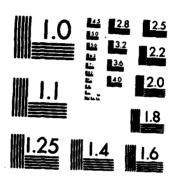
AFTER-TEST ENGINE INSPECTION OF US ARMY ADMINISTRATIVE AND LIGHT-TACTICAL. (U) SOUTHWEST RESEARCH INST SAN ANIONIO TX ARMY FUELS AND LUBRICA. WE BUTLER ET AL. FEB 83 AFLRL-167 DAAK70-82-C-0001 F/G 21/7 AD-A137 312 1/2 UNCLASSIFIED NL ****



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

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INTERIM REPORT AFLRL No. 167

By

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Under Contract to

U.S. Army Belvoir Research and Development Center Materials, Fuels, and Lubricants Laboratory Fort Belvoir, Virginia

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February 1983



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number slighteen spark ignition engines from U.S. Army tactical vehicles, which were part of a fleet tender of operating such engines with gasohol as a fue Army Fuels and Lubricants Research Laboratory inspections. Twelve of the engines were operated and six of the engines were operated.	administrative and lightest to determine the effects l, were shipped to the U.S. (USAFLRL) for after-test ed with gasohol as a fuel,

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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 lighttactical 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

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

*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, VA1

Type Engine		Chrysle	r V-8, 318	CID	MISI	AZ Jeep, 4	Cylinder,	140 CID
Vehicle Serial Number	07121303		03223146			AZ Jeep, 4 5003049	5001675	
AFLAL Number	ı	3	2	Manufacturer's	6	5	4	Manufacturer's
Type Fuel	Gasohol	Gasohol	Unleaded Gasoline	Specifications Service Limits	Gasohol	Ga sohol	Unleaded Gasoline	Specifications Service Limits
Components								
Compression Ring Gaps								
Top	0.029	0.030	0.029	0.010-0.020	0.023	0.039	0.033	0.010-0.027
Bass	(0.74) 0.033	(0.76) 0.031	(0.74) 0.027	(0.25)-(0.51)	(0.58) 0.027	(0.99) 0.045	(0.84)	(0.25)-(0.69)
Bottum	(0.84)	(0.79)	(0.69)		(0.69)	(1.14)	0.032 (0.81)	
Cylinder Bore Diameter	(0.04)	(0.77)	(0.0)		(0.03)	()	(0.01)	
Top	3.9118	3.9112	3.9117	3.9100-3.9120	3.8763	3.8786	3.8768	3.8753-3.8777
-		(99.344)		(99.314)-(99.365)	(98,458)		(98.471)	(98.433)-(98.494)
Middle	3.9113	3.9107	3.9112		3.8761	3.8781	3.8766	
•		(99.332)				(98.504)		
Botton	3.9112	3.9108 (99.334)	3.9113		3.8763	3,8783 (98,509)	3.8766	
	(77.344)	(77.334)	(77.34/)		(70.430)	(90.309)	(70.400)	
Cylinder Bore Out-of-Round								
Top	0.0005	0.0005	0.0008	0.0050 max	0.0002	0.0005	0.0005	0.005 max
•	(0.013)	(0.013)	(0.020)	(0.127)	(0.005)	(0.013)	(0.013)	(0.13)
Middle	0.0006	0.0009	0.0007		0.0004	0.0005	0.0003	
•	(0,015)	(0.023)	(0.018)		(0.010)	(0.013)	(0,008)	
Bot ton	0.0005 (0.013)	0.0005 (0.013)	0.0004 (0.010)		0.0004 (0.010)	0.0003 (0.008)	0.0002	
	(0.013)	(0.013)	(0.010)		(0.010)	(0.008)	(0.003)	
Taper of Cylinder Bore	0.0006	0.0006	0.0005	0.010 max	0.0003	0.0003	0.0002	0.008 max
	(0.015)	(0.015)	(0.013)	(0.25)	(0.008)	(0.008)	(0.005)	(0.20)
Main Bearings			2 4000	0 /005 0 5005				
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	2.2483 (57.107)	2.2482-2.2490
Shell Diemeter	2,5027	2.5029	2.5022	2.5000-2.5030	2.2511	2.2514	2.2526	(57.104)-(57.125) 2.2494-2.2512
SHELL DIMERET	(63,569)				(57,178)			(57.135)-(57.180)
	,	(***************************************				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(5.555)
Connecting Rod Bearings								
Journal Diameter	2.1239	2.1237	2.1235	2.1240-2.1250	1.9986	1.9985	1.9987	1.9982-1.9990
45 - 4.5 may	(53.947)				(50.764)		(50.767)	
Shell Diemeter	2.1262	2.1267 (54.018)	2.1265	2.1245-2.1275 (53.962)-(54.039)	2.0005 (50.813)	2.0008 (50.820)	1.9998	1.9992-2.0010 (50.780)-(50.825)
	(54.005)	(34.0.0)	(34.013)	(331702)-(341037)	(30.013)	(50,820)	(3027937	(30.760)-(30.6237
Piston Average Disasters								
(Middle and Bottom								
of Skirt)	3.9089	3.9089	3.9096	3.9085-3.9115	3.8735	3.8745	3.8736	3.8741-3.8765
	(99.286)	(99.286)	(99.304)	(99.276)-(99.3521)	(98.387)	(98,412)	(98, 389)	(98.402)-(98.463)
Valve Stem to Guide								
Clearance								
Intake	0.0023	0.0023	0.0024	0.001-0.017	0.0027	0.0027	0.0056	0.0010-0.0025
	(0.058)	(0.058)	(0.061)	(0.03)~(0.43)	(0.069)	(0.069)	(0.140)	(0.025)-(0.064)
Exhaus t	0.0023	0.0024	0.0024		0.0031	0.0027	0.0051	0.0010-0.0035
	(0.058)	(0.061)	(0.061)		(0.079)	(0.069)	(0.130)	(0.025)-(0.089)
Valve Spring Force								
Intake	80	60	78 78	-88 @ I-11/16"	110	107	108	132 1b @ 1.505"
	(356)	(356)	(347) (347)-(391)@ 42.86mm	(489)	(476)	(480)	(587) (N-m) @ (38.23 mm)
Exhaus t	80	79	78		110	109	109	Wear Limit-110 1bs
	(356)	(351)	(347)		(489)	(485)	(485)	
Canalyst Labo Lift								
Intake	0.2362	0,240	0.240	0.243-0.249 ³	0.240	0.232	0.231	0.2369-0.2419
	(5.99)	(6.10)	(6.10)	(6.17)~(6.32)	(6.10)	(9.89)	(5.87)	(6.017)-(6.144)
Exhaus t	0.252	0,256	0.258	0.260-0.267	0.233	0.230	0.225	0.2330-0.2380
	(6.40)	(6.35)	(6.55)	(6.60)~(6.78)	(3.92)	(5.84)	(5.72)	(5.918)-(6.045)

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^{1.} All measurements are averages expressed in inches and (nm) except Valve Spring Force [1b and (N-b)].
2. Campbaft 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. Hear limits were determined statistically by using the mean and standard deviation of the mean for intake and exhaunt valve user measurements respectively and using the formula: Range of U = x 2 (o=/vm)(t) where U = population mean, x = aample mean, 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, $\mathrm{WA}^{\mathbf{1}}$

Type Engine			. V-8, 318	CID	H151	A2 Jeep,	Cylinder	140_CID
Serial Number	02260516	12110971			251 89 1	235875	235880	
AFIRL Number	11	12	10	Manufacturer's	7	9	6 Unleaded	Manufacturer's Specifications
Type Puel	Gasohol .	Gasohol	Unleaded Gasoline	Specifications Service Limits	Ga sohol	Gasohol	Gasoline	Service Limits
Components								
Compression Ring Gaps	_							
Top	0.0302	0.034	0.028	0.010-0.020	0.051	0.054	0.052	0.010-0.027
-	(0.76)	(0.86)	(0.71)	(0.25)-(0.51)	(1.30)	(1.37)	(1.32)	(0.25)-(0.69)
Bottom	0.032	0.034	0.028		0.070	0.069	0.072	
	(0.81)	(0.86)	(0.71)		(1.78)	(1.75)	(1.83)	
Cylinder Bore Diameter								
Top	3.9115	3.9120	3.9108	3.9100-3.9120	3.8778	3.8776	3.8786	3.8753-3.8777
	(99.352)	(99.365)	(99.334)	(99.314)-(99.365)	(98.496)	(98.491)	(98.516)	(98.433)-(98.494)
Middle	3.9112	3.9121	3.9105		3.8769	3.8770	3.8780 (98.501)	
Botton	(99.344) 3.9112	(99.367) 3.9119	(99.317) 3.9104		(98.473) 3.8770	(98.476) 3.8763	3.8770	
201102	(99.304)				(98.476)	(98.458)		
	•	•	• • • •					
Cylinder Bore Out-of-Round								
Top	0.0007	0.0005	0.0006	0.0050 max	0.0007	0.0011	0.0015	0.005
*** * * * *	(0.018)	(0.013)	(0.015)	(0.127)	(0.018)	(0.028)	(0.038) 0.0004	(0.13) max
Middle	0.0010 (0.025)	0.0006	0.0005 (0.013)		0.0002 (0.005)	(0.010)	(0.010)	
Bottom	0.0004	0.0004	0.0004		0.0003	0.0004	0.0006	
	(0.010)	(0.010)	(0.010)		(0.008)	(0.010)	(0.015)	
Taper of Cylinder Bore	0.0006	0.0003	0.0004	0.010 max	0.0008	0.0013	0.0016	0.008
	(0.015)	(0.008)	(0.010)	(0.25)	(0.020)	(0.033)	(0.041)	(0.20) max
Main Bearings								
Journal Diameter	2.4998	2.4997	2.4995	2.4995-2.5005	2.2485	2.2483	2.2484	2.2482~2.2490
	(63.495)	(63.492)	(63.487)		(57.112)			
Shell Diameter	2.5022	2.5021	2.5026	2.5000-2.5030	2.2527	2.2527	2.2523	2.2494~2.2512
	(63,556)	(63,553)	(63.56 6)	(63.500)-(63.576)	(57.219)	(57.219)	(57, 208)	(57.135)-(57.180)
Connecting Rod Bearings								
Journal Diameter	2.1238	2.1242	2.1242	2.1240-2.1250	1.9987	1.9982	1.9987	1.9982-1.9990
	(53.945)	(53.955)			(50.767)	(50.754)		(50.754)-(50.775)
Shell Diameter	2.1265	2.1265	2,1259	2.1245-2.1275	2.0016	2.0020	2.0020	1.9992-2.0010
	(54.013)	(54,013)	(53,998)	(53.962)-(54.039)	(50.841)	(20.821)	(50.851)	(50.780)-(50.825)
Piston Average Diameters								
(Middle and Bottom								
of Skirt)	3.9074	3.9092	3.9095	3.9085-3.9115	3.8735	3.8730	3.8739	3.8741-3.8765
	(99.248)	(99.294)	(99.301)	(99.276)-(99.351)	(98.387)	(98.374)	(98.397)	(98.402)-(98.463)
Valve Stem to Guide								
Clearance								
Intake	0.0056	0.0066	0.0055	0.001-0.017	0.0059	0.0067	0.0053	0.0010~0.0025
	(0.142)	(0.168)	(0.140)	(0.03)-(0.43)	(0.150)	(0.170)	(0.135)	(0.025)-(0.064)
Exhaust	0.0065	0.0078	0.0073		0.0049	0.0085	0.0059 (0.150)	0.0020~0.0035 (0.051)~(0.089)
	(0.165)	(0.198)	(0.185)		(0.124)	(0.216)	(0.130)	(0.031)-(0.089)
Valve Spring Force								
Intake	164	157	158	170 1b @ 1 5/16 in.		105	108	132 1b @ 1.505 in.
	(730)	(698)	(703)	(347)(N-m) €	(476)	(476)	(480)	(587) (N-m) @ 38.23 ==
Exhaus t	116	111	112	42.86 mm	107	104 (463)	107 (476)	Wear Limit-110 lbs
	(516)	(494)	(498)		(476)	(40)	(4/0)	
Camehaft Lobe Lift				4				
Intake	0.239	0.238	0.238	0.243-0.2494	0.242	0.238	0.225	0.2369-0.2419
	(6.07)	(6.05)	(6.05)	(6.17)-(6.32)	(6.15)	(6.05)	(5.20)	(6.017)-(6.144)
Exhaus t	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)
	(5173)	(0070)	(4144)	/4144\ /4114\	/	,,-,	,,	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,

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

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

Type Engine		Ford 5	v-8, 400 C	ID	CJ5 Jeen AMC, 6 Cylinder, 232 CID				
Vehicle Serial Number	CD7097	CD7098	CD7099		CD0939	CD0935	CD0941	.,	
AFLEL Number	13	14	15 Unleaded	Manufacturer's Specifications	16	18	17 Unleaded	Manufacturer's Specifications	
Type Fuel	Gasohoi	Ga schol	Gasoline	Service Limits	Gasohol	Gasohol	Gasoline	Service Limits	
Components									
Compression Ring Gaps Top	0.029	0.034	0.033	0,010-0.020	0.027	0.029	0.028	0.010-0.020	
	(0.74)	(0.86)	(0.84)	(0,25)-(0,51)	(0.69)	(0.74)	(0.71)	(0.25)-(0.51)	
Sattan.	0.040	0.056	0.039	0.010-0.020	0.035	0.033	0.034	0.010-0.020	
	(1.02)	(1.42)	(0.99)	(0.25)-(0.51)	(0.89)	(0.84)	(0.86)	(0.25)~(0.51)	
Cylinder Bore Diameter		4.0039		4.000-4.0048	2 2541	2 2600			
Тор	4.0037		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	4.0031	4.0032		3.7519	3.7515	3.7511		
) (101.679))	(95.298)				
Bottom	4.003l (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	0.0003	0.0006	0.0015 max	0.0007	0.0006	0.0006	0.003	
•	(0.020)	(0.008)	(0.015)	(0.038)	(0.018)	(0.015)	(0.015)	(0.08)	
Middle	0.0011	0.0004	0.0010		0.0003	0.0004	0.0003	ULA X	
Bottom	(0.028) 0.0008	(0.010) 0.0006	(0.025) 0.0007		(0,008) 0,0002	(0.010) 0.0001	(0.008) 0.0003		
au t tom	(0.020)	(0.015)	(0.018)		(0.005)	(0.003)	(0.008)		
Taper of Cylinder Bore	0.0007	0.0007	0.0009	0.010 max	0.0021	0.0006	0.0006	0.005 max	
	(0.018)	(0.018)	(0.023)	(0.25)	(0.053)	(0.015)	(0.015)	(0.13)	
Maia Bearings									
Journal Diameter	2.9991	2.9898	2.9993	2.9994-3.0002	2.4989	2.4989	2.4989	2.4986-2.5001	
Shell Diameter	(76,177) 3,0036	(75.941) 2.9954	(76.182) 3.0019	(76.185)-(76.205) 3.0002-3.0028	(63,472) 2,5020	(63,472) 2,5012	(63.472) 2.5015	(63.464)-(63.503) 2.4996-2.5021	
SHELL DISMETER	(76.291)		(76.248)		(63.551)				
Connecting Rod Bearings									
Journal Diameter	2.3104	2.3107	2.3101	2.3103-2.3111	2.0940	2.0943	2.0945	2.0934-2.0955	
	(58.684)		(58.677)	(58.682)-(58.702)	(53.188)		(53,200)	(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				Coded Blue					
of Skirt)	3.9994	3.9997) (101.592	3.9997) (101.592	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)	
W-1 64 65 6 44-				, ,		,	*,		
Clearance				Service Clearance					
Intake	0.0032	0.0032	0.0042	0.005	0.0023	0.0021	0.0027	0.001-0.003	
	(0.081)	(0.081)	(0.107)	(0.127)	(0.058)	(0.053)	(0.069)	(0.03)-(0.08)	
Exhauet	0.0048	0.0039	0.0048	0.005	0.0026	0.0030	0.0030	0.001-0.003	
	(0.122)	(0.099)	(0.122)	(0,127)	(0.066)	(0.076)	(0.076)	(0.03)-(0.08)	
Valve Spring Force				76-84 @ 1.82					
				(338)-(374)@(46.23)				
Intake	174.0	71	220.3	215-237 @ 1.39	88	85	81	95-105 @ 1 13/16"	
	(774)	(316)	(980)	(956)-(1054)@	(391)	(376)	(360)	(423)-(467)8(46.0	
				(35.31) 79-87 @ 1.68					
				(351)-(387)@42.67)					
Exhaust	177.4	69	219.4	215-237 @ 1.39	88	87	85	95-105 @ 1 13/16"	
	(789)	(307)	(976)	(956)-(1054)@ (35.31)	(391)	(387)	(378)	(423)-(467) @ (46.0	
Camshaft Lobe Lift									
Intake	0.188	0,235	0.233	0.245-0.250	0.230	0.227	0.228	0.227-0.2320	
	(4.78)	(5.97)	(5.92)	(6.22)-(6.35)	(5.84)	(5.77)	(5.79)	(5.77)-(5.892)	
Exhaus t	0.210	0.231	0.231		0.229	0.219	0.230	0.227-0.2332	
	(5.33)	(5.87)	(5.87)		(5.82)	(5.56)	(5.84)	(5.77)-(5.923)	
Market .									

Note: All measurements are averages expressed in inches and (mm) except Valve Spring Force [1b and (M-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.	% Outsi	Unleaded Gasoline	Station
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 Average	33	$\frac{19}{25}$	Ft. Lewis
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	re newro
Ford V-8, 400 CID					
CD7097	8	16	50		Ft. McCoy
CD7098	8	16	50		Ft. McCoy
CD 7099	6	16		38	Ft. McCoy
		Average	50	38	Tet necoy
AMC, 6 Cylinder, 232 CI	D				
CD0939	5	16	31		Ft McCom
CD0935	6	16	38		Ft. McCoy
CD0941	6	16		38	Ft. McCoy
- -	·	Average	35	38	Ft. McCoy
	0veral	1 Average	41	42	

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

Type Engine Serial Number AFLRL Number	Chrysl 07121303 1	07090311 3	8 CID 03223146 2 Unleaded	Jeep, 4 500283 6	Cylinder, 5003049 5	140 CID 5001675 4 Unleaded
Type Fuel	Gasohol	Ganoho1	Gasoline	Gasohol	Gasohol	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 Underside of				9.30	8.40	9.75
Intake Manifold	9.00	6.20	8.88			
Front Seal Housing	,,, ,	0.20	0.00	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	~ = -	7 77	~ ~
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	Chrysl	er V-8, 31	8 CID	Jeep, 4 Cylinder, 140 C			
Serial Number	02260516	12110971	01212997	251891	235875	235880	
AFLRI Number	11	12	10 Unleaded	7	9	8 Unleaded	
Type Fuel	Gasoho1	Gasohol	Gasoline	Gasohol	Gasohol	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 Underside of				9.75	9.29	7.50	
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	776	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		V-8, 400			ylinder,	
Vehicle Serial Number	CD-7097	CD-7098	CD-7099	CD-0935	CD-0939	CD-0941
AFLRL Number	13	14	15 Unleaded	18	16	17 Unleaded
Type Fuel	Gasohol	Gasohol	Gasoline	Gasohol	Gasohol	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	0.00	0.15	0.15			
Intake Manifold Oil Pan	8.99 9.34	9.15 9.40	9.15 9.54	9.60	9.60	9.17
Left Valve Deck	5.35	9.40	9.75	9.00	9.00	7.17
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	<u>9.60</u>	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	6.65 ⁴⁴ 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	4.71	5.37	5.56	8.00 8.56	9.50 8.28	$\frac{2.60}{6.06}$
Average	4.71	3.37	3.30	0.30	0.20	0.00
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.

