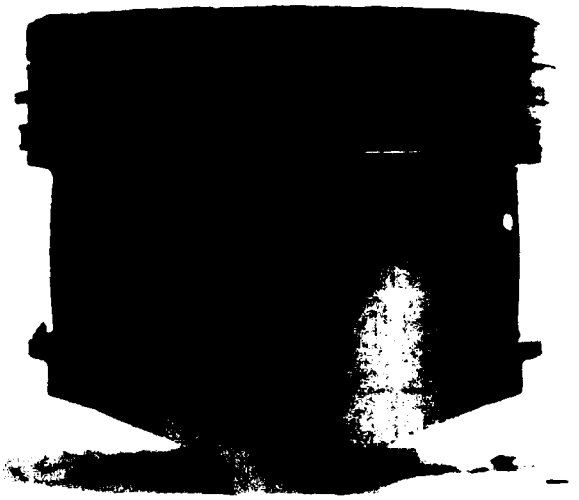
LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1

RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

FT. BELVOIR, VA
ENGINE NO: 07121303 FUEL: GASOHOL

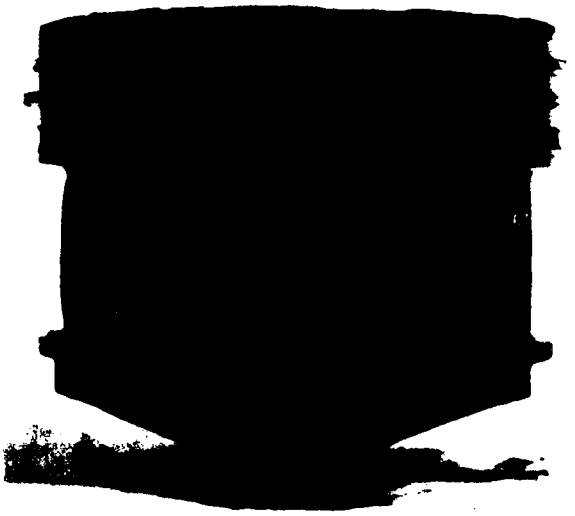


PISTON NO. 1 THRUST SIDE



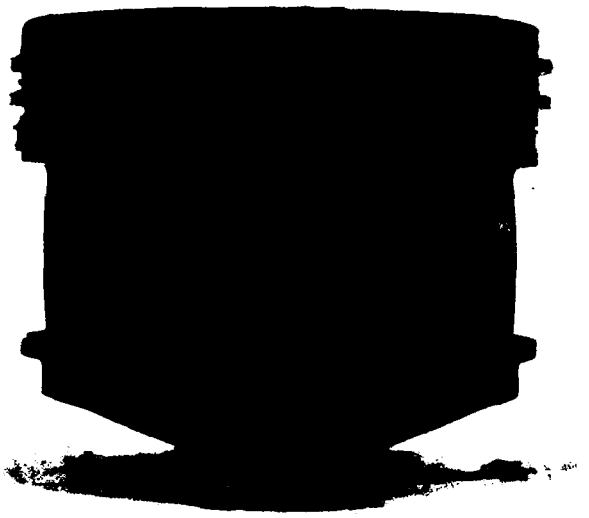
PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE

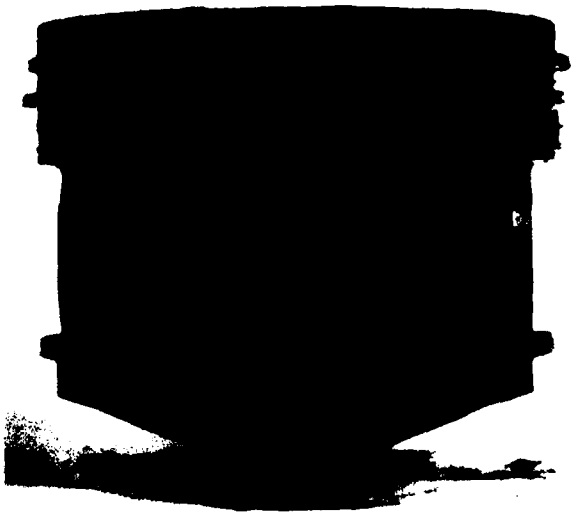


PISTON NO. 3 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 07121303 FUEL: GASOHOL



PISTON NO. 2 THRUST SIDE

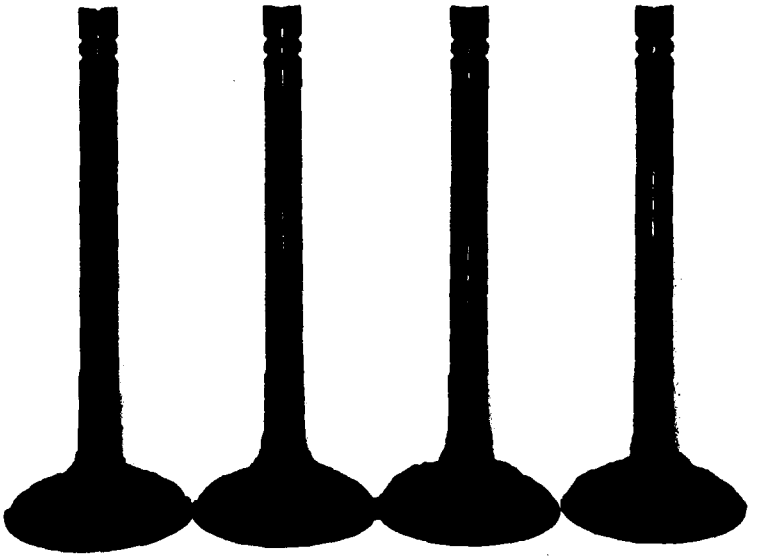


PISTON NO. 2 ANTI-THRUST SIDE

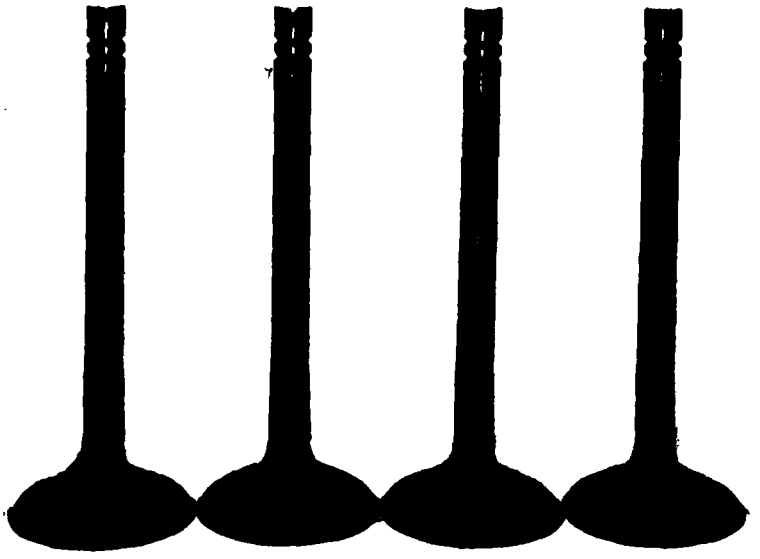
PISTON NO. 4 THRUST SIDE

PISTON NO. 4 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 07121303 FUEL: GASOHOL

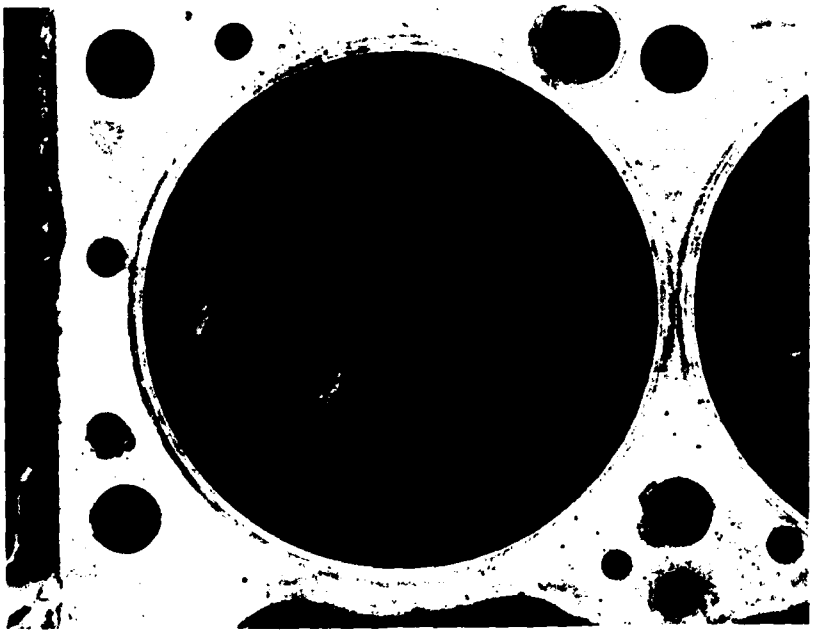


INTAKE VALVES 1-4 LEFT

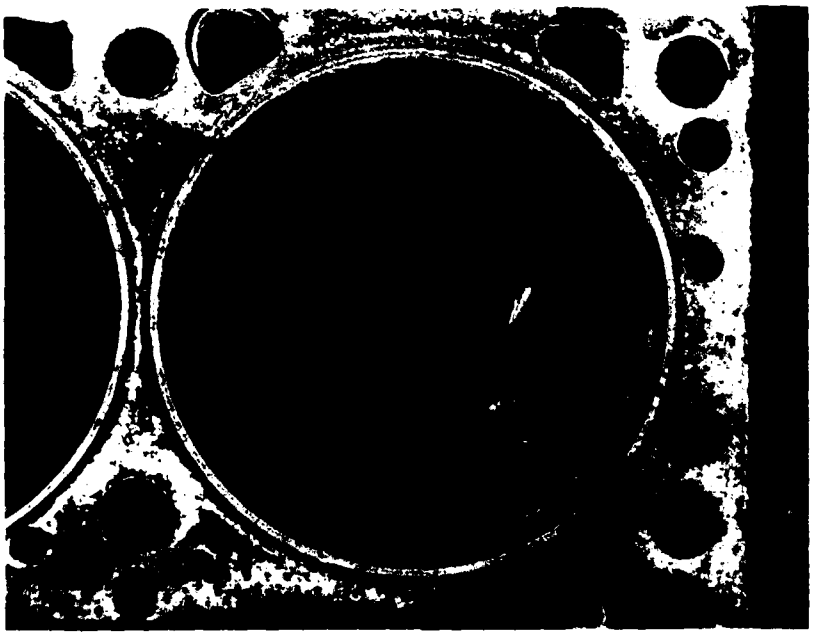


INTAKE VALVES 1-4 RIGHT

FT. BELVOIR, VA
ENGINE NO: 07121303 FUEL: GASOHOL

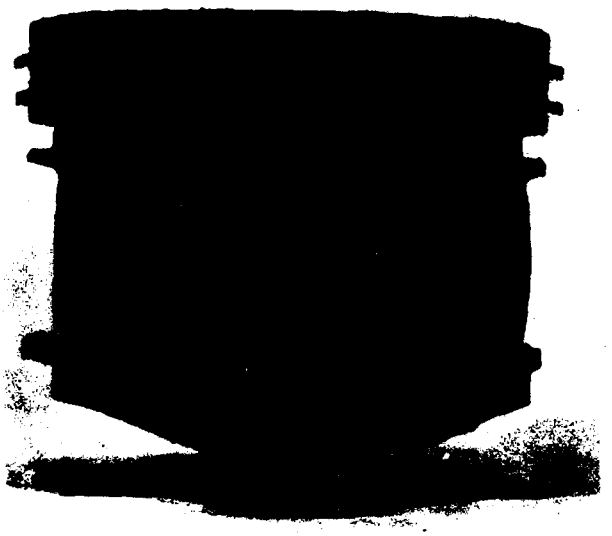


LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1



RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

FT. BELVOIR, VA
ENGINE NO: 07090311 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE

PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE

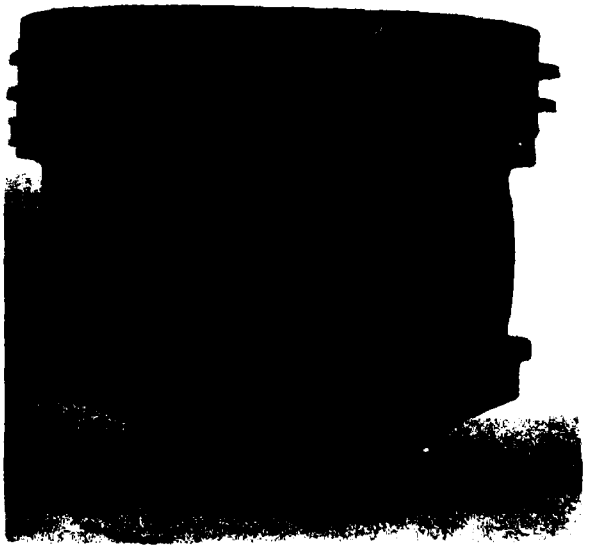
PISTON NO. 3 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 07090311 FUEL: GASOHOL

