TENRAC/EDF--070-Pt.2

DE83 900880

DIVISION OF ENGINES, FUELS AND LUBRICANTS

COTTONSEED OIL AS A DIESEL-ENGINE FUEL

Horace E. Staph
Joseph J. Staudt

SOUTHWEST RESEARCH INSTITUTE
6220 Culebra Road, San Antonio, TX 78284

FINAL REPORT
PART 2—APPENDICES
July 31, 1982

Prepared For

TEXAS ENERGY and NATURAL RESOURCES ADVISORY COUNCIL

Energy Development Act
Project No. 80-B-4-3

and

INTERNATIONAL HARVESTER COMPANY

P.O. FE 79757

NOTICE

PORTIONS OF THIS REPORT ARE ILLEGIBLE. It has been reproduced from the best available copy to permit the broadest possible availability.

Approved:

John A. Vitkovits

John A. Vitkovits, Vice President
Division of Engines, Fuels and Lubricants

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

FOREWORD

This report describes the effort devoted to a study of the use of diesel and cottonseed oil blends as alternate fuels for diesel engines.

Due to the bulk of material presented in this report, the report has been divided into two parts. Part 1 describes the engine, fuels, test procedure, and the abridged results. The results are discussed and summarized and recommendations for further work are presented. Part 2 is an appendix containing the original data and the methods used to reduce the data.

NOTICE

PORTIONS OF THIS REPORT ARE ILLEGIBLE. It has been reproduced from the best available copy to permit the broadest possible availability.

REPRODUCED FROM BEST AVAILABLE COPY

TABLE OF CONTENTS

	Page
FOREWORD	ii
LIST OF FIGURES	iv
LIST OF TABLES	v
INTRODUCTION	vii
APPENDIX A	A-1
APPENDIX B	B-1
APPENDIX C	C-1
APPENDIX D	D-1
APPENDIX E	E-1

LIST OF FIGURES

Figure		Page
A-1	INJECTOR TIPS AT END OF TEST NUMBERS 4, 5, and 6 RESPECTIVELY	A-69
A-2	INJECTOR TIPS AT END OF TEST NUMBERS 7-10 RESPECTIVELY	A-121
A-3	COMBUSTION AND INJECTOR PRESSURE TRACES FOR CYLINDER NUMBER 6	A-151
B-1	PHOTOGRAPHS OF ENGINE AT END OF DURABILITY EVALUATION USING 50/50 BLEND OF DF-2 & CSO . .	B-67
C-1	PHOTOGRAPHS OF ENGINE AT END OF DURABILITY EVALUATION USING 100% ESCO	C-91
D-1	PHOTOGRAPHS OF ENGINE AT END OF DURABILITY EVALUATION USING 100% DF-2	D-87

LIST OF TABLES

Table		Page
A-I	PERFORMANCE DATA FOR TEST NUMBERS 1-6	A-7
A-II	CORRECTED RESULTS FOR POWER CURVE TEST NO.'s 1-6	A-21
A-III	EMISSION DATA FOR TEST NUMBERS 1-6	A-29
A-IV	BRAKE SPECIFIC EMISSIONS POWER CURVE TEST NUMBERS 1-6	A-67
A-V	PERFORMANCE DATA FOR TEST NUMBERS 7-10	A-77
A-VI	CORRECTED RESULTS FOR POWER CURVE TEST NO.'s 7-10	A-87
A-VII	EMISSION DATA FOR TEST NUMBERS 7-10	A-93
A-VIII	BRAKE SPECIFIC EMISSIONS POWER CURVE TESTS NUMBERS 7-10	A-119
A-IX	PERFORMANCE DATA FOR TEST NUMBERS 11 & 12 . . .	A-131
A-X	CORRECTED RESULTS FOR POWER CURVE TESTS NUMBER 11, 12	A-137
A-XI	EMISSIONS DATA FOR TEST NUMBER 11	A-141
A-XII	BRAKE SPECIFIC EMISSIONS, POWER CURVE TESTS NUMBER 11	A-149
A-XIII	USED ENGINE OIL ANALYSIS - POWER TESTS	A-165
B-I	PERFORMANCE DATA FOR 200 HOUR DURABILITY EVALUATION: 50% DF2 + 50% CSO	B-5
B-II	CORRECTED PERFORMANCE RESULTS FOR 200 HR DURABILITY EVALUATION: 50% DF-2 and 50% CSO .	B-45
B-III	ENGINE RATING RESULTS, 200 HOURS DURABILITY EVALUATION: 50% DF-2 + 50% CSO	B-62
B-IV	CHART FOR PISTON DEMERITS	B-64
C-I	PERFORMANCE DATA FOR 200 HOUR DURABILITY EVALUATION: 100% ESCO	C-3
C-II	CORRECTED PERFORMANCE RESULTS FOR 200 HR DURABILITY EVALUATION: 100% ESCO	C-45
C-III	EXHAUST GAS EMISSIONS DATA FOR 200 HOUR DURABILITY EVALUATION: 100% ESCO	C-63

LIST OF TABLES (Con't)

Table		Page
C-IV	BRAKE SPECIFIC EMISSIONS, 200 HOUR DURABILITY EVALUATION: ESCO FUEL	C-83
C-V	ENGINE RATING RESULTS, 200 HOUR DURABILITY EVALUATION: 100% ESCO	C-84
C-VI	PISTON RING PROUDNESS	C-86
C-VII	CHART FOR PISTON DEMERITS	C-88
D-I	PERFORMANCE DATA FOR 200 HOUR DURABILITY EVALUATION: 100% DF-2	D-3
D-II	CORRECTED PERFORMANCE RESULTS FOR 200 HR DURABILITY EVALUATION: DF-2 FUEL	D-45
D-III	EXHAUST GAS EMISSION DATA FOR 200 HOUR DURABILITY EVALUATION: 100% DF-2	D-63
D-IV	BRAKE SPECIFIC EMISSIONS, 200 HOURS DURABILITY EVALUATION: DF-2 FUEL	D-80
D-V	ENGINE RATING RESULTS, 200 HOUR DURABILITY EVALUATION: 100% DF-2	D-81
D-VI	PISTON RING PROUDNESS	D-83
D-VII	CHART FOR PISTON DEMERITS	D-85
E-1	ELEMENTAL FUEL ANALYSIS	E-6

INTRODUCTION

This collection of appendicies contains the data obtained in the accomplishment of this project. Summaries of these data will be found in the report proper.

Tables and figures referenced in the text material for each appendix are located in the order of reference at the end of the particular appendix instead of occurring after the initial mention. A number of the tables consist of many pages of data. In the interest of editorial simplicity, these tables are preceded by a page which contains the table number and title. The pages of the table do not, therefore, contain table numbers on them. This title page is set apart by a black line along the outer edge of the sheet. Furthermore, within such tables a number of the data sheets are often grouped together according to a common theme (e.g., test number), and these groupings are separated by unnumbered blue sheets.

APPENDIX A

This Appendix contains description, data, and photographs relating to the 12 power curve tests. The results are grouped according to their common fuel elements. Within this category are discussion and description of the appropriate tests, a photograph of the injector tips after test, the raw performance data and the exhaust gas emission results. The appendix closes with an analysis of the used crankcase oil for all of the power curve tests.

A. TEST NUMBERS 1-6; BLENDS OF DF-2 & CSO

A summary of the raw data obtained during Test Numbers 1 through 6 is given in Table A-I. Some general comments may be made concerning the data and its format. Each test consists of two pages and the individual tests are separated by colored interleaves. The word "Photo" and the numerals arrayed across the top of the data column refers to photographs of the combustion pressure and fuel injection pressure traces made during the test. These photographs are grouped together at the end of this Appendix A. The "Time" refers to the time of day when the observations were made. In general, two sets of observations were made at each speed/load condition; the first set near the beginning of the test cycle and the second set near the end, just prior to changing the conditions of speed and load. The brake horsepower is computed directly from the dyno load and the engine rpm and is uncorrected for standard conditions. The "fuel rate" is determined from the measured time to use 1 lb. of fuel. Later it appeared more advantageous to measure the time to use 1/2 lb. of fuel.

Test Number 1, the initial test, suffered some "opening night" problems. During the initial condition of high idle the exhaust temperatures were not recorded. Therefore, the high idle condition was rerun at the end of the test, along with the maximum torque and maximum power conditions as reference. A comparison of exhaust temperatures at maximum power and maximum torque observed at the beginning at the test and during the reruns shows the latter to be a little higher. Probably this means the engine was not fully warmed up when the test started inspite of its having been run at various power levels for about 1 hour prior to starting the actual testing.

Considerable difficulty was experienced with the smoke (opacity) meter during Test Number 1 so that the values noted may be subject to error. A different meter was used for the later tests and those values are more likely to be correct.

The fuel measuring times for Test Number 1 was for 1 lb. of fuel. Under conditions of low idle it was difficult to complete the measurement in the time normally allotted. As will be noted, later fuel measurement was made for 1/2 lb.

The fuel system discharges the fuel from the bulk tank into a glass beaker used in the fuel measurement system. The engine transfer pump takes fuel from this beaker into the engine. In the process of measuring the amount of fuel used, the fuel in the beaker becomes agitated at one point by control air from a valve-sensing line submerged in the fuel. With regular diesel fuel the event goes virtually unnoticed. Cottonseed oil, on the other hand, foams and bubbles. Test Number 3 with 80 percent cottonseed oil was particularly bad in this respect. Fortunately the weighing process is not volume dependent so the bubbles do not affect the amount of fuel measured.

Fuel leakage was noted at a joint in the two-piece exhaust manifold during Test Number 3. It was particularly bad at low idle indicating considerable carryover of unburned fuel. Whenever cottonseed oil was in the fuel some carryover was observed.

At the end of each test the cylinder, valves, and pistons were observed through a borescope inserted in the injector bore. In Tests Number 1 and 2 the cylinder walls, and the top of the piston including the spray cup were dry. Some minor wetness was observed on some of the valves after Test Number 2 which used 50 percent cottonseed oil. After Test Number 3 the entire combustion chamber was wet. The cylinder walls had streaks of wet fuel running down the sides. Some fuel had pooled in the bottom of the piston spray cups. The valve heads had drops of fuel clinging to them.

Test Number 4 experienced some problems with an ailing fuel inlet solenoid valve. The test was delayed by valve problems until afternoon when only the high idle and maximum power conditions were run. The following day the test picked up where it left off and again experienced valve failure and engine shutdown several times. The complete valve was finally replaced.

Test Number 5 with DF-2 fuel was a repeat of Test Number 1 to evaluate the continuing performance of the engine. Broadly speaking, the performance was identical to that obtained earlier. The data taken at 4:40 and 5:00 should have been for half-power conditions. Instead maximum power conditions were repeated. The half-power condition was eventually run after the half-torque condition, at 5:50 and 6:05 pm.

Test Number 6 was run to provide results using small percentages of cottonseed oil. After the test the combustion chamber was examined using the borescope. The injection cups showed some dampness due to unburned fuel. Some of the valves showed damp areas but for the most part the combustion chamber was dry. The engine was run for 2 hours using diesel fuel and again examained. There was now no evidence of unburned fuel.

A summary of the data from Table A-I, corrected to standard dry conditions by methods given in Appendix E, is presented in Table A-II. The speed, horsepower, fuel rate and inlet air temp-

erature to the air cleaner are averages of two readings, one taken shortly after the speed/load condition was established and the other taken approximately 20-30 minutes later.

Table A-III shows the emission data. Readings were made for each of the six speed/load conditions run during the test and the data are presented in the order of their acquisition during the test. Each test is separated from the others by colored interleaves. For all of these tests the NOx data are in error. The cell used to make this measurement was faulty. It read low because it was insensitive to NO_2 and basically was reflecting only the NO. Hence the NO and NOx readings are, in the table, essentially equal.

Table A-IV gives the brake specific emissions for Test Numbers 1-6. These results were obtained from the exhaust emissions using computation procedures given in Appendix E.

Figure A-1 shows the state of the injector tips after Test No's 4, 5, 6 respectively. Photographs were not made prior to Test No. 4. The tips show buildup around the ports when CSO was used, although no ports were blocked.

B. TEST NUMBERS 7-10; BLENDS OF DF-2, CSO, & ESCO

After the durability evaluation using DF-2 and CSO, the engine was rebuilt using new liners, pistons, rings, rod bearings, and cam followers. A power curve test, Test Number 7, was then run with DF-2 fuel and the results compared to those of Test Numbers 1 and 5, also run with DF-2, to see if the rebuild process had altered the engine's operating characteristics. The engine performance was normal and practically the same as that obtained in the earlier tests. However the after-test inspection with the borescope revealed a very different situation from that observed earlier when using a diesel fuel. The cylinders, valves, and cups ranged from dry to wet. There is no explanation for this different appearance. The Number 5 cylinder wall showed what appeared to be a vertical scratch near the bottom of the stroke on the anti-thrust side.

Table A-V provides the original data obtained during the power curve tests, Test Numbers 7 through 10. The data format and presentation is the same as that for the earlier tests.

During Test Number 8, soot was blown out of the exhaust stack. The build-up of soot probably had occurred during the earlier high CSO blend tests. The exhaust gases had a slight castor oil odor which apparently is characteristic of cottonseed oil when used as a fuel. The cylinders when examined after the test showed some dampness characteristic of cottonseed oil fuel.

Test Number 9 experienced some problems with higher than usual injection pressures in cylinder Number 6 during the high idle phase. Injectors 5 and 6 were switched but the problem

persisted. The injectors were returned to their original positions without noticeable change. The effect was not noticeable during the other speed/load phases of the test.

The borescope examination at the end of the test showed dry cylinders and cups, much like the usual diesel tests. The intake valves had a drop of fuel clinging to them. The scratch in cylinder Number 5 was still evident.

The smoke meter failed after the initial reading in Test Number 10 and no further smoke readings were attempted. Otherwise the test proceeded without incident. Because the engine was to be cleaned thoroughly before making the 100 percent ESCO run, the head was removed for observation instead of using the borescope. The injectors showed some deposit build-up but not as much as resulted from the tests with CSO. The outstanding characteristic was the soot deposits. Soot was smoothly and evenly deposited on the piston tops and the underside of the head, including the valves. This high soot level is consistent with the results using high cetane number fuels.* Except for a spot on one valve, the combustion chamber was dry. Each cylinder wall had an approximately 1/4 in. wide by 3/8 in. long greasy, sooty smudge where the top ring gap was located. The alleged scratch in cylinder Number 5 was found to be real, its cause unknown. The scratch was deep enough to be felt with the fingernail. Prior to the endurance test this scratch was smoothed out by light honing.

A summary of the corrected results of Test Numbers 7-10 are in Table A-VI. As was the case for the earlier power curve test, the speed, horsepower, fuel rate, and inlet air temperature to the air cleaner are averages of two readings except for the fuel rate at the low idle condition. Here the time needed to measure the fuel made only one reading possible.

Table A-VII presents the exhaust gas emission results. The data for NOx are valid; the faulty cell was replaced prior to these tests. Table A-VIII contains the brake specific emissions computed from the exhaust emissions.

Photographs of the injector tips are in Figure A-1. There appears to be some build-up of deposits with all tests except the diesel fuel test.

C. TEST NUMBERS 11 & 12; 100 PERCENT DF-2

After the durability evaluation using 100 percent ESCO fuel, the engine was rebuilt with new liners, pistons, and rings. Test Number 11 was made with DF-2 fuel to demonstrate that the engine characteristics had not changed due to the rebuild process. Also, this DF-2 fuel was from a second batch and the results from Test Number 11 confirmed the "sameness" of this latest batch of fuel with the earlier DF-2.

---

* Obert, E.F. Internal Combustion Engines, 3d Ed., International Textbook Co., Scranton, PA, 1968, pg 273.

Test Number 12 was run after the durability test using DF-2 fuel and merely served to assure that the engine behavior had not been altered by the durability test.

Table A-IX gives the original performance data obtained during Test Numbers 11 and 12. No problems were encountered with either test. The power levels and fuel rates were well within acceptable experimental error of the results obtained from the previous runs on diesel fuel. The cylinders were dry after each test.

The summary of the corrected results of Test Numbers 11 and 12 are given in Table A-X.

No photographs of the injectors were taken after the tests. Smoke readings were made for Test Number 11 only, as were the emissions measurements, the results of which are given in Table A-XI. Table A-XII presents the brake specific emissions based on the exhaust gas emission data in Table A-XI.

D. COMBUSTION AND INJECTION PRESSURE TRACES

Pressure transducers were placed in the engine head and the injector of cylinder Number 6 to measure the combustion pressure and the injection pressure. Measurements were made during the power curve tests only, not during the durability runs.

The pressure traces were produced on an oscilloscope screen and photographed. Figure A-3 reproduces these traces. The clearer, humped curve is a time trace of the combustion pressure. The dimmer, jagged curve is a time trace of the injection pressure. For all of the traces, the combustion vertical scale was 400 psi/cm* and for the injection pressure was 2000 psi/cm. These scales have been used to determine the peak pressures given in Figure A-3. The horizontal time scale varies and is noted below each photograph in degrees (implied is degrees/cm). The number accompanying the photographs corresponds to the number at the top of the performance data sheet (e.g. Table A-I) opposite the word "Photo" and indicates under which operating conditions the photograph was made. In most cases two photographs were taken for any one condition but only one is displayed in Figure A-3.