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

M151A2 Jeep, 4-Cylinder, 140 CID Engines

AFLRL Carburetor Top	Number VLAI LAL AL DBRL	4***	5**	6**
Plat	¥		15	10
ā	DBRL	10		09
	BI* VLAL LAL AL DBRL BL	06	85	30
Top	I.A.	-	•	
Ventu	Ψľ	2	30	
ri	DBRL	S	40	10
	BI	06	30	96
				• •
Bott	IAL	100	10 30	20 40
om Pl	AL			
ate	VIAL LAL AL DBRL BL		09	40
		7	-	
н	TAL	25 2	01	_
30tto	LAL	20	٠,	. 01
n Ven	AL		2	70
turi	VLAL LAL AL DBRL BL	15	09	30
	BL	40	25	40

Chrysler V-8, 318 CID Engines

	Bottom Venturi	VLAL LAL AL DBRL BL VLAL LAL AL DBRL BL	10 10 10 30 40	20 30 30 20	10 10 70
	te	BRL BL			4
	Bottom Pla	LAL AL DI	25 35 20 20 50 20 25 5		9
		L VLAL	50 2	95 5	95 90
	urt	DBRL B	20 20	20 70	5 95
	Top Vent	VLAL LAL AL DBRL BL	25 35	10	
		BL VLAL			02
				0 30	10
	Top	VLAL LAL AL DBRL	75 25	20 50	10
AFLRL		Number VI.	1** 75	2***	3** 10

*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

MI51A2 Jeep, 4-Cylinder, 140 CID Engines

	BI	20		
nturi	DBRL	30		
m Ve	귛	20		2
Botto	Ĭ¥I		20	75
Bottom Venturi	VLAL		20	20
	BI	80		
late	VLAL LAL AL DBRL BL	10		7
Om P	V V	•		
Bott	[A]			18
	VLAL	5	100	80
	BL	85		
ırı	LAL AL DBRL BL	10		
Vent	VI.			85
Top	<u> </u>			10
	VLAL	5	100	2
	BL*	10		
ie e	VLAL LAL AL DBRL	10		5
Pla.	ĮĮ.	20		
Tor	¥		10	75
	VLAL	10	8	20
AFLRL Carburetor	Number	7	8 (Control) 90	6

Chrysler V-8, 318 CID Engines

	EL	30		20	
turi	VLAL LAL AL DBRL BL	10 30		15 25 40	
т Vел	AL			25	
Botto	IAL	07		15	
	VLAL	20			
	BL BL	25		30	
ate	DBRL	25		20 20 30 30	
om P1	¥.	25		20	
Bott	Ţ¥]	10		70	
	VLAL LAL AL DBRL BL	20 50 15 15 15 10 25 25 25 20 40			
		15		20	
Ï	VLAL LAL AL DBRL BL	15		10 10 10 70	
Ventu	¥	20		10	
Top	3	20		10	
	BL* VLAL	85	engine	80	
	Ыi	15		20	
Top	L LAL AL DBR		Did not accompany		
	VLAL	(10	D16		
AFLRL Carburetor	Number	10 (Control)		12	

*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

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

Ford V-8, 400 CID Engines

	12	10	09	
nturi	DBRL	20 10	70	
m Ve	VI.	20	20	
Botto	IAL	30 30		
	VLAL	30		
	BL		20	
late	VLAL LAL AL DBRL BL VLAL LAL AL DBRL BL		30 50 20	
om P.	VI.		30	
Bott	I¥I			
	VLAL	100		
	BI.		20	
ırı	VLAL LAL AL DBRL BL	20 80	30 70	
Ventu	ΨΓ			
Top	₹.			
	VLAL			
	BI.	8		
		10	20	eu
Pla	¥I.		40	ngin
Top	I¥I		40 40 20	lth e
	VLAL LAL AL DBRL		•	Not with engine
AFLRL Carburetor	Number	13**	14**	15

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

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

					<u></u>	TD
Engine Type/Station	Top	Тор	Bottom	Bottom		Unleaded
AFLRL Engine No.	Plate	Venturi	Plate	Venturi	<u>Gasohol</u>	Gasoline
Chrysler V-8/Ft. Belvoir	r					
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 Engi	lne				
12	9.000	8.750	7.250	7.000	32	
Jeep, 4 Cyl./Ft. Belvoin	r					
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 Carbureto	or with I	Engine				
AMC, 6 Cyl./Ft. McCoy		J				
16	7.000	9.750	+	++		
17 (C)	6.750	8.500	5.125	6.250		27
18 - No Carburetor	with Engi	lne				
	ŭ		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

^{*}O=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.
- o 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 Compression Ming Cape Top Button Tylinder Bore Dismeter Ton	0.041		0.030		Cylinder No. 3 0,030 0,030 0,030	7 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	0.030	187
	3.8767 3.8767 0.0011 0.0007	3.8771	3.8764 3.8764 0.0000 0.0002	3,8763	3.8764 3.8764 0.0004 0.0003	3.8761	3.8769 3.8770 0.0006 0.0002	3.8765 3.8766
	H 1.9987 1.9994	1.9988 8 8 1.9996	H 1,9989 2,0002	V 1.9989 2.0001	1.9986 1.9996	V 1.9985 1.9993	H 1.9984 2.0002	v 1.99883 8 8 1.9998
	0.234	6.222	0.230	0.215	0.237	0.232	0,222	0.229
Welve Stem to Guide Clearance	0.0061	0,0040	0,000.0	0.0054	0.0044	0.0056	0.0058	D.0035
	101	110	100	108 E	100	110	109	100
iston Avg. Diameter Middle and bottom of skirt	3.8736		3.8739		3.6737		3,8733	
	No. 1 H 2.2480 2 7.2526 2	2.2480 2.2529	NO. H 2.2484 P 7.2525	2 2.2484 2.2522	No. H 2.2484 P 7.2528	3 2.2484 2.2524		
			Manu	Manufacturer's Service Limits, Inches	Service L	dafte, Inc	hee	
	0.010-0.027 3.8753-3.8777 0.005 max 0.008 max 1.9982-1.9990	327 -8777 -9990 -9990	Camehaft Intake Exhaust Valve Stee Intake Exhaust Valve Sprivalve	Camehaft Lobe Lift Intake Exhaus Valve Stem to Guide Clearance Intake Exhaust Valve Spring Force (1b)	Clearance (1b)	0,2369 0,2330 0,0010-0,0025 0,0010-0,0035 132 at 1,505"	0025 0035 505" :-110	Piston Dismeter Main Bastings Journal Dismeter Shell Dismeter

2,2482-2,2490 3.8741-3.8765

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

										98.402-98.463 57.104-57.125 57.135-57.180
			7 98.466 98.463	50.762 50.795	5.82	0.140	180			Piston Diameter Main Bearings Journal Diameter Shell Diameter
		0.76	98.473 98.475 98.476 0.015	30.759 50.805	3.64	0.147	1897	98.382	3 57.109 8 57.211	mite, mm 6.017 5.918 0.025-0.064 0.025-0.089 887 at 38.23 mm
-			98.461 98.453 98.463	50.762 80.762	5.89	0.142	7 7 7 8 8 7		H 57.109 3 57.221 3	
Cylinder No.	} ;	0.76	8 98.471 8 98.461 8 98.463 0.010 0.008	2 50.764 3 50.787	F.02	- 5.11.2	1084	98.392	li i	Manufacturer's Service Limits, Camehaft Lobe Lift 6.017 Entant Exhaust Valve Stem to Guide Clearence 0.025 Inteke Pares Pares (N-m) 587 at Mear
5/11			7 98.468 1 98.458 3 98.468	2 50.772 5 50.803	2 99.5 1	- 0.137	47.2		No. 2 9 57.109 4 57.206	Manufacturer's Service Camebaft Lobe Lift Intake Exhaust Valve Stem to Guide Clear Intake Intake Exhaust Valve Spring Porce (N-m)
		0.76	98.468 98.468 98.461 98.463 0.000	50.772 F 50.805	5.84	- 0.152	1 587	98.397	80. 109 57. 109 57. 214	Camehaft Intake Enhaus Valve St. Intake Exhaus
			7 98.458 98.478 98.461	80.770 B 50.790	- 15.	0.102	£89			0.25-0.69 90.43-90.494 0.13 max 0.20 max
	:	2.0	98.486 98.468 98.468 0.028	80.767 F 50.785	5.94	0.135	1 944	98.389	100 1 V V V V V V V V V V V V V V V V V	0.25-0.69 98.433-98.494 0.13 max 0.20 max
	Conpression hing Caps	Top Lotten	Cyllader Bore Diameter Top Middle Bottom Out-of-round Taper	Consecting Rod Bearings Journal Dismeter Shell Dismeter	Compute Lobe Life	Valve Stem to Guide Clearence	Value Spring Porce (H-m)	Piston Avg. Diameter Hiddle and bottom of skirt	Main Bearings Journal Dismeter Shell Dismeter 77.216	Compression Ming Caps Top Bottom Cylinder Bore Dimeter Cut-of-round Taper Journal Dieseter

d_ - Longitudinal, T - Transversal, H - Horizontal, V - Vertical, P - Porward, B - Back, I - Intake, E - Exhaust
+ - Hessuresants are in m

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

Commonent				9114	Cylinder No.			4
Compression Ring Gaps							1	
lop Bottom	0.030		0.044		0.038		0.037	
Cylinder Bore Diameter Top Middle Bottom Out-of-round Taper	1,8787 3,8787 3,878 0,0008	1.8795 3.8789 3.8790	1. 3.8789 3.8784 3.8788 0.0005	3.8794 3.8787 3.8787	3.8774 3.8777 3.8774 0.0001	7 3.8775 3.8774 3.8777	3.8783 3.8780 3.8782 0.0005	1 3.8788 3.8783
Connecting Rod Bearings Journal Dismeter Shell Dismeter	H 1.9985 F 2.0006	v 1.9985 B 2.0010	H 1.9986 F 2.0010	v 1.9987 B 2.0008	H 1.9985 F 2.0010	v 1.9985 B 2.0010	1.9984 F. 2.0004	V 1.9984 B 2.0008
Comshaft Lobe Lift	0.230	0.230	0.230	0.233	0.236	0.230	0.230	E 0.228
Valve Stem to Guide Clearance	0.0028	E 0.0027	0.0026	0.0022	0.0028	E 0.0029	0.0025	E 0.0029
Valve Spring Force (1b)	101	E 108	101	E 110	1 100	E 108	108	108
Pleton Avg. Diemeter Middle and bottom of skirt	3.8745		3.8745		3.8746		3.8742	
Journal Diameter H 2.2465 Shell Diameter F F 7.2512	No. 1 V 5 2.2480 2 2.2515	1	No. H 2.2485 P 2.2510	No. 2 V 2.2484 B 2.2509	1 16 46	No. 3 H 2.2486 2.7 F F 2.2518 2.7	2,2486 2,2486 2,2520	
			He H	Manufacturer's Service Limits, Inches	Service 1	imits, Inc	흵	
Compression Ming Gaps Top Bottom Syllader Bots Diameter	0.010-0.027	27	Camehaft I Intake Exhaust	Camahaft Lobe Lift Intake Exhaust Valve Stem to Guide Clearance	Clearance	0.2369		Piston Dismeter Main Bearinge Journal Dismeter Shell Dismeter
Out-of-round Taper Compering Red Bestage Journal Dismeter Shell Diameter	0.005 max 0.008 max 1.9982-1.9990 1.9992-2.0010	9990 0010	Intake Exhaust Valve Spr	Intake Exhaust Valve Spring Force (1b)	(1P)	0.0010-0.0025 0.0010-0.0035 132 at 1.505" wear limit-110	.0025 .0035 .505" It-110	

b. Congitudinal, T = Transversal, H = Horitontal, V = Vertical, P = Porverd, B = Back, I = Intake, E = Exhaust

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2,2482-2,2490 3.8741-3.8765

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

•				Cylinder No.	er No.			
Component							1	
Compression Ring Caps Top Bottom	0.99		1.04		0.97		0.94	
Cylinder Bore Diameter Top Hiddle Botton Out-of-round Taper	98.519 98.496 98.506 0.020	7 98.539 98.524 98.527	98.524 98.511 98.522 0.013	7 98.537 98.519 98.519	98.486 98.494 98.486 0.003	7 98.486 98.494	98.509 98.501 98.506 0.013	T 96.522 98.506 98.509
Consecting Bod Bearings Journal Diameter Shall Diameter	80,762 50,815	v 50.762 B 50.825	H 50.764 F 50.825	50.767 8 50.820	H 50.762 F 50.825	V 50.762 B 50.825	H 50.759 F 50.810	\$6.739 8 \$6.820
Comstaft Lobe Lift	3.8.2	5.84	5.84	5.92	5.99	5.84	5.84	5.79
Valve Stem to Guide Clearence Valve Spring Force (H-m)	1 0.071 176	087 3 690.0 3	0.066 1 1 476	0.056 7.056 789	0.071 1.72	0.074 0.074	0.064 1 480	2.074 2.074 280
Piston Avg. Diameter Hiddle and bottom of skirt	.rt 98.412		98.412		98.415		98.405	
Main Bearings Journal Dismeter Shell Biameter	No. 1 No. 1 57.112 57.1100 57.1180	1	H 57.112 57.175	No. 2 V 57,109 F 57,173	منا تمنا ا	H 57.144 57. 57.196 57.	3 v 57.144 87.201	
			Menu	Manufacturer's Service Limits, mm	Service 1	Linits, mm		
Compression Ring Caps Top Bottom Spilinder Nore Dismeter Out-of-round Taper Commercing Bod Bearings Journal Dismeter Shall Dismeter	0.25-0.69 98,433-98,494 0.13 max 0.20 max 50.754-50.775 50.780-50.825	.494	Camphaft Intake Exhaust Valve Ster Exhaust Valve Spr	Camehaft Lobe Lift Intake Exhaust Valve Stem to Guide Clearance Intake Exhaust Valve Spring Force (M-m)	Clearance (N-m)	6.017 5.918 0.025-0.064 0.025-0.089 587 at 38.23 mm	164 189 1. 489	Piston Dismeter Main Bearings Journal Dismeter Shell Dismeter

57,104-57,125 57,135-57,180 98,402-98,463

ENGINE COMPONENTS MEASUREMENTS
FT. RFI VOTE VA

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

0,0001 0,0001 1,9985 1,9966 1,9966 2,0002 2,0003 2,0008 0,231 0,241 0,241 0,241 0,241 109 109 111 109 109 111 109 109 111 109 109 111 2,8727 180,3 18727 2,844 2,2463 2,2511
E I E I E 0.237 0.231 0.241 E I I E I 0030 0.0028 0.0029 0.0028 0 110 109 109 0 110 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 109 109 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 <t< td=""></t<>
E I E I
E I E I 0 110 109 109 3.8727 3.8727 3.8727 V 111 No. 3 V 2.2484 2.2483 B 2.2512 2.2511 2.2512 2.2511
3,8740 No. 3 V No. 3 V Z.2484 Z.2484 Z.2484 Z.2585 S.29 Z.2512 Z.25
V II No. 11 1485 2.22484 P F P P P P P P P P P P P P P P P P P

#L = Longitudiani, T = Transversal, H = Horizontal, V = Vertical, P = Forward, B = Back, I = Intake, E = Exhaust

3.8741-3.8765 2.2482-2.2490 2.2494-2.2512

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

Composes			2	Cylind	Cylinder No.		7			
Compression hing Caps Top Bottom	0.56		0.58 0.71		0.53		0.64			
Cylinder Bore Diameter Top Niddle Bottom Out-of-round Taper	1. 98.463 98.471 98.473 0.008	7 98.455 98.443	P8.466 98.461 98.468 0.005	T 98.463 98.455 98.471	98.463 98.455 98.463 0.008	7 98.453 98.463	98.445 98.440 98.448 0.003	7 98.448 98.440 98.443		
Consecting Bod Bearings Journal Diameter Shell Diameter	H 50.767 F 50.813	80.767 80.820	H 50.764 F 50.810	50.764 B 50.803	H 50.764 F 50.815	V 50.762 B 50.805	H 50,764 50,813	V 30.764 50.820		
Comehaft Lobe Lift	1 6.15	6.02	6.12	5.87	1 6.02	5.87	6.12	E 5.94		
Valve Stem to Caide Clearance	0.071	0.084	10.064	0.076	1,010	0.074	0.071	0.079		
Value Spring Porce (H-m)	194	3 587	1 485	789 789	189	185 185	1 485	F 494		
Piston Avg. Disseter Middle and botton of skirt	98.389		98.389		_		98.367			
Main Bearings Journal Diameter Shell Diameter 77.160	No. 1 V 4 57.109 0 57.178	1	No. 2 H 57.109 57. F 57.170 57.	57.112 B 57.173	1 15 15	No. 3 H V 57.109 57.106 F B B 57.180 57.178	57.136 F F F F F F F F F F F F F F F F F F F	No. 4	Mo. 5	Ho. 6
			Manu	facturer's	Manufacturer's Service Limits,	inite, mm				
Compression Ring Caps Top	0.25-0.69		Camshaft Lobe Lift Intake	Jobe Lift		6.017		Piston Diameter Main Bearings		98.402-98.463
Sottom Cylinder Bore Dismeter Onton Coronad	98.433-98.494	767	Exhaust Valve Ster	to Guide	Exhaust Valve Stem to Guide Clearance		:	Journal Diameter Shell Diameter		57,104-57,125 57,135-57,180
Connecting Red Bearings Journal Disputer	0.20 max 0.20 max 50.754-50.775	375	inteke Exhaust Valve Spri	Anteke Exhaust Valve Spring Force (N-m)	(H-B)	0.025-0.064 0.025-0.069 587 at 38.23 mm	.23 .489			
SPELL FLAMETER	50, 750-50	.823								

= Longitudinal, T = Transversal, H = Horizontal, V = Vertical, P = Porward, B = Back, I = Intake, E = Exhaust
* = Meserraments are in am

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

,								Cylin	Cylinder No.							i
Component Compression Ring							7									
Gapta Top Bottom	0.030		0.029		0.028		0.032		0.029		0.028		0.026		0.026	
Cylinder Bore Diameter Top Middla Bortom Out-of-round Taper	3.9114 3.9111 3.9110 0.0006	T 3.9120 3.9112	3.9114 3.9114 3.9115 0.0004 0.0001	3.9118 3.9110 3.9112	3.9118 3.9113 3.9111 0.0010	3,9108 3,9107 3,9111	3.9121 3.9110 3.9112 0.0011	1 3.9110 3.9106 3.9112	3.9118 3.9115 3.9114 0.0011	3.9107 3.9106 3.9113	3.9122 3.9118 3.9118 0.0012	3.9110 3.9106 3.9113	3.9126 3.9122 3.9122 0.0012	3.9114 3.9105 3.9104	3.9124 3.9119 3.9118 0.0001	3.9123 3.9116 3.9118
Consecting Rod Bearings Journal Diameter Shall Diameter	7.1237 F. 1265	2.1236 8 2.1263	2,1234 F 2,1265	V 2.1232 B 2.1261	H 2.1235 2.1269	V 2,1238 B 2,1267	H 2.1233 F 2.1268	V 2.1236 B 2.1268	H 2.1233 P 2.1262	v 2.1235 B 2.1266	H 2.1234 P 2.1268	V 2.1236 B 2.1266	2.1233 2.1263	V 2.1236 2.1262	H 2.1237 F 2.1262	2.1235 8 2.1265
Camabaft Lobe Lift	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 Ouide Clearance	0.0026	0.0020	0.0021	E 0.0024	0.0024	0,0025	0.0023	E 0.0026	0.0024	0.0021	0.0020	0.0025	0.0026	0.0022	0.0024	E 0.0025
Valve Spring Force (1b)	1 84	3 O G	1 00	E 78	1 09	74	I 78	3 94 19	1 9.	FI 080	77	80 E	78	3 OS	1 09	2 8/
Piston Avg.Diameter Hiddle & bottom of skirt	3.9105		3.9105		3.9097		3.9102		3.9088		3.9086		3,9096		3.9086	
Main Bearings Journal Diameter Shell Diameter	144	Na. R 2.5000 P 7.5022	2.5019	2.5004 2.5004	No. 2 2.5000 2.5023		No. 3 H 2.4998 2 F F 2.5017 2	3 2.4999 2.5026	H 2.4994 P 2.5023	No. 4 2.4995 2.5023		No. 3 2.4996 2.5025	2.4999 2.5027			
					ž	ufacture	Manufacturer's Service Limits, Inches	vice Limi	te, Inch	밁						
Compression Ring Caps Top Buttom Cylinder Bore Dismeter Out-of-round Taper Taper Connecting Rod Bearing, Journal Dismeter Shell Dismeter	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.00 4.00	0.010-0.020 3.9100-3.9120 0.0050 mex 0.010 mex 2.1240-2.1250 2.1243-2.1275	g 9 <u>≈</u>	Camehaft Lo Intake Exhaust Valve Stem Intake Exhaust Valve Sprir		be Lift to Guide Clearance ig Force (1b)		0.249 0.267 0.001-0.017 78-88 1b at	0,249 0,267 0,001-0,017 78-88 lb at 1-11/16"	조 문	Pteton Diameter Min Bearings Journal Diameter Shell Diameter			3,9085-3,9115 2,4995-2,5005 2,5000-2,5030	3.9215 2.5005 2.5030

e. - Longitudinal, T = Transversal, H = Horizontal, V = Vertical, F = Porvard, B = Back, I = Intake, E = Exhaust + = Measurements are in an

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

Component				2]		11/0	Cylinder No.							
Compression Ling Caps Top Bottom	0.76		0.74		0.71		0.81		0.74		0.71		99.0		0.66	
Cylindar Bore Diameter Top Middle Bottom Out-of-round Taper	99.350 99.342 99.339 0.015	7 99.365 99.344 99.350	99.350 99.350 99.352 0.010	7 99,360 99,339	99.360 99.347 99.342 0.026	7 99.334 99.342	99.367 99.339 99.344 0.028	7 99,339 99,329	1 99.360 99.352 99.350 0.028	7 99.332 99.347	99.370 99.360 99.352 0.031	7 99.339 99.347	99.380 99.370 99.372 0.030	99.350 99.327 99.324	99,362 99,362 99,360 0,003	99.372 99.355 99.360
Consecting Eod Bearings Journal Dismater Shell Diameter	H 53.942 F 54.013	53.939 54.008	H 53.934 F 54.013	V 53.929 8 54.003	H 53.937 54.023	V 53.945 8 54.018	H 53.932 F 54.021	V 53.939 8 54.021	H 53.932 F 54.005	V 53.937 54.016	н 53.934 7 54.021	53.939 54.016	н 53.932 г 54.008	53.939 54.005	83.942 84.005	53.937 54.013
Comehaft Lobe Lift	6.15	6.55	1 6.12	E 6.58	6.17	E 6.58	1 6.07	E 6.68	1 6.15	E 6.50	1 5.99	£ 6.55	6.03	6.58	51.5	5.45 6.45
Valve Stem to Guide Clearance	0.066	0.051	1 0.053	E 0.061	1 0.061	0.064	1 0.058	E 0.066	I 0,061	0.053	0.051	£ 0.064	0.066	0.056	190.0	20.0
Valve Spring Force (M-m)	1 12	356	. 356	347	1 356	329 E	34,1	338	338	356	329	356	11. I	356	138	3/2
Piaton Avg. Dissets: Middle and botton of shirt	er 99.327		99.327		99,306		99,319		99.284		99.278		99,304		99.278	
Mais Bearings Journal Dismeter Shell Dismeter	य थ।	No. B 63.500 F 63.556	1 63.495 8 63.548	63.538	No. 2 V 0 63.500 63.558		H 63,495 F 63,543	3 V 63.497 B 63.566	63.485 63.558	No. 4 V 63.487 63.558		No. H 63,490 F 63,564	5 V 63.497 B 63.569			
					킾	nufactur	er's Ser	Manufacturer's Service Limits, mm	ite, m							
Compression Ming Caps Top Bottom	•	0.0	0.25-0.51		Camehaft Intake Exhaust	Camehaft Lobe Lift Intake Exhaust	1ft		6.325 6.782		Pisto Main Jou	Piston Diameter Main Bearings Journal Diameter	er eter		99.276-99.352 63.487-63.513	99.352
Cylinder Bore Dismeter	ı ter	8 2	99.314-99.365 0.13 max	365	Valve St	ten to G	Valve Stem to Guide Clearance Intake		0.03-0.43		She	Shell Dismeter	ter Ter		63.500-63.576	63.576

		CAMBRILL LODG LIFT	
104	0.25-0.51	Intake 6.	6.325
Potte		Exhaust	6.782
Cylinder Bore Dissetter	99.314-99.365	Valve Stem to Guide Clearance	
Out-of-round	0.13 max	Intake	0.03-0.43
Toper	0.25 max	Exhaust	
Commecting Rod bearings		Valve Spring Force (N-B)	347-391 @ 42.86
Journal Diameter	53.950-53.975		
Shell Diester	33.962-54.039		