PISTON NO. 2 THRUST SIDE

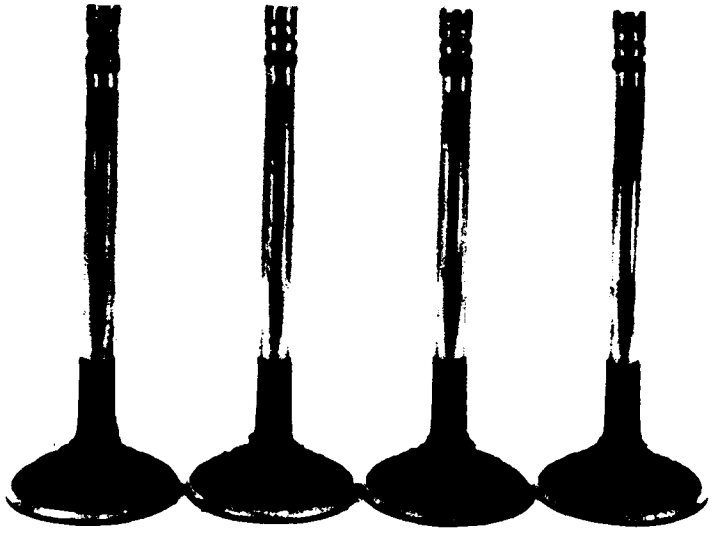
PISTON NO. 2 ANTI-THRUST SIDE

PISTON NO. 4 THRUST SIDE

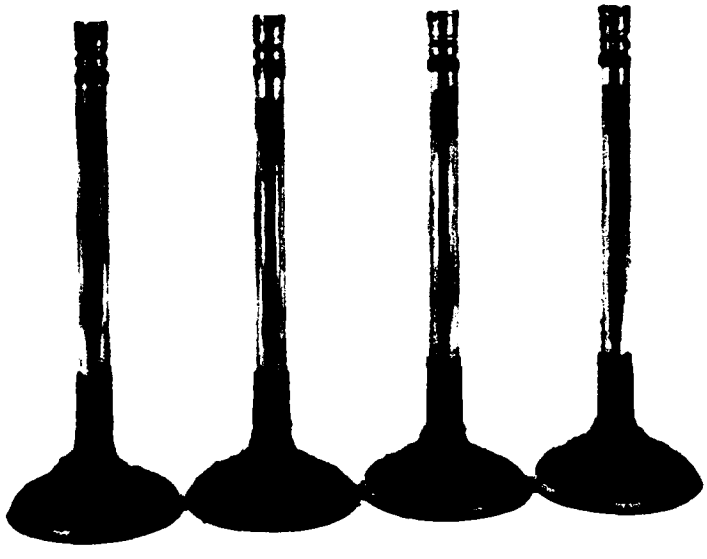


PISTON NO. 4 ANTI-THRUST SIDE

FT. BELVOIR, VA
ENGINE NO: 07090311 FUEL: GASOHOL

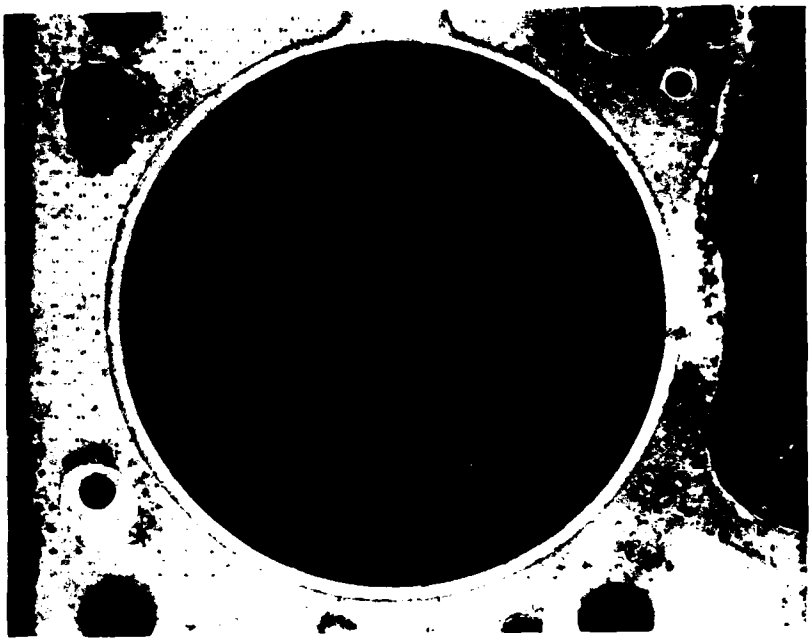


INTAKE VALVES 1-4 LEFT

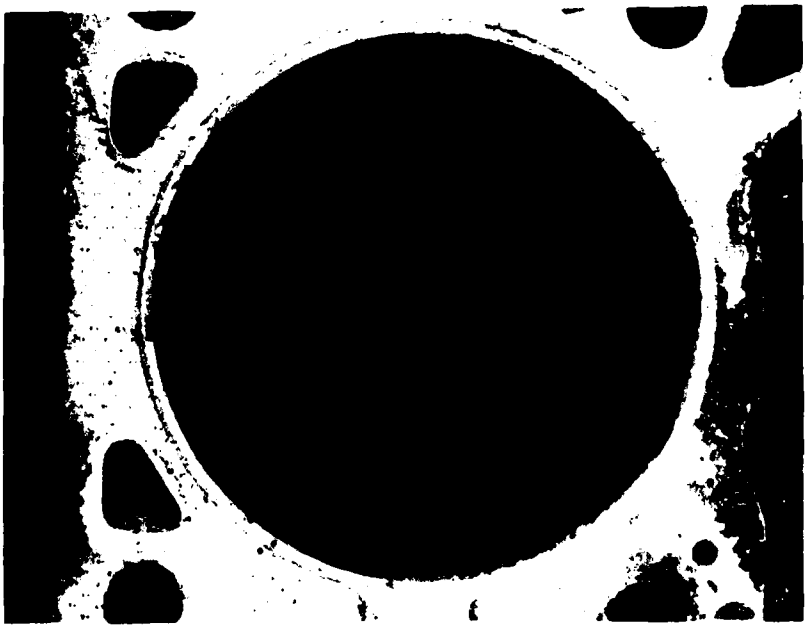


INTAKE VALVES 1-4 RIGHT

FT. BELVOIR, VA
ENGINE NO: 07090311 FUEL: GASOHOL

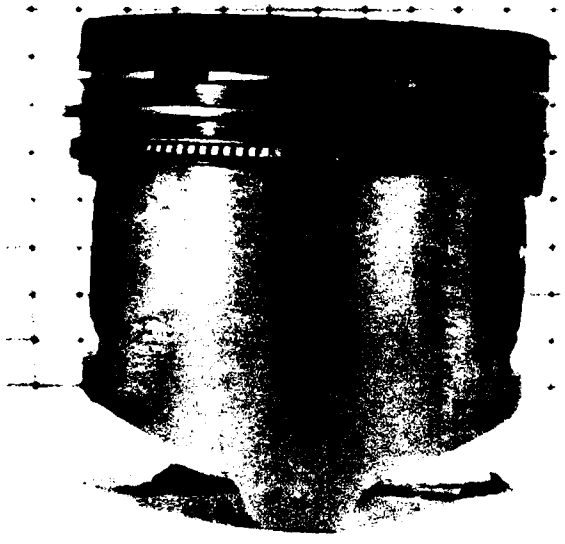


LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1

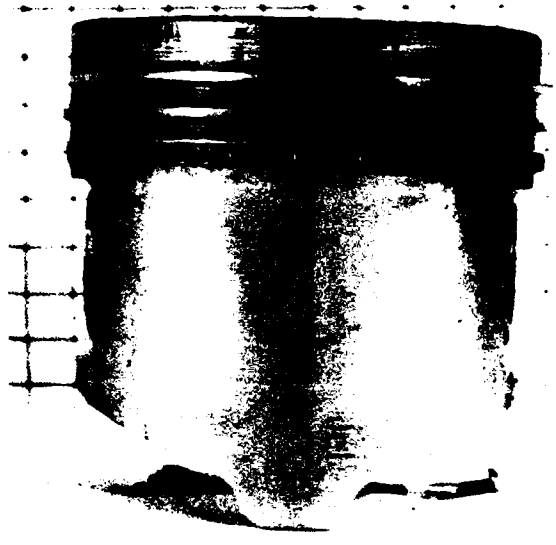


RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

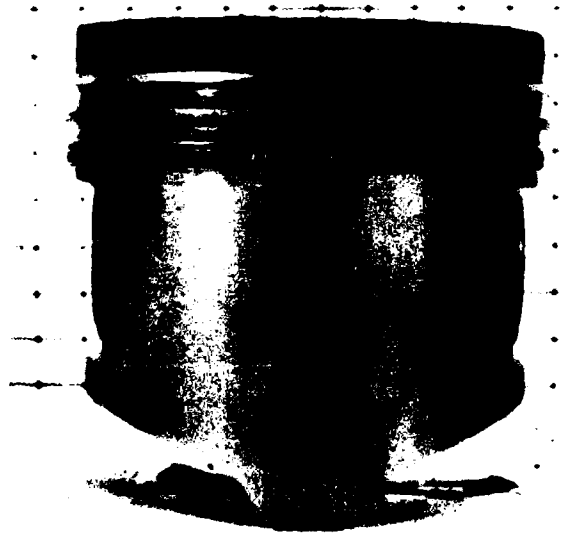
FT. LEWIS, WA
ENGINE NO: 235880 FUEL: UNLEADED GASOLINE



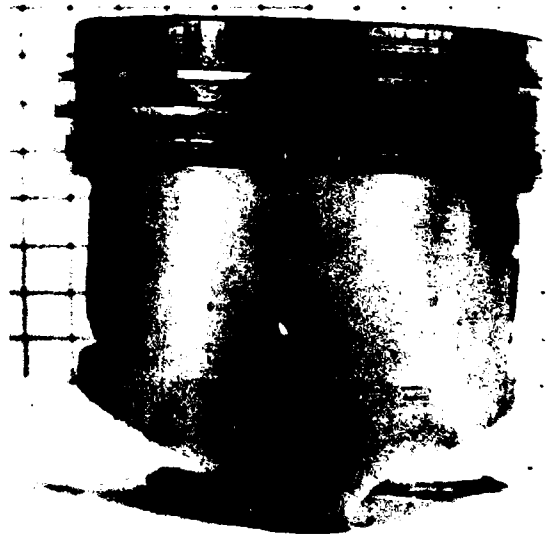
PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

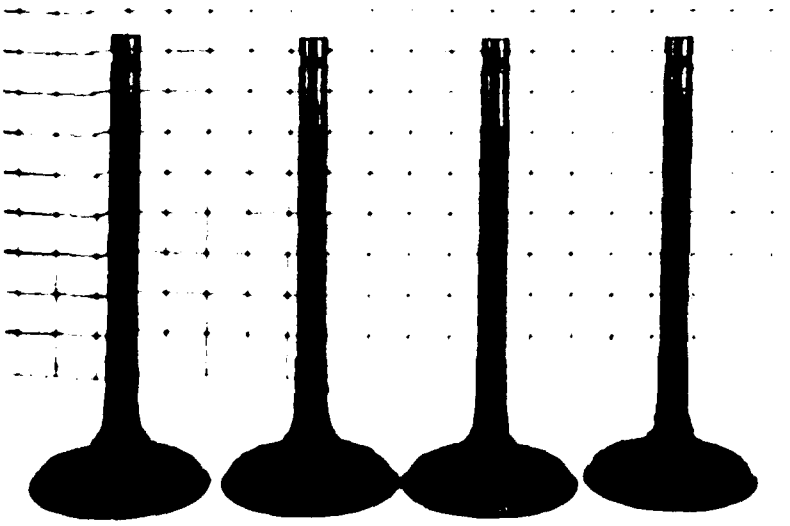


PISTON NO. 2 THRUST SIDE

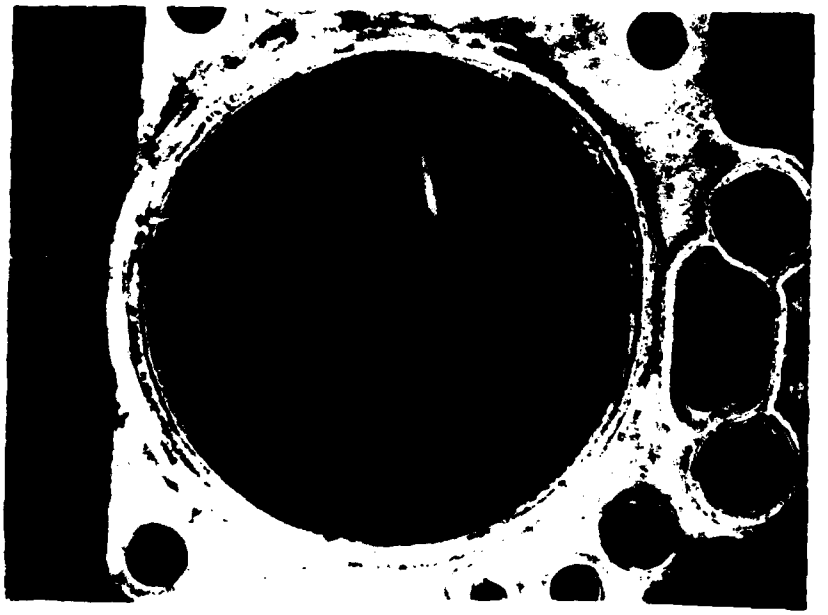


PISTON NO. 2 ANTI-THRUST SIDE

FT. LEWIS, WA
ENGINE NO: 235880 FUEL: UNLEADED GASOLINE



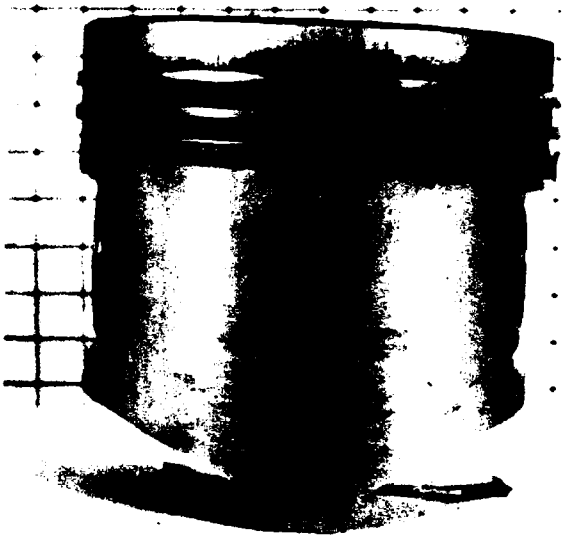
INTAKE VALVES 1-4



CYLINDER HEAD COMBUSTION CHAMBER NO. 1

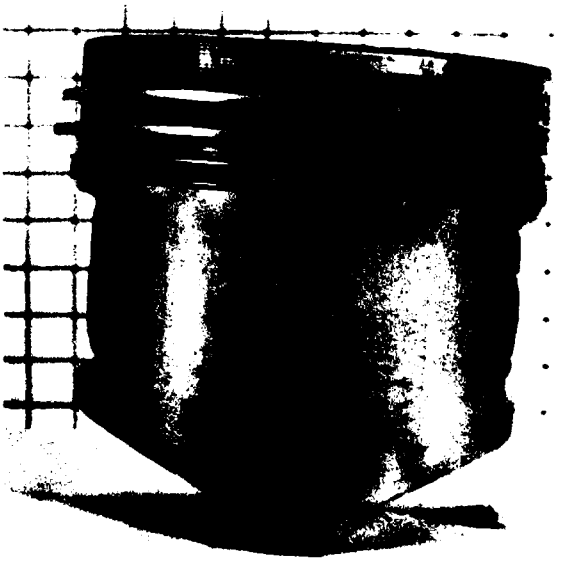
FT. LEWIS, WA
ENGINE NO: 251891 FUEL: GASOHOL

PISTON NO. 1 THRUST SIDE



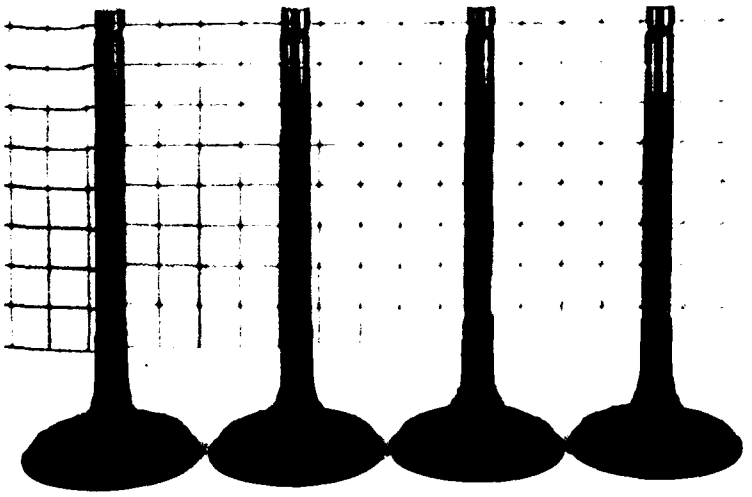
PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 2 THRUST SIDE