The shape of the curves and the magnitude of the peaks shows little variation between fuels suggesting the engine and injection system were well capable of handling the fuels. Some comments on features found in the photographs are, however, appropriate. The comments do not apply solely to those photographs discussed below; these are only used as examples and the comments apply to other instances where the same feature or phenomenon

---

* On the original CRT screen the main grid liner were spaced 1 cm apart. Photographic processes have changed the grid size slightly.

are found. In Photo 1, the late secondary rise in combustion pressures results from a long ignition delay caused by a small quantity of fuel injected into a relatively cold cylinder. The high idle state was always the first run of the test. A somewhat similar situation exists in Photo 4 under conditions of low idle. However, here the engine is hot and the ignition delay is shorter. Small quantities of fuel generally do not result in the most efficient ignition condition.

The early low pressure hump prior to the steep pressure rise in the injection pressure in Photo 2 probably results from the compression of ever-present vapor bubbles in the stream of fuel at the start of injection under conditions of maximum fuel transport at high speed. Compression of the fuel starts but the collapsing vapor bubbles keep the line pressure low until finally the fuel stream is solid. Then the pressure shoots up. Occasionally a similar situation is found at the maximum torque condition but because the amount of fuel transported and the speed are less, the early pressure rise is not as pronounced. The pressure peaks after injection are probably due to ringing or resonances in the fluid line. The peaks are not likely to be caused by after-injection or bounce of the injector pintle due to the design of the injection system.

The irregular combustion pressure pattern in photo 3 is probably caused by uneven fuel light-off. Some of this is also seen in Photo 2.

Photo 4 shows another example of pressure line ringing after injection.

The irregular combustion pressure in Photos 5 and 6 are due to resonances of the gas column in the small diameter drilled hole between the combustion chamber and the pressure transducer. Transducers mounted flush with the combustion chamber walls do not exhibit such behavior.

Table A-XIII details the analyses of the crankcase oil at the end of each power test. Data for the unused oil is included. The acid number and total base number for Test Numbers 1-6 are uniformly in error. Their values should be more nearly those of Tests Numbers 7-10. An error was observed in the equipment during the time that these tests were made. An attempt was made by the laboratory to redo all of the bad tests but unfortunately this group escaped being picked up for repeat.

TABLE A-I

PERFORMANCE DATA FOR TEST NUMBERS 1-6

INTENTIONALLY BLANK

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-14-81 Test No. 1 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	1	1	2	2	3	3	4	4
Time	10:05	10:35	11:15	11:45	12:20	12:55	2:10	2:40
Engine RPM	2767	2770	2500	2500	1800	1800	725	716
Dyno Load (lb) Observed	9.6	3.2	204.2	204.4	255.6	255.6	3.8	3.2
BHP	8.9	3.0	170.3	170.3	153.4	153.4	.9	.8
1 - Coolant Out Temperature, F	186	186	186	186	186	186	174	185
2 - Coolant In Temperature, F	183	182	177	177	177	176	173	182
3 - Oil Sump Temperature, F	212	212	220	220	214	214	172	189
4 - Intake Air Temperature, F	86	84	82	87	83	83	87	88
5 - Fuel Temperature, F	100	99	98	98	95	95	101	97
6 - Intake Manifold After Turbo	136	135	255	259	215	214	94	96
7 - Ambient Air Temperature, F	80	79	80	80	82	83	85	85
8 - Exhaust Temperature Cyl. #1			907	909	926	924	216	219
9 - Exhaust Temperature Cyl. #2			972	975	1000	998	206	213
10 - Exhaust Temperature Cyl. #3			937	940	966	963	208	216
11 - Exhaust Temperature Cyl. #4			938	944	973	970	214	222
12 - Exhaust Temperature Cyl. #5			945	951	990	986	215	222
13 - Exhaust Temperature Cyl. #6			881	888	934	933	226	228
Oil Gallery Pressure, psi	49.5	49.5	46.0	46.0	38.0	38.0	28.0	19.0
Pressure Before Fuel Filter, psi	66.0	66.0	55.0	55.5	45.0	44.0	30.0	29.0
Pressure After Fuel Filter, psi	66.5	66.5	55.0	55.5	44.5	44.0	28.0	27.5
Intake Manifold Pressure, In. Hg.	3.0	3.0	27.0	27.0	21.5	21.5	0	0
Intake Air Restriction, In. H_2O	8	8	8	8	1	8	3	0
Fuel Rate LBS/HR	17.84	17.75	67.77	66.86	57.07	56.41	2.85	
Fuel Time Sec/ 1 lb.	201.81	202.81	53.12	53.84	62.96	63.56	1262.90	
					63.22	63.25		
					63.06	64.66		
Barometer Pressure, In. Hg.		29.32		29.32		29.30		29.25
Dry Bulb Temp., F		81.0		85.0		85.0		84.0
Wet Bulb Temp., F/R.H.%	66%	72.0	57%	73.0	57%	73.0	65%	74.5
Blow-by, CFH								
Smoke RDG. % 0-20% scale								2

REMARKS: 1:15 pm: fuel leak at fuel filter fitting. Shut down for about ½ hour.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-14-81 Test No. 1 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	5	5	6	6		3 Repeat	2 Repeat	1 Repeat
Time	3:35	4:05	4:45	5:15		5:30	6:00	6:25
Engine RPM	2500	2500	1806	1808		1802	2501	2771
Dyno Load (lb) Observed	102.4	102.5	127.2	127.4		252.3	205.0	6.0
BHP	85.3	85.4	76.6	76.8		151.6	170.9	5.5
1 - Coolant Out Temperature, F	185	186	186	186		187	187	185
2 - Coolant In Temperature, F	179	180	180	180		177	178	181
3 - Oil Sump Temperature, F	214	214	208	208		216	222	211
4 - Intake Air Temperature, F	91	91	95	93				
5 - Fuel Temperature, F	98	98	96	96				
6 - Intake Manifold After Turbo	182	182	148	147				
7 - Ambient Air Temperature, F	85	86	87	86				
8 - Exhaust Temperature Cyl. #1	686	689	665	662		941	930	485
9 - Exhaust Temperature Cyl. #2	719	723	690	690		1019	989	482
10 - Exhaust Temperature Cyl. #3	693	694	667	665		981	953	472
11 - Exhaust Temperature Cyl. #4	713	716	680	679		997	964	486
12 - Exhaust Temperature Cyl. #5	694	696	684	681		1017	967	479
13 - Exhaust Temperature Cyl. #6	662	662	648	646		954	910	480
Oil Gallery Pressure, psi	57.5	57.5	41.0	40.8				
Pressure Before Fuel Filter, psi	59.0	59.0	47.0	47.0				
Pressure After Fuel Filter, psi	58.5	59.0	46.5	46.7				
Intake Manifold Pressure, In. Hg.	12.5	11.5	6.7	6.7				
Intake Air Restriction, In. H_2O	5	5	2	2				
Fuel Rate LBS/HR	38.14	38.45	29.32	29.67		-	66.84	17.61
Fuel Time Sec/ 1 lb.	93.03	93.01	123.17	122.94			53.86	204.46
	94.09	94.92	122.38	119.74				
	96.02	92.96						
Barometer Pressure, In. Hg.		29.30	-					
Dry Bulb Temp., F		90.0	89					
Wet Bulb Temp., F/R.H.%	40%	71.0	73	47%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale	8		3.5	4		10	3	2

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-16-81 Test No. 2 Oil Code LO-7616

Fuel Code 50% DF-2; 50% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	7	7	8	8	9	9	10	10
Time	9:45	10:15	10:45	11:15	11:45	12:15	12:45	1:15
Engine RPM	2757	2756	2500	2498	1800	1800	726	707
Dyno Load (lb) Observed	5.4	6.0	210.6	210.5	260.0	259.5	4.0	4.2
BHP	5.0	5.5	175.5	175.3	156.0	155.7	1.0	1.0
1 - Coolant Out Temperature, F	188	188	189	187	189	188	182	183
2 - Coolant In Temperature, F	184	183	180	178	179	178	179	181
3 - Oil Sump Temperature, F	214	213	223	222	217	217	184	184
4 - Intake Air Temperature, F	81	82	83	84	86	85	83	85
5 - Fuel Temperature, F	99	100	92	91	91	91	90	90
6 - Intake Manifold After Turbo	132	133	259	260	221	221	93	94
7 - Ambient Air Temperature, F	78	80	83	83	81	83	81	86
8 - Exhaust Temperature Cyl. #1	463	466	906	913	952	952	221	220
9 - Exhaust Temperature Cyl. #2	463	467	971	986	1025	1023	214	214
10 - Exhaust Temperature Cyl. #3	454	459	944	952	994	993	214	211
11 - Exhaust Temperature Cyl. #4	468	472	960	969	1004	999	221	221
12 - Exhaust Temperature Cyl. #5	469	475	957	966	1008	1004	216	217
13 - Exhaust Temperature Cyl. #6	473	476	898	904	966	946	230	226
Oil Gallery Pressure, psi	50.0	49.5	46.5	46.5	37.5	37.5	21.0	20.0
Pressure Before Fuel Filter, psi	70.0	72.0	59.5	59.0	48.5	48.0	36.0	35.5
Pressure After Fuel Filter, psi	70.0	72.0	58.5	58.5	47.5	47.2	34.0	34.0
Intake Manifold Pressure, In. Hg.	3.5	3.5	28.2	28.2	22.0	21.9	0	0
Intake Air Restriction, In. H_2O	4	4	6	6	4	4	1	1
Fuel Rate LBS/HR	18.77	19.21	76.45	74.61	62.50	62.06	3.28	2.73
Fuel Time Sec/ 1 lb.	191.79	187.38	47.09	48.25	57.60	58.01	549.4*	1317.93
Barometer Pressure, In. Hg.	29.40	29.40		29.40		29.40		29.28
Dry Bulb Temp., F		80		83		83		85
Wet Bulb Temp., F/R.H.%	63%	70.5	57%	71.0	57%	71	51%	71
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.5		2.0		8.0		2.0

REMARKS: * Fuel time, sec/½ lb.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-16-81 Test No. 2 Oil Code LO-7616

Fuel Code 50% DF-2; 50% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	11	11	12					
Time	2:40	3:10	3:45	4:15				
Engine RPM	2506	2503	1805					
Dyno Load (lb) Observed	105.5	109.6	129.8					
BHP	88.1	91.4	78.1					
1 - Coolant Out Temperature, F	188	187	185					
2 - Coolant In Temperature, F	182	181	179					
3 - Oil Sump Temperature, F	216	215	207					
4 - Intake Air Temperature, F	85	81	82					
5 - Fuel Temperature, F	90	91	90					
6 - Intake Manifold After Turbo	178	178	139					
7 - Ambient Air Temperature, F	82	78	82					
8 - Exhaust Temperature Cyl. #1	694	695	673					
9 - Exhaust Temperature Cyl. #2	717	724	707					
10 - Exhaust Temperature Cyl. #3	694	697	680	RAN OUT OF FUEL				
11 - Exhaust Temperature Cyl. #4	727	733	672					
12 - Exhaust Temperature Cyl. #5	705	701	681					
13 - Exhaust Temperature Cyl. #6	676	671	641					
Oil Gallery Pressure, psi	47.5	47.5	42.5					
Pressure Before Fuel Filter, psi	63.0	63.0	51.3					
Pressure After Fuel Filter, psi	62.5	62.5	50.1					
Intake Manifold Pressure, In. Hg.	11.5	12.2	7.0					
Intake Air Restriction, In. H_2O	5	5	3					
Fuel Rate LBS/HR	42.54	44.29	33.17	-				
Fuel Time Sec/ 1 lb.	83.31	82.16	108.54					
	84.63	80.39						
	85.96							
Barometer Pressure, In. Hg.		29.34	29.32					
Dry Bulb Temp., F		81	80					
Wet Bulb Temp., F/R.H.%	68%	73	73	70%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale	Rain	1.5	Rain					

REMARKS: Ran out of fuel at 4:15

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-20-81 Test No. 3 Oil Code LO-7616

Fuel Code 20% DF-2; 80% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	13	14	14	15	15	16	16	17
Time	1:15	1:20	1:50	2:10	2:25	2:45	3:00	3:25
Engine RPM	2770	2500	2500	1800	1800	739	742	2500
Dyno Load (lb) Observed	8.6	211.6	211.6	254.6	253.8	4.6	4.6	105.4
BHP	7.9	176.3	176.3	152.8	152.3	1.1	1.1	87.8
1 - Coolant Out Temperature, F	188	188	188	187	188	184	182	188
2 - Coolant In Temperature, F	184	178	180	178	178	180	180	182
3 - Oil Sump Temperature, F	212	222	222	216	216	184	183	217
4 - Intake Air Temperature, F	89	93	94	94	95	94	93	94
5 - Fuel Temperature, F	94	93	93	91	91	92	92	94
6 - Intake Manifold After Turbo	140	271	273	226	228	102	101	185
7 - Ambient Air Temperature, F	83	87	87	87	88	88	87	89
8 - Exhaust Temperature Cyl. #1	469	932	940	961	965	231	230	705
9 - Exhaust Temperature Cyl. #2	468	1009	1013	1034	1041	221	219	717
10 - Exhaust Temperature Cyl. #3	462	971	981	1007	1013	211	210	702
11 - Exhaust Temperature Cyl. #4	477	989	995	1015	1018	220	218	732
12 - Exhaust Temperature Cyl. #5	480	990	996	1026	1030	221	218	706
13 - Exhaust Temperature Cyl. #6	493	936	940	961	964	232	231	691
Oil Gallery Pressure, psi	50.0	48.0	48.0	39.0	39.0	22.0	22.0	48.0
Pressure Before Fuel Filter, psi	72.0	60.0	59.0	51.0	51.0	39.0	39.0	64.0
Pressure After Fuel Filter, psi	72.0	59.0	58.0	50.0	50.0	37.0	37.0	63.0
Intake Manifold Pressure, In. Hg.	3.5	28.0	28.0	21.0	21.0	0	0	12.0
Intake Air Restriction, In. H_2O								
Fuel Rate LBS/HR	20.22	80.23		64.67		3.10*	3.47*	
Fuel Time Sec/ 1 lb.	179.69	45.18		54.51		580.85	519.04	
	176.40	45.18		55.36				
		44.25		57.12				
Barometer Pressure, In. Hg.		29.10		29.10	29.10	29.10	29.10	
Dry Bulb Temp., F		88		91		90		
Wet Bulb Temp., F/R.H.%		73	50%	71	39%	74	48%	
Blow-by, CFH								
Smoke RDG. % 0-20% scale	3		1.75	4.50		2	2	1.25

REMARKS: Many bubbles in the fuel beaker
* Fuel time, Sec/½ hr.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-20-81 Test No. 3 Oil Code LO-7616

Fuel Code 20% DF-2; 80% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	17	18	18					
Time	3:40	3:55	4:10					
Engine RPM	2502	1800	1800					
Dyno Load (lb) Observed	105.1	157.1	127.1					
BHP	87.7	76.3	76.3					
1 - Coolant Out Temperature, F	188	186	186					
2 - Coolant In Temperature, F	182	180	180					
3 - Oil Sump Temperature, F	216	208	208					
4 - Intake Air Temperature, F	94	94	93					
5 - Fuel Temperature, F	94	92	92					
6 - Intake Manifold After Turbo	184	148	149					
7 - Ambient Air Temperature, F	89	89	88					
8 - Exhaust Temperature Cyl. #1	702	676	687					
9 - Exhaust Temperature Cyl. #2	713	707	714					
10 - Exhaust Temperature Cyl. #3	697	684	687					
11 - Exhaust Temperature Cyl. #4	730	766	675					
12 - Exhaust Temperature Cyl. #5	709	688	688					
13 - Exhaust Temperature Cyl. #6	689	657	659					
Oil Gallery Pressure, psi	47.5	43.0	42.0					
Pressure Before Fuel Filter, psi	65.0	53.0	53.0					
Pressure After Fuel Filter, psi	64.0	52.0	52.0					
Intake Manifold Pressure, In. Hg.	12.0	7.0	7.0					
Intake Air Restriction, In. H_2O								
Fuel Rate LBS/HR	43.88	33.59	33.08					
Fuel Time Sec/ 1 lb.	81.98	107.16	108.82					
	82.16							
	81.98							
Barometer Pressure, In. Hg.	29.05		29.00					
Dry Bulb Temp., F	93		92					
Wet Bulb Temp., F/R.H.%	75	44%	75	46%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale	1.25	2.25	2.25					

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-22, 23-81 Test No. 4 Oil Code LO-7616