B. - Longitudiaal, T - Transversal, H - Horizontal, V - Vertical, F - Porusid, B - Back, I - Intake, E - Exhaust

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

Component				2				2110	Cylinder No.			9				
Top Top	0.028		0.028		0.030		0.032		0.028		0.028		0.028		0.028	
Diameter Diameter Top Middle Buttom Out-of-Found Toper	3.9116 3.9110 3.9110 0.0003	3.9111 3.9111 3.9110	3.9123 3.9122 3.9121 0.0001	3.9124 3.9113 3.9115	3.9119 3.9112 3.9108 0.0001	7.3.9118 3.9112 3.9110	3.9122 3.9117 3.9117 0.0009	1.3.9113 3.9109 3.9115	1.0006 3.9116 3.9111 0.0006 0.0006	1.3.9110 3.9104 3.9109	1.9123 3.9123 3.9119 0.0007 0.0008	7.9116 3.9112 3.9117	3.9121 3.9121 3.9118 0.0010	1.3.9111 3.9102 3.9101	3.9120 3.9114 3.9113 0.0003	3.9123 3.9116 3.9117
Consecting Rod Bearings Journal Diameter Shell Diameter	1.1237 7.1237 7.1262	V 2.1237 B 2.1258	H 2.1236 2.1261	V 2.1237 B 2.1261	H 2.1239 F 7.1258	V 2.1240 B 2.1258	H 2.1240 F 2.1267	2.1240 B 2.1261	H 2.1238 P 2.1260	2.1241 B 2.1260	2.1239 P. 2.1264	2.1238 2.1238 2.1260	H 2.1238 F 2.1269	V 2.1238 B 2.1269	2.1239	2.1239 2.1262
Camebaf t Lobe Liff t	0.240	0.254	0.236	E 0.256	0.238	0.250	0.233	E 0.239	0.239	0.255	0.236	0.257	0.235	E 0.246	0.237	0.255
Valve Stam to Guide Clearance	0.0022	E 0.0026	0.0026	0.0020	1 0.0025	E 0.0021	I 0.0026	0.0024	0.0020	0.0023	0.0022	E 0.0026	0.0024	0.0021	0.0022	0.0023
Valve Spring Force (1b)	2	78	1 48	F 78	1 90	980 PR	1 2/	E 82	1 82	3 78	1 8/	3 08	1 18	7.	1 8/	2 Q
Piston Avg. Diameter Middle & bottom of skift	3,9092		3.9091		3.9081		3.9090		3,9083		3.9084		3.9095		3.9093	
Main Bearings Journal Diameter Shell Diameter	### ## 	No. H 2.5000 F F 7.5022	2.5003 2.5023	I M M	No. H 2.4996 F 7.5023	2 V 2.4994 2.5022	• • •	No. H 2.4992 F 7.5037	. 3 2.4994 2.5022	11 1	N 2.4994 F 7.5034	No. 4 2.4995 2.5035		2.4995 2.4995 2.5025	No. 5 7.4996 2,5028	19 18
Compression hing Cape Top Bottom Cylinder Bore Diameter Out-of-round Taper Commercing Rod Bearings Journal Diameter Shell Diameter		0.010-0.020 3.9100-3.9120 0.0030 max 0.010 max 2.1240-2.1250	10 1120 250 275	U \$ \$	Cambhaft Lo Intake Exhaust Valve Stem Intake Exhaust Walve Sprin	Manufacturer', Camehaft Lobe Lift Intake Exhaust Valve Stem to Guide Clee Intake Exhaust Valve Spring Force (1b)	ianufacturer's Servibe Lift to Guide Clearance ig Force (1b) 78-8	Manufacturer's Service Limits, Inches obe Lift 0.249 0.267 to Guide Clearance 0.001-0.017 ng Force (lb) 76-88 lb at 1-11/16"	Limite, Inche 0.249 0.267 0.001-0.017 et 1-11/16"	Inches 0.017	4. X	Piston Dismeter Main Bearings Journal Dismete Shell Dismete	ston Diameter in Bearinge Journal Diameter Shell Diameter	<u>u</u>	3.90 2.69 2.50	2,4995-2,9015 2,4995-2,5005 2,5000-2,5030

⁶L = Longitudinal, T = Transversal, H = Horisontal, V = Vertical, P = Porward, B = Back, I = Intake, E = Exhaust
• = Heasurements are in an

ENGINE COMPONENTS MEASUREMENTS

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

Composest		_						4 6714	Cylinder No.							
Compression Ring Caps Top betton	0.71+ 0.81		0.71		0.76		0.81 0.81		0.71		0.71		0.71		0.71	
Cylinder Bore Disserter Top Middle Bottod Outcof-round Taper	99.355 99.335 99.334 0.008	99.347 99.342 99.339	1 99.372 99.367 0.003 0.005	1 99.375 99.347 99.352	1 99.362 99.334 0.002	7 99.360 99.346	99.370 99.357 99.344 0.023	T 99.347 99.337 99.352	1 99,355 99,342 99,334 0,016	T 99.339 99.337	1 99.372 99.362 99.352 0.017	7 99.355 99.357	1 99.367 99.360 99.357 0.025	1 99.342 99.319	1 99.365 99.347 0.007 0.018	1 99.372 99.355
Consecting Rod Bearings Journal Diameter Shell Diameter	53.942 F 54.005	53.995	53.939 54.003	V 53.942 B 54.003	H 53.947 F 53.995	V 53.950 B 53.995	H 53.950 F 54.018	53.950 8.003	H 53.945 F 54.000	V 53.952 B 54.000	53.947 54.011	V 53.945 B 54.000	H 53.945 F 54.023	53.945 53.945 54.023	H 53.947 F 54.008	53.947 54.005
Cambelt Lobe	I 6.10	E 6.45	5.99	8.50 6.50	6.03	6,35	3.66	E 6.07	10.9	6, 48	1.91	6.53	5.97	6.25	10.9	2 9
Valve Stem to Guide Clearance	0.056	2 0.066	1 0.066	E 0.051	10.064	E 0.053	1 0.066	0.061	0.051	E 0.058	1 0.056	990°0	0.061	0.053	0.056	0.058
Valve Spring Force (H-m)	1 356	175	37.4	347	1 356	356	334	365	365	374	10 I	336	360	343	14	336
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 Journal Diameter Shell Diameter		63.500 63.550	1 V 63.508 8 63.558	63.558	No. 2 63.485 63.556		No. H 63.480 F 63.594	3 V 63.485 63.556	63.586	63.589		No. H 63.487 F 63.564	5 V 63.490 B 63.571			
	1				최	Hanufacturer'	er's Ser	Manufacturer's Service Limits, am	ite, mm							
Top Notice Cylinder Doron Disserer Out-of-round Taper Isper Journal Disserer Shell Disserer		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0.25-0.51 99.314-99.365 0.13 mex 0.25 mex 53.950-53.975 53.962-54.039	35 SS 39	Intake Exhause Valve Stem Intake Exhaust	pring Po	Interest Covering Exhaust Valve Spring Force (H-m)	rance	6.325 6.782 0.03-0.43 347-391 @ 42.86 mm	42.86		First Disserer	France Jameter Journal Dismeter Shell Dismeter		63,487-63,513 63,500-63,576	63.513 63.576
•																

el. = Longitudinal, T = Transversel, H = Horizontal, V = Vertical, P = Porusid, B = Back, I = Intake, E = Exhaust + • Measurements are in ma

ENGINE COMPONENTS MEASUREMENTS

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

								Cylin	Cylinder No.							
10000				~										_		
Compression hing Caps Top Bottom	0.039		0.032		0.024		0.027		0.022 0.026		0.023		0.024		0.031	
Cylinder Bore Diameter Top Middle Bottom Out-of-round Taper	1.9119 3.9107 3.9107 0.0008	3.9112 3.9111 3.9110	3.9109 3.9108 3.9107 0.0003	7 3.9106 3.9102 3.9102	1.9119 3.9119 3.9110 0.0014	1.9105 3.9105 3.9105	3.9115 3.9110 3.9108 0.0011	T 3.9104 3.9101 3.9106	3.9118 3.9112 3.9108 0.0011	7 3.9107 3.9102	3.9117 3.9112 3.9112 0.0010	7.3.9107 3.9100 3.9107	3.9119 3.9115 3.9111 0.0016	1 3.9103 3.9105 3.9102	3.9116 3.9116 3.9108 0.0010	1.9106 3.9114
Consecting Rod Bearings Journal Dissect Shell Dissect	H 2.1238 F	V 2.1239	H 2.1237	2.1235	H 2.1237	2.1238	H 2.1235	le le		æ		وا		V 2.1237	2.1235	v 2.1235
Comehaft lobe 14ft	L	2	2.1270	2.1272	2,1261	2.1262	150	Ĺ.	2.1276	2.1270	2.1268	2,1260	2.1266	2.1267	2.1262	2.1265
	L	0.262	~	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 Stam to Guide Clearance	0.0022	0.0021	0.0023	0.0020	0.0023	E 0.0024	0.0024	E I 0.0026 0.0023		0.0025	1 0.0020 0.0024	1	0.0021	0.0021	0.0026	0.0028
Valve Spring Force (1b)	I 69	79	1 08	78	1 78	3 08	1 2	F 24	1 84	78 78	1 08	2 79 18	1 64	78	I 08	1
Piston Avg. Dismeter Middle & bottom of skirt	r 3.9091		3.9092		3.9083		3.9082	.,	3.9086		3.9094		3.9095		3,9091	
Mais Bearings Journal Dismeter Shell Dismeter		2.1992 2.5022	1 2.4955 8 2.5026	2.5028	No. 2 2.4994 2.5027		، ، أو	V 4995 B 5045	No. 1.4995 2.5024	2.4997 2.5024		، ، اؤ	5 2.4992 8 2.5023			
					툂	ufacture	Manufacturer's Service Limits, Inches	ice Limit	Inch.	2)						
Compression Ming Caps Force Bottom Cylinder Bote Dismater Connecting Bod Bearings Journal Dismater Shell Dismater		2.2 2.2 2.12	0.010-0.020 3.9100-3.9120 0.0050 max 0.010 max 2.1240-2.1250 2.1245-2.1275		Camahaft Lobe Lift Intake Exhaust Valve Stem to Guide Cla Intake Exhaust Exhaust Valve Spring Force (1b)	Camehaft Lobe Lift Intake Exhaust Valve Stem to Guid Intake Exhaust Exhaust Valve Spring Porce	Lift Guide Clearence 'orce (1b)		0.249 0.267 0.001-0.017 78-88 1b at 1-11/16"	7 1-11/10	2 8	Pfeton Diameter Main Bearings Journal Diameter Shell Diameter			3.9085-3.9115 2.4995-2.5005 2.5000-2.5030	.\$115 .\$003 .\$030

| all pagitudinal, T = Itansversal, H = Horisontal, V = Vertical, P = Porverd, B = Back, I = Intake, E = Exhaust

 Measurements are in ms

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

Composes								Ç11	Cylinder No.							
								1		2		6		-		
setion Ring			,													
no 1 og	0.84		0.81		0.61		0.69		0.56		0.58		0.61		0.79	
Cylinder Bore Diemeter		۰		•	•	•	•	•			;		•		: :	
Top	.362	ŧ	99.337	99.329	99.362	99.327	99.352	99.324	7 00	7 00	7	1	-	-	7	•
	. 332	99.342	99.334	99.319	99.347	99.314	99.339	99.317	99.344	99.319	99,344	99.332	99.362	99.322	99.355	99.329
f-round			0.008	410.46	0.035	99.327	99,334	99,329	99.334	99,342	99.342	99,332	99.342	99,319	99.334	99,350
14041	0.030		0.005		0.023		0.018		0.026		0.025		0.040		0.026	
Consecting had bearing		:	:												0.021	
	12	12	53,942	53.937	53.942	53.945	53.937	51.010	41 04.5	V V	# 6	2	=	>	×	>
	54.018 5	34.016	54.026		54.003			100	2		23.942	53.939 B	53.942 P	l	4	53.937
Cambbelt Lobe Lift		•	-		,			170.17	140.40	24.026	54.021	24.000	54.016	\$4.018	34.003	34.013
	6, 10		1	6.65	6.12	6.38	2029	E 6.71	707	B 7	-	2	- 1	2	1	~
Valve Stan to									;	ì	66.6		6.12		6.07	6.02
Culde Clearance	0.036 0	0.053	0.058	0.051	1000	300	1	2	-	a.	1	N.	-	M	⊢	
Valve Spring										1	0.031	L	0.053	5	2.066	0.071
3	369	Tr.	- 1	26.7E	1	7	-	2		6 4)	-	a	-	•		•
Ĩ								347	74.	347	326	Ì	E E	ĺ	38	360
Middle 6 bottom of shirt	99.291	•	99.294		99.271	•	950									
Main Bearines		•					997.66		99.278		99.299		106.96	•	99.291	
Journal Disserer	=	وٰ ا	-	¥	No. 2		No. 3	-	ž	No. 4	ſ	No. S				
Shell Disserer	63.556		63.386 63.566	63.485 F 63.571	63.485 63.569			63.487	63.487	63.492	is is		63.480 B			
					2	Manufacturer's Service Limits, ma	's Servi	ce Limit	, e.) ; ;			0000			
Compression Ming Caps Top		0.25-0.51	0.51	,	Lamehaft	Camehaft Lobe Lift	ي ا	;			Piston	Piston Diameter		•	99.274.00.352	32
Cylinder Fore Disserer	_	18.66	99.314-99.365		Exhaust Valve Stem		to Guide Clearance		6.782		Metn Be Jourr	Main Bearings Journal Diameter	ter	· •	63.487-63.513	5 13
Taper Connection Bod Bearings	,	0.13 Ex	ĔĔ		Intake Etheust				0.03-0.43		T e uc	Shell Disseter	<u> </u>	•	3,500-63	.576
Journal Diameter Shell Diameter	.	53.95(53.950-53.975		alve Spr	Valve Spring Force (N-m)	(N-B)	347	-391 6	347-391 @ at 42.86	9					

4L - Longitudiadi, T - Transversal, H - Horizontal, V - Vartical, P - Perward, B - Back, I - Latake, E - Exhaust

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

			Cylinder No.	r No.		j		
Component	-		7		1	3	1	
Compression Ring Caps Top Bottom	0.039 0.071	0.056		0.058		0.056		
Cylinder Bore Disseler Top Niddla Bortos Out-of-rousd Taper	1,8784 3,8794 3,8794 3,8776 3,8773 3,8773 0,0010 0,0021	1. 3.8783 3. 3.8769 0.0020 0.0014	1.8803 3.8785 3.8775	3.8783 3.8778 3.8770 0.0015	T 3.8768 3.8777	1,8779 3,8774 3,8767 0,0014 0,0012	T 3,8793 3,8773	
Connecting Rod Bearings Journal Dismeter Shall Dismeter	H V 1.9987 1.9988 F B B 2.0022 2.0016	H 1.9987 F F 7.0018	1,9987 B 2,0021	H 1.9987 7 2.0020	V 1.9987 8 2.0021	H 1.9687 F 2.0018	V 1.9966 B 2.0019	
Camabatt Lobe Lift	1 E 0,204 0,235	0.225	0.232	0,232	0,236	0,239	0.234	
Valve Stem to Guide Clearance	1 0.0053 0.0059		0.0058	0.0053	0.0058	0.0053	0.0060	
Valve Spring Force (1b)	1 108 104	101	E 107	108	108	TIO	107	
Piston Avg. Diameter Middle and bottom of skirt	3.8740	3,8738		3.8742		3,8737		
Main Bearings Josinal Diameter Shell Diameter	No. 1 H V 2,2484 2,2485 F B 2,2513 2,2511	1 1 2 1 2	H 2.2484 F 2.2534	No. 2 V 2.2485 B B 2.2530		H 2.2484 7.2525	2.2484 2.2524	
		Ē	Manufacturer's Service Limits, Inches	Service !	Limite, Inc	thes		
Compression Ring Caps Top Bottom (y)linder fore Diameter Out-of-round Taper Comsecting Rod Bearings Journal Diameter Shell Diameter	0.010-0.027 3.8753-3.8777 0.005 max 0.008 max 1.9882-1.9990 1.9992-2.0010	Camshaft Intake Intake Exhaust Valve Stee Intake Exhaust Valve Spriv	Camehaft Lobe Lift Intake Exhaust Walve Stem to Guide Clearance Intake Exhaust Valve Spring Force (1b)	e Clearand	0.2369 0:2330 0.0010-0.0025 0.0010-0.0035 132 at 1.505"	.0025 .0035 .505" .t-110	Piston Diameter Main Bearings Journal Diameter Shell Diameter	

- Longitudisal, T = Transversal, H = Horizontal, V = Vertical,
P = Porward, B = Back, I = Intake, E = Exhaust
+ • Measuremente are in m

2,2482-2,2490 3,8741-3,8765

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

Component				Cylind	Cylinder No.				
Compression Ming Caps Top Bottom	0.99 ⁺ 1.80		1.42		1.47		1.42		
Syliader Bore Dismeter Top Middle Mottom Out-of-round Taper	98.511 98.491 98.458 0.026	7 98.537 98.483	28.509 98.514 98.473 0.051	98.560 98.514 98.489	1 98.509 98.496 98.476 0.038	T 98.471 98.494 98.473	1 98.499 98.486 98.468 0.035	7 98.506 98.483	
Consecting Rod Bearings Journal Disseter Shall Disseter	H 50.767 50.856	v 50.770 B 50.846	H 50.767 F 50.846	V 50.767 B 50.853	H 50.767 F 50.851	50.767 50.853	H 50.767 F 50.846	V 50.770 50.848	
Comehaft Lobe Lift	5.18	5.97	5.72	5.89	5.89	5.99	10.9	5.94	
Valve Stem to Guide Clearance	0.135	0.150	0.130	E 0.147	0.135	0.147	0.135	0.152	
Talve Spring Force (H-m)	1 084	E 463	476	476	1 180	480	1 687	3/2	
Piston Avg. Diameter Middle and bottom of skirt	98.400		98.395		98.405		98.392		
Mais Bearings Journal Dissets: 87,109 Shell Dissets: 77,163	Mo. 1 V V O9 57,112 83 57,178	1	No. 2 H 57.109 57 F 57.236 57	57.112 B 57.226	21 21	No. 3 H 57.109 57. 7.214 57.	3 V 57.109 8 57.211		
			Manu	Manufacturer's Service Limits, ma	Service L	inite, me			
Compression Ring Cape Top Bottom Outcof-round Taper Consecting Red Bearings Journal Diameter Shell Diameter	0.25-0.69 98.433-98.494 0.13 max 0.20 max 50.754-50.775	.494 .775 .825	Camehaft Intake Exhaust Valve Steel Intake Intake Exhaust Valve Sprivelen	Camehaft Lobe Lift Intake Exhaust Valve Stem to Guide Clearance Intake Exhaust Valve Spring Force (N-m)	Clearance (N-m)	6.017 5.918 0.025-0.064 0.025-0.089 587 at 38.23	64 89 .23	Piston Dismeter Main Bearings Journal Dismeter Shell Dismeter	

 ⁶L = Longitudinal, T = Transversal, H = Norisontal, V = Vertical,
 P = Porvard, B = Back, I = Intake, B = Exhaust
 Measurements are in ms

57.104-57.125 57.135-57.180 98.402-98.463

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

Composent				Cylinder No.	No.				
Compression Ring Gaps Top Bottom	0.048		0.054		0.051		0.049		
Sylinder Bore Disseter Top Middle Bottom Out-of-round Taper	1.8782 3.8773 3.8771 0.0011	1.8793 3.8778 2.8776	3.8777 3.8771 3.8774 0.0007	3.8784 3.8771 3.8773	1.8768 3.8768 3.8763 0.0006	3.8774 3.8765 3.8767	1. 3.8770 3.8765 3.8766 0.0004	T 3.8774 3.8767 3.8769	
Comsecting Rod Beatings Journal Dismeter Shell Dismeter	H 1.9988 F 7.0013	v 1.9987 B 2.0016	H 1.9987 F 2.0012	V 1.9987 B 2.0020	H 1.9988 F 2.0004	v 1.9987 B 2.0012	H 1.9987 F 2.0025	V 1.9987 B 2.0024	
Camshaft Lobe Lift	0.244	E 0.236	0.242	0.239	0.241	0,229	0.240	R 0.235	
Valve Stem to Guide Clearance	0,0063	E 0.0048	0.0052	E 0.0046	0.0054	0.0050	0.0067	\$500 <u>*</u> 0	
falve Spring Force (1b)	100	E 110	1 901	E 105	108	E 106	I 106	108	
Piston Avg. Diameter Middle and bottom of skirt	3.8738		3.8738		3.8735		3.8730		
Main Bearings Journal Dismeter Shell Dismeter	No. H 2.2485 F 2.2523	1. V 2.2486 8 2.2522		2.2485 2.2531	No. 2 V 2.2485 B 2.2528		No. H 2.2485 F 2.2528	3 V 2.2484 3.2532	
Compression Ring Gaps 0.0 Top Retons Cylinder Bore Dismeter 3.8 Taper Taper 0.00 Consecting Red Bestings Journal Dismeter 1.9 Shell Dismeter 1.9	0.010-0.027 3.8753-3.8777 0.005 max 0.006 max 1.9962-1.9990	Hanufac Camshaft I Intake Exhaust Valve Ster	Manufacturer's Servi	1 u	Manufacturer's Service Limits, Inches shaft Lobe Lift 0.2369 ntake 0.236 ve Stem to Guide Clearance 0.0010-0.0025 Exhaust 0.0010-0.0025 ve Spring Force (1b) 132 at 1.505'	225 225 235 110	Pater Main Jo Sh	Pieron Diameter Main Bearings Journel Diameter Shell Diameter	3.8741-3.8765 2.2482-2.2490 2.2494-2.2512

aL = Longitudinal, T = Transversal, H = Horizontal, V = Vertical, F = Forward, B = Back, I = Intake, E = Exhaust
+ = Messurements are in am

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

Composent			,			Cylin	Cylinder No.		
Compression hing Capa Top Bottom	1.22		1.37		1.30		1.24		•
Cylinder fore Disseter Top Middle Buttom Out-of-round Taper	98.483 98.483 98.478 0.028	7 98.534 98.496 98.491	28.494 98.478 98.486 0.017	T 98.511 98.478 98.483	L 98.471 98.458 98.463 0.015	T 98,486 98,463 98,468	28.476 98.463 98.466 0.010	T. 98.486 98.473	
Consecting Rod Bearings Journal Dismeter Shell Dismeter	H 50,770 F 50,833	v 50.767 B 50.841	H 50.767 F 50.830	v 50,767 B 50,851	H 50.770 F 50.810	v 50,767 8 50,830	H 50.767 F 50.864	v 50.767 8 50.861	
Camehaft Lobe Lift	6.20	5.99	6.15	E 6.07	I 6.12	5.82	1	8.97	
Valve Stem to Guide Clearance	0910	0.114	0.132	0.117	0.137	E 0.127	0.170	E 0.137	
Walve Spring Force (N-m)	1485	E 485	472	E 467	180	£72	472	Z 280	
Piston Avg. Dismater Middle and bottom of skirt	98.395		98.395		98.387		98.374		
Journal Diameter H Shell Diameter F F F Shell Diameter S7,208	Mo. 1 2 57.114 8 57.206	,	No. 2 H 57.112 57 F 57.229 57	2 V 57.112 B 57.221	57. 17.	No. 3 H V 57.112 57.109 F B 57.221 57.231	15.		
Compression Ming Capa Top Top Detroit Collection Collection Connecting Red Bearings Journal Dismeter Shell Dismeter	0.25-0.69 98.433-98.494 0.13 max 0.20 max 50.754-50.775	.494 .775	Hanufacturer' Camehaft Lobe Lift Intake Exhauer Valve Stem to Guid Intake Exhauer Exhauer Valve Spring Porce	Hanufacturer's Service L amshaft Lobe Lift Intake Exhauer Valve Stem to Guide Clearance Intake Exhauet Valve Spring Force (N-m)	Manufacturer's Service Limits, aft Lobe Lift 6-017 august 5-918 august 6-017 august 6-017 august 6-017 seast 6-017 seast 7-025 Spring Force (N-m) 587 at 16-17	6.017 5.918 0.025-0.064 0.025-0.089 587 at 38.23 mm	4 9 23 mm 489	Piston Diameter Main Bearings Journal Diameter Shell Diameter	98,402-98,463 57,104-57,125 57,135-57,180

*E = Longitudinal, T = Transversal, H = Horizontal, V = Vertical, P = Forward, B = Back, I = Intake, E = Exhaust

ENGINE COMPONENTS MEASUREMENTS

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

Cylinder No.