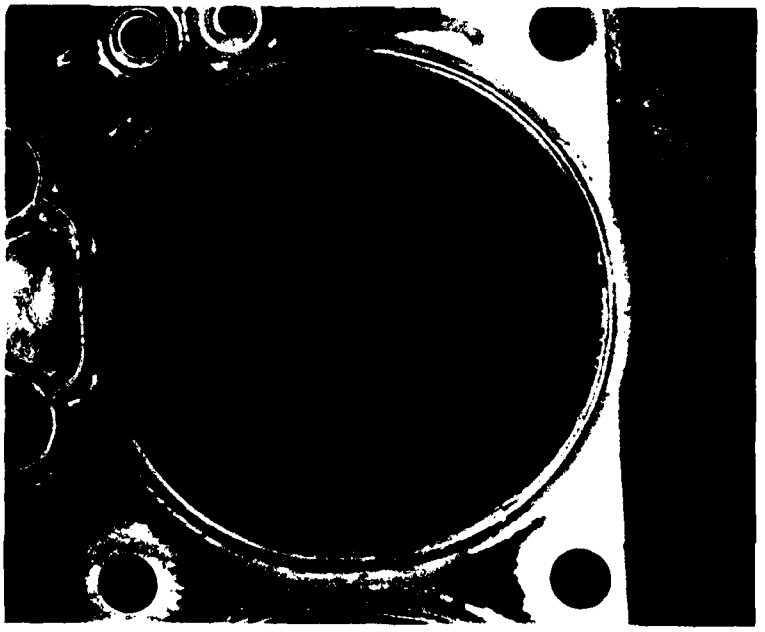


PISTON NO. 2 ANTI-THRUST SIDE

FT. LEWIS, WA
ENGINE NO: 251891 FUEL: GASOHOL



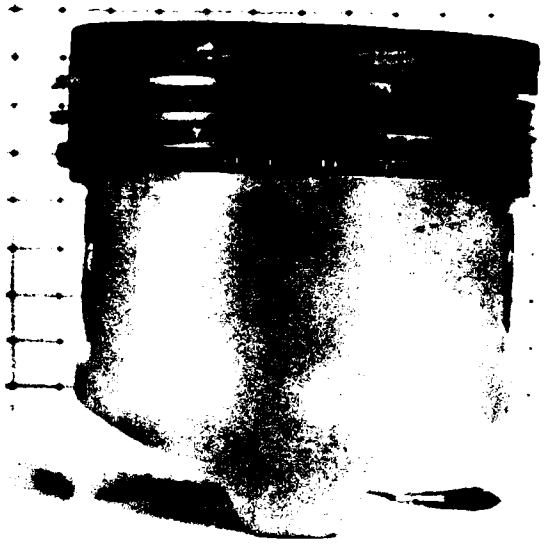
INTAKE VALVES 1-4



CYLINDER HEAD COMBUSTION CHAMBER NO. 1

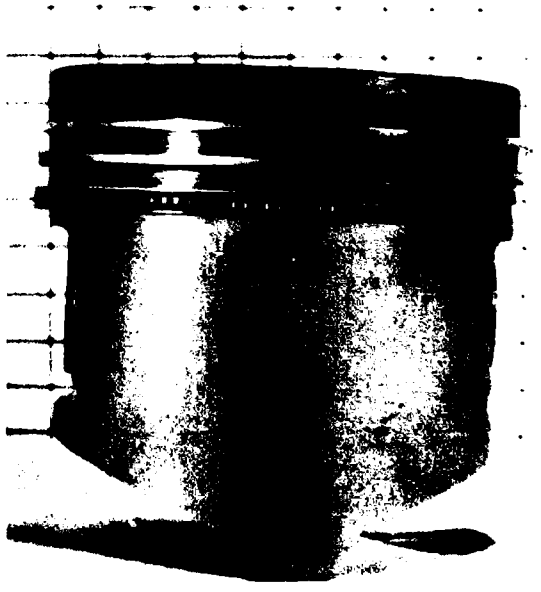
FT. LEWIS, WA
ENGINE NO: 235875 FUEL: GASOHOL

PISTON NO. 1 THRUST SIDE



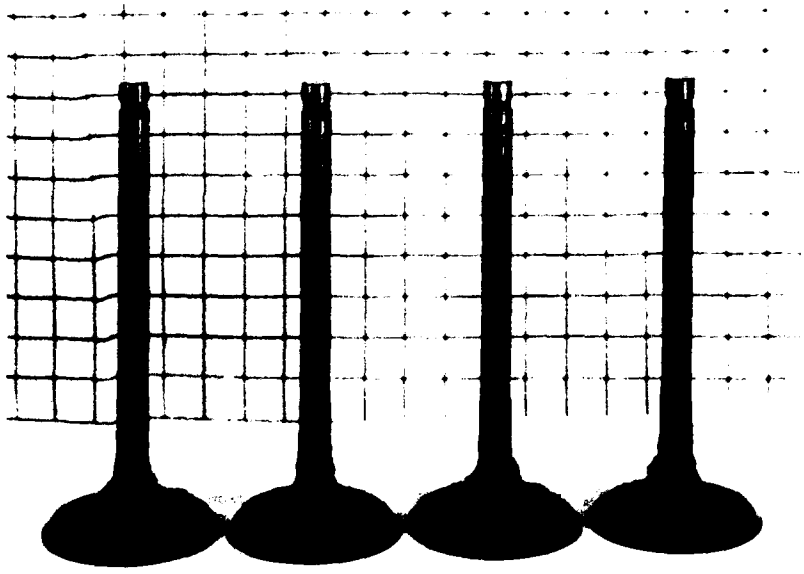
PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 2 THRUST SIDE

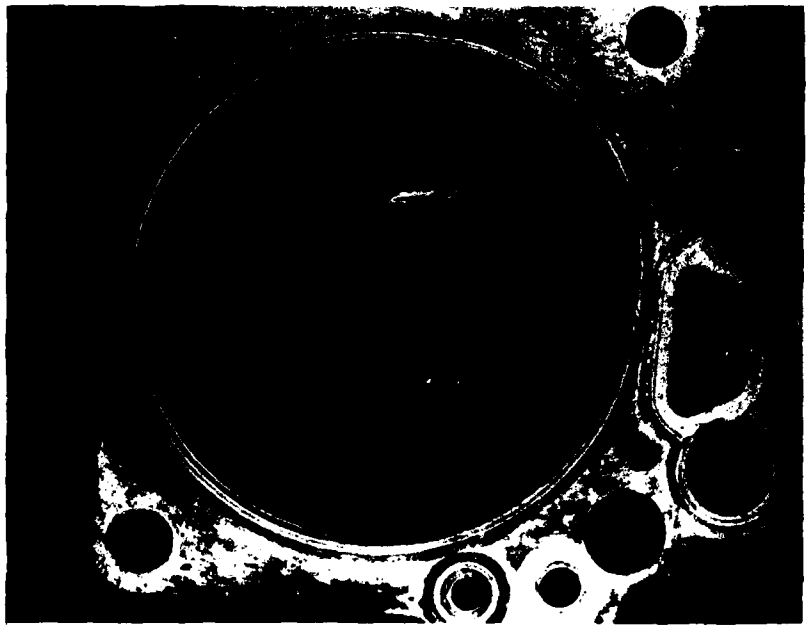


PISTON NO. 2 ANTI-THRUST SIDE

FT. LEWIS, WA
ENGINE NO: 235875 FUEL: GASOHOL

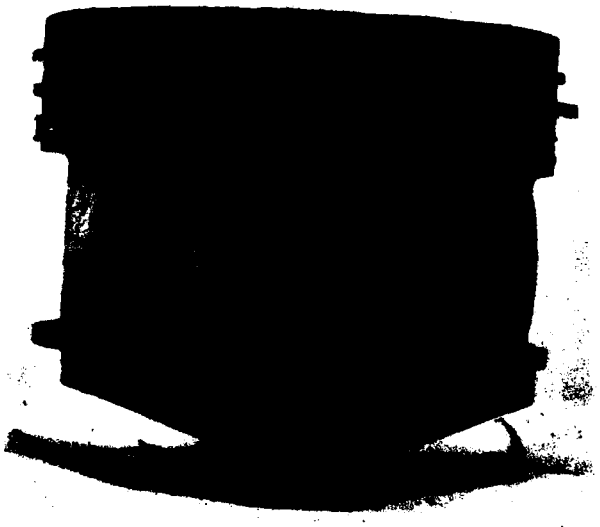


INTAKE VALVES 1-4



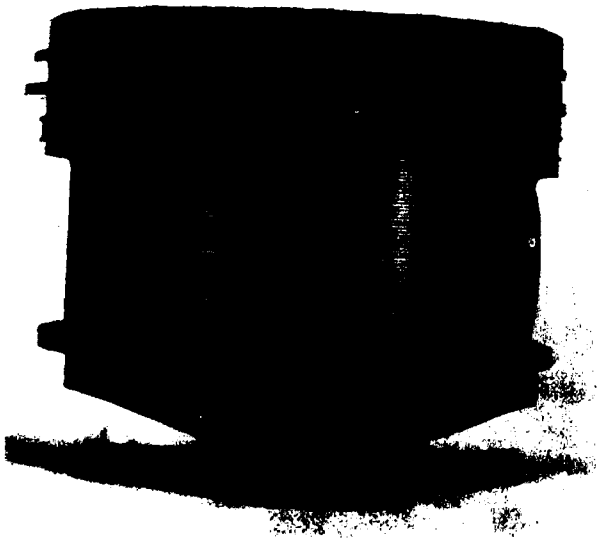
CYLINDER HEAD COMBUSTION CHAMBER NO. 1

FT. LEWIS, WA
ENGINE NO: 01212997 FUEL: UNLEADED GASOLINE



PISTON NO. 1 THRUST SIDE

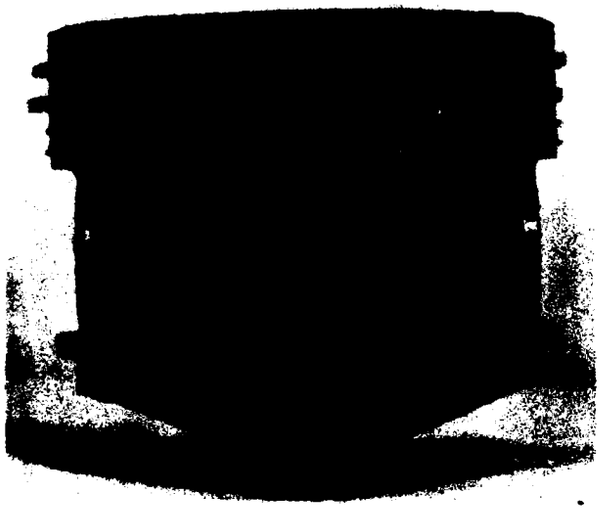
PISTON NO. 1 ANTI-THRUST SIDE



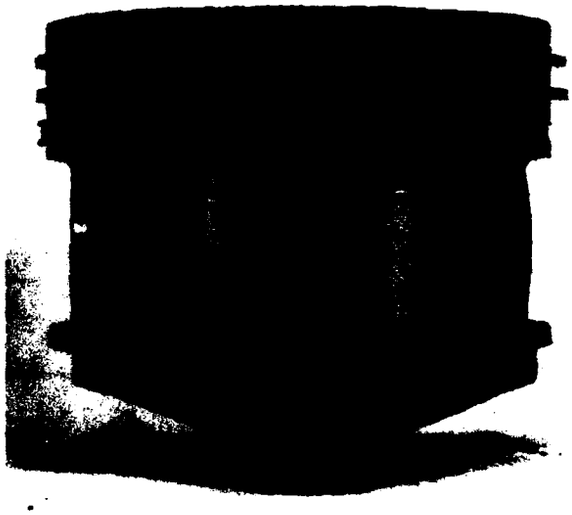
PISTON NO. 3 THRUST SIDE

PISTON NO. 3 ANTI-THRUST SIDE

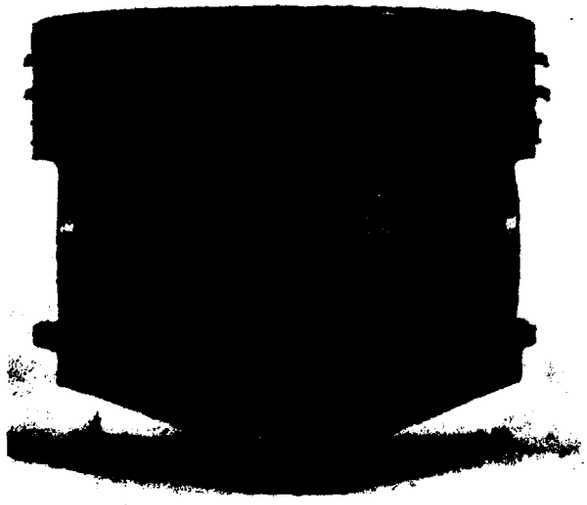
FT. LEWIS, WA
ENGINE NO: 01212997 FUEL: UNLEADED GASOLINE