Fuel Code 35% DF-2; 65% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	19	19	20	20	4-23-81 21	21	22	22
Time	3:00	3:15	3:50	4:05	9:00	9:15	10:05	10:20
Engine RPM	2757	2758	2498	2496	1805	1803	720	720
Dyno Load (lb) Observed	5.0	5.0	211.0	210.8	258.4	257.0	3.5	4.2
BHP	4.6	4.6	175.6	175.4	155.5	154.5	.8	1.0
1 - Coolant Out Temperature, F	186	187	186	185	189	187	178	177
2 - Coolant In Temperature, F	182	183	177	177	180	178	176	176
3 - Oil Sump Temperature, F	214	214	223	223	220	219	179	179
4 - Intake Air Temperature, F	82	82	84	87	83	83	82	82
5 - Fuel Temperature, F	94	94	93	93	88	88	87	87
6 - Intake Manifold After Turbo	133	132	263	265	221	221	89	89
7 - Ambient Air Temperature, F	77	77	79	81	76	76	76	76
8 - Exhaust Temperature Cyl. #1	473	474	927	935	952	952	213	212
9 - Exhaust Temperature Cyl. #2	475	476	1001	1006	1032	1031	202	203
10 - Exhaust Temperature Cyl. #3	461	464	953	960	992	992	203	203
11 - Exhaust Temperature Cyl. #4	468	472	965	974	1009	1007	222	223
12 - Exhaust Temperature Cyl. #5	475	479	964	970	1007	1006	211	211
13 - Exhaust Temperature Cyl. #6	492	496	928	931	956	955	229	228
Oil Gallery Pressure, psi	50.0	50.0	47.0	47.0	37.3	37.5	22.0	21.9
Pressure Before Fuel Filter, psi	73.0	73.5	62.0	61.5	50.0	50.0	37.0	37.0
Pressure After Fuel Filter, psi	73.5	74.0	61.0	61.0	49.2	49.2	36.0	36.0
Intake Manifold Pressure, In. Hg.	3.5	3.0	28.5	28.5	22.0	22.0	0	0
Intake Air Restriction, In. H_2O	1	1	8	8	4	3	1	1
Fuel Rate LBS/HR	19.92		73.77	74.30	61.92	60.81		3.10
Fuel Time Sec/ ½ lb.	89.94		24.40	23.94	29.07	29.60		580.76
	91.48			24.51				
	89.65							
Barometer Pressure, In. Hg.	28.92		28.92		28.95			28.99
Dry Bulb Temp., F	81		81		76			79
Wet Bulb Temp., F/R.H.%	71	61%	72	65%	69	70%	68%	71
Blow-by, CFH								
Smoke RDG. % 0-20% scale	2.0		1.5	1.5		4.5		2.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 4-22, 23-81 Test No. 4 Oil Code LO-7616

Fuel Code 35% DF-2; 65% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	23	23	24	24				
Time	12:45	1:00	1:40	1:55				
Engine RPM	2500	2500	1802	1802				
Dyno Load (lb) Observed	105.0	105.0	127.6	127.8				
BHP	87.5	87.5	76.7	76.8				
1 - Coolant Out Temperature, F	187	185	181	181				
2 - Coolant In Temperature, F	181	179	175	175				
3 - Oil Sump Temperature, F	218	217	206	206				
4 - Intake Air Temperature, F	82	87	89	91				
5 - Fuel Temperature, F	91	92	91	91				
6 - Intake Manifold After Turbo	175	180	145	147				
7 - Ambient Air Temperature, F	78	90	81	82				
8 - Exhaust Temperature Cyl. #1	701	706	684	695				
9 - Exhaust Temperature Cyl. #2	708	714	715	720				
10 - Exhaust Temperature Cyl. #3	687	690	685	689				
11 - Exhaust Temperature Cyl. #4	716	720	675	670				
12 - Exhaust Temperature Cyl. #5	688	692	671	671				
13 - Exhaust Temperature Cyl. #6	681	682	648	650				
Oil Gallery Pressure, psi	47.0	47.2	42.2	42.2				
Pressure Before Fuel Filter, psi	64.5	64.5	52.8	52.8				
Pressure After Fuel Filter, psi	65.0	65.0	52.0	52.0				
Intake Manifold Pressure, In. Hg.	11.8	11.8	7.1	7.1				
Intake Air Restriction, In. H_2O	5	5	4	4				
Fuel Rate LBS/HR	40.30	38.16	33.49	33.80				
Fuel Time Sec/ ½ lb.	44.66	47.17	53.75	53.09				
Barometer Pressure, In. Hg.	28.98		28.95	28.95				
Dry Bulb Temp., F	80		80					
Wet Bulb Temp., F/R.H.%	69	59%	70	61%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.0	4.0					

REMARKS: Engine shut off several times between run 22 and 23. Finally had to replace solenoid valve on fuel inlet line.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-6-81 Test No. 5 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	25	25	26	26	27	27	28	28
Time	2:15	2:30	2:50	3:05	3:20	3:35	3:55	4:15
Engine RPM	2777	2777	2505	2505	1800	1800	707	707
Dyno Load (lb) Observed	5.2	5.4	205.2	205.6	255.2	255.6	2.6	2.8
BHP	4.8	5.0	171.3	171.7	153.1	153.4	.6	.7
1 - Coolant Out Temperature, F	183	184	183	183	182	184	176	177
2 - Coolant In Temperature, F	179	180	174	174	172	174	174	176
3 - Oil Sump Temperature, F	213	213	222	222	215	216	180	178
4 - Intake Air Temperature, F	88	88	92	91	93	95	90	92
5 - Fuel Temperature, F	94	94	93	93	93	92	92	93
6 - Intake Manifold After Turbo	141	143	273	270	233	235	98	99
7 - Ambient Air Temperature, F	87	91	90	86	89	91	87	90
8 - Exhaust Temperature Cyl. #1	482	483	920	917	953	956	224	223
9 - Exhaust Temperature Cyl. #2	502	502	1007	1003	1043	1046	221	221
10 - Exhaust Temperature Cyl. #3	480	479	960	957	1003	1008	227	224
11 - Exhaust Temperature Cyl. #4	492	495	998	994	1029	1031	227	221
12 - Exhaust Temperature Cyl. #5	492	492	985	980	1029	1029	215	215
13 - Exhaust Temperature Cyl. #6	489	488	950	944	975	975	199	202
Oil Gallery Pressure, psi	49.0	49.0	46.0	46.5	38.0	38.0	22.0	22.0
Pressure Before Fuel Filter, psi	67.0	67.0	56.0	56.0	44.0	44.5	38.0	27.6
Pressure After Fuel Filter, psi	67.0	67.0	56.0	56.0	44.0	45.0	36.5	26.3
Intake Manifold Pressure, In. Hg.	4.0	3.8	28.0	28.5	22.0	22.5		0
Intake Air Restriction, In. H_2O	1	1	2	2	1	1	1	1
Fuel Rate LBS/HR	17.96	17.89	65.79	65.67	56.66	55.88	2.11	
Fuel Time Sec/ ½ lb.	100.23	100.61	27.36	27.91	31.77	32.21	854.75	
				26.91				
Barometer Pressure, In. Hg.	28.98		28.98		28.98		28.94	
Dry Bulb Temp., F	90		90		90		89	
Wet Bulb Temp., F/R.H.%	72	43%	72	43%	72	43%	73	48%
Blow-by, CFH								
Smoke RDG. % 0-20% scale	1.5		3.0		9.5		.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-6-81 Test No. 5 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	29	29	30	30	31	31		
Time	4:40	5:00	5:15	5:30	5:50	6:05		
Engine RPM	2500	2501	1803	1802	2500	2500		
Dyno Load (lb) Observed	203.6	204.1	126.8	126.0	106.4	104.8		
BHP	169.7	170.2	76.2	75.7	88.7	87.3		
1 - Coolant Out Temperature, F	186	186	183	183	186	185		
2 - Coolant In Temperature, F	178	177	177	176	179	179		
3 - Oil Sump Temperature, F	222	224	209	208	216	217		
4 - Intake Air Temperature, F	94	92	92	93	93	92		
5 - Fuel Temperature, F	92	94	93	93	93	94		
6 - Intake Manifold After Turbo	272	270	147	148	190	188		
7 - Ambient Air Temperature, F	92	88	89	90	90	87		
8 - Exhaust Temperature Cyl. #1	925	923	656	654	708	705		
9 - Exhaust Temperature Cyl. #2	990	988	700	699	749	744		
10 - Exhaust Temperature Cyl. #3	950	949	671	669	715	706		
11 - Exhaust Temperature Cyl. #4	993	991	698	696	754	749		
12 - Exhaust Temperature Cyl. #5	974	973	688	685	720	715		
13 - Exhaust Temperature Cyl. #6	940	956	664	660	706	700		
Oil Gallery Pressure, psi	46.0	45.5	41.5	41.7	47.2	47.0		
Pressure Before Fuel Filter, psi	56.0	55.6	46.5	46.5	58.5	58.5		
Pressure After Fuel Filter, psi	56.0	56.0	46.5	46.5	59.0	59.0		
Intake Manifold Pressure, In. Hg.	28.0	28.0	7.0	7.0	12.0	12.0		
Intake Air Restriction, In. H_2O	7	7	3	3	4	4		
Fuel Rate LBS/HR	64.47	66.47	28.37	28.09	38.53	39.26		
Fuel Time Sec/ ½ lb.	27.92	27.08	63.45	64.07	46.72	45.85		
Barometer Pressure, In. Hg.	28.91		28.91		28.90			
Dry Bulb Temp., F	90		90		90			
Wet Bulb Temp., F/R.H.%	73	46%	72	43%	73	46%		
Blow-by, CFH								
Smoke RDG. % 0-20% scale	3.5		2.5		3.0			

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-8-81 Test No. 6 Oil Code LO-7616

Fuel Code 70% DF-2; 30% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	32	32	33	33	34	34	35	35
Time	8:58	9:15	9:50	10:05	10:40	10:55	11:32	11:47
Engine RPM	2768	2767	2505	2501	1801	1805	703	704
Dyno Load (lb) Observed	6.8	3.2	208.6	209.0	260.6	260.2	3.2	3.1
BHP	6.3	3.0	174.2	174.2	156.5	156.6	.8	.7
1 - Coolant Out Temperature, F	183	180	179	178	176	176	169	170
2 - Coolant In Temperature, F	179	176	172	169	166	166	167	168
3 - Oil Sump Temperature, F	211	209	219	218	210	210	173	173
4 - Intake Air Temperature, F	79	80	84	84	86	88	85	86
5 - Fuel Temperature, F	92	91	89	89	88	88	88	88
6 - Intake Manifold After Turbo	132	133	268	268	228	229	93	93
7 - Ambient Air Temperature, F	77	80	85	80	81	83	82	83
8 - Exhaust Temperature Cyl. #1	465	474	921	923	952	954	211	212
9 - Exhaust Temperature Cyl. #2	480	485	1008	1007	1038	1041	220	219
10 - Exhaust Temperature Cyl. #3	463	466	966	969	1004	1007	210	211
11 - Exhaust Temperature Cyl. #4	482	486	998	1001	1027	1027	212	211
12 - Exhaust Temperature Cyl. #5	486	488	981	982	1025	1027	207	207
13 - Exhaust Temperature Cyl. #6	489	498	949	948	970	971	212	213
Oil Gallery Pressure, psi	50.0	50.0	47.0	47.0	40.0	40.0	23.0	23.0
Pressure Before Fuel Filter, psi	71.0	71.0	59.5	59.3	47.0	47.2	32.5	32.5
Pressure After Fuel Filter, psi	71.1	71.3	59.6	59.2	46.2	46.7	25.5 (?)	31.1
Intake Manifold Pressure, In. Hg.	3.5	3.3	29.3	29.2	22.6	22.3	0	0
Intake Air Restriction, In. H_2O	4	4	6	6	4	4	1	1
Fuel Rate LBS/HR	19.16	20.30	69.74	68.55	61.14	57.64	2.23	
Fuel Time Sec/ ½ lb.	93.96	88.66	25.81	26.26	29.44	31.23	806.43	
Barometer Pressure, In. Hg.		28.94		28.94	28.95		28.95	
Dry Bulb Temp., F		80		80	82		84	
Wet Bulb Temp., F/R.H.%	69%	72	72%	73	72	61%	73	60%
Blow-by, CFH								
Smoke RDG. % 0-20% scale		1.8		2.0		11.8	.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-8-81 Test No. 6 Oil Code LO-7616

Fuel Code 70% DF-2; 30% CSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	36	36	37	37				
Time	12:18	12:33	1:10	1:25				
Engine RPM	2501	2501	1800	1806				
Dyno Load (lb) Observed	105.1	104.8	130.8	131.2				
BHP	87.6	87.4	78.5	79.0				
1 - Coolant Out Temperature, F	177	177	175	175				
2 - Coolant In Temperature, F	171	170	168	169				
3 - Oil Sump Temperature, F	210	210	201	201				
4 - Intake Air Temperature, F	88	87	87	88				
5 - Fuel Temperature, F	91	91	90	90				
6 - Intake Manifold After Turbo	185	184	146	146				
7 - Ambient Air Temperature, F	85	87	84	87				
8 - Exhaust Temperature Cyl. #1	697	692	659	663				
9 - Exhaust Temperature Cyl. #2	726	724	711	717				
10 - Exhaust Temperature Cyl. #3	701	701	681	687				
11 - Exhaust Temperature Cyl. #4	747	743	708	712				
12 - Exhaust Temperature Cyl. #5	714	708	692	699				
13 - Exhaust Temperature Cyl. #6	706	704	654	659				
Oil Gallery Pressure, psi	48.0	48.1	45.0	45.0				
Pressure Before Fuel Filter, psi	61.1	61.8	49.3	49.3				
Pressure After Fuel Filter, psi	62.0	62.0	49.0	49.0				
Intake Manifold Pressure, In. Hg.	12.0	12.0	7.5	7.5				
Intake Air Restriction, In. H_2O	5	5	4	4				
Fuel Rate LBS/HR	38.97	39.74	32.26	30.63				
Fuel Time Sec/ ½ lb.	46.19	45.30	55.79	58.76				
Barometer Pressure, In. Hg.		28.92		28.92				
Dry Bulb Temp., F		86		85				
Wet Bulb Temp., F/R.H.%	50%	73	57%	73				
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3.8		3.8				

REMARKS:

TABLE A-II

CORRECTED RESULTS FOR POWER
CURVE TEST NO.'s 1-6

INTENTIONALLY BLANK

TEST NO.: 1

DATE: 04-14-81 FUEL: DF-2 HV: 18319 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2769	6.0	17.8	85	29.32	0.70	1.013	6.0	2.9515	4.0	54068.2	4.71

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	170.3	67.3	85	29.32	0.69	1.012	172.4	0.3905	125.3	7153.2	35.57

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	153.4	56.7	83	29.30	0.69	1.011	155.1	0.3658	156.5	6701.5	37.96

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
721	0.9	2.9	88	29.25	0.74	1.020	0.9	3.2864	2.2	60203.8	4.23

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	85.4	38.3	91	29.30	0.56	1.017	86.8	0.4412	63.1	8082.4	31.48

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1807	76.7	29.5	94	29.30	0.65	1.024	78.5	0.3756	78.9	6880.1	36.98

TEST NO.; 2

DATE; 04-16-81 FUEL; 50% DF-2; 50% CSO HV; 17017 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2757	5.3	19.0	82	29.40	0.63	1.003	5.3	3.6045	3.5	61337.0	4.15

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2499	175.4	75.5	84	29.40	0.64	1.006	176.5	0.4278	128.3	7280.1	34.95

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	155.9	62.3	86	29.40	0.64	1.009	157.3	0.3960	158.7	6739.5	37.75

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
717	1.0	3.0	84	29.28	0.62	1.011	1.0	2.9481	2.6	50167.7	5.07

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2505	89.8	43.2	83	29.34	0.73	1.011	90.7	0.4763	65.8	8105.8	31.39

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1805	78.1	33.2	82	29.32	0.74	1.011	78.9	0.4201	79.4	7149.7	35.58

TEST NO.: 3

DATE: 04-20-81 FUEL: 20% DF-2; 80% CSO HV: 16416 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2770	7.9	20.2	89	29.10	0.66	1.025	8.1	2.4972	5.3	40994.1	6.21

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	176.3	80.2	94	29.10	0.66	1.031	181.7	0.4415	132.0	7247.5	35.10

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	152.6	64.7	95	29.10	0.55	1.028	156.8	0.4124	158.3	6769.3	37.58

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
741	1.1	6.5	94	29.10	0.68	1.032	1.1	5.7691	2.8	94706.4	2.69

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2501	87.8	43.9	94	29.05	0.68	1.034	90.7	0.4836	65.9	7939.2	32.04

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	76.3	33.3	94	29.00	0.69	1.036	79.0	0.4219	79.7	6926.3	36.73

TEST NO.; 4

DATE; 04-22; 23-81 FUEL; 35% DF-2; 65% CSO HV; 16728 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2758	4.6	19.9	82	28.92	0.66	1.022	4.7	4.2365	3.1	70868.1	3.59

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2497	175.5	74.1	86	28.92	0.70	1.028	180.5	0.4107	131.3	6870.9	37.03

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1804	155.0	61.4	83	28.95	0.64	1.022	158.4	0.3874	159.5	6481.2	39.25

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
720	0.9	3.1	82	28.99	0.68	1.020	0.9	3.3748	2.3	56454.3	4.51

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	87.5	39.2	85	28.98	0.59	1.021	89.3	0.4389	64.9	7341.8	34.65

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1802	76.8	33.7	90	28.95	0.63	1.031	79.1	0.4260	79.7	7126.1	35.70