			ľ							
Composent		1	2				3			
Compression Ring Cape Top Bottom	0.052		0.056		0.055		0.054			
Cylinder bore blameter Top Middle Bottom Out-of-round Taper	1.8767 3.8 3.8767 3.8 3.8752 3.8 0.0008 0.0010	3.8768 3.8764	1.877 3.8777 3.8772 3.8763 0.0012	3.8789 3.870 3.8764	1.8768 3.8768 3.8765 3.8762 0.0011	1.8779 3.8779 3.8765	3.8770 3.8773 3.8773 0.0014 0.0007	1,8784 3,877 3,8768		
Consecting had Bearings Journal Diemeter Shell Diemeter	H 1.9981 1.9 F 7.0035 2.0	V 1.9980 B 2.0034	H 1.9981 7 2.0010	V 1.9982 B 2.0014	H 1.9982 F 2.0014	v 1.9982 B 2.0020	H 1.9982 F 2.0018	V 1.9962 B 2.0018		
Commobalt Lobe Lift	I E 0.236 0.236	ı	0,240	0.235	0.235	E 0.226	0.239	0.234		
Valve Stem to Guide Clearance	1 0.0072 0.0	0.0100	0.0065	F 00.00	1 0.0067	E 0.0097	0.0062	0.0067		
Valve Spring Force (1b)	104 102		106	E 103	10)	E 104	107	E 103		
Piston Avg. Dismeter Middle and bottom of skirt	3.8734		3.8732		3.8721		3,8731			
bain Bearings Journal Diameter Shell Diameter	No. 1 2.2483 2.2 F 2.2526 2.2	1 V 2.2484 B 2.2524		No. 2 H Z. 2464 Z. 2527 Z. 2527	2 V 2.2483 2.2524		No. H 2,2481 F 2,2529	2.2480 2.2531		
			Menu	facturer's	Manufacturer's Service Limits, Inches	infte, Inc	ile in			
Compression Ming Gape Top Bottom Cylinder Bore Dismeter Cylinder Bore Dismeter Color-of-round Taper Commercing Rod Berings Journal Dismeter Shell Dismeter	0.010-0.027 3.8753-3.8777 0.005 max 0.008 max 1.9982-1.9990 1.9992-2.0010		Camshaft Intake Exhaust Valve Stee Exhaust Fxhaust	Camahaft Lobe Lift Intake Exhaust Valve Stem to Guide Cle Intake Exhaust Valve Spring Force (1b)	Camehaft Lobe Lift Intake Exhaust Valve Stem to Guide Clearance Intake Exhaust Exhaust Valve Spring Porce (1b)	0.2369 0.2330 0.0010-0.0025 0.0010-0.0035 172 at 1.505"	.0025 .0035 .505" [t-110	Mato Bearings Journal Diameter Shell Diameter	aton Diameter in Bearinge Journal Diameter Shall Diameter	3.8741-3.8765 2.2482-2.2490 2.2494-2.2512

al. - Longitudinal, T - Transversal, H - Horizontal, V - Vertical, P - Porward, B - Back, I - Intake, E - Exhaust

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

					Cylinder No.				
Component			7				1		
Compression Ring Gaps Top Bottom	1.32+		1.42		1.40		1.37		
Sylinder Bore Dimmeter Top Middle Buttom Out-of-round Taper	98.468 98.455 98.443 0.021	7 98.489 98.471	L 98.494 98.481 98.458 0.030	7 98.524 98.476 98.461	0.016	7 98.499 98.476 98.463	1. 98.476 98.483 98.458 0.035	T 96.511 96.494 96.471	
Consecting Rod Bearings Journal Dismeter Shall Dismeter	н 50.752 г 50.889	V 50.749 B 50.886	H 50.752 F 50.825	V 50.754 B 50.836	30.754 50.836	V 50.754 B 50.851	50.754 50.846	y 30.754 8 30.846	
Comstaft Lobe Lift	10.9	E 5.99	1 6.10	E 5.97	5.97	S.74	10.9	5.94 5.94	
Talve Stem to Guide Clearance	0.183	E 0.254	0.165	0.188	0.170	0.246	0.157	0.170	
Valve Spring Force (H-m)	1 199	454	472	3 85 t	476	E 97	1897	Z 295	
Piston Avg. Dismeter Middle and bottom of ekirt	98.384		98,379		98.351		98.377		
Mais Bestings Journal Diameter Shell Diameter	H 57.107 57.216	57.109 57.211		No. 2 H 57,109 5 57,219 5	2 57.107 8 57.211		No. H 57.102 F 57.224	3 57.099 8 57.229	
			Hen.	facturer	Manufacturer's Service Limits, ma	Inite, me			
Compression Ming Caps Top Top Out-of-round Taper Connecting Nod Bearings Journal Dismeter Shell Dismeter	0.25-0.69 98.433-98.494 0.13 max 0.20 max 50.754-50.775 50.760-50.825) 1.494 .775 3.825	Camehaft Intake Exhaust Valve Stee Intake Intake Exhaust Valve Stee Valve Spri	Camehaft Lobe Lift Inteke Inteke Exhaust Inteke Inteke Exhaust Exhaust Valve Spring Force (N-m)	Camehaft Lobe Lift Intake Exhaut Exhaut Intake Intake Exhaust Valve Spring Force (N-m)	6.017 5.918 0.025-0.064 0.025-0.064 0.07 at 38.23 mm	064 089 3.23 ■ 1t 489	Piston Diameter Min Bestings Journal Diameter Shell Diameter	

4L = Longitudinal, T = Transversal, H = Norizontal, V = Vertical, P = Forward, B = Back, I = Intake, E = Enhaust
• = Mesaurements are in am

57.104-57.125 57.135-57.180 98.402-98.463

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

								5	Cylinder No.							
Component				7				7								
Compression Ring Caps Top Bottom	0.032		0.030		0.030		0.030		0.023		0.032		0.025		0.025	
Cylinder Bore Disseter Top Middle Bottom Out-of-round Toper	3.9103 3.9103 3.9103 0.0002 0.0006	1.9107 3.9105 3.9106	1.9113 3.9103 3.9102 0.0005 0.0011	1.9108 3.9107 3.9107	1.9105 3.9107 3.9101 0.0002 0.0004	1.9107 3.9104 3.9101	1.9104 3.9108 3.9102 0.0004	T 3.9108 3.9103 3.9102	3.9106 3.9102 3.9110 0.0008	7 3.9114 3.9112	1.9101 3.9104 3.9106 0.0008	1.9109 3.9106 3.9103	1.9105 3.9102 3.9100 0.0013	7.3.9118 3.9115	3.9105 3.9101 3.9101 0.0004 0.0003	3.9104
Consecting Rod Bearings Journal Disseter Shall Disseter	2.1241 7.1255	2.1240 2.1263	H 2.1243 F 7.1250	2, 1243 B 2, 1257	H 2.1243 F 2.1261	2.1242 B 2.1266	H 2.1243 F 2.1254	V 2.1243 B 2.1256	2,1242 2,1246	V 2.1242 B 2.1264	2.1242 7.1242 2.1256	2.1242 B 2.1259	2.1242 2.1262	2.1242 B 2.1261	H 2.1242 7 21260	v 2.1242 B 2.1258
Camehaft Lobe Lift Valve Stam to	0.244	0.259	0,229	E 0.261	0.233	P. 264	0.242	E 0.264	0.225	0.264	0.246	0.263	0.242	0.249	0.242	E 0.259
Guide Clearance Valve Spring Porce (1b)	0.0053	0.0067	0.0063 IS7	0.0077 E 114	0.0037 I 156	0,0070 1112	0.0058 I 158	0.0067 1111	0.0059 155	0.0074 0.0074 115	0.0054 I I S9	0.0084 0.0084 113	0,0053	E 0.0081	0.0064 159	0.0070 111
Piston Avg.Dismeter Middle 6 bottom of skirt	3,9098		3.9093		3.9092		3.9093		3,9099		3,9092		3.9098		3.9095	
Mais Bearings Journal Dismater Shell Dismater	H H	No. 1 2.4996 2 2.5027 2	2.5024	1 14 14	No. H 2.4992 F F 2.5019	2 V 2.4993 2.5021		No. H 2.4994 2.5039	2.5041		H 2.4996 2.5016	2.4997 2.5020		2.4995 2.5028	No. 5 2.4995 2.5029	عادا ا
Compression Ming Caps Top Button Cylinder Dre Dismeter Out-of-round Taper Connecting Red Bearings Journal Dismeter Shell Dismeter		0.010-0.020 3.9100-3.9120 0.0050 mm 0.010 max 2.1240-2.1250 2.1245-2.1250	0 120 250 275	ŭ , ,	mmehaft i Intake Exhaust blve Stem Intake Exhaust	Manufacturer's Serv Camehaft Lobe Lifft Intake Exhaust Valve Stem to Guide Clearance Intake Exhaust Valve Spring Force (1b) 78-81	te Clears	Service ance 78-88 1b 170-184 1	Manufacturer's Service Limits, Inches obe Lift	inches 1,017 16"		Pieton Mein We Jouri Shell	Piston Dismeter Main Bearings Journal Dismeter Shell Dismeter	1		3.9085-3.911 2.4995-2.500 2.5000-2.503

ENGINE COMPONENTS MEASUREMENTS

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

Concest				2				3,114	Cylinder No.							60
Compression Ring Caps Top Bottom	0.81		0.76		0.76		0.76		0.58 0.56		0.81 0.66		0.64		0.64	
Splinder Bore Disserer Top Middle Bottom Out-of-read	99.332 99.322 99.322 0.005	7 99.332 99.327 99.329	99.347 99.322 99.319 0.013	1 99.334 99.332 99.332	1 99.327 99.332 99.317 0.005	7 99.332 99.317	1 99.324 99.334 99.319 0.010	7 99.334 99.322 99.319	L 99.329 99.339 0.021	7 99.350 99.347 99.344	29.317 99.314 99.314 0.020	T 99.337 99.329	1 99.327 99.319 99.314 0.033	T 99.360 99.352	0.010	r 99.337 99.324 99.317
Connecting Red Bearings Journal Dismeter Shell Dismeter	53.952 53.966	53.950 54.008	53.937 53.975	V 53.957 8 53.993	H 53.957 F 54.003	V 53.955 B 54.016	H 53.957 53.985	V 53.957 53.990	и 53.955 <u>Р</u> 54.016	V 53.955 B 54.011	н 53.955 <u>F</u> 53.990	V 53.955 B 53.998	н 53.955 F 54.005	V 53.955 B 54.003	H 53.955 7 54.000	V 53.955 B 53.995
Campair Son	1	6.58	5.82	19.9	1 5.92	E 6.71	6.15	E 6.71	1 5.72	E 6.71	6.25	F 6.68	1 6.15	6,32	1 6.15	6.58
Valve Stam to Galde Clearance	0.135	0.170	0.160	0.196	0.094	E 0.178	0.147	E 0.170	1 0.150	E 0.188	0.137	0.213	0.135	E 0.206	0.163	0.178
Valve Spring Perce (H-m)	721	, 189 1	1 862	, E	1 263	2 2	703	767 a	1 689	\$12 512	104	503	703	3 67 3	ı e	767
Piston Avg. Diameter Hiddle & bottom of okirt	7. 8.30		99.296		99.294		99.296		99.311		99.294		99.309		99,301	
Main Bearings Journal Diameter Shell Diameter	1 16 16	но. 83.490 г 63.569	1 63.485 63.561	No No	No. H 63.480 F 63.548	2 63.482 63.553	112 10	No. H 63.485 F 63.599	. 3 V 63.490 63.604		No. H 63.490 F 63.541	63,551	المال	63.487 63.571	No. 5 63.487 63.574	22
Compression hing Gape Top Top Strom Cylinder Bore Diameter Out-of-round Commercing Rod Berings Journal Diameter Shell Diameter		0.25-0.51 99.314-99.365 0.13 max 0.25 max 53.950-51.975	365 975 039	J \$ \$	Camshaft Lo Intake Exhaust Valve Stem Intake Exhaust	Manufact, Camahaft Lobe Lift Intake Exhaust Kalve Spring Force	Manufacturer's Service Camahaft Lobe Lift Intake Exhaust Intake Exhaust Exhaust Exhaust (Wive Spring Force (W-m) 736-818		Manufacturer's Service Limits, mm obe Lift 6,325 6,782 to Ouide Clearance 0,03-0,43 ng Force (W-m) 756-818 @ at 33,34 mm	6 4 3 B		Piston Main E Jour Shel	Piston Dismeter Main Bearings Journal Dismeter Shell Dismeter	r 66 5 Fr		99.276-99.35 63.487-63.51 63.500-63.57

^{# -} Longitudinal, T - Transversal, H = Horizontal, V - Vertical, P - Porward, B - Back, I - Intake, E - Exhaust

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

,								316	Cylinder No.	;	;	1				
Composent		_		7							9					
Compression Mag Gaps Top Lutton	0.028		0.035		0.032		0.030		0.030		Broken		0.030		0.028	
Cylinder Bore Bisseler Top Middle Bottom Out-of-round	1.9118 3.9111 3.9111 0.0004 0.0007	1.9114 3.9108 3.9108	3.9120 3.9111 3.9111 0.0002	7 3,9118 3,9115	3.9110 3.9110 3.9111 0.0010	7 3.9120 3.9116	2.3.9113 3.9106 3.9112 0.0011	3.9124 3.9122 3.917	1.9113 3.9113 0.0009 0.0000	3.9115 3.9115 3.9111	1.9108 3.9108 3.9113 0.0014 0.0005	7.9122 3.9122 3.9110	3.9109 3.9101 3.9102 0.0006 0.0007	7.9103 3.9119 3.9118	3.9115 3.9109 3.9112 0.0001	3.9116 3.9112 3.9111
Connecting End Bearings Journal Dismeter Shell Dismeter	7.1742 7.1262	7.1211 8 2.1268	2.1240 2.1266	2.1241 2.1265	H 2.1240 F 2.1258	V 2.1236 8 2.1259	7.1239 F 7.1267	7.1238 3.1238 2.1266	2,1240 2,1240 2,1263	7,1241 2,1265	H 2.1241 2.1268	2.1242 2.1242 8 2.1266	2,1239 2,1239 2,1267	2.1238 2.1238 2.1265		2.1241 2.1363
Complete Lobe	0.247	0.256	0,246	0.251	0.246	0.260	0.221	0.262	0.234	0.764	0.240	0.231	0.235	0.250	0.240	0.261
Valve Stam to Guide Clearance	0.0052	0.0063	0.0057	8900°0	1900.0	0.0059	10.0048	0.0068	,	8 0.0066	0900.0	0,0071	0.0035	0.0058	L-	0.0066
Valve Spring Force (1b)	189	911	163	116	163	114	163	E 118	I 165	F 116	1 S 1	11)	160	1911	181	113
Plates Avg. Dissetor Middle & bottom of shirt	3.9080		3.9082		3.9070		3.9079		3.9075		3,9061		3.9064		3.9061	
Main Bearings Journal Diameter Shell Diameter	1441	1.4998 7.5022	2.4997 2.5025	1 14 14	3.5000 2.5000 2.5021	2 V 2.4998 2.5018	1 14 14	No. 7.5000 7.5023	2.4999 2.5025		H 2,4999 2,5019	2.5000 2.5015	14-1-	H 2.4996 2.5023	No. 5 2.4996 2.5028	الواء
Compression Ming Caps Top Defice Splinder Bore Diameter Out-of-round Taper Toper Compering Red Bastings Journal Diameter Shell Diameter		0.010-0.020 3.9100-3.9120 0.0050 max 0.010 max	0 120 250 275	J \$ \$	Manufacturer's Camehaft Lobe 1.1ft Inteke Exhaust Valve Stem to Guide Clea Inteke Exhaust Valve Spring Force (1b)	Manufacturer's obe 11ft i to Guide Clear ng Force (1b)	Clear	Service L ance 78-88 1b 170-184 1	Service Limits, Inches 0.249 0.267 ance 0.001-0.017 79-88 1b at 1-11/16" 170-184 1b at 1-5/16"	Inches -0.017 1/16" -5/16"		Pieton Mein B Jour Shei	Piston Dissetar Main Bearings Journal Disseter Shell Disseter		2, 499 2,599	3,9085-3,9115 2,4995-2,5005 2,5000-2,5030

ENGINE COMPONENTS MEASUREMENTS

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

								cylte	Cylinder No.							
Composent				2										_		
Compression Ring Cape Top	• 1. ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °		68		0.81		9.76		0.76		Broken		0.76		0.71	
	?		5		;		?		5				3			
Cylinder bore Dismeter Too	1 260	T 99,350	L 99, 365	T 99, 360	L 99 119	T 99,365	1 00 147	1 99 775	1 00	T 99, 370	T 00	170	L 000	T 00 123	T 00	7 86_155
Hiddle	99.342		99,342		99.329	99.355					99,332	99.370	99.317	99.362	99.337	99.344
Out-of-round Taper	0.010	Š.	0.005		0.026						0.036	66.66	0.015	33.380	0.000	34.34
Commecting Bod Bearings																
Journal Disseter	83.955	53.955 53.876	53.950		53	53.	53.947	53.945	83.950	53.952	53.952	53.955	2	53.945	53.932	53.952
Shell Dimeter	\$4.005 54	54.021	54.016	54.013	53.995	53.998	54.018	34.016	54.008	54.013	54.021	54.016	54.018	54.013	34.011	34.008
Commission Lobe	1 6.27	2 05.9	6.25	6.38	1 6.25	E 6.60	5.61	8.65	5.94	E 6.71	5.10 6.10	5.87	1 6.8	6.35	1 6.10	2 ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °
Valve Stem to Guide Clearance	0.132	0.160	0.145	E 0.173	1 0.155	0.150	0.122	0.173	0.142	0.168	0.132	0.180	0.140	0.147	- 1_	E 0.168
Valve Spring Force (H-m)	1 25	- S16	725	516	125	E 507	725	E 525	734	316 516	734	520	712	316	730	503
Piston Avg. Diameter Hiddle 6 bottom of shirt	99.263		99.268		99.238		99.261		99.251		99.215		99.273		99.215	
Mais Bearings Journal Diameter Shell Diameter	1 12 12	No. # 63.495 P 63.556	1 V 63.492 B 63.564) Fei Fei	H 63.500 F 63.553	2 63.495 63.546	i he he	No. H 63.500 F 63.558	. 3 63.497 63.564		No. H 63.497 P 63.548	63.538	166	H 63.490 F 63.558	80, 5 63,490 63,571	<u> يا وا ا</u>
						Manufact	urer's S	Service 1	Manufacturer's Service Limits, mm	# J						
Compression Ring Caps Top Bottom Cylinder Fore Dissect Ont-of-round Taper Connecting Red Searings Journal Dissect Shell Dissect		0.25-0.51 99.314-99.365 0.13 max 0.25 max 53.950-53.975 53.962-54.039	365 975 039	Ŭ > 	Camehaft Lobe Lift Intske Exhaust Valve Stem to Guid- Intske Exhaust Valve Spring Porce	Lobe Lift 10 Outs	Cambhaft Lobe Lift Intake Exhaust Valve Stem to Guide Clearance Intake Exhaust Exhaust Valve Spring Porce (N-m) 347-	ance 347-391 4 756-818 4	Camehaft Lobe Lift Intake Exhaust Valve Stem to Guide Clearance 0.03-0.43 Exhaust Walve Spring Porce (N-m) 347-391 at 42.86 mm	3 11		Pletor Main 1 Jour Shel	Piston Dismeter Main Bearings Journal Dismeter Shell Dismeter			99.276-99.352 63.487-63.513 63.500-63.576

W. - Longitudinal, T - Transversal, H - Horizontal, V - Vertical, P - Forward, B - Beck, I - Intaka, E - Exhaust + + Measurements are in an

ENGINE COMPONENTS MEASUREMENTS

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

Camponent				2				116	Cylinder No.	2		9		1		•
Compression Ring Caps Top Botton	0.032		0.035		0.038		0.034		0.034		0.032		0.035		0.030	
Cylinder Bore Diameter Top Middle Middle Bottom Out-of-round	3.9117 3.9116 3.9116 0.0007	3.9114 3.9114 3.9114	3.9124 3.9124 3.9120 0.0002	7.9122 3.9125 3.9124	1.9138 3.9136 3.9136 0.0004 0.0002	1.9142 3.9141 3.9141	3.9118 3.9117 3.9117 0.0007	1 3.9125 3.9126 3.9120	3.9117 3.9116 3.9116 0.0006	7 3.9123 3.9126 3.9122	3.9110 3.9112 3.9111 0.0009	3.9119 3.9123 3.9117	1.9119 3.9121 3.9124 0.0002	3.9127 3.9123 3.9120	3.9114 3.9112 3.9109 0.0004	3.9110 3.9110 3.9106
Connecting Red Bearings Journal Dimmeter Shell Diameter	2.1242 F 7.1242	2.1242 B B 2.1284	H 2.1242 F 7.1268	V 2.1240 2.1269	H 2.1242 P 2.1270	2.1242 2.1269	H 2.1242	2.1242 2.1256	2.1241 2.1260	2.1241 B 2.1262	H 2.1242 F 7.1261	2, 1242 B B 2, 1260	2.1243 2.1259	2.1242 B 2.1256	2.1243 P. 1262	2.1243 B 2.1262
Compafi Lobe	0.249	0.264	0.237	0.251	0.244	0.250	0.241	0.253	0,241	E 0.267	0,233	E. 0.216	0.222	0,252	1 0.238	0.261
Valve Stem to Guide Clearence	0.0067	0,0080	0.0066	0.0067	1 0.0066	8.00.0	0,0060	0.0078	0.0053	0.0070	0.0073	0.0082	0.0069	0.0085	0.0072	0.0082
Valve Spring Force (1b)	158	112	157	110	151	£111	154	E 110	154	E 109	154	110	191	112	159	102
Piston Avg. Dismeter Hiddle 6 bottom of shirt	3.9091		3.9094		3.9092		3.9090		3.9101		3,9089		3.9089		3.9091	
Mais Beerings Journal Diameter Shell Diameter		H 2.4994 7 2.5022	2.4995 2.5025	110 16	H 2.4997 F 7.5018	2.4996 2.4996 2.5015		No. H 2.4998 F 7.5028	2.5025	11. 1	H 2.4998 2.5010	No. 4 V V V V V V V V V V V V V V V V V V	1 100 15	2.5024	No. 5 V 7 2.4997 7 2.5025	55
						Manufac	turer 'e	Service	Manufacturer's Service Limits, Inches	Inches						
Compression Ring Cape Top Bottom Cylinder Dote Diameter Ont-of-round Taper Competing Ded Berings		0.010-0.020 3.9100-3.9120 0.0050 max 0.010 max	120	ט א	Camshaft Lobe Intake Exhaust Valve Stem to Intake Exhaust	Camehaft Lobe Lift Inteke Exhaust Valve Stem to Guide Cle Inteke Exhaust Valve Spring Force (1b)	• Clear (1b)	ance 78-88 1b 170-184	0.249 0.267 ance 0.201-0.017 78-68 lb at 1-11/16"	0.017		Pieto Mein Jou She	Pieton Diameter Main Bearings Journal Diameter Shell Diameter	ter meter iter		3,9085-3,911 2,4995-2,500 2,5000-2,503
Shell Dimeter		2.1245-2.1275	32					124-21	:	?						