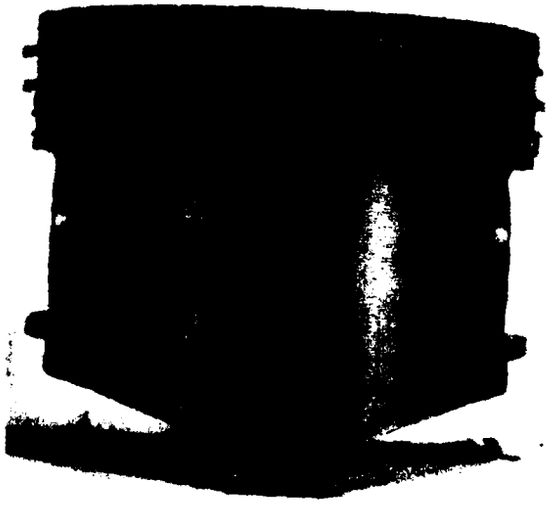
PISTON NO. 2 THRUST SIDE



PISTON NO. 2 ANTI-THRUST SIDE

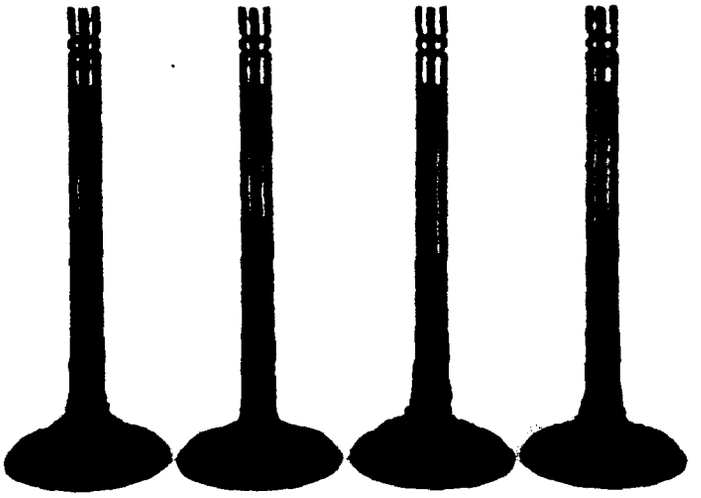


PISTON NO. 6 THRUST SIDE

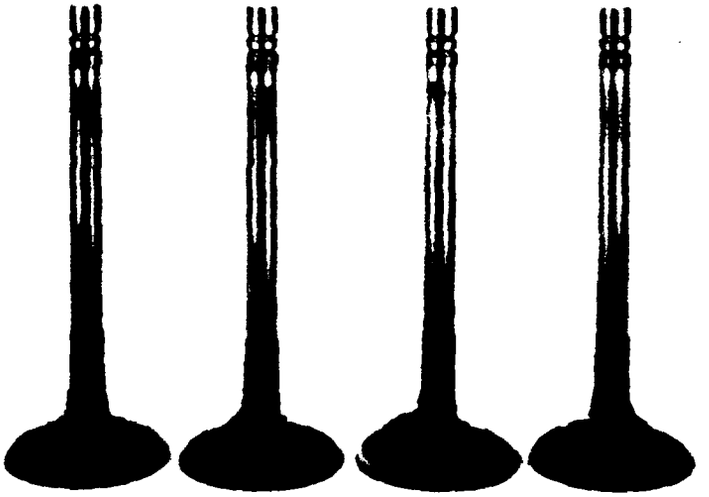


PISTON NO. 6 ANTI-THRUST SIDE

FT. LEWIS, WA
ENGINE NO: 01212997 FUEL: UNLEADED GASOLINE

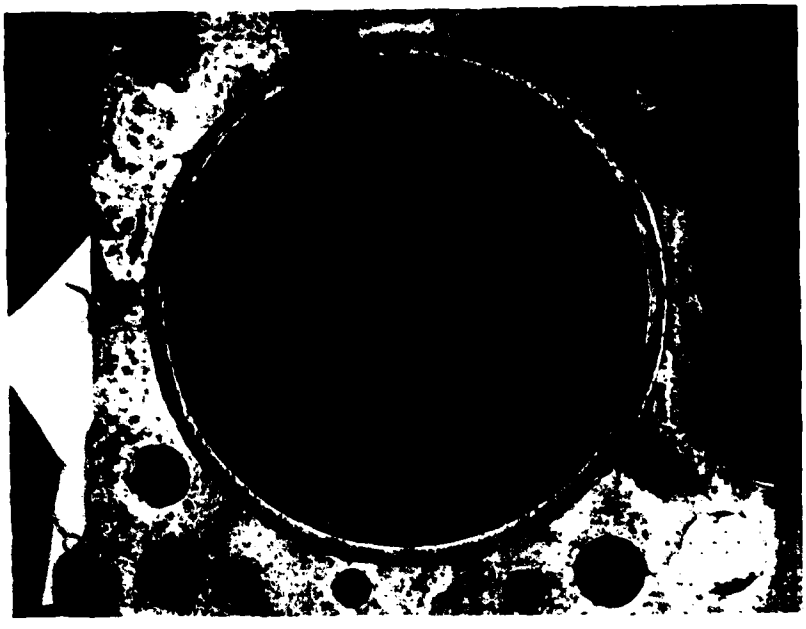


INTAKE VALVES 1,3,5,7 LEFT

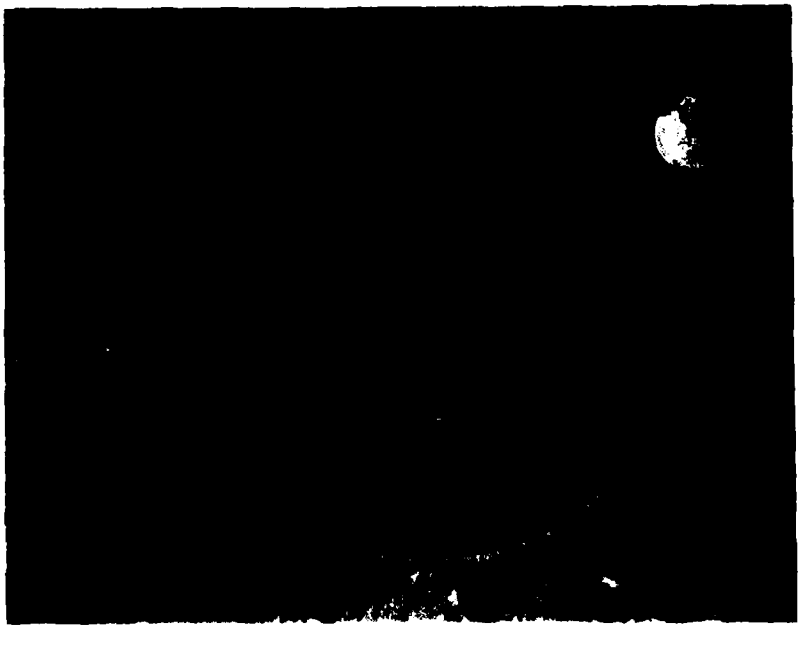


INTAKE VALVES 2,3,6,8, RIGHT

FT. LEWIS, WA
ENGINE NO: 01212997 FUEL: UNLEADED GASOLINE



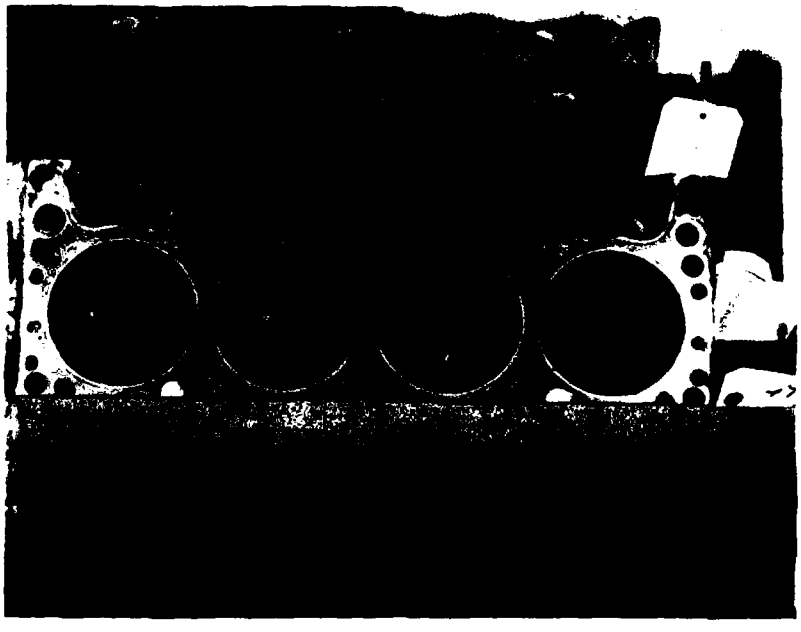
LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1



RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

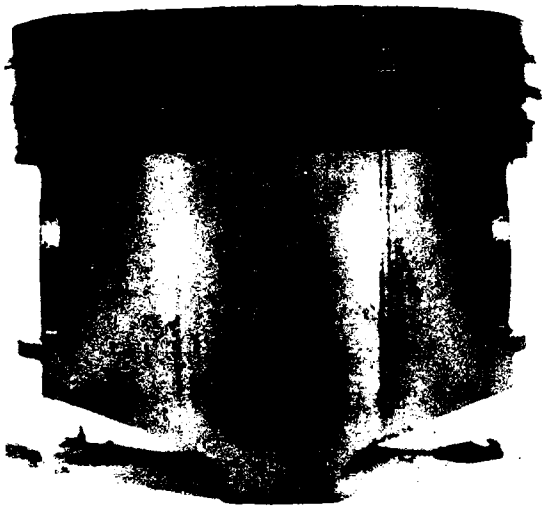
FT. LEWIS, WA
ENGINE NO. 01212997 FUEL: UNLEADED GASOLINE

CYLINDER HEAD LEFT

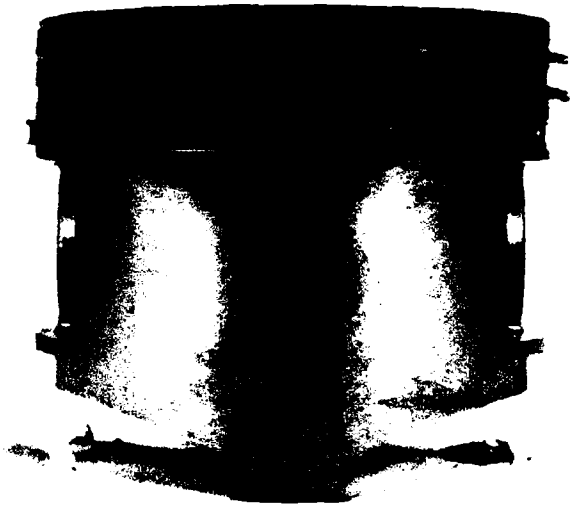


CYLINDER HEAD RIGHT

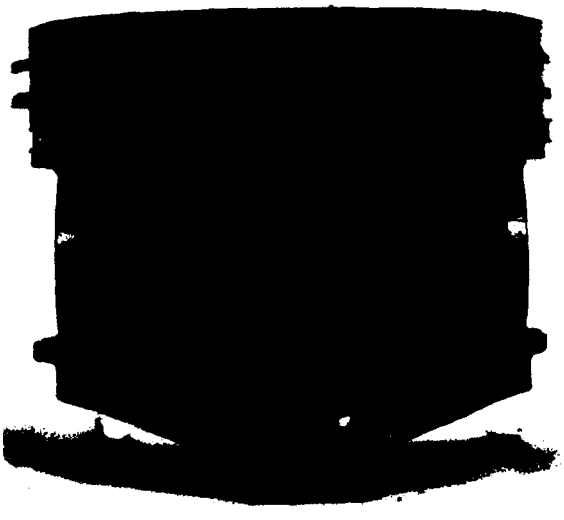
FT. LEWIS, WA
ENGINE NO: 02260516 FUEL: GASOHOL



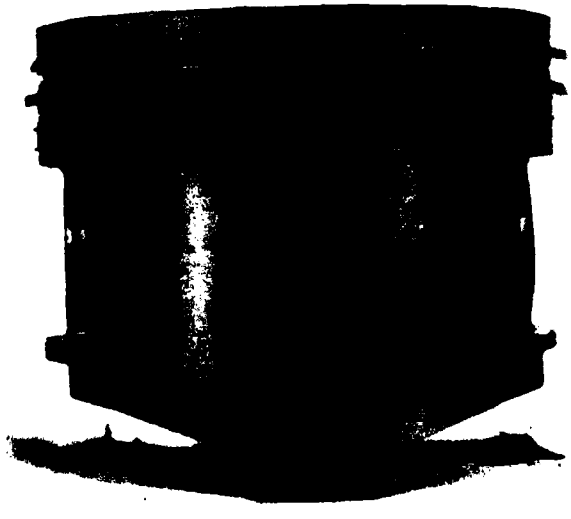
PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

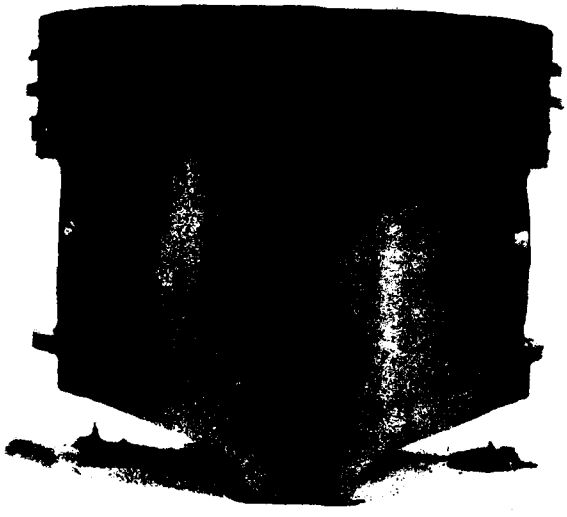


PISTON NO. 3 THRUST SIDE

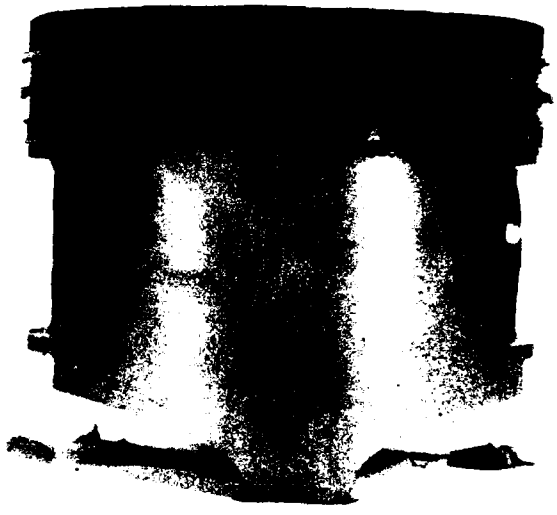


PISTON NO. 3 ANTI-THRUST SIDE

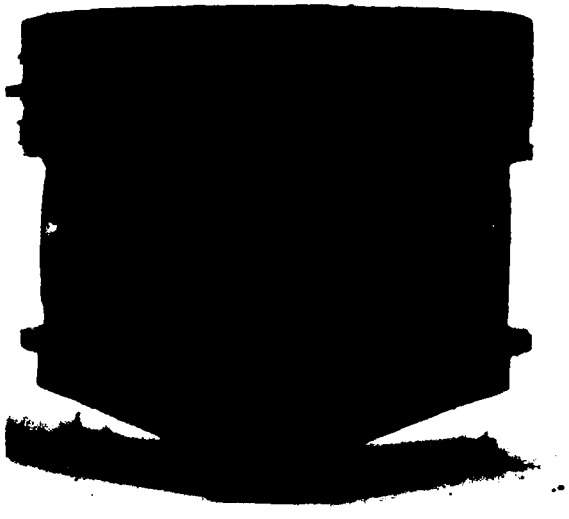
FT. LEWIS, WA
ENGINE NO: 02260516 FUEL: GASOHOL