TEST NO.: 5

DATE: 05-06-81 FUEL: DF-2 HV: 18319 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2777	4.9	17.9	88	28.98	0.60	1.026	5.0	3.5662	3.3	65328.6	3.89

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2505	171.5	65.7	92	28.98	0.60	1.030	176.7	0.3719	128.1	6812.0	37.35
2501	170.0	65.5	93	28.91	0.64	1.036	176.1	0.3716	127.9	6808.0	37.37

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	153.3	56.3	94	28.98	0.60	1.034	158.4	0.3552	159.9	6507.2	39.10

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
707	0.7	2.1	91	28.94	0.65	1.033	0.7	3.1364	1.7	57455.0	4.43

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	88.0	38.9	93	28.90	0.64	1.036	91.2	0.4265	66.2	7813.9	32.56

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1803	76.0	28.2	93	28.91	0.60	1.034	78.5	0.3594	79.2	6583.9	38.64

TEST NO.; 6

DATE; 05-08-81 FUEL; 70% DF-2; 30% CSO HV; 17414 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2768	4.7	19.7	80	28.94	0.71	1.020	4.7	4.1562	3.1	72376.3	3.52

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2503	174.2	69.1	84	28.94	0.74	1.027	178.9	0.3864	129.8	6729.4	37.81

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1803	156.6	59.3	87	28.95	0.69	1.029	161.1	0.3684	162.3	6415.6	39.66

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
704	0.8	2.2	86	28.95	0.70	1.027	0.8	2.8973	2.0	50452.7	5.04

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2501	87.5	39.3	88	28.92	0.68	1.030	90.1	0.4365	65.5	7601.4	33.47

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1803	78.8	31.4	88	28.92	0.69	1.031	81.2	0.3872	81.8	6743.4	37.73

TABLE A-III

EMISSION DATA FOR TEST NUMBERS 1-6

INTENTIONALLY BLANK

EMISSION DATA

Date 4-14-81 Test No. 1

Engine IH DT 436B

Engine hours 1 HR

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb None

Rpm 2770

Gas	Rdg	Scale	Amount	
LCO	13.0	R1	0.0325	%
CO_2	27.8	R1	3.4	%
O_2	69.6	R25	17.4	%
HC	10.3	R500	502.0	ppm
NO	52.6	R250	131.7	ppm
NO_x	52.3	R250	131.4	ppm

Time of Completion 10:20 AM

Remarks:

EMISSION DATA

Date 4/14/81 Test No. 1

Engine IH DT 436B

Engine hours 2 Hrs.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 204.5

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	10.5	R3	0.0085	%
CO_2	56.9	R1	7.48	%
O_2	38.3	R25	9.58	%
HC	28.0	R100	280.0	ppm
NO	95.5	R1000	955.0	ppm
NO_x	95.7	R1000	957.0	ppm

Time of Completion 11:21 AM

Remarks:

EMISSION DATA

Date 4/14/81 Test No. 1

Engine IH DT 436 B

Engine hours 3 Hrs.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 254.8

Rpm 1793

Gas	Rdg	Scale	Amount	
LCO	34.9	R1	0.1023	%
CO_2	67.0	R1	9.7	%
O_2	30.0	R25	7.5	%
HC	27.5	R100	275	ppm
NO	59.2	R2500	1480	ppm
NO_x	59.2	R2500	1480	ppm

Time of Completion 12:50 PM

Remarks:

EMISSION DATA

Date 4/14/81 Test No. 1

Engine IH DT 436B

Engine hours 4 Hrs.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 3.6

Rpm 720

Gas	Rdg	Scale	Amount	
LCO	26.5	R3	0.0225	%
CO_2	16.4	R1	1.86	%
O_2	72.0	R25	18.0	%
HC	28.8	R100	288	ppm
NO	62.1	R250	155.3	ppm
NO_x	62.3	R250	153.3	ppm

Time of Completion 2:24 PM

Remarks:

EMISSION DATA

Date 4/14/81 Test No. 1

Engine IH DT436B

Engine hours 5 Hrs.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 102.5

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	11.3	R3	0.0093	%
CO_2	46.8	R1	5.78	%
O_2	51.0	R25	12.75	%
HC	32.1	R100	321	ppm
NO	60.7	R1000	607	ppm
NO_X	60.1	R1000	601	ppm

Time of Completion 3:39 PM

Remarks:

EMISSION DATA

Date 4/14/81 Test No. 1

Engine IH DT 436B

Engine hours 6 HRS.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 127.4

Rpm 1810

Gas	Rdg	Scale	Amount	
LCO	10.9	R3	0.009	%
CO_2	53.6	R1	6.86	%
O_2	44.5	R25	11.1	%
HC	34.5	R100	345	ppm
NO	44.1	R2500	1103	ppm
NO_X	44.2	R2500	1103	ppm

Time of Completion 4:52 PM

Remarks:

EMISSION DATA

Date 4/16/81 Test No. 2

Engine IH DT436B

Engine hours 1 HR.

Fuel Code 50% DF-2; 50% CSO

Oil Code LO 7616

Engine load, lb 5.4

Rpm 2756

Gas	Rdg	Scale	Amount	
LCO	12.5	R1	0.312	%
CO_2	28.0	R1	3.5	%
O_2	69.4	R25	17.35	%
HC	22.0	R100	220	ppm
NO	51.6	R250	129.0	ppm
NO_x	51.5	R250	128.8	ppm

Time of Completion 9:50

Remarks:

EMISSION DATA

Date 4/16/81 Test No. 2

Engine IH DT 436 B

Engine hours 2 HRS.

Fuel Code 50% DF-2; 50% CSO

Oil Code LO 7616

Engine load, lb 210.2

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	21.0	R3	0.018	%
CO_2	59.4	R1	7.98	%
O_2	42.0	R25	10.5	%
HC	31.5	R100	315	ppm
NO	40.0	R2500	1000	ppm
NO_X	40.0	R2500	1000	ppm

Time of Completion 11:05

Remarks:

EMISSION DATA

Date 4/16/81 Test No. 2

Engine IH DT 436B

Engine hours 3 Hrs.

Fuel Code 50% DF-2; 50% CSO

Oil Code LO 7616

Engine load, lb 259.5

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	32.5	R1	0.0925	%
CO_2	68.4	R1	10.02	%
O_2	30.4	R25	7.73	%
HC	38.5	R100	385	ppm
NO	55.9	R2500	1398	ppm
NOx	55.7	R2500	1393	ppm

Time of Completion 12:10

Remarks:

EMISSION DATA

Date 4/16/81 Test No. 2

Engine IH DT 436B

Engine hours 4 Hrs.

Fuel Code 50% DF-2; 50% CSO

Oil Code LO 76/6

Engine load, lb 4.2

Rpm 707

Gas	Rdg	Scale	Amount	
LCO	18.0	R1	0.048	%
CO_2	16.5	R1	1.88	%
O_2	75.6	R25	18.90	%
HC	50.7	R100	507	ppm
NO	38.5	R250	96.3	ppm
NO_x	40.1	R250	100.025	ppm

Time of Completion 1:10

Remarks:

EMISSION DATA

Date 4/16/81 Test No. 2

Engine IH DT 436B

Engine hours 6

Fuel Code 50% DF-2; 50% CSO

Oil Code LO 7616

Engine load, lb 104.2

Rpm 2510

Gas	Rdg	Scale	Amount	
LCO	22.0	R3	0.019	%
CO_2	47.9	R1	5.98	%
O_2	53.3	R25	13.325	%
HC	64.8	R100	648	ppm
NO	49.5	R1000	495	ppm
NO_X	49.0	R1000	490	ppm

Time of Completion 2:55

Remarks:

EMISSION DATA

Date 4/16/81 Test No. 2

Engine IH DT 436 B

Engine hours 7

Fuel Code 50% DF-2; 50% C50

Oil Code LO 7616

Engine load, lb 129.8

Rpm 1805

Gas	Rdg	Scale	Amount	
LCO	31.7	R3	0.0277	%
CO_2	53.8	R1	6.88	%
O_2	47.3	R25	11.83	%
HC	66.5	R100	665	ppm
NO	31.5	R2500	787.5	ppm
NO_x	31.5	R2500	787.5	ppm

Time of Completion 4:00

Remarks:

EMISSION DATA

Date 4/20/81 Test No. 3

Engine IH DT 436 B

Engine hours .5 Hrs.

Fuel Code 20% DF-2; 80% CSO

Oil Code LO 7616

Engine load, lb 5.0

Rpm 2752

Gas	Rdg	Scale	Amount	
LCO	13.0	R1	0.0325	%
CO_2	28.0	R1	3.5	%
O_2	74.1	R25	18.5	%
HC	24.0	R100	240	ppm
NO	49.7	R250	124	ppm
NOx	49.6	R250	124	ppm

Time of Completion 1:20

Remarks:

EMISSION DATA

Date 4/20/81 Test No. 3

Engine IH DT 436 B

Engine hours 1.0 Hrs.

Fuel Code 20% DF-2; 80% CSO

Oil Code LO 7616

Engine load, lb 211.6

Rpm 2502

Gas	Rdg	Scale	Amount	
LCO	54.0	R1	0.180	%
CO_2	60.5	R1	8.2	%
O_2	41.2	R25	10.3	%
HC	30.3	R100	303	ppm
NO	42.4	R2500	1060	ppm
NO_x	42.5	R2500	1063	ppm

Time of Completion 1:35

Remarks:

EMISSION DATA

Date 4/20/81 Test No. 3

Engine IH DT 436 B

Engine hours 1.5 HRS.

Fuel Code 20% DF-2; 80% CSO

Oil Code LO 7616

Engine load, lb 253.0

Rpm 1802

Gas	Rdg	Scale	Amount	
LCO	35.5	R1	0.104	%
CO_2	68.5	R1	10.05	%
O_2	30.3	R25	7.6	%
HC	20.5	R50	102	ppm
NO	59.4	R2500	1485	ppm
NO_x	59.5	R2500	1488	ppm

Time of Completion 2:25

Remarks:

EMISSION DATA

Date 4/20/81 Test No. 3

Engine IH DT 436 B

Engine hours 2 HRS.

Fuel Code 20% DF-2; 80% C50

Oil Code LO 7616

Engine load, lb 4.8

Rpm 740

Gas	Rdg	Scale	Amount	
LCO	21.5	R1	0.058	%
CO_2	16.5	R1	1.88	%
O_2	80.0	R25	20.0	%
HC	66.0	R50	330.0	ppm
NO	25.4	R250	63.5	ppm
NO_X	25.5	R250	63.8	ppm

Time of Completion 2:52

Remarks:

EMISSION DATA

Date 4/20/81 Test No. 3

Engine IH DT 436B

Engine hours 3.0 Hrs.

Fuel Code 20% DF-2; 80% CSO

Oil Code LO 7616

Engine load, lb 104.6

Rpm 2505

Gas	Rdg	Scale	Amount	
LCO	10.0	R3	0.008	%
CO_2	48.8	R1	6.08	%
O_2	53.0	R25	13.25	%
HC	52.5	R100	525	ppm
NO	60.0	R1000	600	ppm
NO_x	60.1	R1000	601	ppm

Time of Completion 3:30

Remarks:

EMISSION DATA

Date 4/20/81 Test No. 3

Engine IH DT-436B

Engine hours 3.5 Hrs.

Fuel Code 20% DF-2; 80% CSO

Oil Code LO-7616

Engine load, lb 127.0

Rpm 1797

Gas	Rdg	Scale	Amount	
LCO	21.0	R3	0.018	%
CO_2	54.5	R1	7.0	%
O_2	46.7	R25	11.68	%
HC	51.3	R100	513	ppm
NO	91.3	R1000	913	ppm
NO_X	91.4	R1000	914	ppm

Time of Completion 4:05

Remarks:

EMISSION DATA

Date 4/22/81 Test No. 4

Engine IH DT 436B

Engine hours 108 Hrs

Fuel Code 35% DF-2, 65% CSO

Oil Code LO 7616

Engine load, lb 9.5

Rpm 2757

Gas	Rdg	Scale	Amount	
LCO	13.0	R1	0.0325	%
CO_2	28.0	R1	3.5	%
O_2	69.1	R25	17.28	%
HC	14.5	R500	725	ppm
NO	63.2	R250	158	ppm
NO_x	62.5	R250	156.25	ppm

Time of Completion 3:05

Remarks:

EMISSION DATA

Date 4/22/81 Test No. 4

Engine IH DT 436 B

Engine hours 1 Hr.

Fuel Code 35% DF-2; 65% CSO

Oil Code LO-7616

Engine load, lb 211.4

Rpm 2495

Gas	Rdg	Scale	Amount	
LCO	50	R1	0.16	%
CO_2	59.2	R1	7.94	%
O_2	39.5	R25	9.88	%
HC	59.7	R100	597	ppm
NO	56.5	R2500	1413	ppm
NOx	56.0	R2500	1400	ppm

Time of Completion 4:10

Remarks:

EMISSION DATA

Date 4/23/81 Test No. 4

Engine IH DT 436 B

Engine hours .2 Hrs.

Fuel Code 35% DF-2; 65% C50

Oil Code LO-7616

Engine load, lb 258.0

Rpm 1810

Gas	Rdg	Scale	Amount	
LCO	24.0	R1	0.065	%
CO_2	67.5	R1	9.8	%
O_2	31.8	R25	8.0	%
HC	39.1	R100	391	ppm
NO	17.3	R1000	1730	ppm
NO_x	17.3	R1000	1730	ppm

Time of Completion 9:08

Remarks:

EMISSION DATA

Date 4/23/81 Test No. 4

Engine IH DT 436B

Engine hours 1.25 Hrs.

Fuel Code 35% DF-2; 65% CSO

Oil Code LO 7616

Engine load, lb 4.2

Rpm 720

Gas	Rdg	Scale	Amount	
LCO	24.5	R1	0.066	%
CO_2	17.0	R1	1.95	%
O_2	72.1	R25	18.0	%
HC	19.7	R500	985	ppm
NO	31.5	R250	78.8	ppm
NO_X	31.3	R250	78.0	ppm

Time of Completion 10:13

Remarks:

EMISSION DATA

Date 4/23/81 Test No. 4

Engine IH DT 436B

Engine hours 4 HRS.

Fuel Code 35% DF-2; 65% CSO

Oil Code LO 7616

Engine load, lb 105

Rpm 2499

Gas	Rdg	Scale	Amount	
LCO	17.5	R3	0.0145	%
CO_2	48.4	R1	6.04	%
O_2	47.7	R25	11.9	%
HC	20.3	R500	1015	ppm
NO	28.5	R2500	712.5	ppm
NO_X	28.5	R2500	712.5	ppm

Time of Completion 1:05

Remarks:

EMISSION DATA

Date 4/23/81 Test No. 4

Engine IH DT 436B

Engine hours 5 HRS

Fuel Code 35% DF-2; 65% CSO

Oil Code LO 7616

Engine load, lb 127.6

Rpm 1802

Gas	Rdg	Scale	Amount	
LCO	29.3	R3	0.0253	%
CO_2	53.5	R1	6.85	%
O_2	42.7	R25	10.68	%
HC	23.7	R500	1185	ppm
NO	43.2	R2500	1080	ppm
NO_x	43.5	R2500	1088	ppm

Time of Completion 1:47

Remarks:

EMISSION DATA

Date 5/6/81 Test No. 5

Engine IH DT 436B

Engine hours 1 HR.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 206.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	39.0	R1	0.115	%
CO_2	58.0	R1	7.7	%
O_2	38.5	R25	9.63	%
HC	57.0	R50	285	ppm
NO	37.3	R2500	933	ppm
NO_x	37.2	R2500	930	ppm

Time of Completion 3:00 P.M.

Remarks:

EMISSION DATA

Date 5/6/81 Test No. 5

Engine IH DT 436 B

Engine hours 1.5 Hrs

Fuel Code DF-2

Oil Code LO-7616

Engine load, lb 255.0

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	39.5	R1	0.118	%
CO_2	66.5	R1	9.55	%
O_2	26.5	R25	6.63	%
HC	28.0	R50	140	ppm
NO	52.3	R2500	1308	ppm
NO_X	52.4	R2500	1310	ppm

Time of Completion 3:30 P.M.

Remarks:

EMISSION DATA

Date 5/6/81 Test No. 5

Engine IH DT 436B

Engine hours 2.0 Hrs.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 2.6

Rpm 700

Gas	Rdg	Scale	Amount	
LCO	38.5	R1	0.113	%
CO_2	16.2	R1	1.8	%
O_2	64.0	R25	16.0	%
HC	46.0	R50	230	ppm
NO	59.1	R250	147.7	ppm
NO_x	59.0	R250	147.5	ppm

Time of Completion 4:08 P.M.

Remarks:

EMISSION DATA

Date 5/6/81 Test No. 5

Engine IH DT 436B

Engine hours 2.5 HRS.

Fuel Code DF-2

Oil Code LO-7616

Engine load, lb 204.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	39.0	R1	0.115	%
CO_2	57.5	R1	7.6	%
O_2	33.0	R25	8.25	%
HC	50.0	R50	250	ppm
NO	37.6	R2500	940	ppm
NO_X	37.5	R2500	938	ppm

Time of Completion 5:00 PM.

Remarks:

EMISSION DATA

Date 5/6/81 Test No. 5

Engine IH DT 436B

Engine hours 3.0 Hrs.