⁶L - Longitudinal, T - Transversal, H - Horizontal, V - Vertical, P - Forward, B - Back, I - Intake, E - Exhaust

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

								Cy 141	Cylinder No.		i		1			
188				7				,		2				_		
Compression Mag. Caps Top	• 61		68.0		0.97		0.86		0.86		0.81		98.0		76	
	.		0.84		16.0		0.91		0.81		0.89		0.84		0.84	
Cylinder Bore Dimeter		H	ب	-		۲	نــ	•	-	ŧ				•		•
Top Middle	99,357	99,339	99,375	99.370	117.66	99.421	99.360	99.378	99,357	99.372	99.339	99, 362	99.362	99.357	99.350	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	99.367	99.372	99,344	99.339
Taper Taper	0.018		0.002		0.010		0.018		0.015		0.023		0.005		0.011	
Consecting Rod																
Maneter	=		I	>	æ	>	×	>	I	Þ	=	>	3	>	3	:
Shell Diameter	53.955 F		53.955 F	53.950 B	53.955 F	53.955 B	53.955	53.955 B	53.952	2	53.955	53.955	53.957	53.955	53.957	53.957
	24.064	24.061	54.021	54.023	54.026	54.023	53.985	g	8	8	54.003	8	53.998	8	54.005	54.005
Complete Lobe	-	ы	1	es.		ы				ta:	-					ı
	6.32	6.71	6.02	6.38	1	6.35		6.43	6.12	6.78		5.49	5.64	6.40	6.03	6.63
Valve Stem to Guide Clearance	1	1	-		1	- 1						a	-	•	-	•
	0.170	0.203	0.168	0.170	0.168	0.198	0.152	0.198	0.135	6	0,185	0.208	0.175	0.216	0.183	0.208
Valve Spring Force (M-m)	1	3	I 607	3	1	1 N	7		(, i	н	≥1	1	N	H	64
	3	470	920			503	683	489	685	485	589	687	18	867	101	687
Diameter																
	182.83		99.299		99.294		99.289		99.317	•	99.286		99.286		99.291	
Main Bearings Journal Dismeter		ا اف	-	Į į	, او	2 4	1	¥.	3	•	£	7	,	2	No. 5	1
Stell Blanter		3.536	63.564	2 S	63,492 63,546	63.490 8 63.538	14 No	63.495	63.495	,- ,-	63,495 63,525	63.495 63.538		63.561	63.492	دا ما
					_,	Manufact	urer's S.	Manufacturer's Service Limits, am	Inite, m	=1						
Compression hing Caps Top	•	1.25-0.51		ð	Camshaft Lobe Lift Intake	obe Lift			6.325			Piston Mein B	Piston Dismeter Main Bearings	L	99.27	99.276-99.352
Cylinder here Dismiter Cot-of-round		99.314-99.365 0.13 max	65	*	Exhaust lve Stem Intake	to Guid	Exhaust Valve Stem to Guide Clearance Intake	• 04	6.782	.		Journ Shell	Journal Diameter Shell Diameter		63.48	63.487-63.513 63.500-63.576
Comerciae Red Searings Journal Diameter		53.950-53.975	2	>	Exhaust lve Sprir	& Force	(F = 3)	Exhaust Valve Spring Force (N-m) 347-391 at 42,86 756-818 at 33,34		11						
10190000	ż	%67-24°.0	<u>6</u>													

W. - Longitudiani, T - Transversal, H - Morizontal, V - Vertical, F - Ferward, B - Back, I - Intake, E - Exhaust - - Measurements are in ma

ENGINE COMPONENTS MEASUREMENTS

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

Composent			7			Cylinder No.	- 11									
Compression Ring Caps Top Bottom	0.030		0.029		0.027		0.027		0.027		0.026					
Splinder Bore Dissets: Top Middle Bottom Out-of-round Taper	3.7527 3.7517 3.7514 0.0020	1.7507 3.7501 3.7504	3.7527 3.7527 3.7515 0.0012 0.0013	7 3.7515 3.7511 3.7514	1.7524 3.7524 3.7512 0.0017 0.0014	3.7507 3.7505 3.7509	L 3.7522 3.7515 3.7515 0.0008 0.0007	1.7514 3.7512 3.7514	3.7517 3.7513 3.7513 0.0009 0.0004	1.7508 3.7509 3.7511	1.7519 3.7519 3.7511 0.0000 0.0008	1 3.7519 3.7514 3.7516				
Commecting Rod Beatings Journal Diameter Shell Diameter	H 2.0943 F 2.0976	2.0981	H 2.0945 F 2.0981	V 2.0946 2.0981	H 2.0945 F 2.0986	V 2.0945 B 2.0987	H 2.0945 P 7.0981	V 2.0946 2.0982	2.0944 2.0962	V 2.0945 B B 2.0982	H 2.0947 7 2.0979	2.0945 B B 2.0975				
Campbalt Lobe	0.231	E 0.226	0.230	E 0.230	0.230	E 0.232	0.229	0.231	0.224	E 0.229	0.225	0.230				
Valve Stam to Guide Clearance	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 Porce (1b)	1 85	N 99	83	E 88	1 11	78	1 82	99	1 6/	28 27 27	1 82	89.5 E				
Piston Avg.Diameter Middle 6 bottom of shirt	3.7493		3.7498		3.7493		3.7495		3.7493		3.7493					
Main Bearings Journal Diameter Shell Diameter	2.498 2.501	No. 1 V 8 2.4988 5 2.5008	2.4988 8 2.5017	<u>.:</u>	2.4988 2 2.4988 2 2.5014 2	No. 1 2.4990 2.5017	3 2.4990 2.5013	2.5015	No. 4 V 7. 2.4989 5 2.5017		No. 3	2.4990 2.5015	H 2.4987 2.5013	2.4987 2.5016	2.4988 2.5015	No. 7 V 2.4988 B 2.5013
Compression Ling Cape Top Bottom Cylinder Dore Dismeter Out-of-round Taper Commant Dismeter Shell Dismeter		0.010-0.020 3.7500 0.005 max 0.005 max 2.0934-2.0955 2.0944-2.0978	0 9955 275	5 \$ \$	mahaft l Intake Exhaust 11ve Stem Intake Exhaust ilve Spri	Manufactu Camahaft Lobe Lift Intake Exhaust Intake Exhaust Walve Spring Force	Manufacturer's Service Camehaft Lobe Lift 0.232 Exhaust Chicke Inteke Inteke Double Cherance Inteke Exhaust Exhaust False (1b) 95-10	0.232 irance 0.001-0.003	<u> </u>	Linches Piston Diameter Main Bearings Journal Diameter Shell Diameter /16"			3,7483-3,7491 2,4986-2,5001 2,4996-2,5021	.5021		

4L = Longitudinal, T = Transversal, R = Horizontal, V = Vertical, P = Porward, B = Back, I = lataka, E = Exhaust + = Heasurements are in an

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

						Cylinder No.	r No.										
Component		j	7	İ			1	j									
Capression Ling Cape Top To be ton	0.76	-	0.74		0.69		0.69 0.86		0.69		1.02						
Spinster Bore Blameter Top Middle Bottom Out-of-round	95,319 95,293 95,286 0,051 0,033	7 95.268 95.253 95.260	05.319 95.288 95.286 95.286 0.031	1 95.288 95.278 95.286	95.311 95.280 95.275 0.043 0.036	7 95.268 95.263 95.273	95.306 95.288 95.288 0.020 0.018	T 95,286 95,280 95,286	1 95.293 95.283 95.283 0.023	7 95,270 95,273 95,278	1 95.298 95.280 95.278 0.000	T 95.298 95.286 95.291					
Consecting Rod Bearings Journal Disseter Shell Disseter	53.195 53.279	V 53.195 B 53.292	H 53, 200 F 53, 292	V 53.203 B 53.292	83, 200 53, 300	V 53.200 B 53.307	53.200 F 53.292	V 53.203 B 53.294	H 53.198 F 53.294	V 53.200 B 53.294	H 53.205 F 53.287	53.200 83.277					
Complete Lobe	5.87	5.74 5.74	5.84	5.84	1 5.84	E 5.89	5.82	5.87	5.69	S. 82	5.72	5.84					
Valve Stem to Cuide Clearance	0.061	0.00	1 0.0.0	0.0%	0.066	0.086	0.058	8.076	0.069	E 0.066	0.076	20.0					
Valve Spring Force (H-m)	378	383	199	378	I 343	374	1 365	383	351	E 374	365 T	378					
Piston Avg.Dismetor Middle 6 bottom of shirt	r 95.232		95.245		95.232		95.237		95,232		95.232						
Main Bearings Journal Diameter Shell Diameter	63.470 63.538	63.520	63.470 63.543	٠, او	2 V 63.470 6: 63.536 6:	H 63.475 F 63.543	5.475 63.475 63.533	63.467	No. 4 V 63.472 3 63.543	1 2 2	ي او	V 3.475 3.538	No. H 63.467 F 63.533	63.467 63.467 63.541	63.770	63.533	l le le
Camprossion hing Cape Top Top Callader Dec Diameter Out-of-round Camper Journal Diameter Shell Diameter		0.25-0.51 95.250 0.13 max 0.13 max 53.172-53.226 53.198-53.226	226 277		Manutactu Casshaft Lobe Lift Intake Kalve Stem to Guid Intake Intake Kalve Spring Force	obe Lift obe Lift to Guid ng Force	Camehaft Lobe Lift 5.89 Part Intra Library Part Interes Library Part Interes Library Part Interes Carde Clearance Sh Interes Carde Clearance Sh Interes Carde Carde Carde Carde Shaust Carde (N-m) 423-467 at 46.04 of the Spring Force (N-m) 423-467 at 46.04	5.89 france 0.03-0.08 423-467 a	Camehaft Lobe Lift 5.89 Hain Before Limits, Fiston Intaka 5.89 Hain Berne Journ Valve Stem to Guide Clearance Shelf Intake 0.03-0.08 Exhaust Parice (N-m) 423-467 at 46.04 mm	Piston Dismeter Main Bearings Marnal Dismeter Shell Dismeter .04 mm	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	J. C -	95,207-95,227 63,464-63,503 63,490-63,553	5.227 3.503 3.553			

M. = Longitudiani, T = Transversal, N = Norizontal, V = Vertical, P = Perused, B = Back, I = latake, E = Exhaust

• = Nescurements are in m

ENGINE COMPONENTS MEASUREMENTS

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

Component			~			CY11nder No.	2 20									
Compression Ring Caps Top Bottom	0.029		0.030		0.028		0.027		0.029		0.029					
Cylinder Bore Disseior Top Middle Bottom Out-of-round	3.7533 3.7523 3.7522 3.7517 0.0027	3.7506 3.7506 3.7514	1.7529 3.7521 3.7521 0.0012 0.0009	3.7517 3.7517 3.7519	3.7529 3.7521 3.7517 0.0016	3.7513 3.7511	1.7526 3.7520 3.7520 0.0011	1 3.7515 3.7512 3.7516	3.7518 3.7518 3.7517 0.0007 0.0000	3.7511 3.7510 3.7510	1. 7520 3.7520 3.7515 3.7514 0.0001	T 3,7521 3,7516 3,7518				
Connecting Red Bearings Journal Dismoter Shall Dismoter	2.0942 F 2.0970	V 2.0943 B 2.0972	2.0943 P	2.0944 2.0978	H 2.0944 F 7.0972	2.0944 1.0977	2.0945 F 7.0972	V 2.0944 8 2.0976	H 2.0943 7 2.0973 7	V 2.0943 7 2.0971 7	H 2.0942 F 2.0979	V 2.0943 B 2.0979				
Campair Lobe	0.228	0.232	0.229	E 0.232	0.233	E 0.228	0.228	0.229	0.225	0.227	0.218	0.167				
Valve Stam to Guide Clearance	0.0019	0.0032	0.0016	0.0030 0.0017 0.0031	0.0017	5.0031	1 0.5019 0.0028	0.0028	1 0.0020 0		0.0032	E 0.0032				
Valve Spring Force (16)	1	22 C S	1 88	2 2	1 89	2 99	1 11	12 kg	I 28	E 2	- [2				
Piston Avg. Diameter Middle 6 bottom of shirt	3.7496		3.7496	.,	3.7499		3.7498	•	3.7491	n	3.7490					
Mile Bearings Journal Diameter Shall Diameter	12.4990 2.5009	2.4988 2.4988 2.5019	2.5012	2.4		No. 1 2.4992 2.5015	3 V 2.4993 2.5004 er's Serv	2.4989 2.4989 2.5017	H H V H V V H V V Z.4992 Z.4989 Z.4989 Z.5015 Z.5004 Z.5017 Z.5018 Monufacturer's Service Limits. Inches	2:5009	ء ا	2 V 2.4990 2.4 2.5011 2.3	No. 6 2.4968 2 F 7 2.5010 2	6 2.4989 2.5011	2.4987 2.5011	2.4986 2.5017
Compression Ming Cape Top Top Out-of-round Consocials Red Design Journal Dismiter Shell Dismiter	_	0.010-0.020 3.7500 0.003 max 0.005 max 2.0934-2.0955 2.0944-2.0975		Value of the California of the	Camehaft Lobe Lift Intake Exhaus Walve Stem to Guide Clearance Intake Exhaus Exhaus Walve Spring Force (1b) 95-10	to Guide	0.232 Clearance 0.001- (1b) 95-107	Camehaft Lobe Lift 0.232 Main Exhaunt Valve Stem to Guide Clearance She Intake 0.001-0.003 Exhaunt Walve Spring Force (1b) 95-105 at 1 13/16"	Pieton Main B Journ Shell 13/16"	Piston Dismater Main Bearings Journal Dismater Shell Dismater /16"	# # # # # # # # # # # # # # # # # # #	6 22	3.7483-3.7491 2.4986-2.5001 2,4996-2.5021	.91 21		

#L = Longitudiani, T = Transversal, H = Horisontal, V = Vartical, P = Forward, B = Back, I = Intake, E = Exhaust + + Madurements are in an

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

Comments			2			Cylinder No.	er No.					9					
Compression Ring Caps Top	0.74*		0.76		17.0		69.0		0.74	ı	0.74						
Dotton Cylinder Bore Diameter Top	0.86 55.334	T 95.265	12.2	T 95.293	0.80 1.00 95.324	T 95,283	<u> 19</u> =	T 95.288	12.2	1 95.278 95.275	1 95,301 95,288	T 95.303 95.291					
Madie Botton Out-of-round Taper	95.293 95.293 0.069	95.286			95.293 0.041 0.031	95.293	95.298 0.028 0.018	95.291		95.283	95.286 0.002 0.015	95.296					
Connecting Rod Bearings Journal Dieseter	= 5	V X 1. 188	83.195	53, 198	K 53.198	V 53.198	H 53.200	V 53.198	H 53.195	53.195	12	53.195					
Shall Mameter	53.264	53.269			53.269	53.282	53.269	83.279	53.271	53.266	53, 287	53,287					
Campafe tobe	5.79	5.89	5.82	5.89	5.92	E 5.79	5.79	E 5.82	5.72	5.77	5.54	£.24					
Valve Stem to Guide Clearance	10.00	0.081	1.0.0	0.08	0.043	6.079	0.048	0.071	0.051	0.074	0.081	0.081					
Valve Spring Porce (H-m)	37.4	387	166	F 378	1 378	E 391	374	E 387	1 365	378	1 383	387					
Piston Avg. Diameter Middle & bottom of skirt	95.240		95.240		95.247		95.245		95.227		95.225						
Main Bearings Journal Diameter Shell Diameter	63.47	FO. 1 57 63.470 37 63.548	63.472 8 63.530	اف ا	2 63.475 63.528 63.528	H 63.480 P 63.538	3 63.482 63.510	63.543	No. 4 V 63.472 B 63.546		No. 3 63.472 R	5 63.475 63.528	Ho. 63.470 F 63.525	63.472 63.528	63.267 F 63.528	الغ	7 63.464 63.543
					41	anufactu	rer's Se	rvice Li	Manufacturer's Service Limits, mm								
Compression hing Gaps Top Bottom		0.25-0.51		ថី	mehaft l Inteke Exhaust	Camehaft Lobe Lift Inteke Exhaust	. ,	5.89	Piet Mein Jo	Main Bearings Journal Diameter	ster 36 Lameter		63.464-63.503	15.227			
Cylinder Bore Dismeter Out-of-round Taxer		95.250 0.13 Ex		\$	ilve Ster Intake Exhaust	to Out	Valve Stem to Guide Clearance Intake 0.03-4 Exhaust	0.03-0.08	ភ	Shell Diemeter			63.490-1	55.533			
Commecting Bod Bearings Journal Dismeter Shell Dismeter		53.172-53.226 53.198-53.277	226 277	7	lve Spri	ing Porce	4 (B-R)	23-467 4	Valve Spring Force (N-m) 423-467 at 46.04 mm	1							

The Longitudinal, T - Transversal, H - Horizontal, V - Vertical, F - Forward, B - Back, I - Intake, E - Exhaust
+ - Mesaurements are in m

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

#L = Longitudinal, T = Transversal, R = Horizontal, V = Vertical, F = Porward, B = Back, I = Intake, E = Exhaust + = Messuresents are in mm

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

						Cylinder No.	- 1									
Component																
Compression Bing Caps Top Evitor	0.76		0.71		0.69		0.69		0.66 0.94		0.64					
Cylinder Bore Diameter Top Middle Bottom Out-of-round	95.385 95.319 95.303 0.074 0.082	T 95.311 95.273 95.293	1 95.382 95.288 95.291 0.063	T 95.319 95.278 95.283	L 95.362 95.296 95.291 0.008	1 95.354 95.288 95.298	1 95.374 95.298 95.296 0.033	T 95.341 95.291 95.301	L 95.352 95.303 95.303 0.033	T 95.319 95.298 95.308	1 95.367 95.311 95.306 0.005	T 95.372 95.324 95.334				
Consecting Rod Bearings Journal Diameter Shell Diameter	H 53.188 F 53.251	V 53,188 B 53,251	H 53.188 F 53.266	V 53.188 B 53.254	H 53.188 F 53.256	V 53.188 53.236	н 53.188 F 53.256	V 53.188 B 53.254	H 53,188 F 53,251	v 53.188 B 53.249	H 53.188 F 53.256	V 53.190 8 53.254				
Commbaft Lobe Lift	5.84	5.84	5.84	E 5.72	I 5.84	5.84	5.84	5.87	5.84	E 5.84	5.84	5.84				
Valve Stem to Guide Clearance	0.0056	0.066	0.056	0.061	0.056	E 0.076	190.0	E 0.066	0.036	E 6.071	0.058	0.061				
Valve Spring Force (H-m)	1 396	391	191	E 396	1 387	16E	1 396	E 391	387	391	387	E .				
Piston Avg.Disseler Middle 6 bottom of skirt	F 95.222		95.235		95.247		95.225		95.253		95.268					
Mein Bestings Journal Diameter Shell Diameter	63.47 63.55	No. 1 v 0 63.470 3 63.558	63.470 63.470 8 63.556	ا أف	2 V 63.470 6 B 63.54B 6	No. H 63.480 F 63.546	3 63.477 63.561	H 63,475 F 63,553	No. 4 V 63.472 63.548	S S	ر او	5 V 63.467 6	No. H 63.470 F 63.543	63.470 63.546	63.467 63.553	63.467 63.467 63.546
					z:I	nufactus	rer's Sei	Manufacturer's Service Limits, mm	itte, mm							
Compression Ring Cape Top Bottom Cylinder Bore Dismeter Cylinder Forend Taper Taper		0.25-0.51 95.250 0.13 max 0.13 max	<u> </u>	9 3 3	Intake Intake Exhaust Valve Stem Intake Exhaust	Commanaft Lobe Lift Intake Exhaust Valve Stem to Guidd Intake Exhaust Valve Spring Force	to Guide Clearance Co Guide Clearance G Force (N-m) 423-4	Camehaft Lobe Lift 5.89 Main Barin Force (N-m) 423-467 at 46.04 mm	Pieto Mein Jou She She	Piston Diameter Main Bearings Journal Diameter Shell Diameter .04 mm	ler Beter Ster		95.207-95.227 63.464-63.503 63.490-63.553	503		
Shell Diameter		53.198-53.277	272													

et = Longitudinel, T = Transversel, H = Horizontal, V = Vertical, F = Forward, B = Back, I = Intake, E = Exhaust
• = Messurements are in un