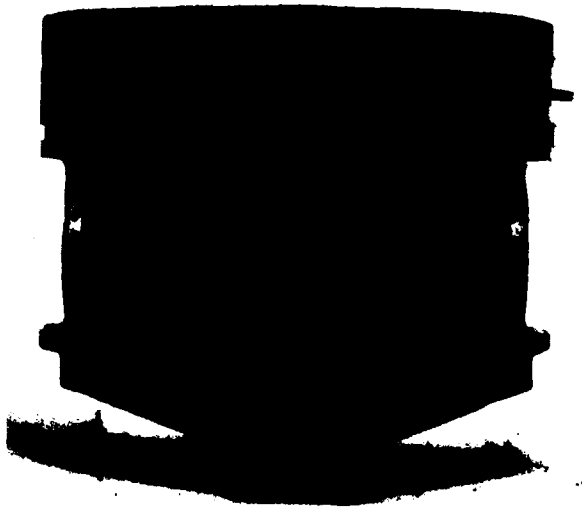
PISTON NO. 2 THRUST SIDE



PISTON NO. 2 ANTI-THRUST SIDE

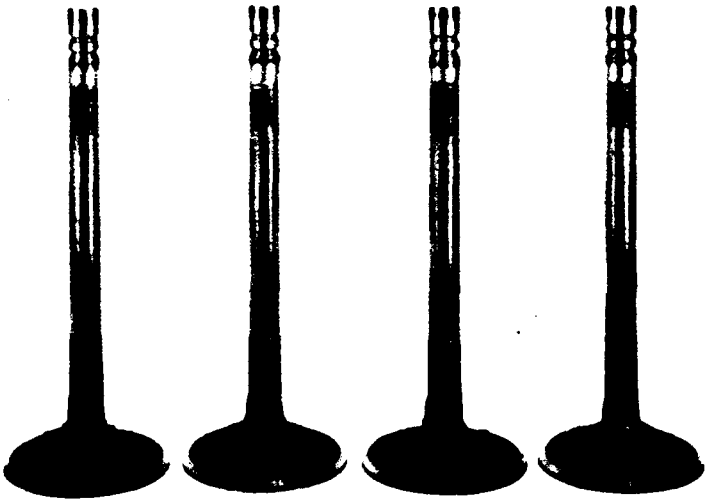


PISTON NO. 6 THRUST SIDE

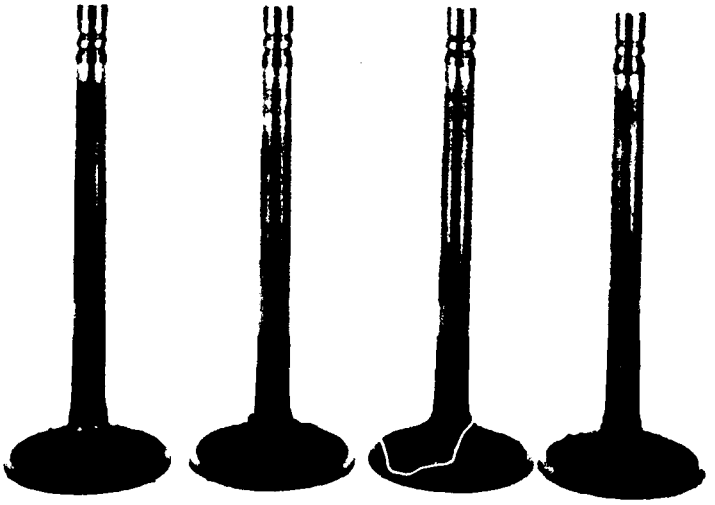


PISTON NO. 6 ANTI-THRUST SIDE

FT. LEWIS, WA
ENGINE NO: 02260516 FUEL: GASOHOL

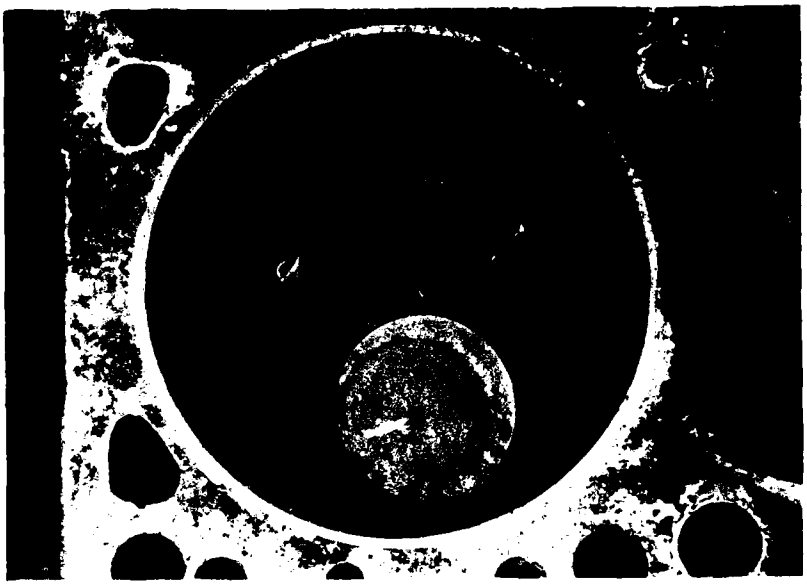


INTAKE VALVES 1,3,5,7, LEFT

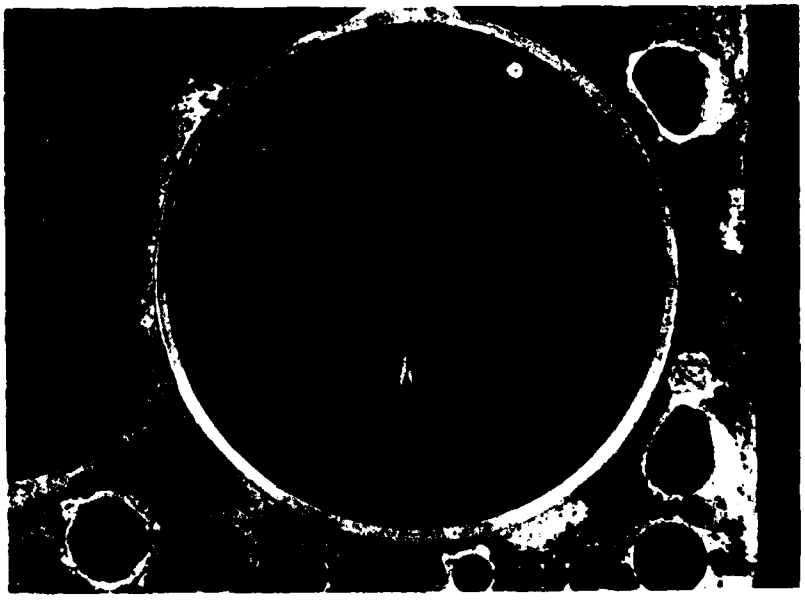


INTAKE VALVES 2,4,6,8 RIGHT

FT. LEWIS, WA
ENGINE NO: 02260516 FUEL: GASOHOL



LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1



RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

AD-A137 312 AFTER-TEST ENGINE INSPECTION OF US ARMY ADMINISTRATIVE AND LIGHT-TACTICAL..(U) SOUTHWEST RESEARCH INST SAN ANTONIO TX ARMY FUELS AND LUBRICA.. W E BUTLER ET AL. 2/2

UNCLASSIFIED FEB 83 AFLRL-167 DAAK70-82-C-0001 F/G 21/7 NL

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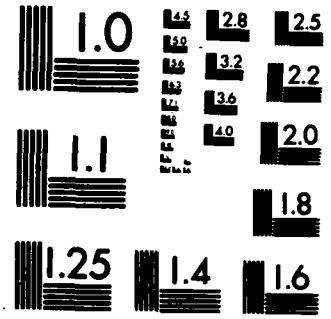


MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

FT. LEWIS, WA
ENGINE NO: 02260516 FUEL: GASOHOL

CYLINDER HEAD LEFT

CYLINDER HEAD RIGHT

FT. LEWIS, WA
ENGINE NO: 12110971 FUEL: GASOHOL

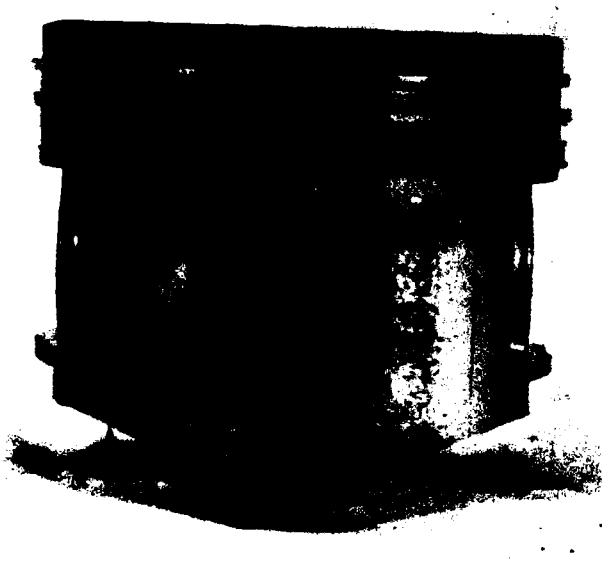
PISTON NO. 1 THRUST SIDE

PISTON NO. 1 ANTI-THRUST SIDE

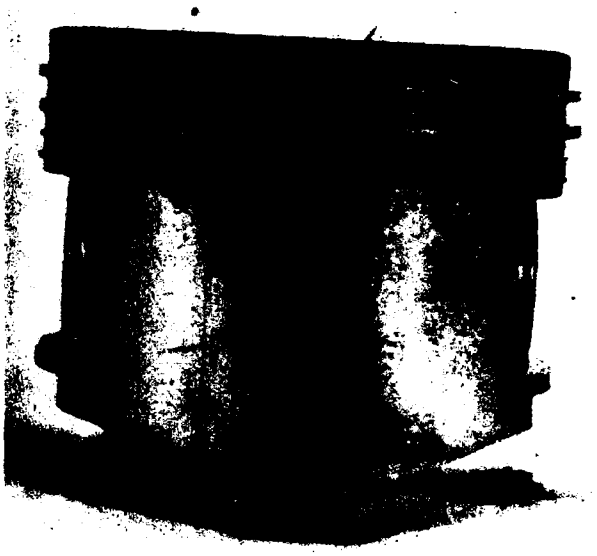
PISTON NO. 3 THRUST SIDE

PISTON NO. 3 ANTI-THRUST SIDE

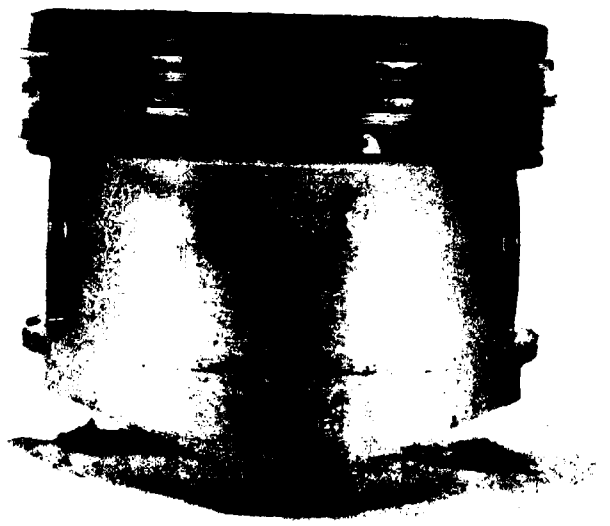
FT. LEWIS, WA
ENGINE NO: 12110971 FUEL: GASOHOL



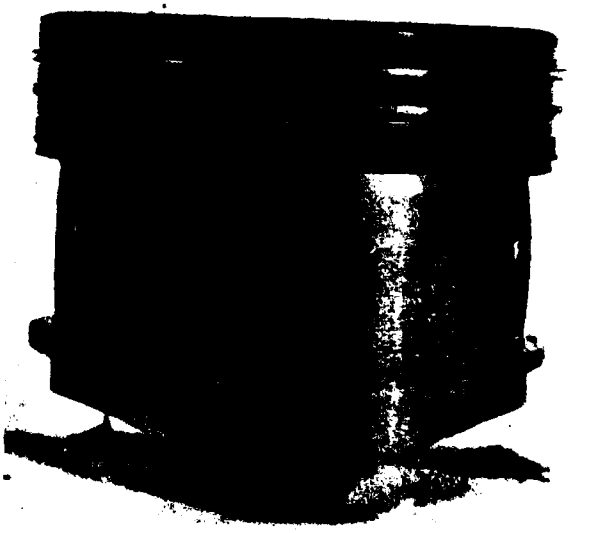
PISTON NO. 2 THRUST SIDE



PISTON NO. 2 ANTI-THRUST SIDE

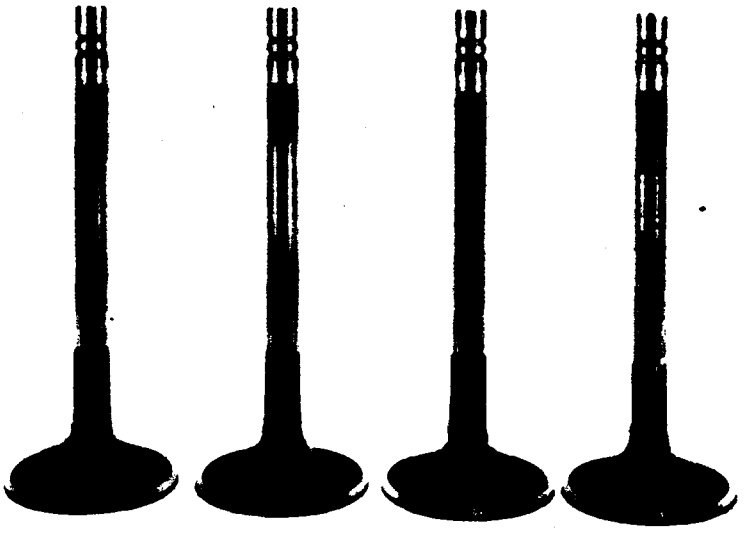


PISTON NO. 6 THRUST SIDE

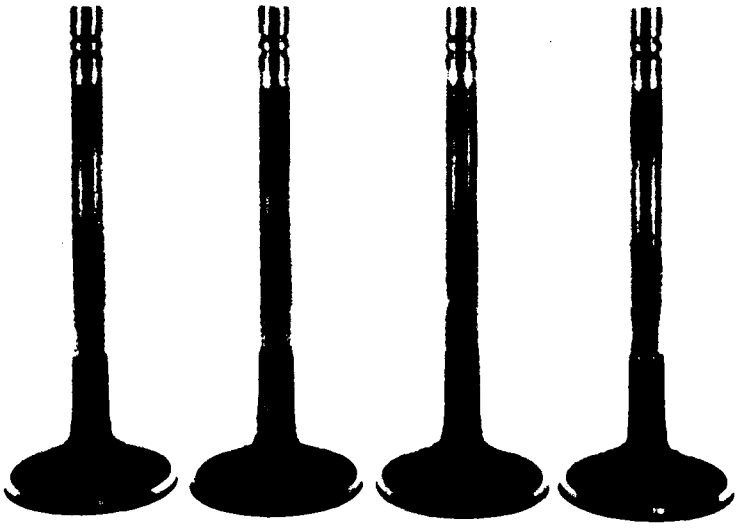


PISTON NO. 6 ANTI-THRUST SIDE

FT. LEWIS, WA
ENGINE NO: 12110971 FUEL: GASOHOL



INTAKE VALVES 1,3,5,7, LEFT



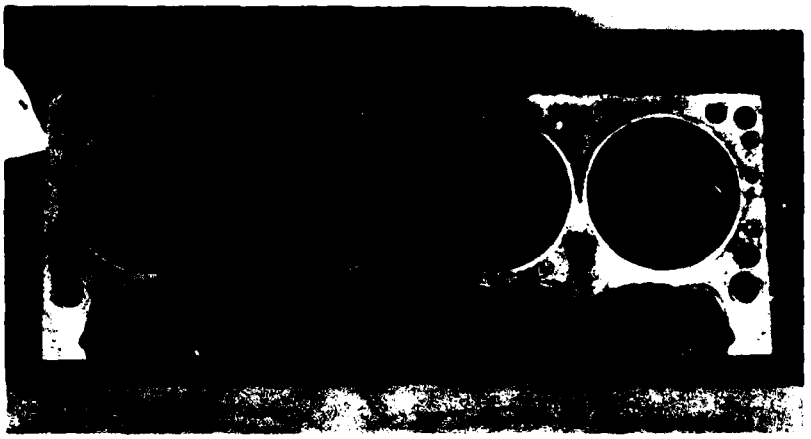
INTAKE VALVES 2,4,6,8, RIGHT

FT. LEWIS, WA
ENGINE NO: 12110971 FUEL: GASOHOL

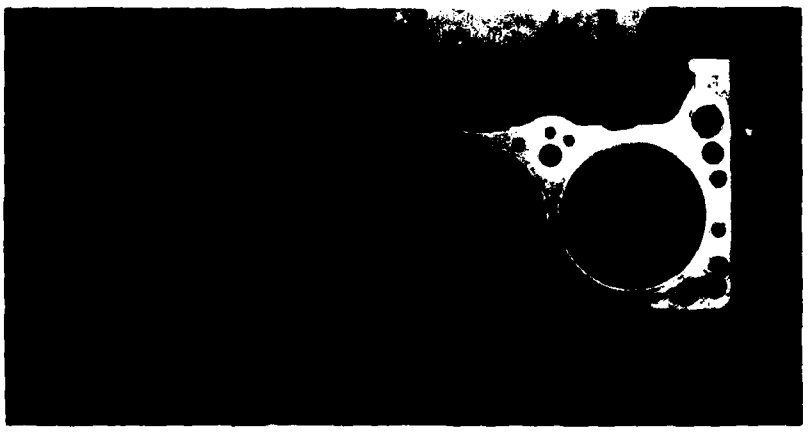
LEFT CYLINDER HEAD COMBUSTON CHAMBER NO. 1

RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

FT. LEWIS, WA
ENGINE NO: 12110971 FUEL: GASOHOL



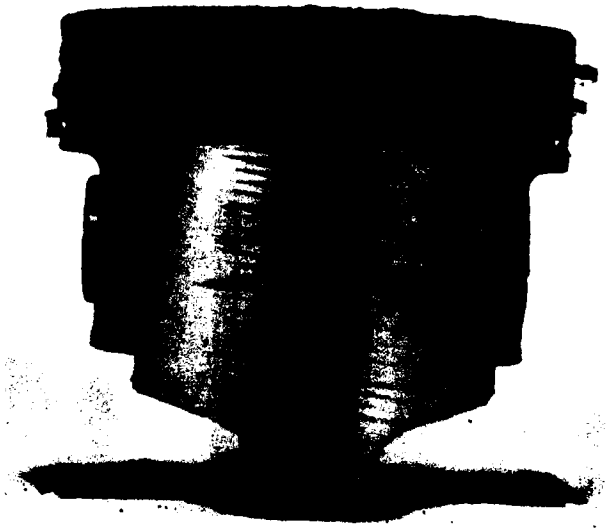
CYLINDER HEAD LEFT



CYLINDER HEAD RIGHT

FT. McCOY, WI
ENGINE NO: CD0941 FUEL: UNLEADED GASOLINE

PISTON NO. 1 THRUST SIDE

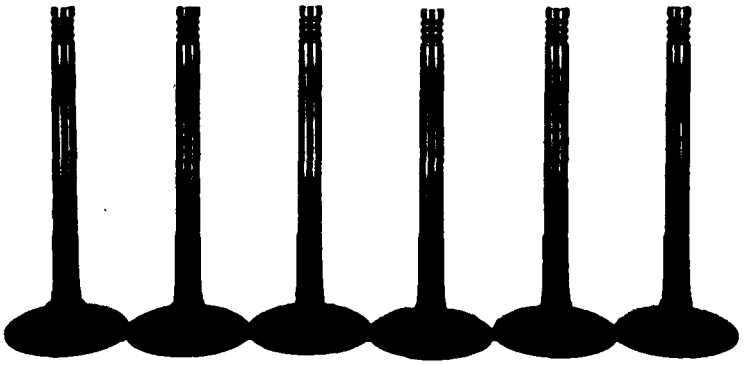


PISTON NO. 1 ANTI-THRUST SIDE

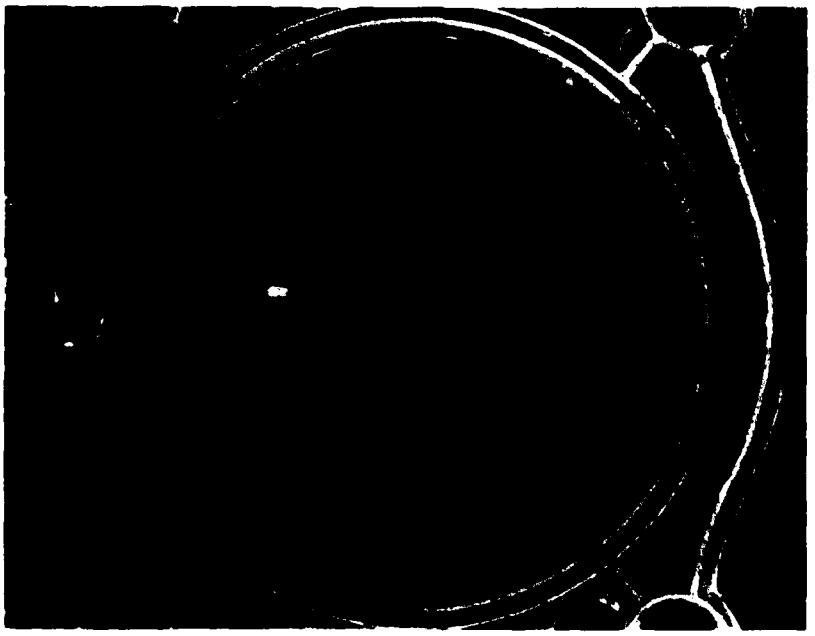
PISTON NO. 4 THRUST SIDE

PISTON NO. 4 ANTI-THRUST SIDE

FT. McCOY, WI
ENGINE NO: CD0941 FUEL: UNLEADED GASOLINE



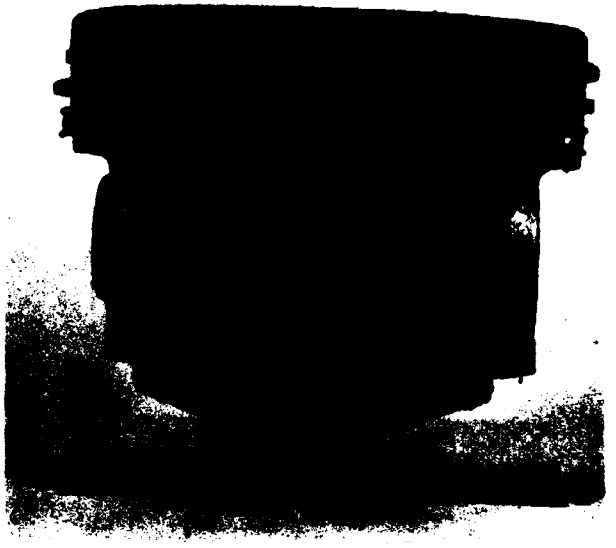
INTAKE VALVES 1-6



CYLINDER HEAD COMBUSTION CHAMBER NO. 1

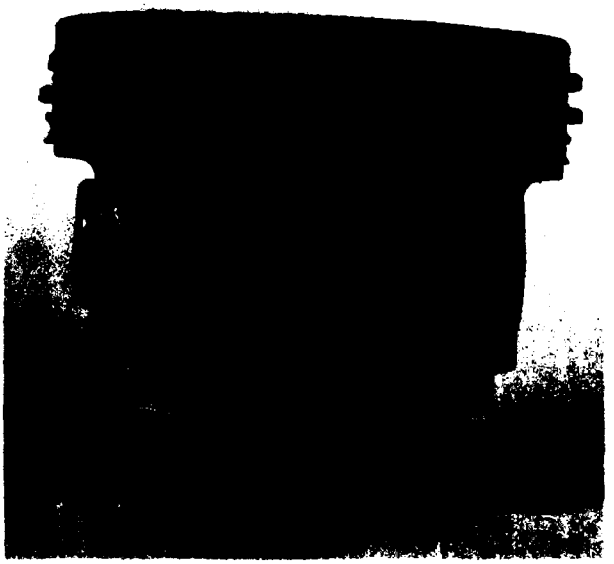
FT. McCOY, WI
ENGINE NO: CD0935 FUEL: GASOHOL

PISTON NO. 1 THRUST SIDE



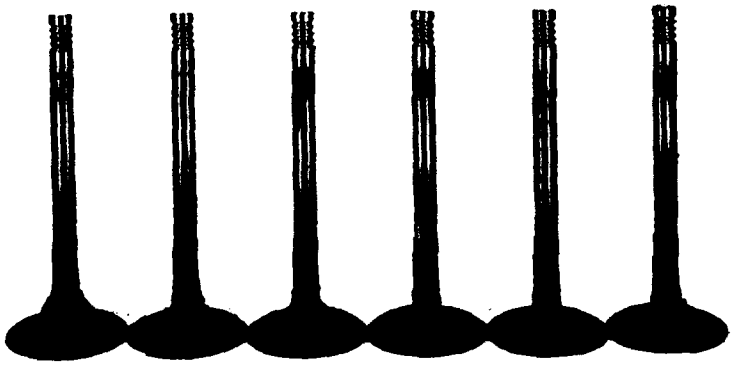
PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 4 THRUST SIDE

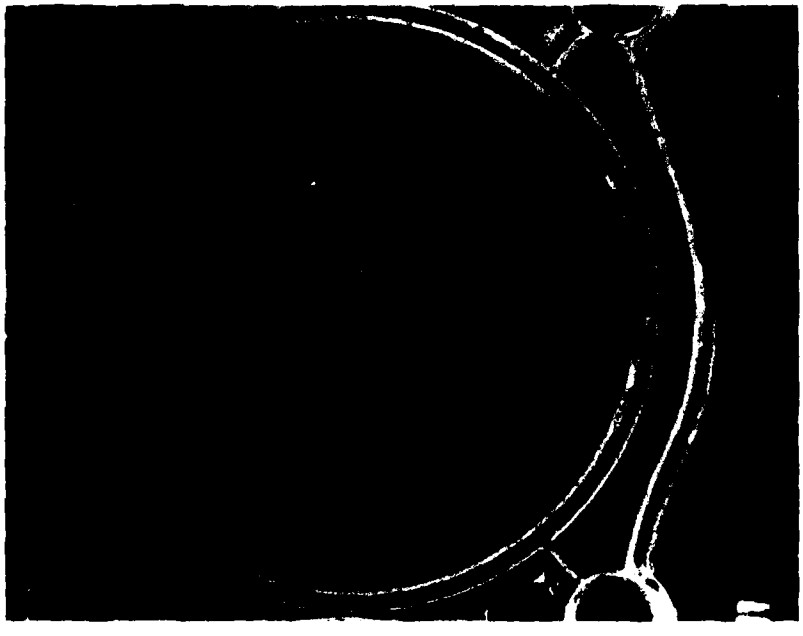


PISTON NO. 4 ANTI-THRUST SIDE

FT. McCOY, WI
ENGINE NO: CD0935 FUEL: GASOHOL

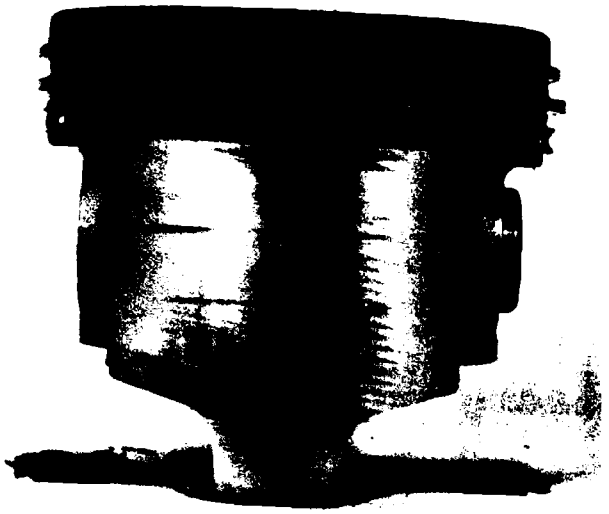


INTAKE VALVES 1-6

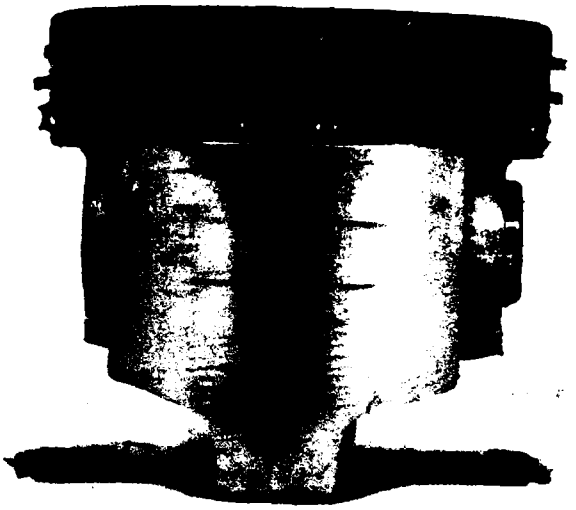


CYLINDER HEAD COMBUSTION CHAMBER NO. 1

FT. McCOY, WI
ENGINE NO: CD0939 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE

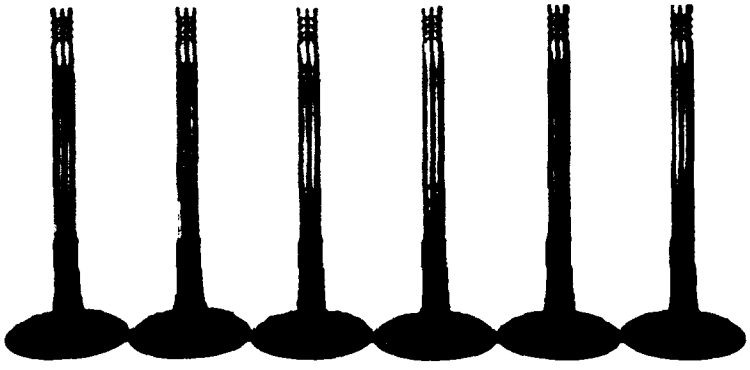


PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 4 THRUST SIDE

PISTON NO. 4 ANTI-THRUST SIDE

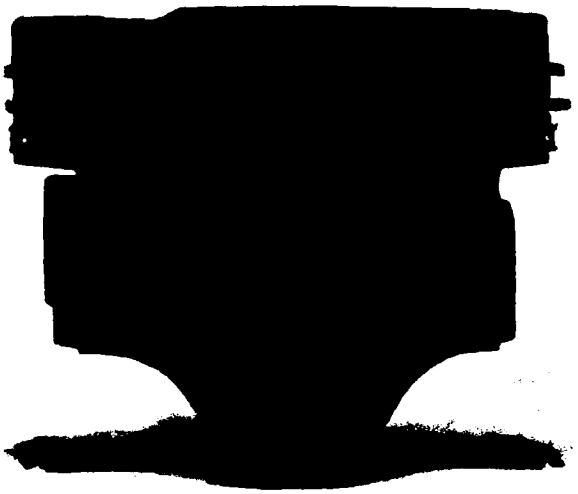
FT. McCOY, WI
ENGINE NO: CD0939 FUEL: GASOHOL



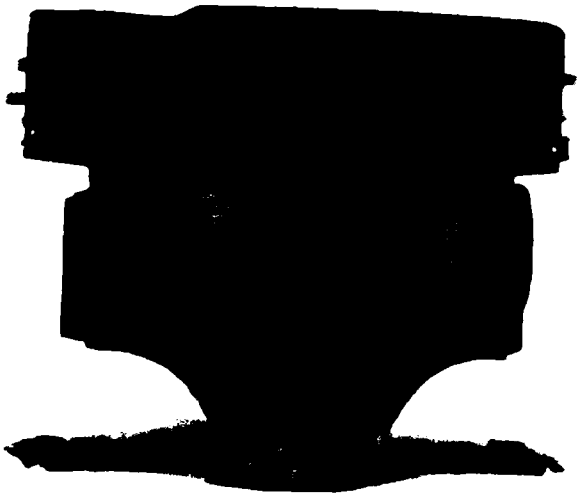
INTAKE VALVES 1-6

CYLINDER HEAD COMBUSTION CHAMBER NO. 1

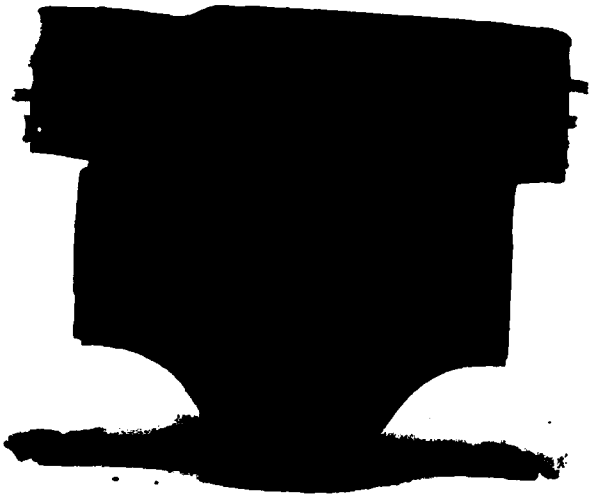
FT. McCOY, WI
ENGINE NO: CD7099 FUEL: GASOHOL



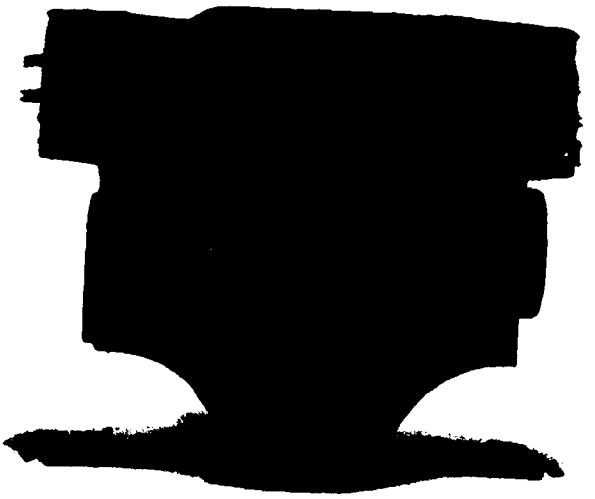
PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