Fuel Code DF-2

Oil Code LO-7616

Engine load, lb 125.0

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	39.0	R1	0.115	%
CO_2	52.0	R1	6.6	%
O_2	37.5	R25	9.38	%
HC	62.0	R50	310	ppm
NO	36.6	R2500	915	ppm
NO_X	36.5	R2500	913	ppm

Time of Completion 5:27 PM

Remarks:

EMISSION DATA

Date 5/6/81 Test No. 5

Engine IH DT 436 B

Engine hours 3.5 Hrs.

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 103.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	36.0	R1	0.105	%
CO_2	47.0	R1	5.8	%
O_2	41.5	R25	10.38	%
HC	38.0	R50	190	ppm
NO	55.9	R1000	559	ppm
NOx	56.0	R1000	560	ppm

Time of Completion 6:05 P.M.

Remarks:

EMISSION DATA

Date 5/8/81 Test No. 6

Engine IH DT 436 B

Engine hours 1 HR.

Fuel Code 70% DF-2; 30% CSO

Oil Code LO-7616

Engine load, lb 2.0

Rpm 2767

Gas	Rdg	Scale	Amount	
LCO	12.2	R1	0.030	%
CO_2	28.7	R1	3.58	%
O_2	67.4	R25	16.85	%
HC	24.2	R100	242	ppm
NO	49.3	R250	123.3	ppm
NO_x	49.4	R250	123.5	ppm

Time of Completion 8:55

Remarks:

EMISSION DATA

Date 5/8/81 Test No. 6

Engine IH DT 436B

Engine hours 2 Hrs.

Fuel Code 70% DF-2; 30% CSO

Oil Code LO-7616

Engine load, lb 208.4

Rpm 2508

Gas	Rdg	Scale	Amount	
LCO	13.0	R3	0.011	%
CO_2	59.6	R1	8.02	%
O_2	36.4	R25	9.10	%
HC	21.5	R100	215	ppm
NO	90.6	R1000	906	ppm
NO_x	91.0	R1000	910	ppm

Time of Completion 9:56

Remarks:

EMISSION DATA

Date 5/8/81 Test No. 6

Engine IH DT436B

Engine hours 3 Hrs.

Fuel Code 70% DF-2 ; 30% CSO

Oil Code LO-7616

Engine load, lb 261

Rpm 1808

Gas	Rdg	Scale	Amount	
LCO	76.0	R3	0.073	%
CO_2	68.3	R1	9.99	%
O_2	61.6	R10	6.16	%
HC	17.4	R100	174	ppm
NO	54.1	R2500	1353	ppm
NO_x	54.4	R2500	1360	ppm

Time of Completion 10:47

Remarks:

EMISSION DATA

Date 5/8/81 Test No. 6

Engine IH DT 436 B

Engine hours 4 HRS.

Fuel Code 70% DF-2; 30% CSO

Oil Code LO-7616

Engine load, lb 3.2

Rpm 705

Gas	Rdg	Scale	Amount	
LCO	23.2	R3	0.020	%
CO_2	17.3	R1	2.00	%
O_2	61.0	R25	15.25	%
HC	19.5	R100	195	ppm
NO	51.4	R250	128.5	ppm
NO_x	51.6	R250	129.0	ppm

Time of Completion 11.35

Remarks:

EMISSION DATA

Date 5/8/81 Test No. 6

Engine IH DT 436 B

Engine hours 5 Hrs.

Fuel Code 70% DF-2; 30% CSO

Oil Code LO-7616

Engine load, lb 107.2

Rpm 2499

Gas	Rdg	Scale	Amount	
LCO	2.9	R3	0.003	%
CO_2	49.0	R1	6.10	%
O_2	41.9	R25	10.48	%
HC	21.5	R100	215	ppm
NO	53.2	R1000	532	ppm
NO_x	53.4	R1000	534	ppm

Time of Completion 12:19

Remarks:

EMISSION DATA

Date 5/8/81 Test No. 6

Engine IH DT436B

Engine hours 6 HRS.

Fuel Code 70% DF-2; 30% CSO

Oil Code LO-7616

Engine load, lb 129.0

Rpm 1805

Gas	Rdg	Scale	Amount	
LCO	7.8	R3	0.007	%
CO_2	54.1	R1	6.91	%
O_2	37.5	R25	9.37	%
HC	22.6	R100	226	ppm
NO	83.6	R1000	836	ppm
NOx	83.8	R1000	838	ppm

Time of Completion 1:18

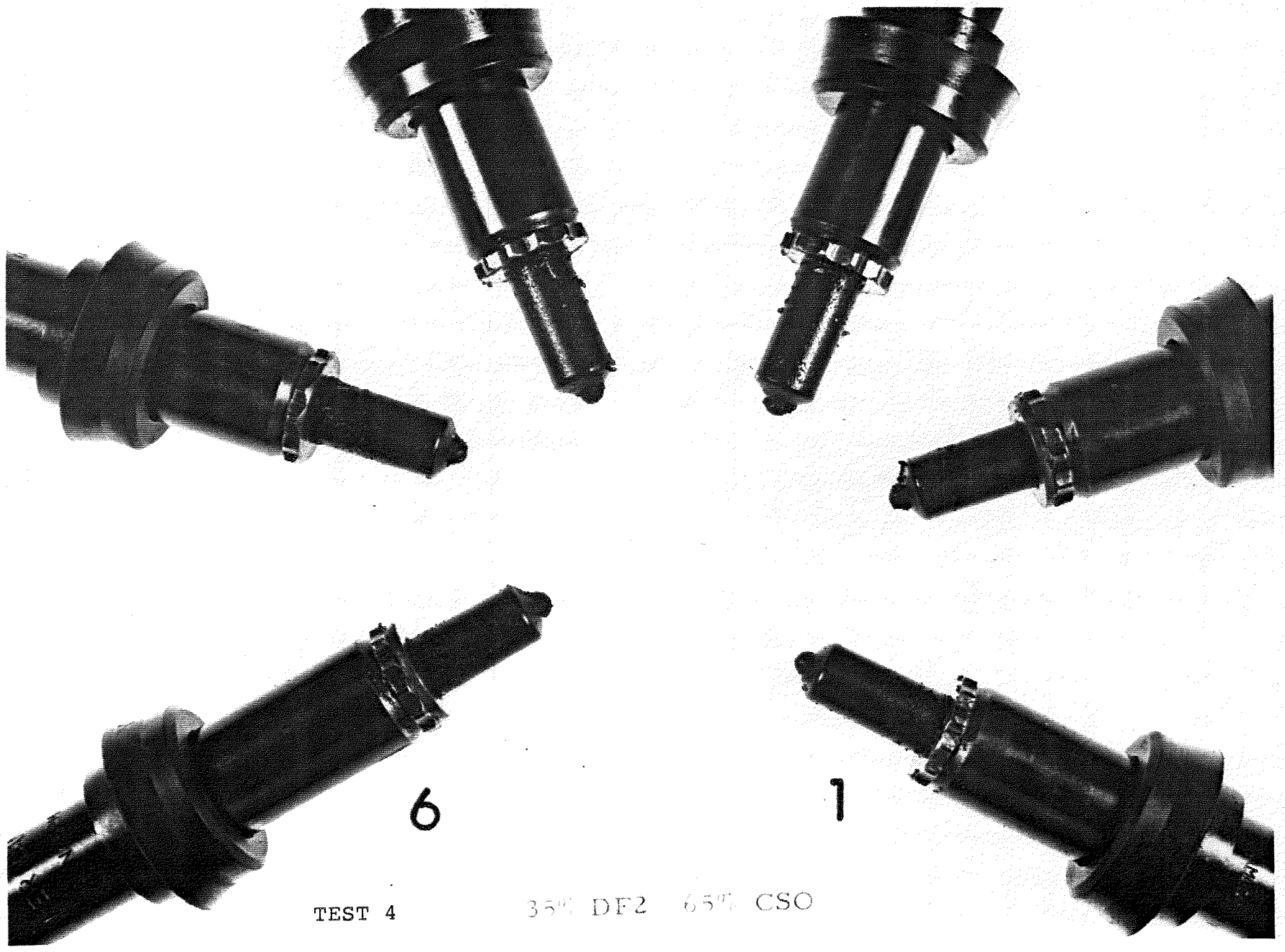
Remarks:

TABLE A-IV

BRAKE SPECIFIC EMISSIONS,
POWER CURVE TEST NUMBERS 1-6

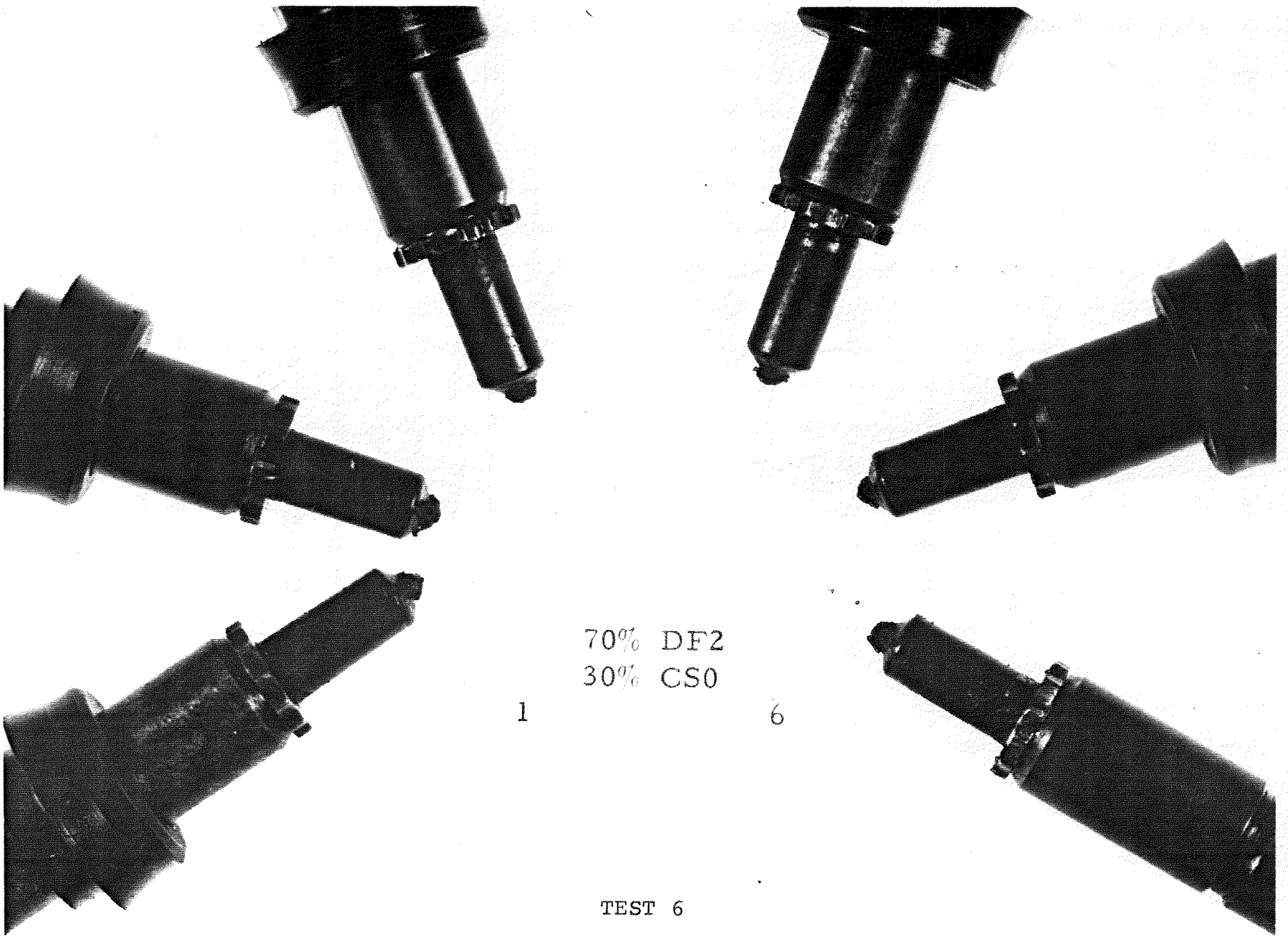
Test No.	Test Condition	Test Hrs.	RPM	HP	A/F Ratio	BSHC %	BSCO %	BSNOx %
1	Max. Power	2	2500	172.4	27.27	.71	.40	7.47
DF-2	Half Power	5	2500	86.8	36.22	1.16	.65	6.85
	Max. Torque	3	1793	155.1	22.21	.51	3.48	8.27
	Half Torque	6	1810	78.5	30.52	.91	.45	9.03
2	MP	2	2500	176.5	27.95	.82	.83	7.53
50% DF-2	HP	6	2510	90.7	36.09	2.43	1.28	5.44
50% CSO	MT	3	1800	157.3	22.84	.74	3.11	7.68
	HT	7	1805	78.9	31.45	1.93	1.44	6.72
3	MP	1	2502	181.7	27.30	.77	7.85	7.61
20% DF-2	HP	3	2505	90.7	35.69	1.98	.52	6.46
80% CSO	MT	1.5	1802	156.8	23.12	.20	3.49	8.20
	HT	3.5	1797	79.0	31.19	1.47	.89	7.44
4	MP	1	2495	180.5	27.00	1.46	6.80	9.78
35% DF-2	HP	4	2499	89.3	33.54	3.47	.87	7.06
65% CSO	MT	2	1810	158.4	23.48	.75	2.15	9.40
	HT	5	1802	79.1	29.83	3.49	1.30	9.20
5	MP	1	2500	176.4	26.73	.66	4.99	6.63
DF-2	HP	3.5	2500	91.2	31.86	.66	6.92	6.06
	MT	1.5	1800	158.4	21.45	.26	3.96	7.23
	HT	3	1800	78.5	28.32	.80	5.60	7.31
6	MP	2	2508	178.9	26.14	.50	.47	6.32
70% DF-2	HP	5	2499	90.1	31.65	.74	.19	5.51
30% CSO	MT	3	1808	161.1	21.20	.32	2.35	7.19
	HT	6	1805	81.2	28.22	.61	.34	6.76

INTENTIONALLY BLANK



TEST 4 35% DF2 65% CSO

TEST 5
1
DF-2
6



70% DF2
30% CS0

1 6

TEST 6

TABLE A-V

PERFORMANCE DATA FOR TEST NUMBERS 7-10

INTENTIONALLY BLANK

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-15-81 Test No. 7 Oil Code LO-7616

Fuel Code 100% DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	38	38	39	39	40	40	41	41
Time	11:35	11:50	12:25	12:40	1:30	1:45	2:15	2:30
Engine RPM	2770	2770	2500	2500	1800	1800	724	724
Dyno Load (lb) Observed	5.0	5.0	203.2	204.2	252.4	252.4	3.2	2.8
BHP	4.6	4.6	169.3	170.1	151.4	151.4	.8	.7
1 - Coolant Out Temperature, F	183	182	178	184	187	187	181	181
2 - Coolant In Temperature, F	179	176	169	176	177	176	178	179
3 - Oil Sump Temperature, F	213	211	218	221	219	219	184	184
4 - Intake Air Temperature, F	90	90	93	93	97	98	94	96
5 - Fuel Temperature, F	97	97	96	96	96	96	96	96
6 - Intake Manifold After Turbo	143	144	274	275	236	238	102	102
7 - Ambient Air Temperature, F	88	89	92	93	95	97	94	94
8 - Exhaust Temperature Cyl. #1	470	472	928	935	969	970	207	208
9 - Exhaust Temperature Cyl. #2	507	505	1021	1024	1065	1066	233	234
10 - Exhaust Temperature Cyl. #3	486	484	978	978	1025	1025	224	224
11 - Exhaust Temperature Cyl. #4	487	487	1006	1004	1036	1039	261	261
12 - Exhaust Temperature Cyl. #5	497	495	999	1002	1039	1041	182	183
13 - Exhaust Temperature Cyl. #6	487	487	951	973	995	1000	196	197
Oil Gallery Pressure, psi	49.0	48.5	46.0	45.0	36.0	36.0	20.8	20.8
Pressure Before Fuel Filter, psi	66.0	66.0	56.0	55.5	44.0	44.0	27.8	27.8
Pressure After Fuel Filter, psi	67.0	67.0	56.0	56.0	44.0	44.0	27.0	27.0
Intake Manifold Pressure, In. Hg.	3.0	3.0	27.5	27.5	21.5	21.5	0	0
Intake Air Restriction, In. H_2O	5	5	6	6	5	5	3	2
Fuel Rate LBS/HR	17.93	17.86	67.49	67.21	56.89	57.51	2.34	-
Fuel Time Sec/ ½ lb.	99.50	99.40	26.67	26.86	31.92	31.68	768.30	
	99.39	102.18		27.16	31.36	31.24		
	102.27			26.32		31.30		
Barometer Pressure, In. Hg.		28.9		28.99		28.99		29.98
Dry Bulb Temp., F		89		91		90		92
Wet Bulb Temp., F/R.H.%	68%	80	67%	81	65%	80	66%	82
Blow-by, CFH								
Smoke RDG. % 0-20% scale	1*	1*	3.8	3.8	14.0	14.0		