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

								T S	Cylinder No.							
				,												
Oppression Mag Cape 10p bottom	0.035		0.033		0.032		0.038		0.031		0.031		0.033		0.031	
Cyliader Bere Biamier Top Niddle Bitton Ont-of-resed Toper	1.0031 4.0034 4.0028 0.0008	4.0043 4.0040 4.0040	1.0042 4.0034 6.0034 0.0002	4.0038 4.0038	4.0040 4.0027 4.0031 0.0001	4.0036 4.0036 4.0034	4.0039 4.0039 0.0008 0.0008	4.0047	4.0024 4.0024 0.0012	4.0035 4.0033	4.0040 4.0029 6.0031 0.0004	4.0029	4.0030 4.0033 0.0002	7 4.0036 4.0033	4.0023 4.0023 0.0012 0.0008	1 4.0043 4.0038
Connecting Bad Barrings Journal Dissector Shell Dissector	2.3130 2.3130	2.3133	2.3100 7.3135	2.3100 2.3100 2.3100 2.3100 P B B P P B P P B P P P P P P P P P P	2.3126	2.3130	2.3100 2.3101 2.3101 2.3100 2.3101 2.3100 1.3100 2.3101 2.3101 2.3101 2.3101 2.3101 2.3100 2.3101 2.3100 2.3101 2.3100 2.3101 2.3100 2.3101 2.3100 2.3130 2.	2.3100 2.3130	2.3101 7.3128	2.3130 2.3130	7 100 7.3100 7.3101 2.3101 2.3101 2.3100 2.3101 2.3101 2.3101 2.3101 2.3101 2.3101 2.3101 2.3101 2.3130 2.3	2.3101 8 2.3129	2.3101	2.3101 2.3125	2.3100 2.3129	2.3101 2.3130
Campbeff Jobs	0.23	0.225	$-\frac{E}{6.235} - \frac{1}{6.237} - \frac{E}{6.237} - \frac{1}{6.235} - \frac{E}{6.231} - \frac{1}{6.232} - \frac{1}{6.233} - \frac{E}{6.239} - \frac{1}{6.239} - \frac{E}{6.239} - \frac{1}{6.239} -$	0.227	0.233	0.236	0.231	E 0.232	0.233	0.231	0.228	6.229	0.233	0.230	0.235	0.239
Valve Stem to Oxide Clearmace	5.0044	0.0040	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	E 0.0039	0.0041	0.0034	0.0043	0.0047	0,0000	0.0047	0.0045	0.0033	0.0039	0.0047	0.0044	0.0051
Valve Spring Porce (1b)	I N	320 E	1232	E 219	233	- 121	1220	217		2119	122	220	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	122	714 T	218
Piston Ang. Dismeter Hiddle & bettom of skirt	4.0000		3.9994		3.9995		4.0000		3.9996		3.9995		3.9999		3.9996	
Main Dearings Journal Diameter Shell Diameter	M M	10. 2.9994 3.0024	2.994 2.9994 3.0020	ci ci	3.0015	2.9992 2.9992 3.0022		Ro. 3 2.9990 2. 7.0012 3.	3.0020		2.9993 3.0001	2.9993 3.0020	1 l . l.	2.9994 2.9994 3.0020	2,9995 2,9995 3,0021	عا طا
						Manufac	Manufacturer's Service Limits, Inches	Service 1	inite, I	nchee						
Compression Mag Cape Top Bottom Cylinder Dere Dismeter Out-of-round		0.010-0.020 4.0000-4.0048 0.0015 max	o. 89	ઇ ≱	Intebe	Comment Lobe Lift Intake Exhauet Falve Stem to Guid Intake	Camebaft Lobe Lift Intels Entels Theory Valve Stem to Guide Clearence Entels Entels Exhaust	•	0.250		Fiston Diameter Mein Bearinge Journel Diameter Shell Diameter	ston Dismeter in Bearings Journel Dismeter Shell Dismeter	ä	3.9994- 2.9994- 3.0002-	3.9994-4.0000 2.9994-3.0002 3.0002-3.0028	
Commercing Red Bearings Journal Diameter Shell Diameter		2,3103-2,3111	11.12	×	alve Spr Inteke Exhaust	Valve Spring Force (1b) Intabe Exhaust	3		76-84 a 215-237 79-87 a 215-237	76-84 at 1.82" 215-237 at 1.39" 79-87 at 1.68" 215-237 at 1.39"						

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

								Cylin	Cylinder No.							
Compensed			7													
Congression Mag Cape Tay Ditton	0.89+		0.97	- 3	0.99		0.97		0.79		0.79		0.99		0.79	
Cylinder Bore Blameter Top Riddia Betom One-of-round Taper	101.694 101.661 101.671 0.015	101.709 101.702 101.702		T 101.712 101.697 101.689	101.702 101.669 101.679 0.003	101.699 101.691 101.686	101.679 101.674 101.679 0.020	101.719 101.707 101.704	1. 101.691 101.656 101.661 0.026 0.030	T 101.717 101.689 101.684	101.674 101.674 101.679 0.011	101.691 101.674 101.666	L 101.712 101.676 101.684 0.005	7 101.707 101.691 101.684	101.664 101.664 101.664 0.030 0.020	7 101.702 101.697
Connecting Bod Barings Justinal Mameter Shell Mameter	38.682 7 38.750	58.674 58.758	56.674 58.763	38.674 38.745	38.674 58.740	38.677	58.677	88.674 38.750	58.677 58.745	58.674 58.750	58.674 58.745	58.677	58.677 58.740	38.677 58.738	38.674 38.748	38.677
Combaft Lobs	5.67	5.72	6.02	3.77	5.92	3.99	5.8	5.89	3.92	3.87	5.79	3.82	3.92	5.84	5.97	10.0
Valve Stem to Outle Clearance	11.0	0.102	0.104	0.09	0.104	E 0.137	- 0.109	E 119	0.102 0.119 0.114	0.119	0.114	0.140	1.099	811.0	0.112	0.130
Valve Spring Porce (D-m)	-	366	1 266	346	1 992	- E	1 6/6	# S94	1 446	3/4	I SE	313	1 0/6	1 E26	1 256	306
Plates Ang. Disseler Hiddle 6 bettes of skirt	101.600		101.585		101.587		101.600		101.595		202.587		101.597		101.590	
Mais Bearings Journal Memoter Shell Memoter	1 1 1	76.165 76.261	76.185	122	76.180 76.238	76.180 76.135		76.175 76.230	76.137		76.187	76.251	سایدا	76.7165	76.187	ها جا ا
						Hanufac	turer's	Service 1	Manufacturer's Service Limits, me	gi						
Compression ting Cape Name of the Dissection of the Cape of the Ca	•	0.25-0.31 101.600-101.722 0.038 max 0.29 max 58.662-58.702 58.702-58.763	1. 722 702 765	J = =	Camebaft Lobe Lift Inteles Exheuet Valve Stem to Oxide Cles Inteles Exheuet Valve Spring Porce (H-m)	obe Life	Cmahaft Lobe Lift Intaka Eshaus Stam to Guide Clasrance Intaka Eshaust Walve Spring Porce (M-m)	• •	6.35 0.13 336-374 956-105 951-387	6.35 Main Main Jou Bha 5.13 at 1.13 at	Figton Diemete Main Bearings Journal Dieme Shell Diemet 33 mm 53 mm 53 mm	Flaton Dissector Main Berings Journal Dissector Shall Dissector Shall Dissector 3 == 31 ==		101, 56: 76, 185- 76, 205-	101.385-101.600 76.185-76.203 76.205-76.271	

M. - Longitudinal, T. - Trameversal, N. - Norisontal, V. - Vertical, P. Pormeri, B. - Back, I. - latake, E. - Enhaust - - Mesurements are in mm.

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

Comparison Lag Control Contr											3	İ	9		_		
State Stat	Ompression Ring																
		0.030		0.028		0.030		0.029		0.029		0.030		0.029		0.0	
State Stat																	
Marchester Mar				L.0028		17	1 100 1	T	-	1	-	-		1			
Comparison Com				4.0024		4.0026	4.0032	4.0021	4.0031	.00.	4.0039	96.4		2.0036	4.0044	.0035	4.0033
Table States but the color of				4.0035		4.0028	4.0031	4.0023	4.0031	4.0023	4.0035	4.0029		4.0032	36		
Shall Dimenter		0.0010		0.0007		0.0003		0.0003		0.007 0.0003		0.0004		9.000			
### Band Band	sessetting Bad																
Shall blaneter		•	,	,	1												
Shall blameter	•	2.3104 2	3106		100		*	= =	•	-	•	-	-	-	•	-	•
Litt		7 4140	4		-	-	-	-		£13103	3	2. JIOS	z. 310g	2.3105 P	2.3105	2.3165	2.310
Life		2 2216				2.3123	2.3120	3122	2.3122	2.3119	EE:	2.3120	2.3121		2.5172	RIF:	2.3
1																	
Color Colo		- 1	- 1	1	- 1	- 4	- 1		•	-		-	~	-	•	•	•
State Stat									0.236	0.116	0.109	0.217	9.20	0.218	0.226	0.23	0.242
Course C																	
0.0035 0.0028 0.0028 0.0035 0.0046 0.0039 0.0039 0.0030 0.0030 0.0037 0.		-	2	1	M	-	m	-	~	-	•		•	•	•	,	1
The Special Control of the Control	-	0.0035 0	0028	. 0025	3.0046	.0039	6.0045	0.0029	0.0060	0.0030	0.0067	0.0027	0.0033	0.0032	9.00.0	0.0034	9.00E
17		Ĺ	Ĺ	اً		1							-	_			•
No. 1													E			E	E
# 1995 3.9994 3.9994 3.9996 3.9996 3.9996 3.9997	istes Avg.Diemeter Widdle & bottom																
Ho		.9996	•	.9992	•••	.9994		3.9995		3.9996		3.998		3.9987		3,900;	
	its Bearings		•				_		•			•			i		
1.5927 2.993	Journal Diameter		1	-	l	ŀ	-	1		ŀ			J	ı	-	اء	ļ
3.0037 3.0035 3.0042 3.0042 3.0034 3.0034 3.0037 Manufacturer's Service Limits, inches 3.0034 3.0037 Manufacturer's Service Limits, inches 3.0034 3.0034 3.0034 G.010-0.020 Camehaff Lobe Lift 0.250 Piston Dismertal Release 4.0000-4.0048 Valve Service Clearance 0.005 Piston Dismertal Dis		2.99		9993	Ľ		9990	 	0666	2.9990		2.9990	2.000	L	1000		Ŀ
Manufacturer's Service Limits, Inches 3,0034 3,0037				ا عام	Ç		-	۴	_	-		•	•		-		2
Mesufacturer's Sarvice Limits, Inches				ŝ	3		3	n	.0042	3.8038		3.0034	3.0037	L	3.0028	3.0030	le.
6.010-0.020 Cameshaft Lobe Lift 0.250 Incake Exchange 1.0000-4.0048 Valve Stem to Ouide Classance 0.005 0.0015 max Exchange Exchange 1.3103-2.3111 Intake Spring Force (1b) 76-84 at 1.82" 2.3103-2.3111 Intake 1.39" Exchange 1.39" Ex						~,	Son fact	rer's &	Tyles L	inite, 1	nches						
0.010-0.020 Incake Enhance 4.0000-4.0040 Valve Stem to Oxide Clearance 0.0015 max Intake 0.0010 max Enhance 2.3103-2.3111 Intake 2.3103-2.3111 Intake 2.3111-2.3136 Exhaust Exhaust 2.3111-2.3136 Exhaust 2.3111-2.3136 Intake	apression Ring Cape				3	shaft Ic	be 1.1ft			0.250						•	•
4.0000-4.0048 Exhaust Exhaust Outde Clearance 0.005 Intake Co.0015 max Exhaust Exhaust Tataba Force (1b) 76-84 at 1.82" 2.3103-2.3111 Intake Exhaust 2.3103-2.313 Exhaust 2.3111-2.3136 Exhaust 2.3111-2.3116 Exhaust 2.3116 Exha		0.010	0.020		~	atabe				}			Mala B	ear face	_	3.99	.9994-4.0000
0.001 max Enhant 0.001 max Enhant 0.005 0.010 max Enhant 1.3103-2.3111 Tetaha Porce (1b) 76-64 at 1.82" 2.3111-2.3136 Exhaust 1.39" 2.3111-2.3136 At 1.39"	Mader Bore Dissets		0-4-004		3	Theus t	37.0						Sour	nel Dies	eter.	2.99	4-3.0
0.010 max Etheust 2.3103-2.3111 faths 2.3111-2.3136 Etheust	Oct-of-round	Ī	5 max	,	! "	teke				0.003			She	1 Dieset		 8	3.0002-3.0028
2.3103-2.3111 Tataba 2.3111-2.3136 Etheust			I		-	rheust											
2.3111-2.3136 Intaka 2.3111-2.3136 Exhaust	TESCHING NOT BEATLE				Val.	ve Sprin	g Porce	(a)									
Etherst	Well Master		3-2.311	_	_	its to				79-07	t 1.82"						
					-	theust				21 y 23 y 2 2 3 7 2 3 7 2 3 7 3 3 3 3 3 3 3 3 3 3	at 1.39						
										215-237	at 1,39						

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

Coppens			7	ſ			Sylin	Cylinder No.		ſ					
Cape and an all and a line and a	9.76	0.71	!	0.76		47.0		0.74		9.76		9.74		5	
Pilades Pro	<u>.</u>	5		76.0		ě.		5		1.04		1.07		0.99	
	101.664 101.709 101.661 101.699 101.661 101.707		101.684 101.674 101.671	J 9 =	101.689 1 101.681 2	101.679 201.653	T 101.691 101.679	101.671 101.648	T 01.699	101.702	7 101.69 101.681		101.712	101.712 101.689	101.740
Taper	0.025 0.025	0.013		0.005	-	0.012		0.028		0.028	P. 6-10		101.681 101.689 0.021 0.010	0.051 0.051 0.015	101.712
Commercing Red Baseings Journal Riemeter	>		•		•	-	>		:					·	
Shell Maneter	50.684 56.669 P B 50.725 50.725	58.664 58.720	58.687 58.722	58.687 3 58.727 3	54.664 3 54.725 3	58.687 3 58.730 3	38.682 3	58.682 3 58.722 3	36.720	6.607	38.684 28.684	58.687 58.687	56.687 58.687 58.687 1 7 6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	58.687	31.602
Life total	1.0 - 5.1 E	12:	5.31	131 - 1	3.84	3.61 3	16.5					-			70° /2
falve Stam to Oxide Clearance	1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.064	0.117 0	0.099 0	0.114 0	0.074 0.	8.152 B	l.	36	1.060	1	- 1	- 1	l	
Valve Spring Porce (B-m)	102 - 107 E	1,000	707	7.8	746	787	7.87	783	792 Y	19/		- 1			6.10
Piston dog. Diameter Hiddle & bettan of other	101.590	101.580	~	101.585	×	101.587		ş		9			È		è
Maia Dearings Journal Planeter	2	1 .	ſ	. 2 2	.	- 1	è		- 1	lo.	•	/96 - 101		101.577 No. 5	
Shell Diameter	76.180	76.162	76.175 76.289		76.175	4 4	76.175	76.173	n n	76.175 76.297	76.180 76.294		76.177	76.182	ا اما
				최	mufactur	Manufacturer's Service Limits, pa	rvice Lis	afte.							
Compression Ling Cope Top	0.25-0.51		9	-3	. Lift			5,3			Pieton Med-	Piston Dismeter		101.8	01.585-101.600
Sylinder Bers Muneter Ont-of-remaid	101.600-101.722 0.030 max 0.25 max	101.722	ង ភ្នំ ដ វ	Etheust ilve Step t Intake	to Outde	Exhaust Valve Stem to Guide Clearence Intelle		0,13			Shell	Journal Dismeter	**	76.18	76.185-76.205
Commercing hed hearings Journal Diameter Shall Mameter		1,702	Í	Malve Spring Porce (H-m)	Porce (Î	43 th tal 60	338-374 at 46.23 mg 956-1054 at 35.31 mg 351-387 at 42.67 mg 956-1054 at 35.31 mg	10 46.23 at 35.33 10 42.67	1 1 1 1					

H. - Longitudinal, T. - Transversal, N. - Northontal, V. - Vertical, F. - Forward, B. - Back, I. - Lataka, E. - Libaus; - - Meangements are in mm

ENGINE COMPONENTS MEASUREMENTS

FT. MCCOY, WI
ENGINE TYPE: FORD V-8, 400 CID
ENGINE NUMBER: CD7098 TYPE FUEL: GASOHOL
O111041 No.

Composes				-	$\left\{ \left[ight] ight\}$										ſ	
Compression Mag Cape Top Bottom	0.035		0.035		0.033		0.034		0.033		0.033		0.033		6.63	
Cylinder Bere Diamter	•	-	-	•-		•-	-1						.,			
Middle Better Ost-of-rese	4.0036 4.0037 0.0001	4.0038 4.0025	4.0031 4.0028 0.0002	4.0039 4.0029	4.0037 4.0033 0.0008	4.0034 4.0034 5.0037	4.0034 4.0034 0.0001	4.0039		4.0030 4.0020 4.0021		4.0046 4.0038 4.0041		4.0028		4.0037 4.0029
Commercial But Borrings	0.000		6.000		0.0003		0.0003		0.000\$		90000		0.000		0.000	
Journal Manater Shall Manater	2.3105	2.3106	2.3106 2.3120	2.3111 2.3123	2.3108 2.3120	2.3105	2.3168 2.3122	2.3108	2.3106	2.3106	2.3106 2.3128	2.3/06	2.3107 2.3106 2.3107 2.3107 2.3128 2.3129 2.3138 2.3139	2.3106	2.3107	2.3107
Cambelt Lobe	0.235	0.216	0.233	5.243	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.233	0.236	0.233	0.242	0.223	0.213 0.242 0.223 0.233 0.235 0.235 0.235 0.235 0.235	0.23	0.232	0.235 0.235	- 1	0.231
Valve Stem to Guide Clearance	0.00.0	0.0030		0.0035	0.0042	0.0043	0.0035	0.0033	1 0.0034	0.0030	1	9.0040	100.0	0.0040	0.0025	0.0040
Valve Spring Force (16)	1 1	- 2	I N	1 8	1 1	2	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	73 8	1	1 2	- F	1	- 1	# S	1 2	
Piston Avg. Diameter Hiddle & bettom of white	3.9996		3.997		3.9997		3.9995		4.0004		4.0003	•	3.9986		3.9996	
Main destings Justical Diameter Shall Diameter	3 3 1	2.9855 7 2.9958 7	2.9699 2.9936	144	3.9946 2.9946	2.9699		7.9938 7.9938	2.9899 2.9899 2.9930		2.9899 2.9933	2.9899 2.9930		2.9936	2,9699 2,9699	ما ما ا
					·	Manfact	Manufacturer's Service Limite, Inches	ervice L	lefte, Ir	chee						
Compression Ming Cape type Detrom Cylinder Dere Dismeter Chreef-trend		0.010-0.020 42000-4.0048 0.0015 max	. 1	ਹ \$	Comehaft Lobe Lift Intake Exhaust Falve Stem to Guid Brake	obe Lift to Guid	Comesheft Lobe Lift Intels Extent Extent Palve Stem to Gaide Clearance Fates	ě	0.250		Fiston Disseter Main Bestings Journal Disseter Shell Disseter	riage Pianter Innter	ı	3,9994-4,0000 2,9994-3,0002 3,0002-3,0028	1.0000 3.0028	
Consecting had Bastings Journal Planster Shall Maneter		2.3103-2.3111	= 2	•	Valve Spring Force (1b) Intabe Echaust	Le Porce	â		76-84 at 1.82" 215-237 at 1.39" 79-87 at 1.68" 215-237 at 1.39"	1.82" at 1.39 at 1.39						

W. - Longitudiani, T - Transversai, N - Morisontai, V - Verticsi, P - Perwiti, B - Mack, I - Intaka, E - Exhaust - - Mashrements are in m

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

								Cylin	Cylinder No.							
Comment														ĺ		
Compression Mag Caps Top Bottom	0.89		0.89		1.30		0.86		0.84		0.84		1.50	_	0.84 1.50	
	101.699 1 101.691 1 101.694 1 0.002	T 101.697 101.664 101.666		T 101.699 101.674		101.714 101.686 101.694		L T T 101.697 101.699 101.686 101.676 101.689 101.674 0.002	L 101.689 101.676 101.676 0.013	7 101.676 101.651 101.653	L 101.707 101.694 101.691 0.010	101.717 101.697 101.704	101.764 101.681 101.681 0.005	T 101.699 101.671 101.671	E 58_	T 101.694 101.674 101.679
Taper Commerting Rod Destrings Journal Biometer Shell Diameter	0.005 8 56.687 7 7 58.725	V 58.689 B 58.732	0.023 B 58.694 F 58.725	V 58.702 B 58.732	0.013 H 58.694 F 58.725	V 58.687 B 58.722	0.006 58.689	V 58.694		V 58.689 B	0.016 H 58.689 F 58.745	V 88.689 8 8	0.023 86.692 88.692	V8.689	0.000 0.000 88.692	78.692 10.721
Complete Lobe	- 63		5.92		1 6.5	5.92	1 1 9 9	26.5				3.92	i		1 8:	3.8
Valve Stem to Caide Clearance	0.076	0.076	0.076	0,140	1 0.107	0.109	0.089	F 0.076	0.066	0.076	0.071	0.102	190.0	E 0.102	0.064	0.102
Valve Spring Force (B-m)	T (M	- M	111	34	1 2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	338	- E	1 I	31g	- F	280 280	I 582	1 162	7 SE2	Z80
Piston Avg. Diameter Niddle 6 bottom of skirt	101.590		101.592		101.592		. 101.587		101.610		101.608		101.564		101.590	
Main Bearings Journal Mameter Shell Mameter		Ho. 8 75.933 76.093	V 75.943 76.093	122	H 75.941 P 76.068	2 75.943 76.068	1 ~ ~	8 18 75.941 75.941 76.093	75.943		75.943 76.066	75.943	1 - 1	75.943 7.068	75.943 76.088	l In ho
						Manufaci	Manufacturer's Service Limits, me	ervice L	faite, a	a i						
Compression Ming Cape Top Potton Sylinder Pore Dismeter Out-of-ressed		0.25-0.51 101.600-101.722 0.038 max	1.722	3 \$	Inteke Linteke Ethaust Ive Ster	Camehaft Lobe Lift Intake Exhaust Valve Stem to Guid Intake	Commodate Lobe Lift Intele Entele Entele Folde Clearence Intele	•	6.35 6.35 0.13		Piston Dismeter Main Bearings Journal Disme Shell Dismeter	ston Disseter in Bearings Journal Disseter Shell Disseter		101,585-101,60 76,185-76,205 76,205-76,271	101.585-101.600 16.185-76.205 16.205-76.271	
Taper Commercing had berings Journal Dismeter Shall Dismeter		0.25 max 58.682-58.702 58.702-58.765	702	*	Exhaust 1ve Spri	in g P orce	Exhaust Walve Spring Force (H-m) 336-374 at 46,23 mm 956-1054, 351-387 a 956-1054.	38-374 a	1 46.23 956-105 351-387 956-105	46.23 == 956-1054 åt 35.31 == 351-367 at 42.67 == 956-1054 at 35.31 ==	111					

of . Longitudinal, T. Transversal, R. Rorisontal, V. Vertical, F. Poresal, B. Back, I. Lataka, E. Enhaust • • Nacerraments are in m.