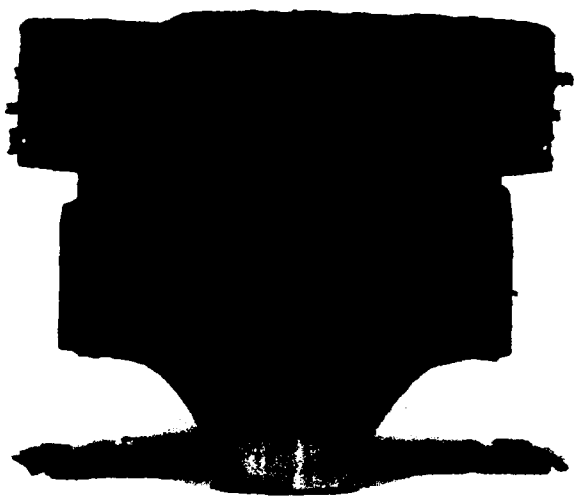


PISTON NO. 3 THRUST SIDE

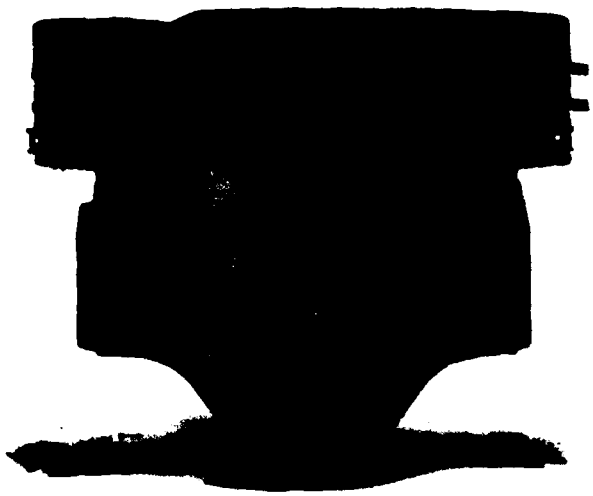


PISTON NO. 3 ANTI-THRUST SIDE

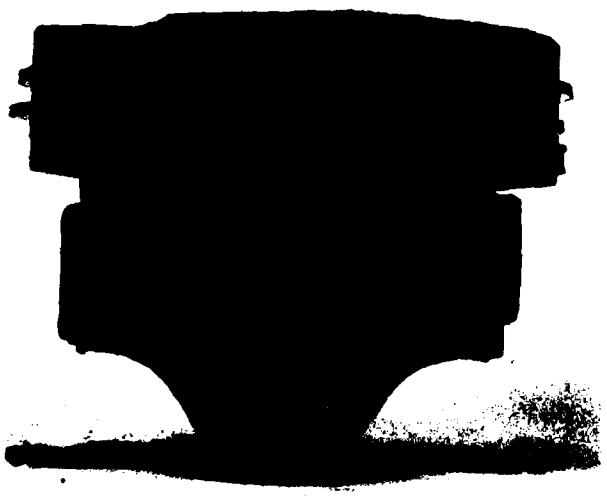
FT. McCOY, WI
ENGINE NO: CD7099 FUEL: GASOHOL



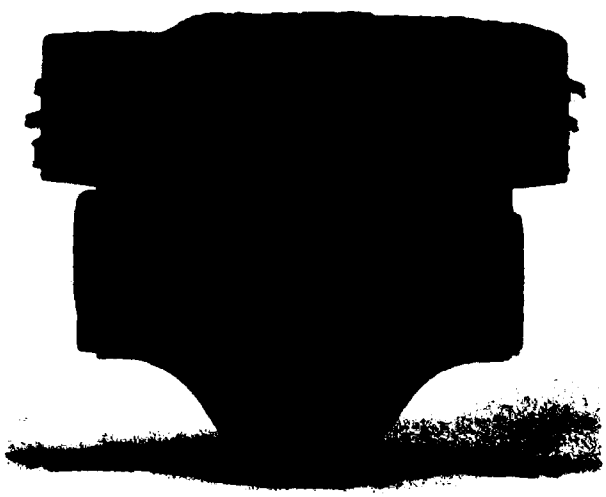
PISTON NO. 5 THRUST SIDE



PISTON NO. 5 ANTI-THRUST SIDE

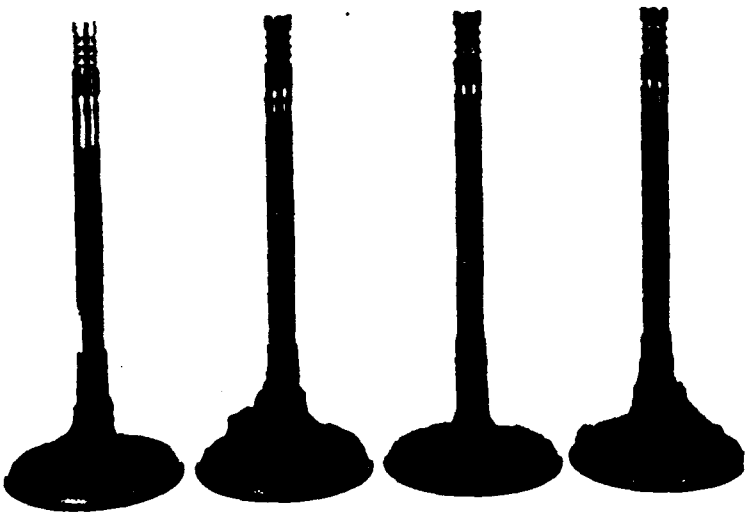


PISTON NO. 7 THRUST SIDE

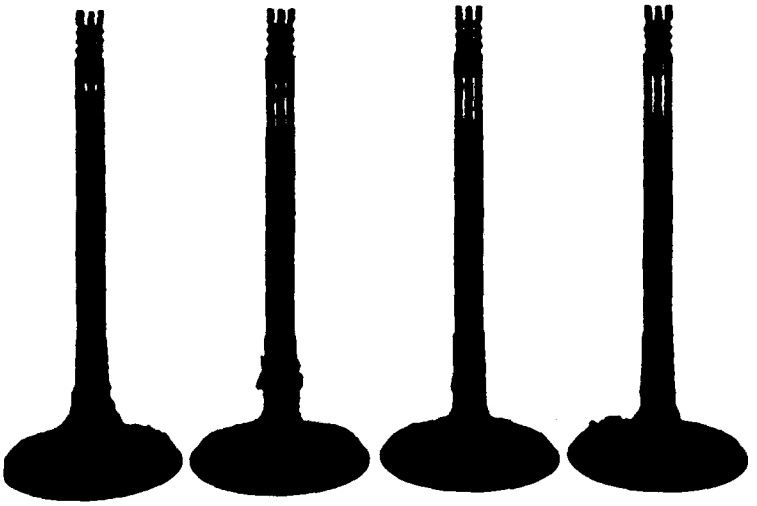


PISTON NO. 7 ANTI-THRUST SIDE

FT. McCOY, WI
ENGINE NO: CD7099 FUEL: GASOHOL

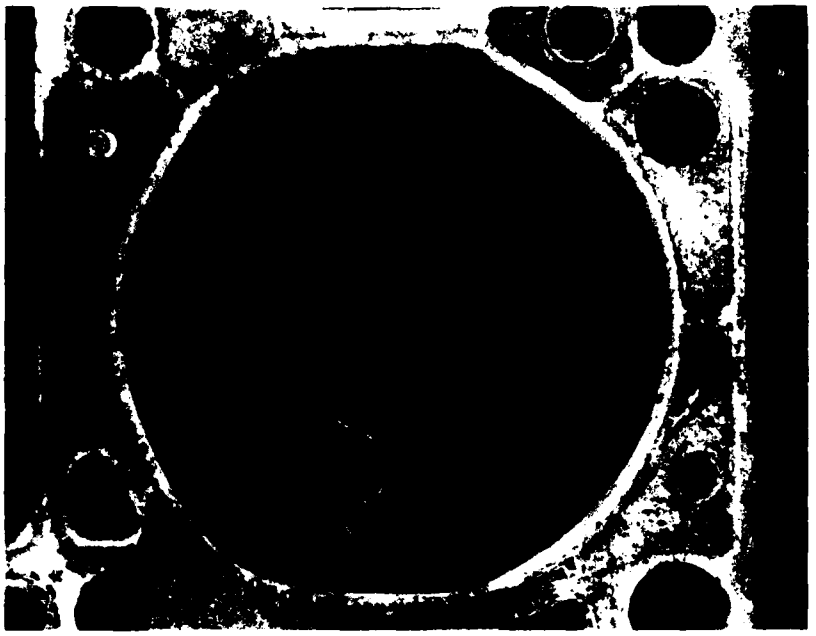


INTAKE VALVES 1-4

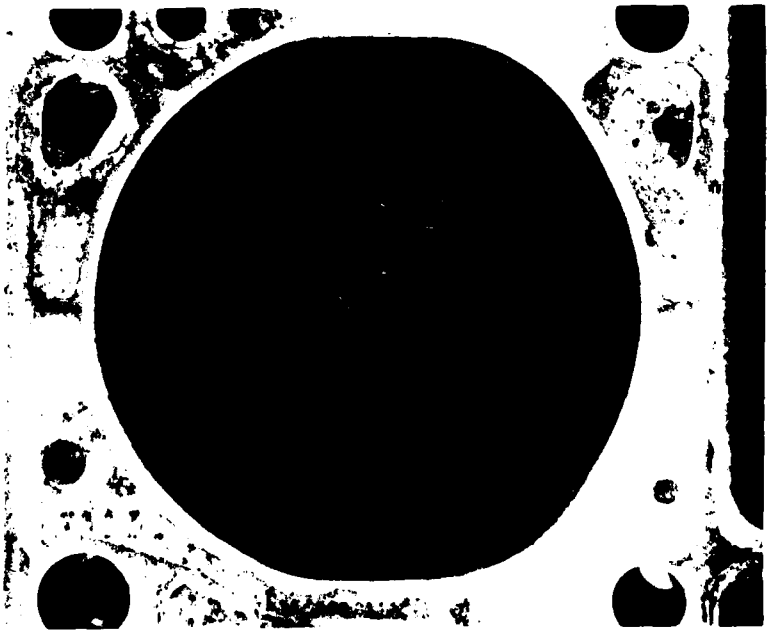


INTAKE VALVES 5-8

FT. McCOY, WI
ENGINE NO: CE7099 FUEL: GASOHOL



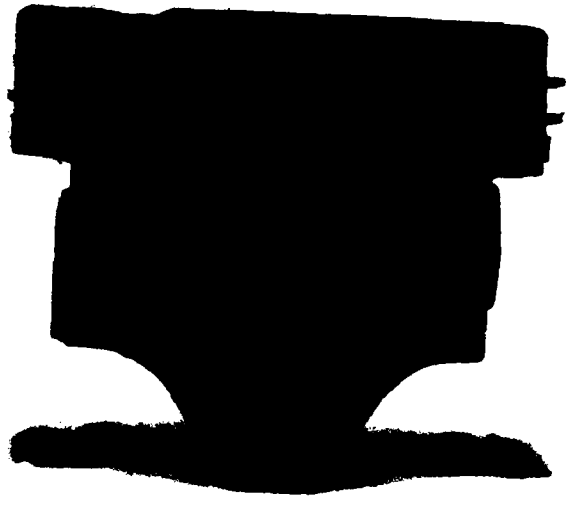
CYLINDER HEAD COMBUSTION CHAMBER NO. 1



CYLINDER HEAD COMBUSTION CHAMBER NO. 5

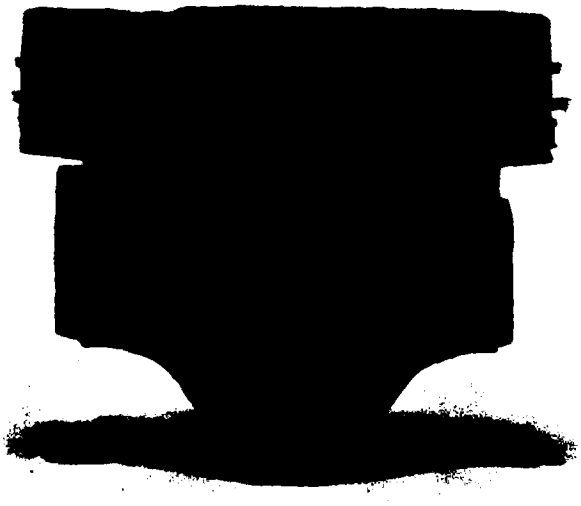
FT. McCOY, WI
ENGINE NO: CD7097 FUEL: GASOHOL

PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

PISTON NO. 3 THRUST SIDE



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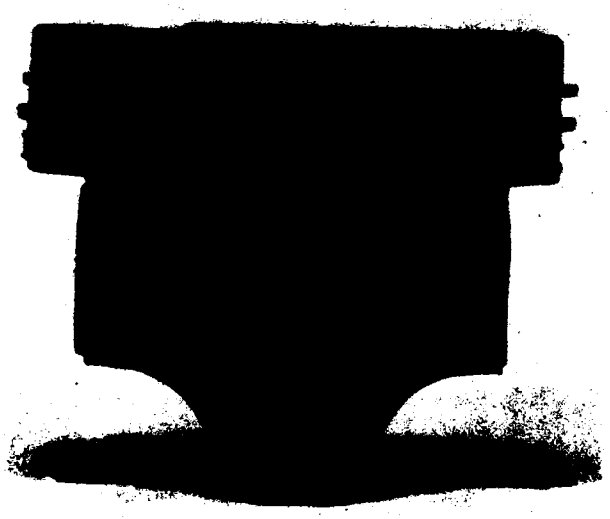
FT. McCOY, WI
ENGINE NO: CD7097 FUEL: GASOHOL



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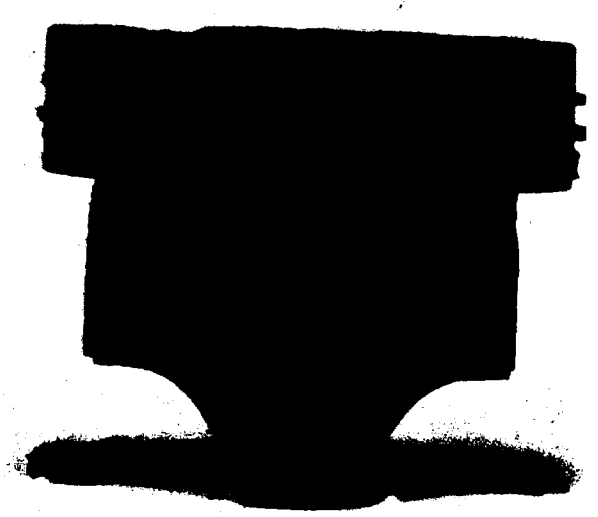

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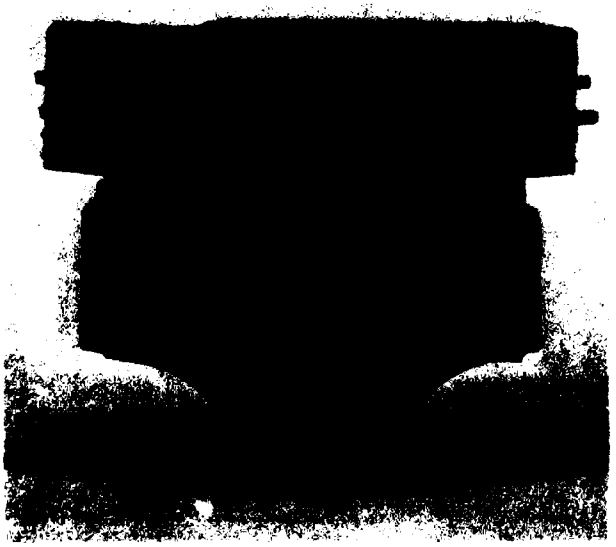
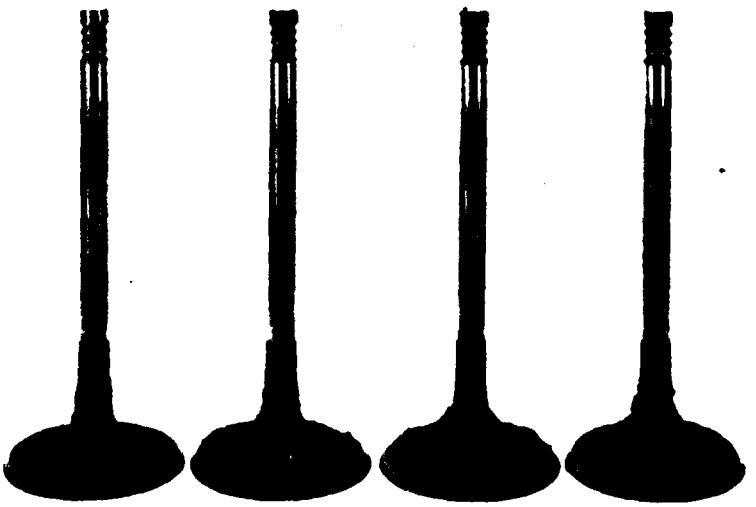