REMARKS: * 0-100% Scale

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-15-81 Test No. 7 Oil Code LO-7616

Fuel Code 100% DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	42	42	43	43				
Time	3:15	3:30	4:00	4:15				
Engine RPM	2500	2500	1800	1800				
Dyno Load (lb) Observed	102.8	102.8	126.0	126.0				
BHP	85.7	85.7	75.6	75.6				
1 - Coolant Out Temperature, F	188	188	187	187				
2 - Coolant In Temperature, F	182	182	181	181				
3 - Oil Sump Temperature, F	219	219	211	211				
4 - Intake Air Temperature, F	96	97	98	96				
5 - Fuel Temperature, F	98	98	97	97				
6 - Intake Manifold After Turbo	188	190	153	150				
7 - Ambient Air Temperature, F	95	94	97	94				
8 - Exhaust Temperature Cyl. #1	691	693	660	655				
9 - Exhaust Temperature Cyl. #2	739	744	711	706				
10 - Exhaust Temperature Cyl. #3	720	723	677	673				
11 - Exhaust Temperature Cyl. #4	733	737	690	685				
12 - Exhaust Temperature Cyl. #5	734	738	698	693				
13 - Exhaust Temperature Cyl. #6	713	718	664	659				
Oil Gallery Pressure, psi	46.0	46.0	39.0	39.0				
Pressure Before Fuel Filter, psi	58.0	58.0	46.0	46.0				
Pressure After Fuel Filter, psi	58.0	58.0	46.0	46.2				
Intake Manifold Pressure, In. Hg.	11.0	11.0	6.0	6.5				
Intake Air Restriction, In. H_2O	5	5	4	3				
Fuel Rate LBS/HR	38.00	37.62	33.91	28.79				
Fuel Time Sec/ ½ lb.	46.62	47.85	53.08	63.14				
	47.97			61.89				
	47.53							
Barometer Pressure, In. Hg.		28.96		28.96				
Dry Bulb Temp., F		92		92				
Wet Bulb Temp., F/R.H.%	81	81	62%	81	62%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale	3.5	3.5	2.4	2.4				

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-17-81 Test No. 8 Oil Code LO-7616

Fuel Code 50% CSO; 50% ESCO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	No Pics		44	44	45	45	46	46
Time	9:00	9:30	10:00	10:15	10:45	11:00	11:30	11:45
Engine RPM	2770	2766	2500	2500	1800	1800	708	708
Dyno Load (lb) Observed	4.2	3.2	205.0	204.8	246.8	247.0	2.4	2.2
BHP	3.9	2.9	170.8	170.6	148.1	148.2	0.6	0.5
1 - Coolant Out Temperature, F	190	187	187	186	187	188	181	182
2 - Coolant In Temperature, F	186	182	178	178	176	177	178	179
3 - Oil Sump Temperature, F	217	216	224	224	217	218	184	184
4 - Intake Air Temperature, F	79	81	81	82	97	85	85	87
5 - Fuel Temperature, F	86	87	86	86	86	86	86	86
6 - Intake Manifold After Turbo	130	129	258	259	216	215	91	91
7 - Ambient Air Temperature, F	83	77	82	80	86	83	82	81
8 - Exhaust Temperature Cyl. #1	455	465	906	905	906	903	201	202
9 - Exhaust Temperature Cyl. #2	489	494	987	988	1005	1000	218	221
10 - Exhaust Temperature Cyl. #3	477	482	961	960	978	977	220	218
11 - Exhaust Temperature Cyl. #4	478	475	975	976	996	997	237	235
12 - Exhaust Temperature Cyl. #5	488	492	966	968	993	992	201	201
13 - Exhaust Temperature Cyl. #6	487	499	920	920	939	938	190	192
Oil Gallery Pressure, psi	49.0	49.0	41.0	45.5	36.5	36.5	21.0	21.0
Pressure Before Fuel Filter, psi	70.0	73.0	59.0	58.0	48.0	48.0	35.0	35.0
Pressure After Fuel Filter, psi	69.0	73.0	59.0	58.0	48.0	47.5	35.0	35.0
Intake Manifold Pressure, In. Hg.	2.5	2.0	22.0	22.0	20.0	20.0	0	0
Intake Air Restriction, In. H_2O	3	3	6	6	4	4	1	1
Fuel Rate LBS/HR	20.7	21.8	77.6	79.2	63.6	63.7	2.9	
Fuel Time Sec/ ½ lb.	86.65	82.41	23.85	22.72	28.17	28.93	604.96	
			22.33		28.45	27.59		
			23.42					
Barometer Pressure, In. Hg.		29.17		29.18		29.18	29.18	
Dry Bulb Temp., F		82		80		80	80	
Wet Bulb Temp., F/R.H.%	62%	72	68%	72	68%	72	72	68%
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.5		1.75		5.25	.75	

REMARKS: Smoke has castor oil odor.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-17-81 Test No. 8 Oil Code LO-7616

Fuel Code 50% CSO; 50% ESCO Cell No. 14 Engine DT.436B Engine Make I.H.

Photo	47	47	48	48				
Time	12:15	12:30	1:05	1:20				
Engine RPM	2500	2500	1800	1800				
Dyno Load (lb) Observed	102.0	102.0	129.6	128.8				
BHP	85.0	85.0	77.7	77.3				
1 - Coolant Out Temperature, F	188	188	186	186				
2 - Coolant In Temperature, F	182	181	179	179				
3 - Oil Sump Temperature, F	219	219	209	209				
4 - Intake Air Temperature, F	84	84	84	84				
5 - Fuel Temperature, F	90	90	88	88				
6 - Intake Manifold After Turbo	174	177	143	141				
7 - Ambient Air Temperature, F	82	84	82	82				
8 - Exhaust Temperature Cyl. #1	673	677	651	649				
9 - Exhaust Temperature Cyl. #2	709	714	695	689				
10 - Exhaust Temperature Cyl. #3	697	700	673	670				
11 - Exhaust Temperature Cyl. #4	705	710	703	696				
12 - Exhaust Temperature Cyl. #5	712	717	707	697				
13 - Exhaust Temperature Cyl. #6	705	708	668	662				
Oil Gallery Pressure, psi	46.0	46.0	39.0	39.0				
Pressure Before Fuel Filter, psi	62.0	62.0	51.0	51.0				
Pressure After Fuel Filter, psi	62.0	62.0	50.5	51.0				
Intake Manifold Pressure, In. Hg.	11.0	11.0	7.0	7.0				
Intake Air Restriction, In. H_2O	4	4	3	3				
Fuel Rate LBS/HR	44.56	44.81	35.24	35.19				
Fuel Time Sec/ ½ lb.	40.50	40.17	50.91	51.04				
	40.38		51.05	51.27				
			51.27					
Barometer Pressure, In. Hg.		29.18	29.18					
Dry Bulb Temp., F		80	80					
Wet Bulb Temp., F/R.H.%	68%	72	72	68%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.0	1.0					

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-19-81 Test No. 9 Oil Code LO-7616

Fuel Code 50% DF-2; 50% ESCO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	49	49	50	50	51	51	52	52
Time	9:10	9:40	10:55	11:10	11:40	11:55	12:25	12:40
Engine RPM	2778	2775	2499	2498	1800	1803	731	732
Dyno Load (lb) Observed	4.8	4.7	196.6	196.5	246.2	246.4	2.2	2.1
BHP	4.4	4.4	163.8	163.6	147.7	148.1	.5	.5
1 - Coolant Out Temperature, F	190	186	186	185	185	185	177	178
2 - Coolant In Temperature, F	186	182	177	176	175	175	174	176
3 - Oil Sump Temperature, F	218	215	223	222	216	215	181	181
4 - Intake Air Temperature, F	82	84	86	89	93	93	90	90
5 - Fuel Temperature, F	94	95	94	94	93	94	94	94
6 - Intake Manifold After Turbo	136	138	256	258	221	222	98	98
7 - Ambient Air Temperature, F	81	82	88	87	88	89	90	90
8 - Exhaust Temperature Cyl. #1	461	462	895	896	935	934	224	224
9 - Exhaust Temperature Cyl. #2	489	489	978	980	1016	1019	231	231
10 - Exhaust Temperature Cyl. #3	482	482	953	954	997	997	224	224
11 - Exhaust Temperature Cyl. #4	473	473	976	978	1000	1000	229	229
12 - Exhaust Temperature Cyl. #5	486	487	969	971	996	996	187	186
13 - Exhaust Temperature Cyl. #6	485	485	918	916	953	953	192	190
Oil Gallery Pressure, psi	48.5	48.8	44.8	44.5	36.2	36.2	21.0	21.5
Pressure Before Fuel Filter, psi	69.3	69.0	57.0	57.0	45.5	45.8	30.2	30.5
Pressure After Fuel Filter, psi	69.8	69.3	57.5	57.2	45.5	45.8	29.8	30.0
Intake Manifold Pressure, In. Hg.	3.0	3.0	25.0	25.0	19.8	19.7	0	0
Intake Air Restriction, In. H_2O	5	5	6	6	4	4	0	1
Fuel Rate LBS/HR	19.28	19.31	69.32	69.28	58.60	57.48	2.65	
Fuel Time Sec/ ½ lb.	92.07	93.58	26.18	25.98	31.44	30.99	678.46	
	94.67	92.81	25.54		29.99	31.56		
			26.18			31.40		
Barometer Pressure, In. Hg.		29.08		29.08		29.08		29.08
Dry Bulb Temp., F		80		80		82		80
Wet Bulb Temp., F/R.H.%	87%	77	87%	77	80%	77	87%	77
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.1	6.0	6.0		6.2		

REMARKS: Very high inj. pressures at hi idle. Switched #5 & #6 inj., but no improvement. Took emissions, then shut down to switch, then back for photos. Photos taken at 10:15.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-19-81 Test No. #9 Oil Code LO-7616

Fuel Code 50% DF-2; 50% ESCO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	53	53	54	54				
Time	1:10	1:25	1:55	2:10				
Engine RPM	2500	2500	1804	1802				
Dyno Load (lb) Observed	96.2	98.0	124.6	125.3				
BHP	80.2	81.7	74.9	75.3				
1 - Coolant Out Temperature, F	185	185	185	185				
2 - Coolant In Temperature, F	179	179	179	179				
3 - Oil Sump Temperature, F	215	216	208	209				
4 - Intake Air Temperature, F	93	93	94	95				
5 - Fuel Temperature, F	95	96	96	96				
6 - Intake Manifold After Turbo	179	181	147	148				
7 - Ambient Air Temperature, F	90	90	89	92				
8 - Exhaust Temperature Cyl. #1	669	673	642	644				
9 - Exhaust Temperature Cyl. #2	709	714	692	694				
10 - Exhaust Temperature Cyl. #3	693	702	657	660				
11 - Exhaust Temperature Cyl. #4	707	715	682	684				
12 - Exhaust Temperature Cyl. #5	712	721	691	691				
13 - Exhaust Temperature Cyl. #6	682	691	644	644				
Oil Gallery Pressure, psi	46.5	46.5	40.0	39.5				
Pressure Before Fuel Filter, psi	60.2	60.2	47.9	47.9				
Pressure After Fuel Filter, psi	60.5	60.5	47.7	47.7				
Intake Manifold Pressure, In. Hg.	9.8	9.8	6.2	6.1				
Intake Air Restriction, In. H_2O	5	5	3	3				
Fuel Rate LBS/HR	38.38	38.91	30.72	31.10				
Fuel Time Sec/ ½ lb.	47.18	46.10	58.11	58.48				
	47.27	45.87	59.09	57.29				
	46.26	46.81						
Barometer Pressure, In. Hg.		29.08		29.08				
Dry Bulb Temp., F		82		81				
Wet Bulb Temp., F/R.H.%	80%	72	83%	77				
Blow-by, CFH								
Smoke RDG. % 0-20% scale		1.9		2.1				

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-22-81 Test No. 10 Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	55	55	56	56	57	57	58	58
Time	9:00	9:15	9:45	10:00	10:30	10:45	11:15	11:30
Engine RPM	2773	2765	2497	2500	1802	1803	716	716
Dyno Load (lb) Observed	4.4	4.2	190.6	190.0	239.6	240.2	2.2	2.2
BHP	4.1	3.9	158.6	158.3	143.9	144.4	.5	.5
1 - Coolant Out Temperature, F	189	187	185	185	185	188	180	181
2 - Coolant In Temperature, F	185	183	176	177	175	177	177	179
3 - Oil Sump Temperature, F	217	216	222	222	215	215	184	184
4 - Intake Air Temperature, F	85	84	89	89	90	90	89	90
5 - Fuel Temperature, F	97	96	94	94	93	93	93	94
6 - Intake Manifold After Turbo	138	137	252	251	214	215	97	98
7 - Ambient Air Temperature, F	84	82	90	90	90	88	89	89
8 - Exhaust Temperature Cyl. #1	465	463	876	878	908	910	231	231
9 - Exhaust Temperature Cyl. #2	494	491	962	962	994	992	235	234
10 - Exhaust Temperature Cyl. #3	482	480	940	939	971	972	204	205
11 - Exhaust Temperature Cyl. #4	467	468	954	951	980	979	216	217
12 - Exhaust Temperature Cyl. #5	485	484	946	945	970	970	203	203
13 - Exhaust Temperature Cyl. #6	482	479	906	907	940	940	216	216
Oil Gallery Pressure, psi	48.8	49.0	46.2	46.0	37.2	37.0	20.0	20.5
Pressure Before Fuel Filter, psi	70.2	70.5	58.8	58.8	46.8	46.8	32.0	32.0
Pressure After Fuel Filter, psi	71.0	71.0	59.0	59.0	47.0	47.0	31.0	31.0
Intake Manifold Pressure, In. Hg.	2.8	2.8	28.8	28.8	18.6	18.6	0	0
Intake Air Restriction, In. H_2O	3	3	6	6	5	5	1	1
Fuel Rate LBS/HR	19.47	20.53	71.97	70.85	60.02	60.27	2.53	
Fuel Time Sec/ ½ lb.	92.43	87.69	24.68	25.43	30.05	29.92	695.33	
			25.34	25.38	30.01	29.81		
					29.91			
Barometer Pressure, In. Hg.		29.01		29.02		29.02		29.02
Dry Bulb Temp., F		84		87		87		87
Wet Bulb Temp., F/R.H.%	70%	76	68%	78	68%	78	68%	78
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.0*						

REMARKS: * Smoke meter failed after first reading

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 6-22-81 Test No. 10 Oil Code LO-7616

Fuel Code 100% ECSO Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	59	59	60	60				
Time	12:00	12:15	12:45	1:00				
Engine RPM	2500	2503	1800	1802				
Dyno Load (lb) Observed	96.2	94.0	120.2	119.8				
BHP	80.2	78.4	72.1	72.0				
1 - Coolant Out Temperature, F	188	188	186	185				
2 - Coolant In Temperature, F	182	182	180	171				
3 - Oil Sump Temperature, F	218	218	209	209				
4 - Intake Air Temperature, F	90	92	93	93				
5 - Fuel Temperature, F	95	95	94	94				
6 - Intake Manifold After Turbo	176	176	145	145				
7 - Ambient Air Temperature, F	90	91	90	93				
8 - Exhaust Temperature Cyl. #1	664	660	637	637				
9 - Exhaust Temperature Cyl. #2	706	699	688	684				
10 - Exhaust Temperature Cyl. #3	696	688	660	659				
11 - Exhaust Temperature Cyl. #4	700	694	671	670				
12 - Exhaust Temperature Cyl. #5	704	697	670	669				
13 - Exhaust Temperature Cyl. #6	681	681	636	634				
Oil Gallery Pressure, psi	46.2	46.2	39.5	39.5				
Pressure Before Fuel Filter, psi	61.8	62.0	49.0	49.0				
Pressure After Fuel Filter, psi	62.0	62.2	49.2	49.2				
Intake Manifold Pressure, In. Hg.	9.8	9.2	6.0	6.0				
Intake Air Restriction, In. H_2O	4	4	4	4				
Fuel Rate LBS/HR	40.83	40.86	32.45	32.24				
Fuel Time Sec/ ½ lb.	44.95	44.02	55.42	55.75				
	43.23	44.08	55.51	55.92				
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

TABLE A-VI

CORRECTED RESULTS FOR POWER
CURVE TEST NO.'s 7-10

INTENTIONALLY BLANK

TEST NO.: 7

DATE: 06-15-81 FUEL: 100% DF-2 HV: 18319 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2770	4.6	17.9	90	28.90	0.94	1.044	4.8	3.7282	3.1	68297.7	3.73

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	169.7	67.3	93	28.99	0.96	1.045	177.4	0.3793	128.9	6949.0	36.61

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	151.4	57.1	98	28.99	0.93	1.050	159.0	0.3594	160.4	6584.7	38.64

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
724	0.8	2.3	95	29.98	1.00	1.014	0.8	3.0821	1.9	56461.8	4.51

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	85.7	37.9	97	28.96	0.94	1.050	90.0	0.4211	65.4	7714.2	32.98

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	75.6	30.3	97	28.96	0.94	1.051	79.4	0.3816	80.2	6990.9	36.39

TEST NO.; 8

DATE; 06//17/81 FUEL; 50% CSO; 50% ESCO HV; 16136 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2768	3.4	21.3	80	29.17	0.69	1.012	3.4	6.1905	2.3	99890.1	2.55