APPENDIX B

PHOTOGRAPHS

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



PISTON NO. 1 THRUST SIDE



PISTON NO. 3 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE



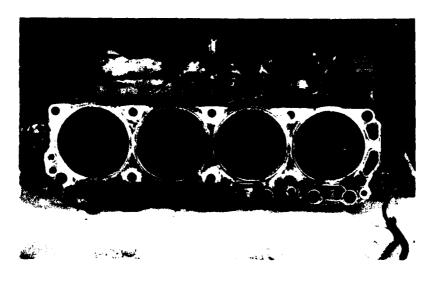
PISTON NO. 3 ANTI-THRUST SIDE

PROCESSION THE MAIN-HOT TILINGS

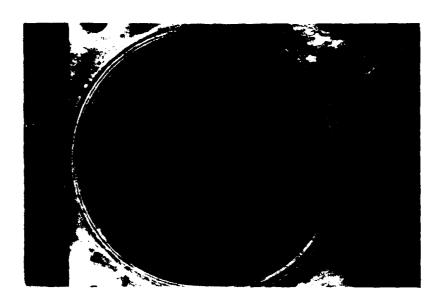


INTAKE VALVES 1-4

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

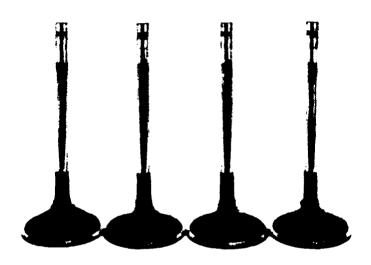


PISTON NO. 3 THRUST SIDE



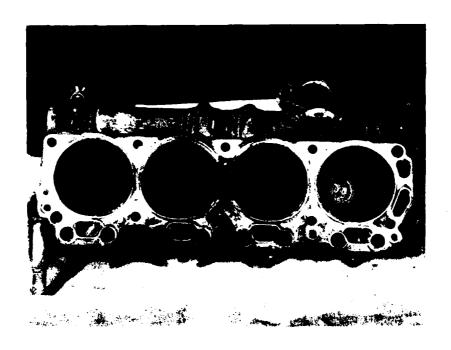
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FT. BELVOIR, VA ENGINE NO: 6003049 FUEL: GASOHOL

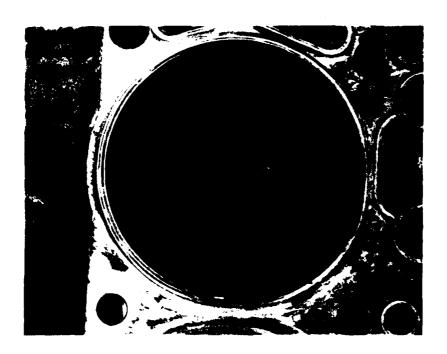


INTAKE VALVES 1-4

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



CYLINDER HEAD



CYLINDER HEAD COMBUSTION CHAMBER NO. 4

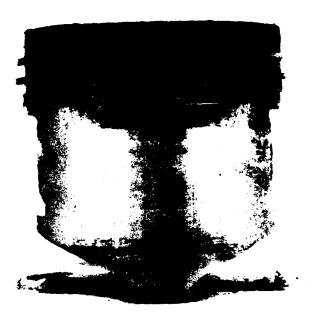
FT. BELVOIR, VA ENGINE NO: 500283 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE



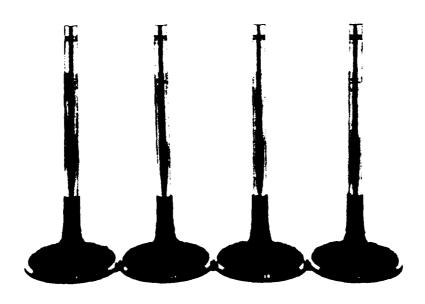
PISTON NO. 3 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

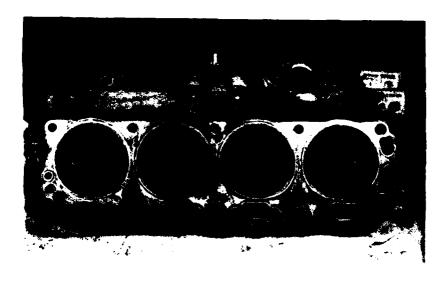


PISTON NO. 3 ANTI-THRUST SIDE



INTAKE VALVES 1-4

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

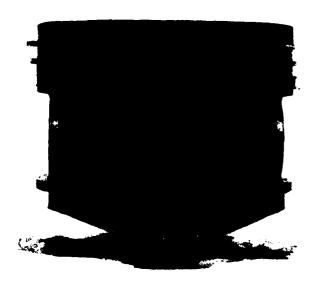


CYLINDER HEAD



CYLINDER HEAD COMBUSTION CHAMBER NO. 2

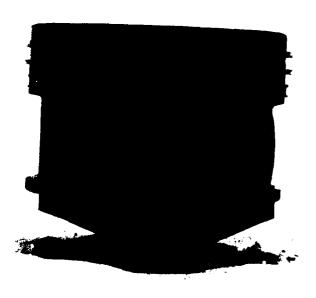
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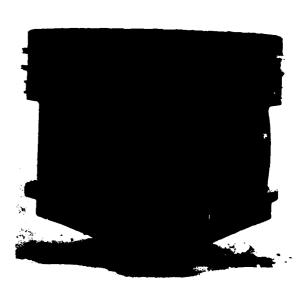
PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE



PISTON NO. 3 THRUST SIDE



PISTON NO. 3 ANTI-THRUST SIDE

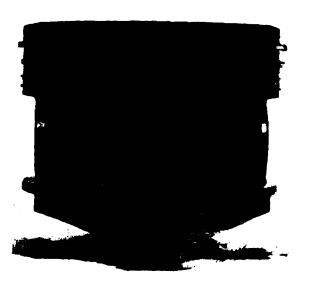
FT. BELVOIR, VA ENGINE NO: 03223146 FUEL: UNLEADED GASOLINE



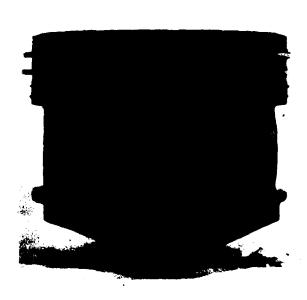
PISTON NO. 2 THRUST SIDE



PISTON NO. 4 THRUST SIDE

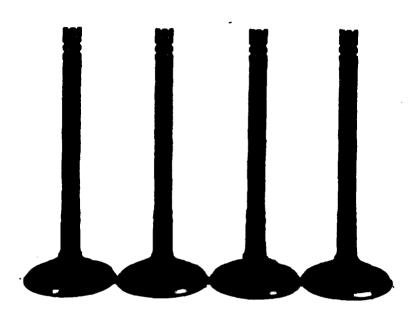


PISTON NO. 2 ANTI-THRUST SIDE

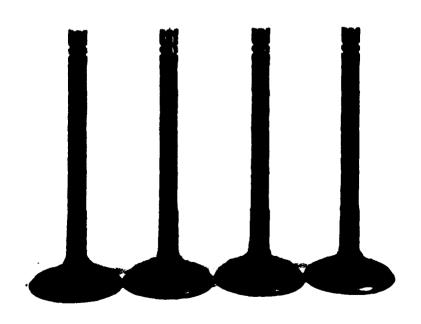


PISTON NO. 4 ANTI-THRUST SIDE

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

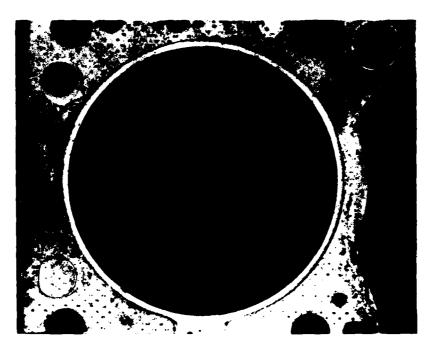


INTAKE VALVES 1-4 LEFT

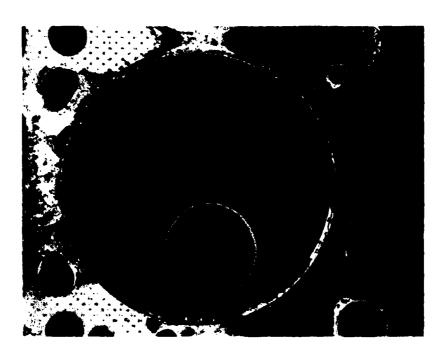


INTAKE VALVES 1-4 RIGHT

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

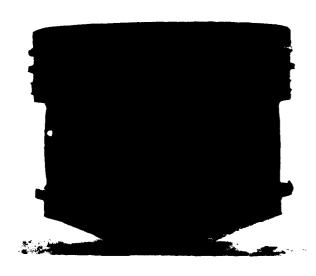


LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1



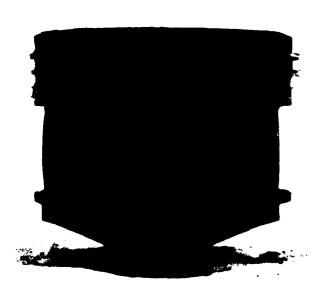
RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

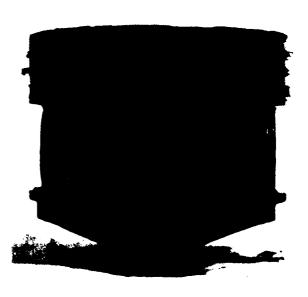
FT. BELVOIR, VA
ENGINE NO: 07121303 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE

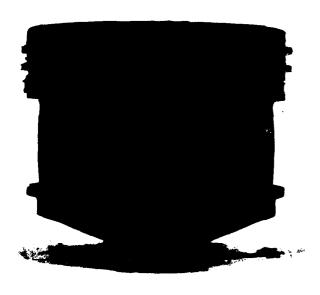
PISTON NO. 1 ANTI-THRUST SIDE





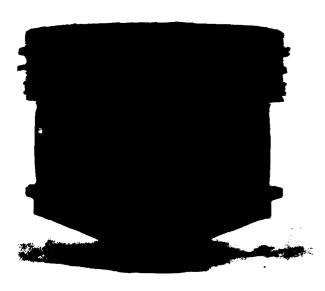
PISTON NO. 3 THRUST SIDE PISTON NO. 3 ANTI-THRUST SIDE

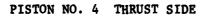
FT. BELVOIR, VA
ENGINE NO: 07121303 FUEL: GASOHOL



PISTON NO. 2 THRUST SIDE

PISTON NO. 2 ANTI-THRUST SIDE

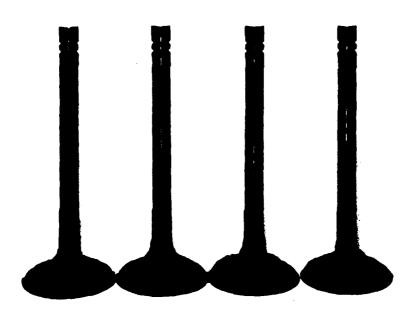




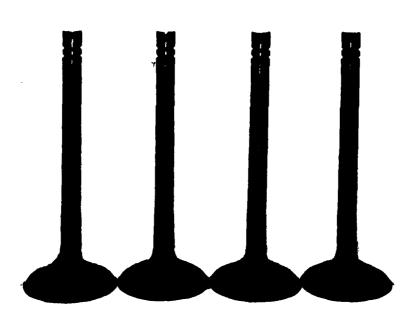


PISTON NO. 4 ANTI-THRUST SIDE

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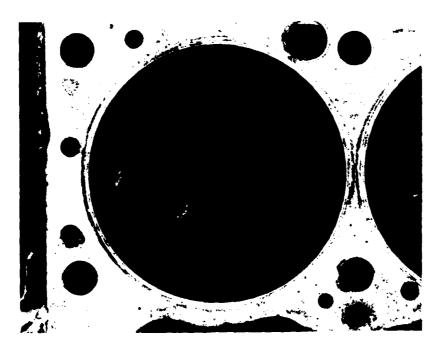


INTAKE VALVES 1-4 LEFT

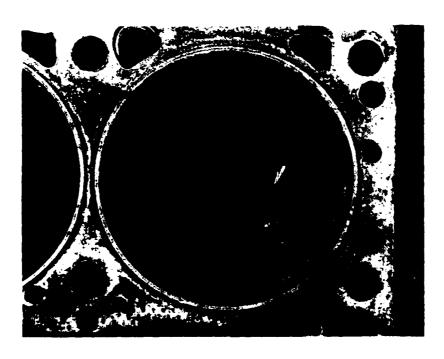


INTAKE VALVES 1-4 RIGHT

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

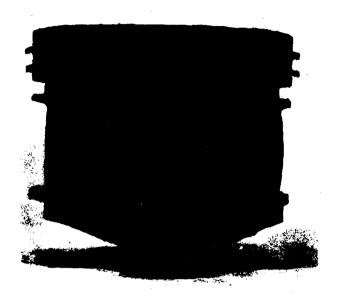


LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1

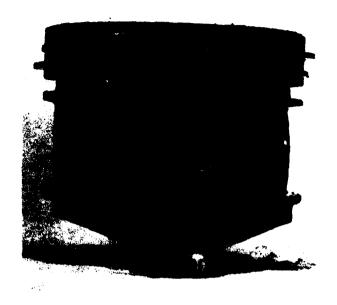


RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

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



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

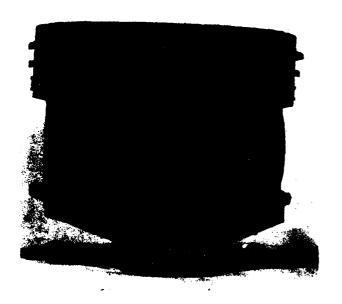


PISTON NO. 3 THRUST SIDE



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

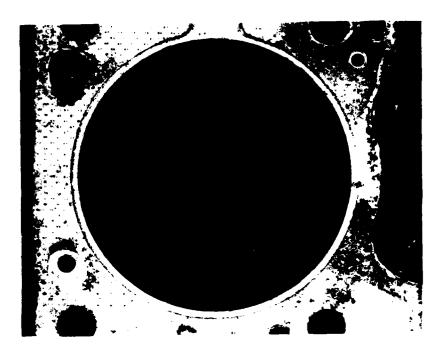


INTAKE VALVES 1-4 LEFT

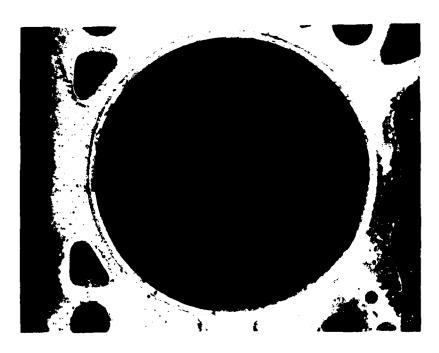


INTAKE VALVES 1-4 RIGHT

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

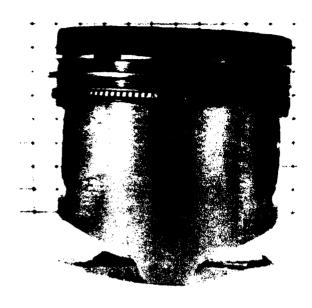


LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1



RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

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



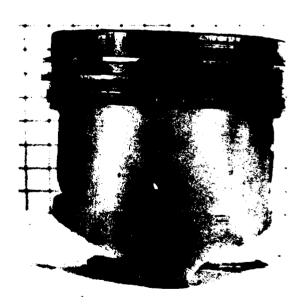
PISTON NO. 1 THRUST SIDE



PISTON NO. 2 THRUST SIDE

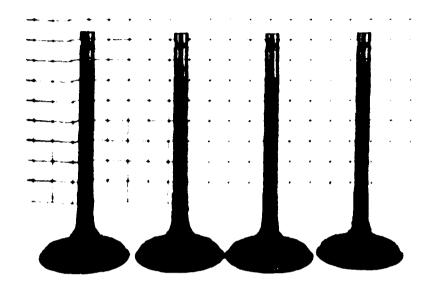


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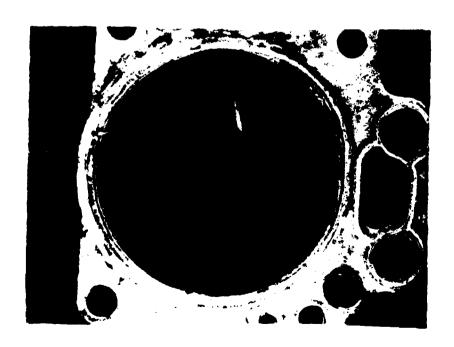


PISTON NO. 2 ANTI-THRUST SIDE

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

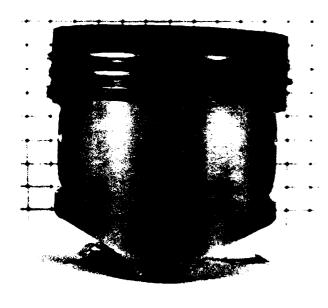


INTAKE VALVES 1-4

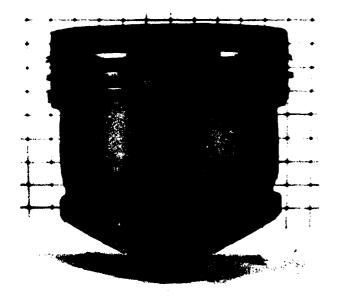


CYLINDER HEAD COMBUSTION CHAMBER NO. 1

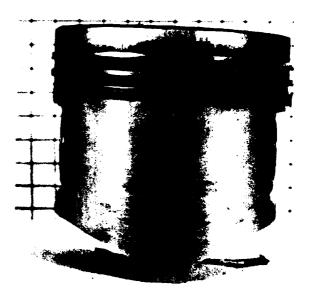
FT. LEWIS, WA ENGINE NO: 251891 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE



PISTON NO. 2 THRUST SIDE

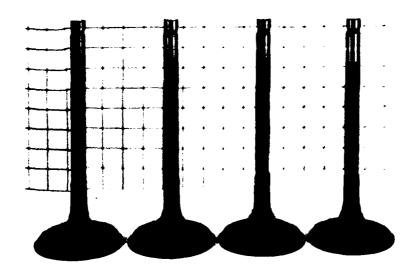


PISTON NO. 1 ANTI-THRUST SIDE

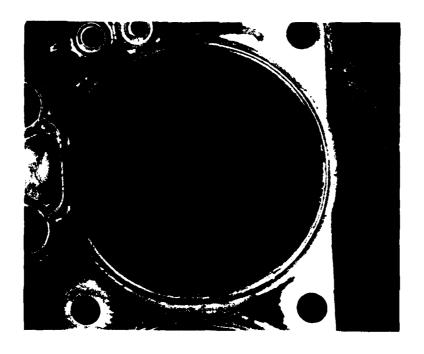


PISTON NO. 2 ANTI-THRUST SIDE

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



INTAKE VALVES 1-4



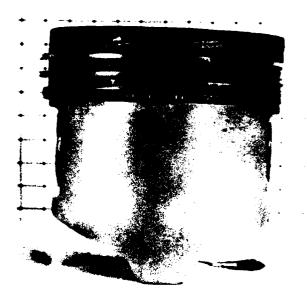
CYLINDER HEAD COMBUSTION CHAMBER NO. 1

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

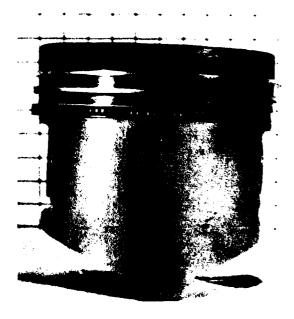


PISTON NO. 1 THRUST SIDE



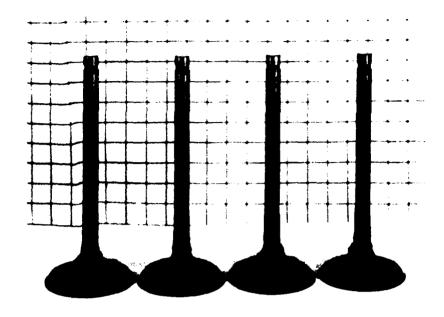


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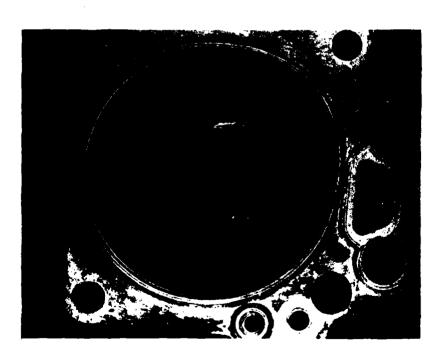