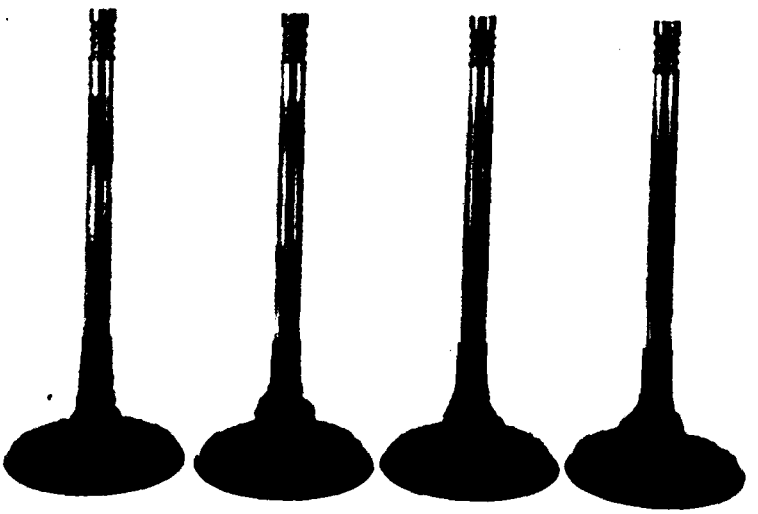
PISTON NO. 7 THRUST SIDE

PISTON NO. 7 ANTI-THRUST SIDE

FT. McCOY, WI
ENGINE NO: CD7097 FUEL: GASOHOL

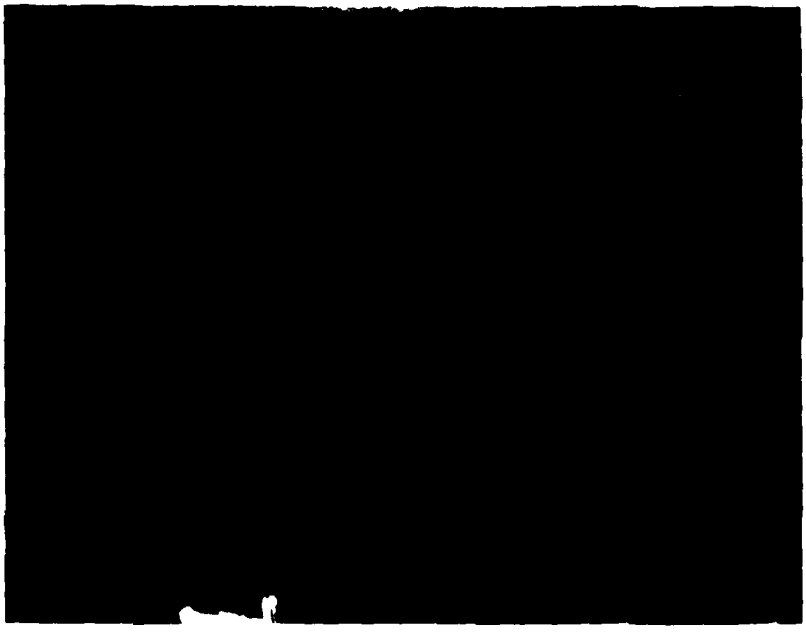


INTAKE VALVES 1-4

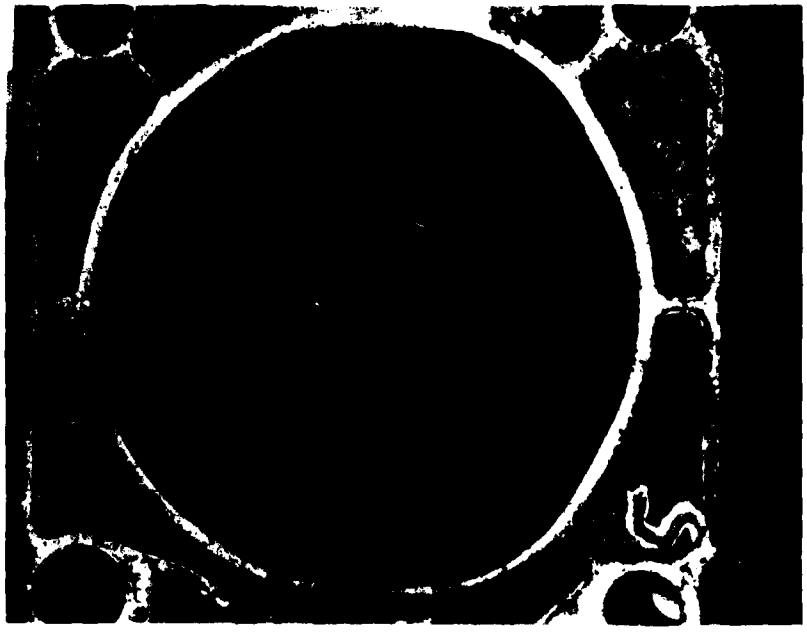


INTAKE VALVES 5-8

FT. McCOY, WI
ENGINE NO: CD7097 FUEL: GASOHOL



CYLINDER HEAD COMBUSTION CHAMBER NO. 1



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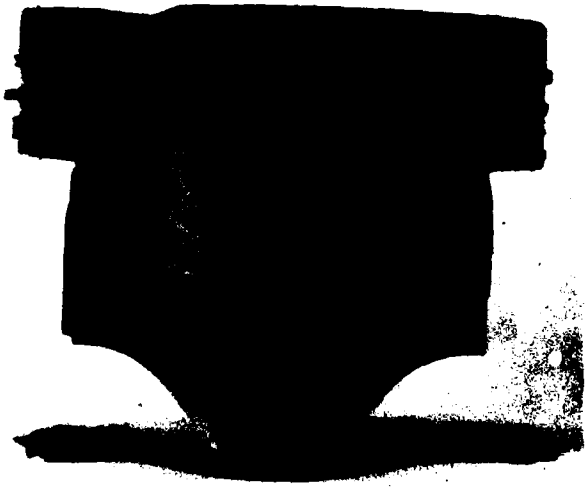
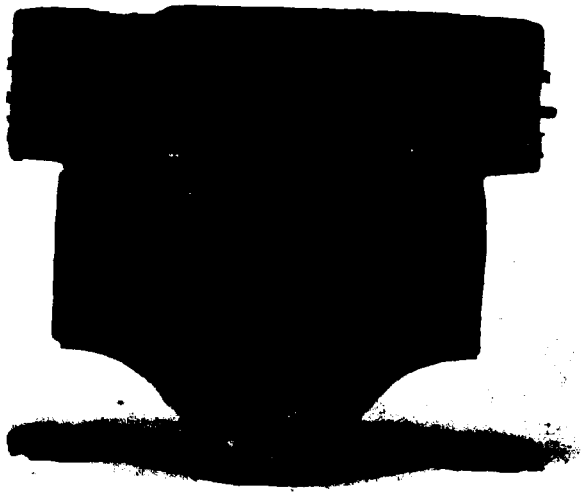


PISTON NO. 1 THRUST SIDE



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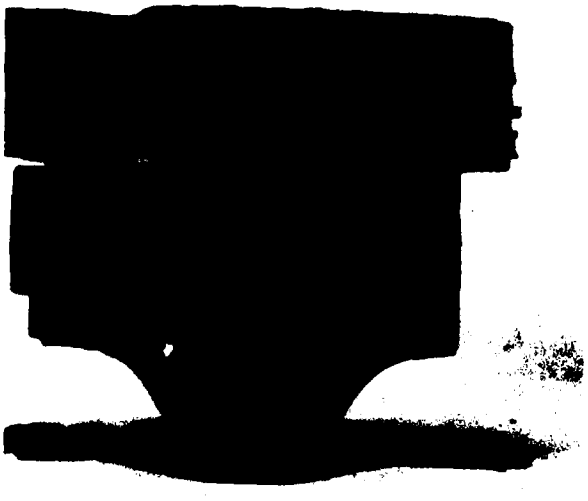

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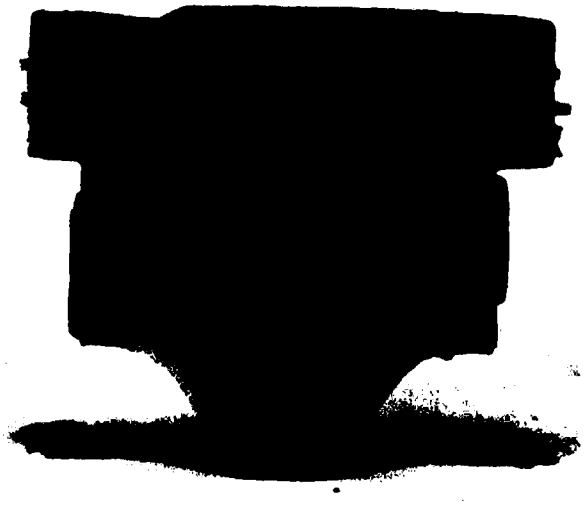
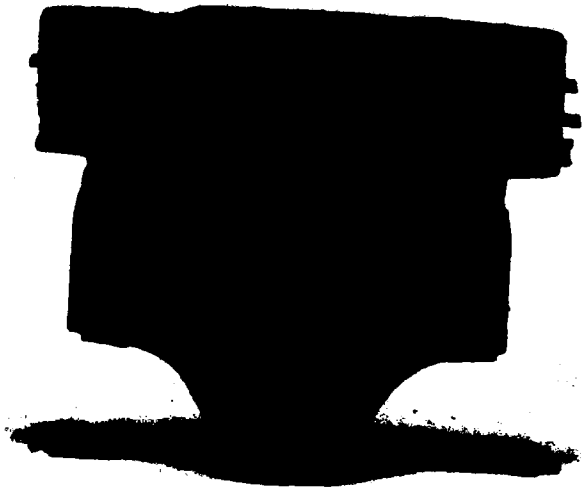


PISTON NO. 3 ANTI-THRUST SIDE

FT. McCOY, WI
ENGINE NO: CD7098 FUEL: GASOHOL

PISTON NO. 5 THRUST SIDE

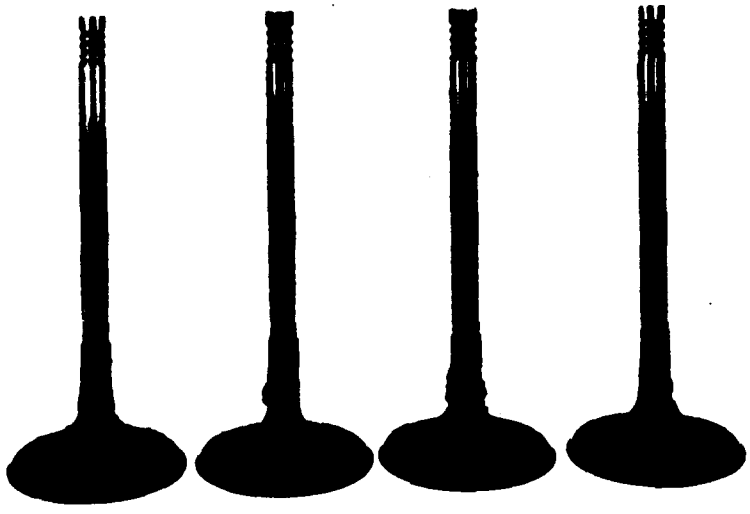


PISTON NO. 5 ANTI-THRUST SIDE

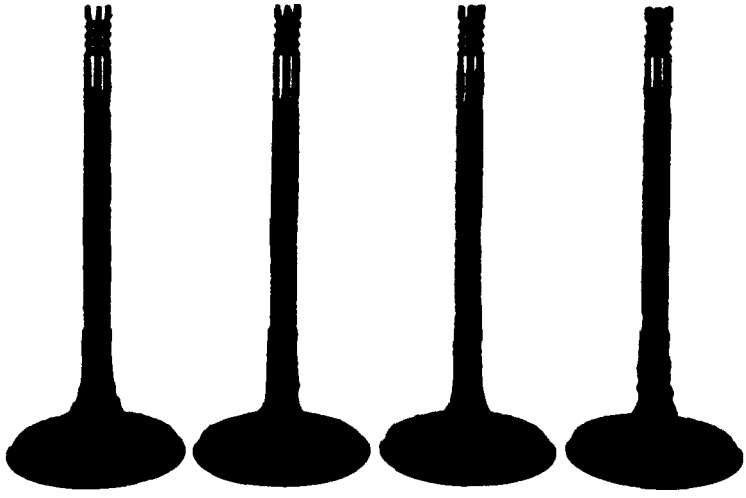
PISTON NO. 7 THRUST SIDE

PISTON NO. 7 ANTI-THRUST SIDE

FT. McCOY, WI
ENGINE NO: CD7098 FUEL: GASOHOL



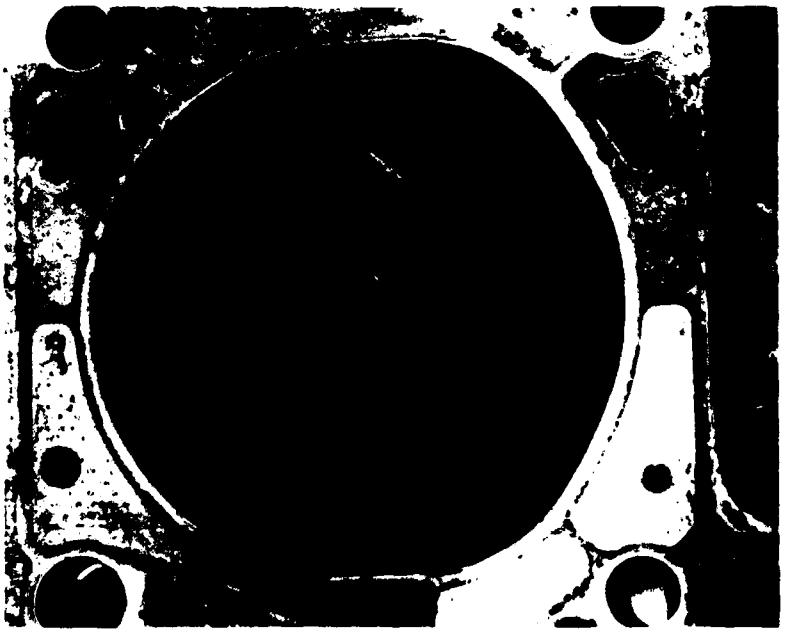
INTAKE VALVES 1-4



INTAKE VALVES 5-8

FT. McCOY, WI
ENGINE NO: CD7098 FUEL: GASOHOL

CYLINDER HEAD COMBUSTION CHAMBER NO. 1



CYLINDER HEAD COMBUSTION CHAMBER NO. 5

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