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	170.7	78.0	82	29.18	0.71	1.014	173.1	0.4506	125.8	7270.2	34.99

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	148.2	63.6	91	29.18	0.71	1.026	152.1	0.4185	153.5	6752.6	37.68

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
708	0.6	3.0	86	29.18	0.71	1.020	0.6	5.3041	1.4	85587.7	2.97

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	85.0	44.6	84	29.18	0.71	1.017	86.5	0.5159	62.8	8324.4	30.56

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	77.5	35.2	84	29.18	0.71	1.017	78.8	0.4467	79.6	7208.2	35.29

TEST NO.; 9

DATE; 06-19-81 FUEL; 50% DF-2; 50% ESCO HV; 17187 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2777	4.4	19.3	83	29.08	0.91	1.027	4.5	4.2710	3.0	73405.1	3.47

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2499	163.7	69.3	88	29.08	0.91	1.033	169.1	0.4100	122.9	7046.1	36.11

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1802	147.9	57.9	93	29.08	0.88	1.039	153.7	0.3770	154.9	6478.9	39.27

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
732	0.5	2.7	90	29.08	0.91	1.036	0.5	5.1214	1.3	88021.9	2.89

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	81.0	38.6	93	29.08	0.69	1.032	83.5	0.4626	60.7	7950.2	32.00

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1803	75.1	30.9	95	29.08	0.89	1.041	78.2	0.3952	78.8	6792.6	37.45

TEST NO.; 10

DATE; 06-22-81 FUEL; 100% ESCO HV; 16147 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2769	4.0	20.0	85	29.01	0.82	1.028	4.1	4.8602	2.7	78478.1	3.24

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2499	158.5	71.4	89	29.02	0.87	1.035	164.1	0.4352	119.3	7027.5	36.20

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1803	144.2	60.1	90	29.02	0.87	1.037	149.5	0.4023	150.6	6495.3	39.17

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
716	0.5	2.6	90	29.02	0.87	1.036	0.5	4.9968	1.3	80683.4	3.15

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2502	79.3	40.8	91	29.02	0.87	1.038	82.3	0.4961	59.8	8011.2	31.76

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1801	72.1	32.3	93	29.02	0.87	1.041	75.0	0.4313	75.6	6964.9	36.53

TABLE A-VII

EMISSION DATA FOR TEST NUMBERS 7-10

INTENTIONALLY BLANK

EMISSION DATA

Date 6/15/81 Test No. 7

Engine IH DT436B

Engine hours 15 HRS

Fuel Code 100% DF-2

Oil Code LO-7616

Engine load, lb 5.2

Rpm 2770

Gas	Rdg	Scale	Amount	
LCO	12.4	R1	0.031	%
CO_2	29.5	R1	3.65	%
O_2	67.8	R25	16.9	%
HC	39.0	R100	390	ppm
NO	57.4	R250	143.5	ppm
NO_x	59.0	R250	147.5	ppm

Time of Completion 11:34

Remarks:

EMISSION DATA

Date 6/15/81 Test No. 7

Engine IH DT 436 B

Engine hours 1.5 Hrs.

Fuel Code 100% DF-2

Oil Code LO-7616

Engine load, lb 203.2

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	14.7	R3	0.012	%
CO_2	61.8	R1	8.46	%
O_2	96.2	R10	9.62	%
HC	21.5	R100	215	ppm
NO	94.8	R1000	948	ppm
NO_X	107.8	R1000	1078	ppm

Time of Completion 12:30

Remarks:

EMISSION DATA

Date 6/15/81 Test No. 7

Engine IH - DT 436 B

Engine hours 2.5 Hrs.

Fuel Code 100 % DF-2

Oil Code LO-7616

Engine load, lb 251.8

Rpm 1806

Gas	Rdg	Scale	Amount	
LCO	52.2	R1	0.17	%
CO_2	69.7	R1	10.3	%
O_2	68.5	R10	6.85	%
HC	21.7	R100	217	ppm
NO	55.1	R2500	1378	ppm
NO_x	62.5	R2500	1563	ppm

Time of Completion 1:30

Remarks:

EMISSION DATA

Date 6/15/81 Test No. 7

Engine IH DT 436B

Engine hours 3.5 Hrs.

Fuel Code 100% DF-2

Oil Code LO 7616

Engine load, lb 3.0

Rpm 725

Gas	Rdg	Scale	Amount	
LCO	18.7	R3	0.016	%
CO_2	18.4	R1	2.15	%
O_2	71.6	R25	17.9	%
HC	23.6	R100	236	ppm
NO	66.3	R250	165.8	ppm
NO_X	76.2	R250	190.5	ppm

Time of Completion 2:23

Remarks:

EMISSION DATA

Date 6/15/81 Test No. 7

Engine IH DT 436B

Engine hours 4.5 Hrs.

Fuel Code 100% DF-2

Oil Code LO-7616

Engine load, lb 102.0

Rpm 2497

Gas	Rdg	Scale	Amount	
LCO	8.4	R3	0.007	%
CO_2	49.6	R1	6.21	%
O_2	49.5	R25	12.4	%
HC	25.2	R100	252	ppm
NO	57.5	R1000	575	ppm
NOx	64.4	R1000	644	ppm

Time of Completion 3:11

Remarks:

EMISSION DATA

Date 6/15/81 Test No. 7

Engine IH DT 436 B

Engine hours 5.5 Hrs.

Fuel Code 100% DF-2

Oil Code LO-7616

Engine load, lb 125

Rpm 1802

Gas	Rdg	Scale	Amount	
LCO	14.0	R3	0.012	%
CO_2	55.2	R1	7.14	%
O_2	43.6	R25	10.9	%
HC	24.3	R100	243	ppm
NO	38.0	R2500	950	ppm
NO_x	44.3	R2500	1108	ppm

Time of Completion 4:09.

Remarks:

EMISSION DATA

Date 6/17/81 Test No. 8

Engine IH DT 436 B

Engine hours 1 HR.

Fuel Code 50% CSO ; 50% ECSO

Oil Code LO-7616

Engine load, lb 5.0

Rpm 2769

Gas	Rdg	Scale	Amount	
LCO	25.4	R3	0.021	%
CO_2	30.5	R1	3.78	%
O_2	68.0	R25	17.0	%
HC	28.4	R100	284.0	ppm
NO	64.1	R250	160.3	ppm
NO_x	69.2	R250	173.0	ppm

Time of Completion 9:14

Remarks:

EMISSION DATA

Date 6/17/81 Test No. 8

Engine IH · DT 436B

Engine hours 2

Fuel Code 50% CSO; 50% ECSO

Oil Code LO-7616

Engine load, lb 205.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	24.8	R3	0.020	%
CO_2	60.7	R1	8.24	%
O_2	40.4	R25	10.1	%
HC	21.3	R100	213.0	ppm
NO	40.8	R2500	1020.0	ppm
NO_X	48.1	R2500	1202.5	ppm

Time of Completion 10:05

Remarks:

EMISSION DATA

Date 6/17/81 Test No. 8

Engine IH DT 436 B

Engine hours 3 HRS.

Fuel Code 50% C50; 50% EC50

Oil Code LO-7616

Engine load, lb 247.2

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	80.5	R3	0.0778	%
CO_2	68.5	R1	10.1	%
O_2	77.5	R10	7.8	%
HC	32.0	R50	160	ppm
NO	59.0	R2500	1475	ppm
NO_x	67.0	R2500	1675	ppm

Time of Completion 10:54

Remarks:

EMISSION DATA

Date 6/17/81 Test No. 8

Engine IH DT 436B

Engine hours 3.5 Hrs.

Fuel Code 50% CSO; 50% ECSO

Oil Code LO-7616

Engine load, lb 2.2

Rpm 709

Gas	Rdg	Scale	Amount	
LCO	43.5	R3	0.038	%
CO_2	34.3	R1	4.2	%
O_2	73.8	R25	18.45	%
HC	52.0	R50	260.0	ppm
NO	36.0	R250	90.0	ppm
NO_X	51.8	R250	129.5	ppm

Time of Completion 11:36

Remarks:

EMISSION DATA

Date 6/17/81 Test No. 8

Engine IH DT 436B

Engine hours 4.5 Hrs.

Fuel Code 50% CSO; 50% ECSO

Oil Code LO-7616

Engine load, lb 103.8

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	17.0	R3	0.014	%
CO_2	94.0	R1	17.5	%
O_2	51.2	R25	12.80	%
HC	32.4	R50	162.0	ppm
NO	61.2	R1000	612.0	ppm
NO_x	69.8	R1000	698.0	ppm

Time of Completion 12:25.

Remarks:

EMISSION DATA

Date 6/17/81 Test No. 8

Engine IH DT 436B

Engine hours 5 Hrs.

Fuel Code 50% CSO; 50% ECSO

Oil Code LO - 7616

Engine load, lb 127.8

Rpm 1805

Gas	Rdg	Scale	Amount	
LCO	54.0	R3	0.050	%
CO_2	57.5	R1	7.6	%
O_2	45.7	R25	11.43	%
HC	56.5	R50	282.5	ppm
NO	36.1	R2500	902.5	ppm
NO_x	41.9	R2500	1047.5	ppm

Time of Completion 1:08

Remarks:

EMISSION DATA

Date 6/19/81 Test No. 9

Engine IH DT 436 B

Engine hours 1 HR.

Fuel Code 50% DF-2; 50% ECSO

Oil Code LO-7616

Engine load, lb 4.2

Rpm 2776

Gas	Rdg	Scale	Amount	
LCO	29.9	R3	0.026	%
CO_2	56.7	R3	2.40	%
O_2	69.9	R25	17.5	%
HC	24.3	R100	243	ppm
NO	15.2	R1000	152	ppm
NOx	16.9	R1000	169	ppm

Time of Completion 9:44

Remarks:

EMISSION DATA

Date 6/19/81 Test No. 9

Engine IH DT 436 B

Engine hours 2.5 Hrs

Fuel Code 50% DF-2; 50% ECSO

Oil Code LO - 7616

Engine load, lb 195.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	14.4	R3	0.012	%
CO_2	59.7	R1	8.04	%
O_2	41.2	R25	10.3	%
HC	21.5	R100	215	ppm
NO	43.3	R2500	1083	ppm
NO_X	48.9	R2500	1223	ppm

Time of Completion 11:02

Remarks:

EMISSION DATA

Date 6/19/81 Test No. 9

Engine IH DT436B

Engine hours 3 Hrs.

Fuel Code 50% DF-2; 50% EC50

Oil Code LO-7616

Engine load, lb 245.8

Rpm 1802

Gas	Rdg	Scale	Amount	
LCO	74.0	R3	0.071	%
CO_2	68.4	R1	10.1	%
O_2	75.8	R10	7.58	%
HC	18.5	R100	185	ppm
NO	62.6	R2500	1565	ppm
NOx	71.5	R2500	1788	pr

Time of Completion 11:49

Remarks:

EMISSION DATA

Date 6/19/81 Test No. 9

Engine IH DT 436 B

Engine hours 4 HRS.

Fuel Code 50% DF-2; 50% EC50

Oil Code LO - 7616

Engine load, lb 2.2

Rpm 233

Gas	Rdg	Scale	Amount	
LCO	17.1	R3	0.014	%
CO_2	17.9	R1	2.09	%
O_2	74.6	R25	18.6	%
HC	21.7	R100	217	ppm
NO	74.7	R250	186.8	ppm
NO_x	90.4	R250	226.0	ppm

Time of Completion 12:37

Remarks:

EMISSION DATA

Date 6/19/81 Test No. 9

Engine IH - DT 436 B

Engine hours 4.5 Hrs.

Fuel Code 50% DF-2; 50% EC50

Oil Code LO-7616

Engine load, lb 97.8

Rpm 2497

Gas	Rdg	Scale	Amount	
LCO	2.6	R3	0.003	%
CO_2	48.1	R1	6.01	%
O_2	52.2	R25	13.1	%
HC	21.6	R100	216	ppm
NO	66.0	R1000	660	ppm
NO_x	73.7	R1000	737	ppm

Time of Completion 1:13

Remarks:

EMISSION DATA

Date 6/19/81 Test No. 9

Engine IH-DT-436B

Engine hours 5.5 Hrs.

Fuel Code 50% DF-2; 50% ECSO

Oil Code LO-7616

Engine load, lb 125.0

Rpm 1803

Gas	Rdg	Scale	Amount	
LCO	43	R3	0.004	%
CO_2	54.2	R1	6.94	%
O_2	46.4	R25	11.6	%
HC	22.5	R100	225	ppm
NO	43.1	R2500	1078	ppm
NO_x	49.7	R2500	1243	ppm

Time of Completion 1:58

Remarks:

EMISSION DATA

Date 6/23/81 Test No. 10

Engine IH DT 436 B

Engine hours 125 HRS

Fuel Code 100% EC50

Oil Code LO-7616

Engine load, lb 5.4

Rpm 2768

Gas	Rdg	Scale	Amount	
LCO	19.5	R3	0.0165	%
CO_2	28.4	R1	3.54	%
O_2	71.4	R25	17.925	%
HC	21.9	R100	219	ppm
NO	13.4	R1000	134	ppm
NO_x	15.7	R1000	157	ppm

Time of Completion 9:00

Remarks:

EMISSION DATA

Date 6/23/81 Test No. 10

Engine IH-DT 436B

Engine hours 1 Hr.

Fuel Code 100% EC50

Oil Code LO-7616

Engine load, lb 189.9

Rpm 2499

Gas	Rdg	Scale	Amount	
LCO	12.5	R3	0.0105	%
CO_2	58.6	R-1	7.82	%
O_2	41.5	R25	10.375	%
HC	19.2	R100	192	ppm
NO	40.1	R2500	1002.5	ppm
NO_X	46.7	R2500	1167.5	ppm

Time of Completion 9:50 A.M.

Remarks:

EMISSION DATA

Date 6/23/81 Test No. 10

Engine IH DT 436B

Engine hours 1.75 Hrs.

Fuel Code 100% EC50

Oil Code LO-7616

Engine load, lb 240.6

Rpm 1806

Gas	Rdg	Scale	Amount	
LCO	52.3	R3	0.0472	%
CO_2	67.5	R1	9.8	%
O_2	31.0	R25	7.75	%
HC	17.4	R100	174	ppm
NO	56.4	R2500	1410	ppm
NO_x	66.8	R2500	1670	ppm

Time of Completion 10:34

Remarks:

EMISSION DATA

Date 6/23/81 Test No. 10

Engine IH-DT436B

Engine hours 2.5 Hrs.

Fuel Code 100% EC50

Oil Code LO-7616

Engine load, lb 2.2

Rpm 716

Gas	Rdg	Scale	Amount	
LCO	20.3	R3	0.0173	%
CO_2	17.6	R1	2.04	%
O_2	74.2	R25	18.55	%
HC	19.8	R100	198	ppm
NO	63.6	R250	159.0	ppm
NO_X	79.6	R250	199.0	ppm

Time of Completion 11:19 AM.

Remarks:

EMISSION DATA

Date 6/23/81 Test No. 10

Engine IH-DT 436B

Engine hours 3.25 Hrs.

Fuel Code 100% ECSO

Oil Code LO-7616

Engine load, lb 92.4

Rpm 2503

Gas	Rdg	Scale	Amount	
LCO	16.6	R3	0.0136	%
CO_2	47.3	R1	5.86	%
O_2	52.7	R25	13.175	%
HC	18.3	R100	183	ppm
NO	57.8	R1000	578	ppm
NO_X	66.6	R1000	666	ppm

Time of Completion 12:06 P.M.

Remarks:

EMISSION DATA

Date 6/23/81 Test No. 10

Engine IH-DT436B

Engine hours 4 HRS.

Fuel Code 100% EC50

Oil Code 20-7616

Engine load, lb 120.4

Rpm 1802

Gas	Rdg	Scale	Amount	
LCO	20.1	R3	0.0171	%
CO_2	52.8	R1	6.76	%
O_2	46.9	R25	11.725	%
HC	20.7	R100	207	ppm
NO	38.2	R2500	955	ppm
NO_X	45.2	R2500	1130	ppm

Time of Completion 12:47 P.M.