PISTON NO. 2 THRUST SIDE PISTON NO. 2 ANTI-THRUST SIDE

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

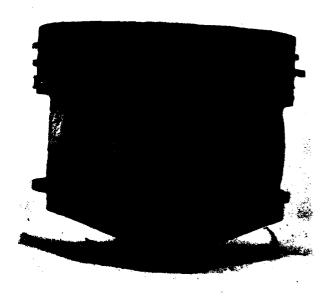


INTAKE VALVES 1-4

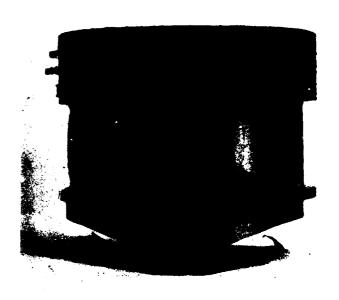


CYLINDER HEAD COMBUSTION CHAMBER NO. 1

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



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

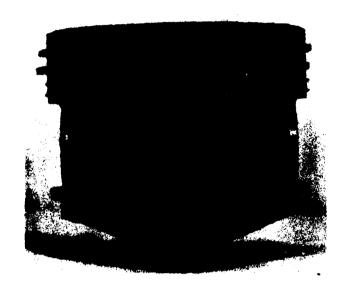


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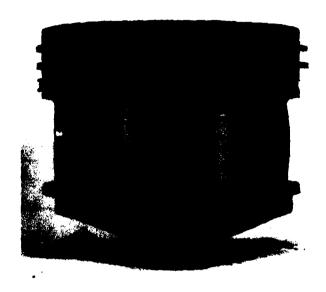


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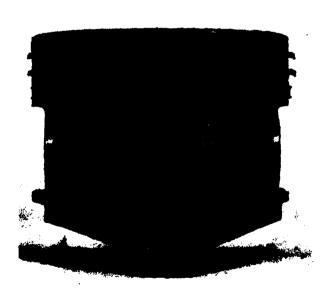
FT. LEWIS, WA ENGINE NO: 01212997 FUEL: UNLEADED GASOLINE



PISTON NO. 2 THRUST SIDE



PISTON NO. 2 ANTI-THRUST SIDE

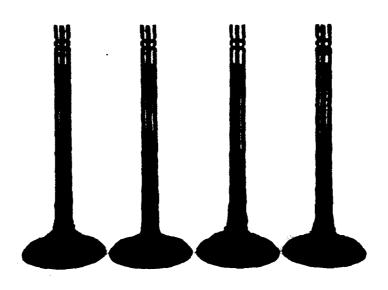


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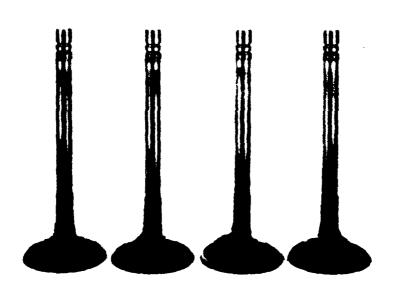


PISTON NO. 6 ANTI-THRUST SIDE

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

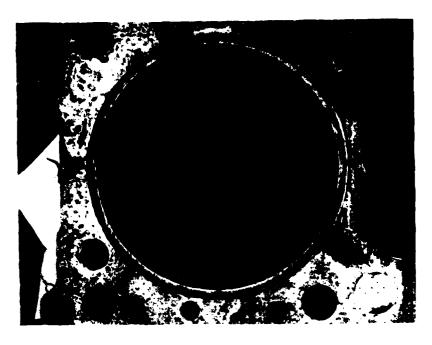


INTAKE VALVES 1,3,5,7 LEFT



INTAKE VALVES 2,3,6,8, RIGHT

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

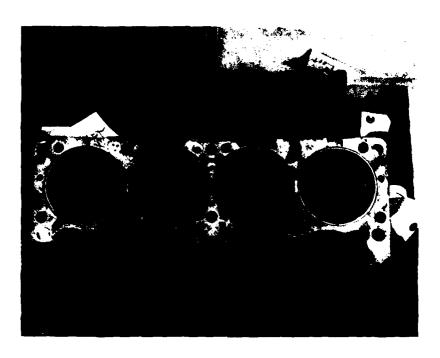


LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1

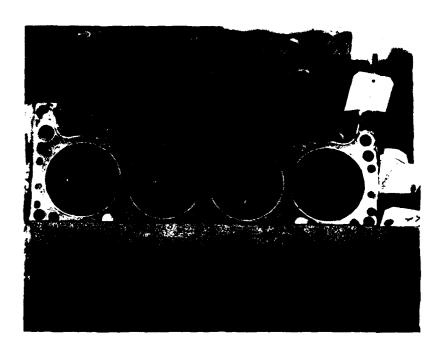


RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2

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



CYLINDER HEAD LEFT



CYLINDER HEAD RIGHT

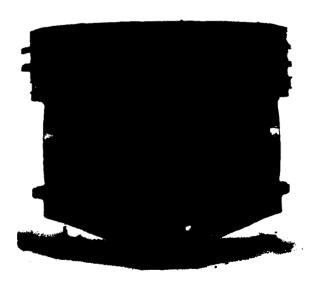
FT. LEWIS, WA ENGINE NO: 02260516 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

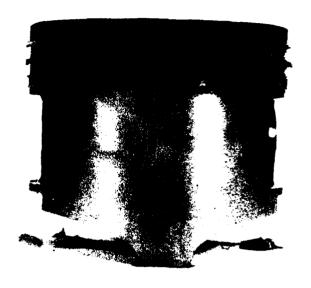




PISTON NO. 3 THRUST SIDE PISTON NO. 3 ANTI-THRUST SIDE

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





PISTON NO. 2 THRUST SIDE PISTON NO. 2 ANTI-THRUST SIDE

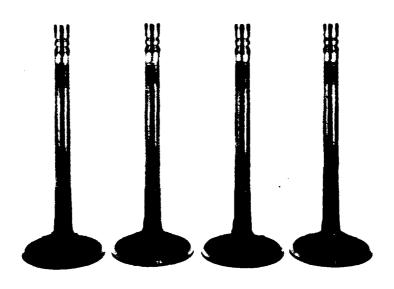


PISTON NO. 6 THRUST SIDE

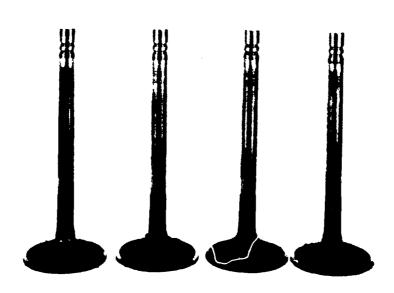


PISTON NO. 6 ANTI-THRUST SIDE

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

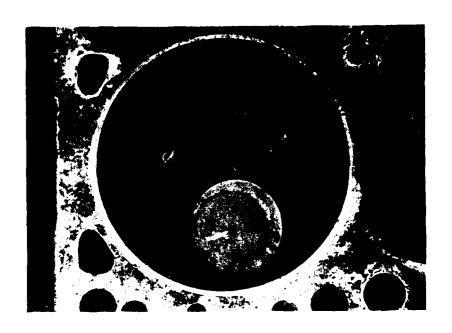


INTAKE VALVES 1,3,5,7, LEFT

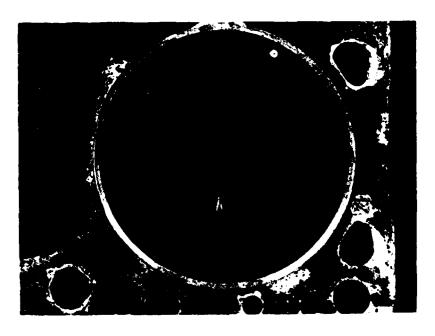


INTAKE VALVES 2,4,6,8 RIGHT

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



LEFT CYLINDER HEAD COMBUSTION CHAMBER NO. 1



RIGHT CYLINDER HEAD COMBUSTION CHAMBER NO. 2



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

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



CYLINDER HEAD LEFT



CYLINDER HEAD RIGHT

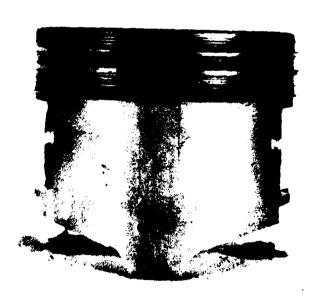
FT. LEWIS, WA ENGINE NO: 12110971 FUEL: GASOHOL



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

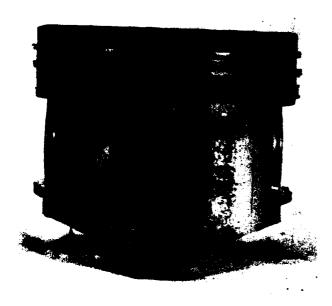


PISTON NO. 3 THRUST SIDE

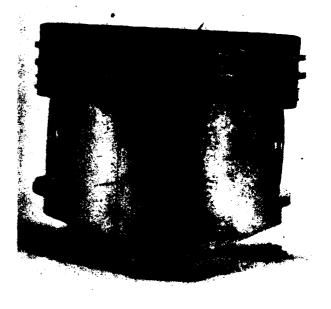


PISTON NO. 3 ANTI-THRUST SIDE

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



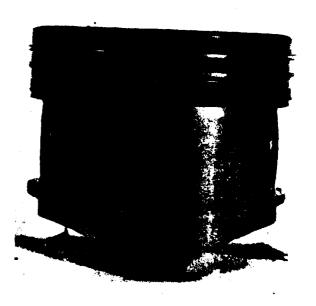
PISTON NO. 2 THRUST SIDE



PISTON NO. 2 ANTI-THRUST SIDE

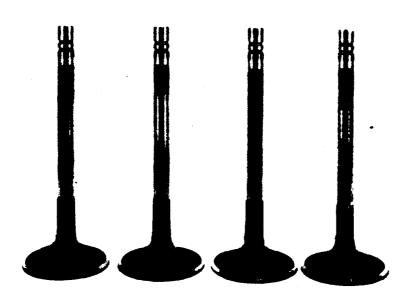


PISTON NO. 6 THRUST SIDE



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: CDO941 FUEL: UNLEADED GASOLINE



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE



PISTON NO. 4 THRUST SIDE

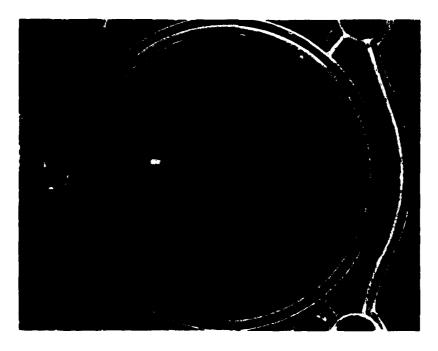


PISTON NO. 4 ANTI-THRUST SIDE

FT. McCOY, WI ENGINE NO: CDO941 FUEL: UNLEADED GASOLINE



INTAKE VALVES 1-6



CYLINDER HEAD COMBUSTION CHAMBER NO. 1

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



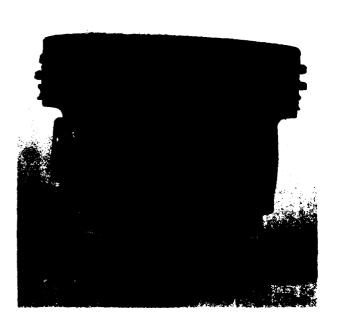
PISTON NO. 1 THRUST SIDE



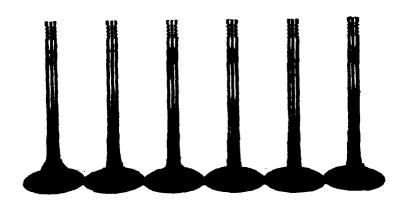
PISTON NO. 1 ANTI-THRUST SIDE



PISTON NO. 4 THRUST SIDE



PISTON NO. 4 ANTI-THRUST SIDE

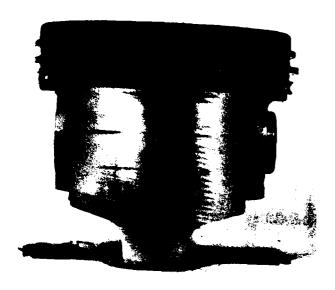


INTAKE VALVES 1-6

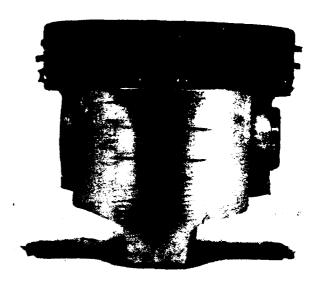


CYLINDER HEAD COMBUSTION CHAMBER NO. 1

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



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE

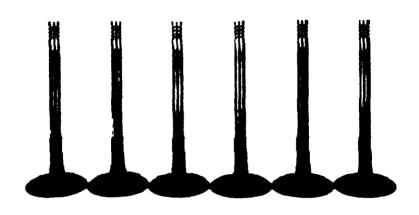


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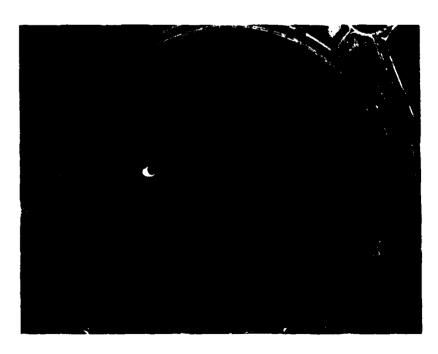


PISTON NO. 4 ANTI-THRUST SIDE

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

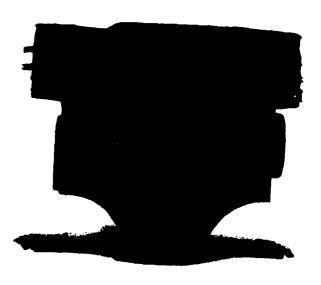


PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE





PISTON NO. 3 THRUST SIDE PISTON NO. 3 ANTI-THRUST SIDE

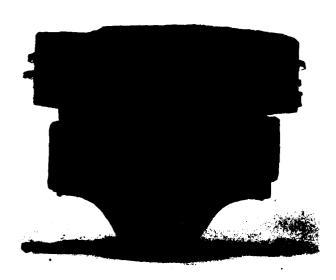
FT. McCOY, WI ENGINE NO: CD7099 FUEL: GASOHOL



PISTON NO. 5 THRUST SIDE



PISTON NO. 5 ANTI-THRUST SIDE

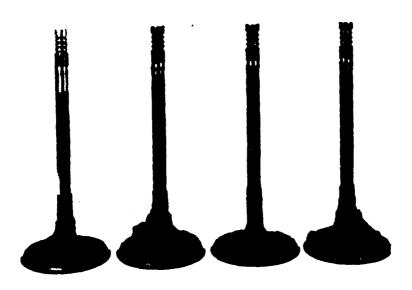


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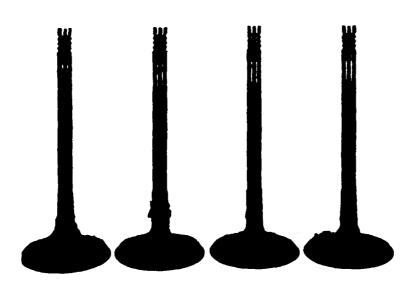


PISTON NO. 7 ANTI-THRUST SIDE

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

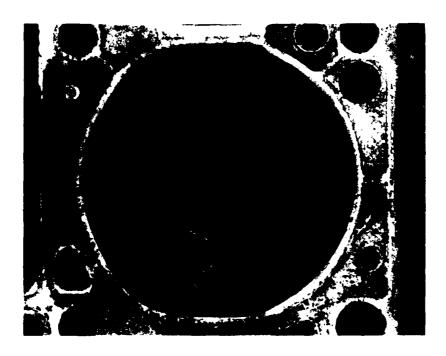


INTAKE VALVES 1-4

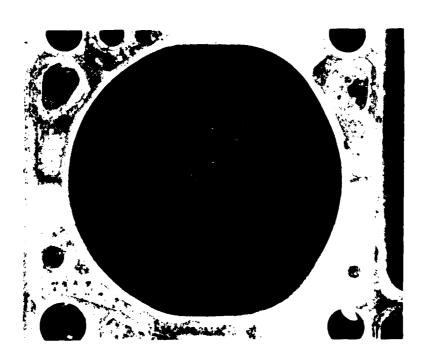


INTAKE VALVES 5-8

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





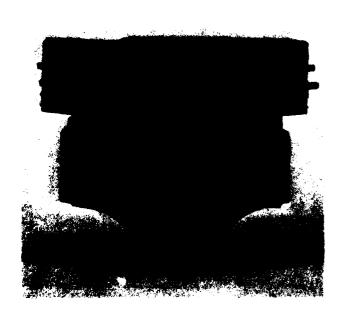
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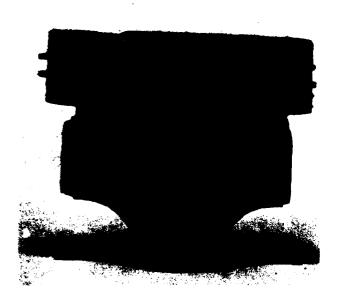
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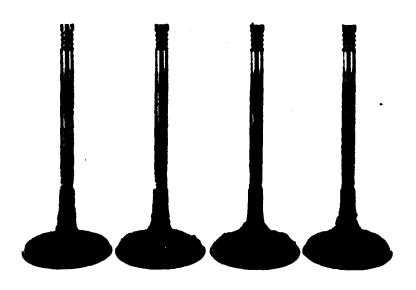
PISTON NO. 5 THRUST SIDE PISTON NO. 5 ANTI-THRUST SIDE



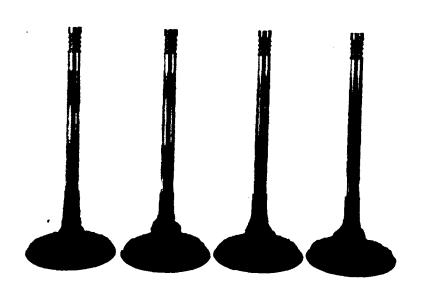


PISTON NO. 7 THRUST SIDE PISTON NO. 7 ANTI-THRUST SIDE

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



INTAKE VALVES 1-4

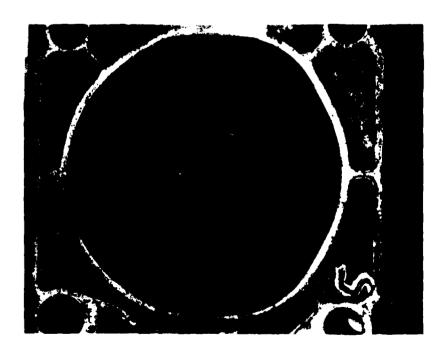


INTAKE VALVES 5-8

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



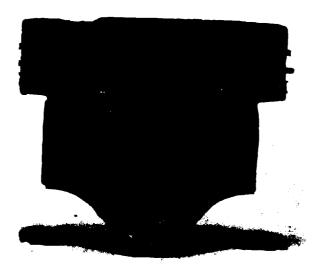
CYLINDER HEAD COMBUSTION CHAMBER NO. 1



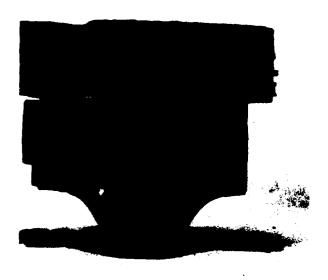
CYLINDER HEAD COMBUSTION CHAMBER NO. 5



PISTON NO. 1 THRUST SIDE



PISTON NO. 1 ANTI-THRUST SIDE



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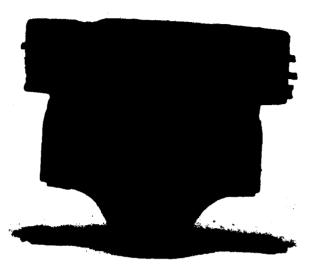


PISTON NO. 3 ANTI-THRUST SIDE

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



PISTON NO. 5 THRUST SIDE



PISTON NO. 5 ANTI-THRUST SIDE

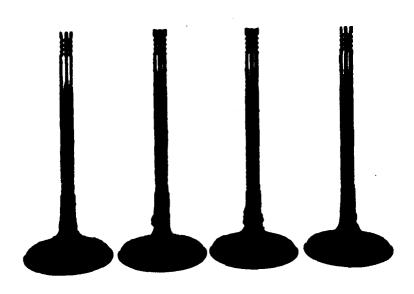


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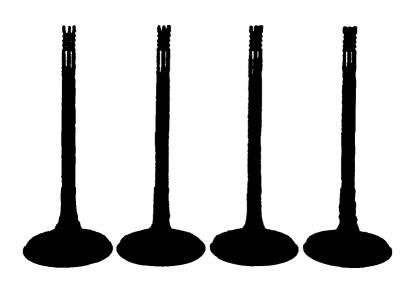


PISTON NO. 7 ANTI-THRUST SIDE

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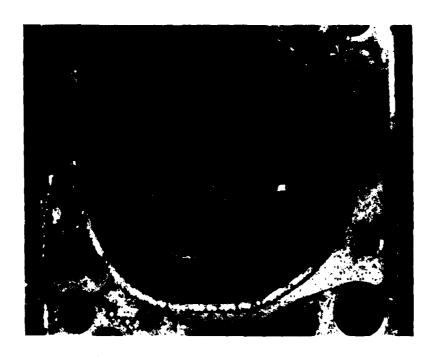


INTAKE VALVES 1-4

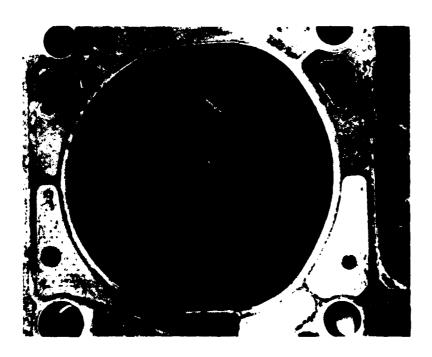


INTAKE VALVES 5-8

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



CYLINDER HEAD COMBUSTION CHAMBER NO. 1



CYLINDER HEAD COMBUSTION CHAMBER NO. 5

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