Remarks:

TABLE A-VIII

BRAKE SPECIFIC EMISSIONS,
POWER CURVE TESTS NUMBERS 7-10

Test No.	Test Condition	Test Hrs.	RPM	HP	A/F Ratio	BSHC %	BSCO %	BSNOx %
7	Max. Power	1.5	2500	177.4	25.89	.47	.49	7.24
DF-2	Half Power	4.5	2497	90.0	34.25	.82	.43	6.53
	Max. Torque	2.5	1806	159.0	21.10	.37	5.33	8.04
	Half Torque	5.5	1802	79.4	29.67	.63	.58	8.86
8	MP	2	2500	173.1	27.59	.56	.88	8.71
50% CSO	HP	4.5	2500	86.5	23.38	.24	.33	2.73
50% ESCO	MT	3	1800	152.1	23.63	.32	2.59	9.14
	HP	5	1805	78.8	29.88	.80	2.36	8.11
9	MP	2.5	2500	169.1	27.70	.53	.53	8.75
50% DF-2	HP	4.5	2497	83.5	35.95	.79	.20	7.96
50% ESCO	MT	3	1802	153.7	22.78	.34	2.25	9.32
	HT	5.5	1803	78.2	31.29	.62	.19	9.94
10	MP	1	2499	164.1	28.52	.52	.47	8.59
ESCO	HP	3.3	2503	82.3	36.41	.74	.92	7.44
	MT	1.8	1806	149.5	23.87	.35	1.55	9.03
	HT	4	1802	75.0	31.99	.63	.88	9.51

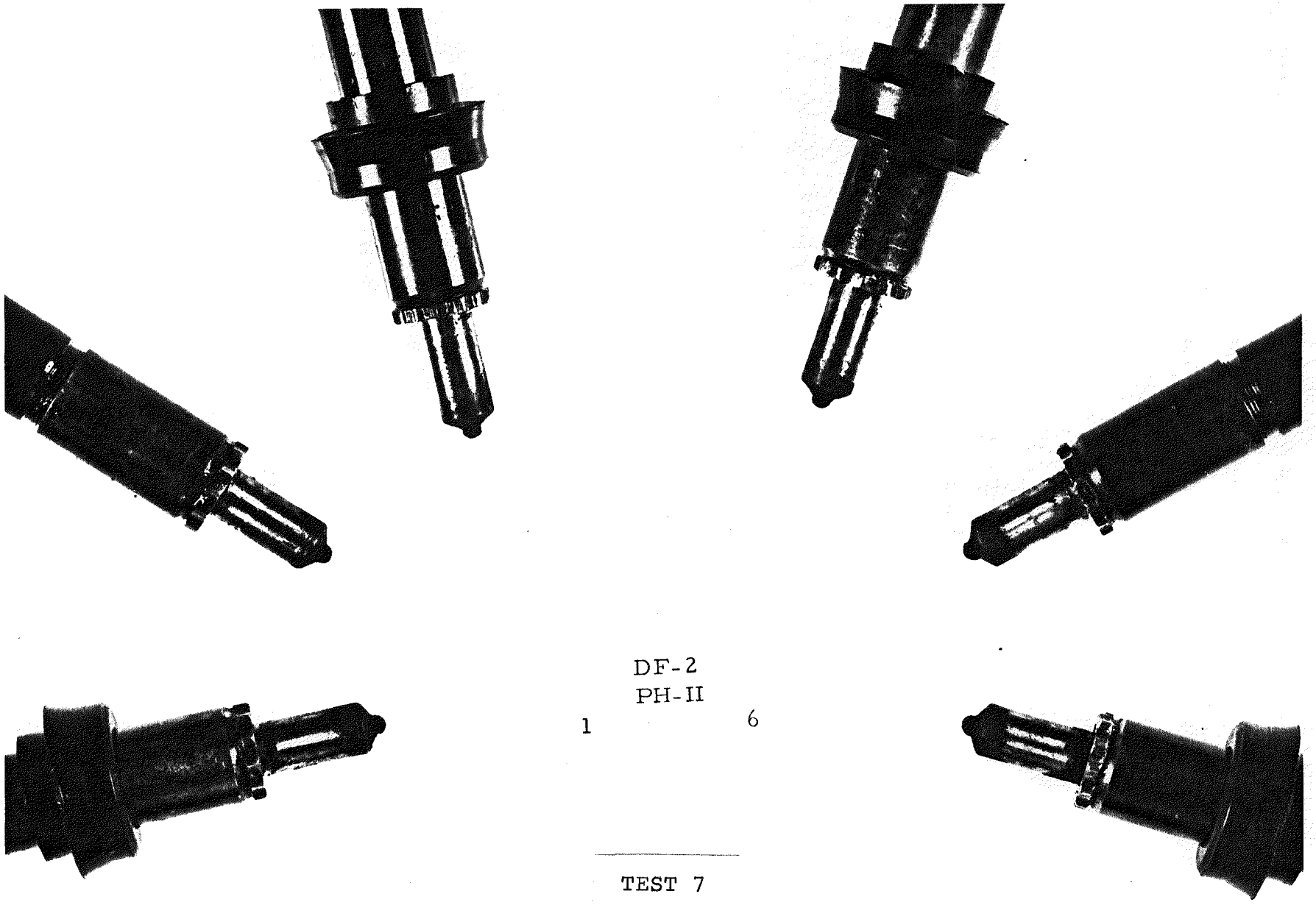
INTENTIONALLY BLANK

FIGURE A-2. INJECTOR TIPS AT END OF TEST NUMBERS 7-10, RESPECTIVELY

INTENTIONALLY BLANK

NOTE

Some copies of this appendix contain black and white Xerox reproductions of the injectors for Test Numbers 7, 8, 9, and 10 instead of colored Xerox. Problems with the color reproduction has forced this expedient in order to facilitate publication.



DF-2
PH-II

1 6

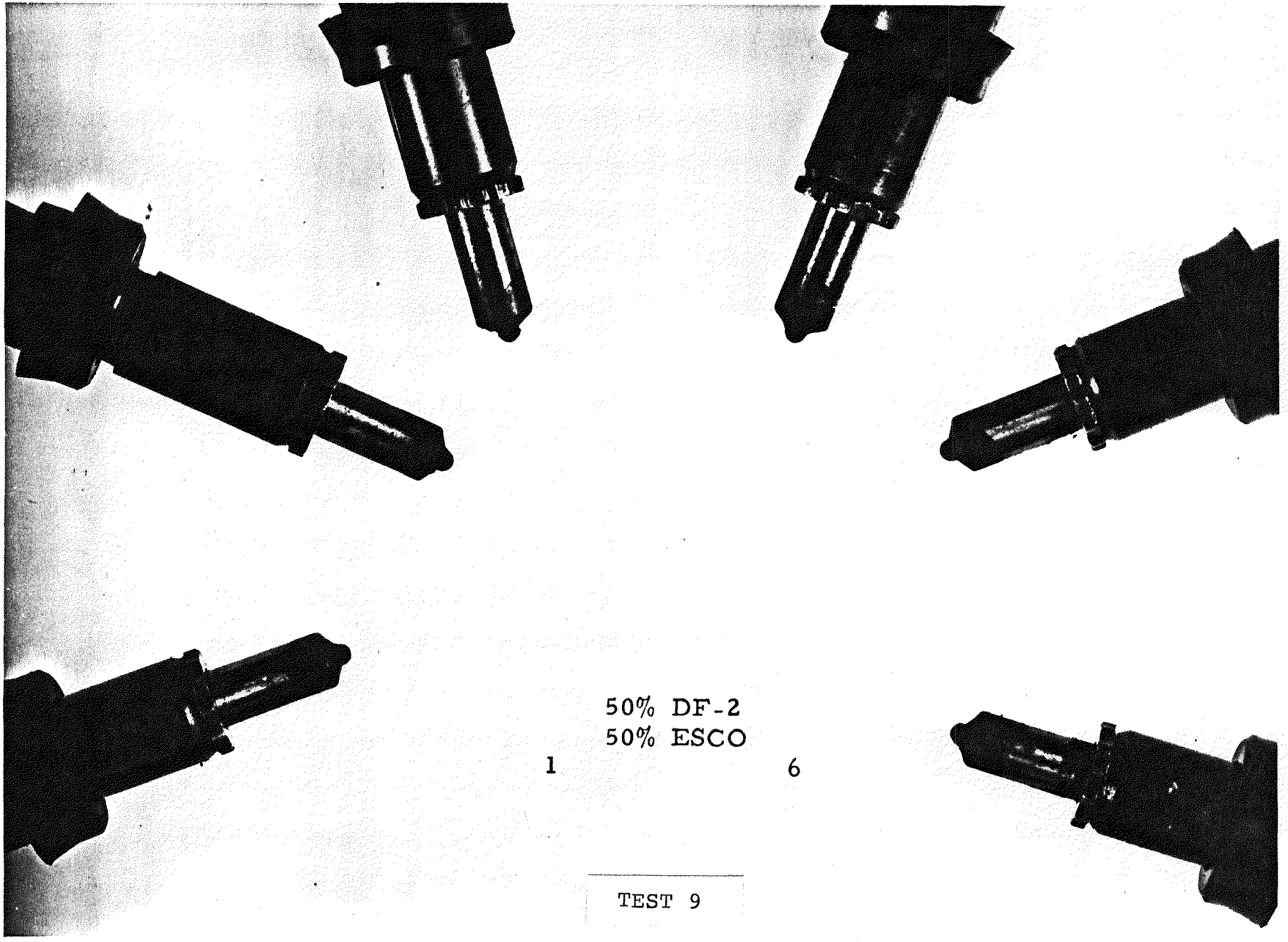
TEST 7

50% CSO
50% ESCO

1

6

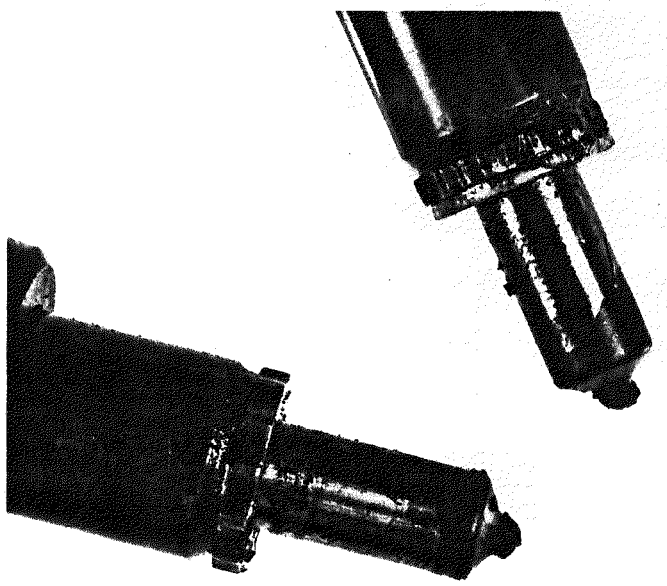
TEST 8

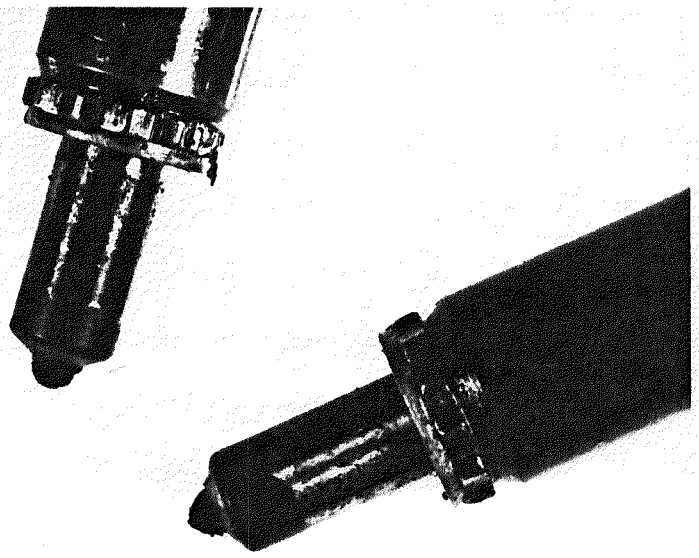


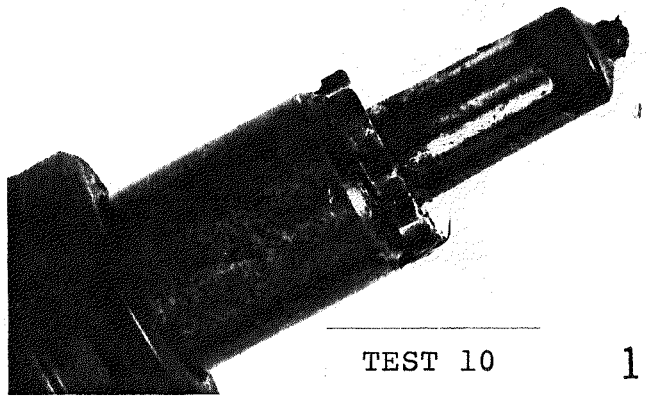
50% DF-2
50% ESCO

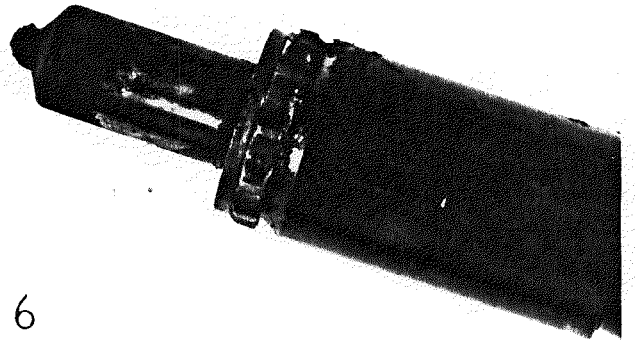
1 6

TEST 9









100% ESCO

TEST 10

1

6

A-129

TABLE A-IX

PERFORMANCE DATA FOR TEST NUMBERS 11 & 12

INTENTIONALLY BLANK

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-21-81 Test No. 11 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	61	61	62	62	63	63	64	64
Time	11:15	11:30	1:22	1:37	2:07	2:22	2:52	3:07
Engine RPM	2779	2777	2500	2500	1800	1800	728	728
Dyno Load (lb) Observed	6.2	6.0	204.2	205.0	248.8	250.2	3.8	3.6
BHP	5.7	5.6	170.2	170.8	149.3	150.1	.9	.9
1 - Coolant Out Temperature, F	186	184	186	185	185	185	178	179
2 - Coolant In Temperature, F	181	180	176	177	175	174	176	177
3 - Oil Sump Temperature, F	217	216	224	223	216	216	183	183
4 - Intake Air Temperature, F	82	84	94	94	96	98	94	96
5 - Fuel Temperature, F	93	93	94	94	94	94	94	95
6 - Intake Manifold After Turbo	138	138	275	274	231	233	101	102
7 - Ambient Air Temperature, F	82	81	95	93	94	94	91	92
8 - Exhaust Temperature Cyl. #1	478	478	966	966	971	976	211	212
9 - Exhaust Temperature Cyl. #2	505	505	1036	1033	1056	1062	234	233
10 - Exhaust Temperature Cyl. #3	492	493	990	989	1021	1030	234	235
11 - Exhaust Temperature Cyl. #4	507	506	1014	1013	1037	1045	261	263
12 - Exhaust Temperature Cyl. #5	498	497	1014	1013	1045	1053	184	184
13 - Exhaust Temperature Cyl. #6	477	479	942	939	947	948	186	188
Oil Gallery Pressure, psi	48.4	48.3	44.0	44.0	36.5	36.5	21.6	21.6
Pressure Before Fuel Filter, psi	68.0	67.8	57.0	56.5	47.5	47.5	29.5	29.5
Pressure After Fuel Filter, psi	68.3	68.1	56.0	56.5	47.0	47.0	29.5	29.5
Intake Manifold Pressure, In. Hg.	0	0	27.0	27.0	21.0	21.0	0	0
Intake Air Restriction, In. H_2O	3	3	7	7	5	5	0	0
Fuel Rate LBS/HR	18.43	18.59	67.52	67.75	55.22	55.76		2.49
Fuel Time Sec/ ½ lb.	98.17	97.08	26.66	26.56	32.70	32.28		721.91
	97.24	96.61		26.58	32.50			
Barometer Pressure, In. Hg.	29.14		29.14		29.14		29.14	
Dry Bulb Temp., F	80		80		88		86	
Wet Bulb Temp., F/R.H.%	73	71%	74	76%	75	56%	73	55%
Blow-by, CFH								
Smoke RDG. % 0-20% scale	1.5	1.5	3.5	3.5	10.0	10.00		

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-21-81 Test No. 11 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Photo	65	65	66	66				
Time	3:37	3:52	4:22	4:37				
Engine RPM	2500	2500	1800	1800				
Dyno Load (lb) Observed	102.4	102.4	124.0	124.0				
BHP	85.3	85.3	74.4	74.4				
1 - Coolant Out Temperature, F	187	186	184	185				
2 - Coolant In Temperature, F	180	179	178	178				
3 - Oil Sump Temperature, F	218	218	209	209				
4 - Intake Air Temperature, F	96	96	98	97				
5 - Fuel Temperature, F	96	96	97	97				
6 - Intake Manifold After Turbo	189	191	152	151				
7 - Ambient Air Temperature, F	94	97	98	96				
8 - Exhaust Temperature Cyl. #1	715	719	677	672				
9 - Exhaust Temperature Cyl. #2	754	757	718	714				
10 - Exhaust Temperature Cyl. #3	726	733	682	680				
11 - Exhaust Temperature Cyl. #4	747	752	712	706				
12 - Exhaust Temperature Cyl. #5	739	742	712	707				
13 - Exhaust Temperature Cyl. #6	700	705	657	652				
Oil Gallery Pressure, psi	46.0	46.0	39.6	39.8				
Pressure Before Fuel Filter, psi	60.0	60.0	50.0	50.0				
Pressure After Fuel Filter, psi	60.0	60.0	50.0	50.0				
Intake Manifold Pressure, In. Hg.	11.0	11.0	6.1	6.1				
Intake Air Restriction, In. H_2O	5	5	3	3				
Fuel Rate LBS/HR	38.63	38.47	28.71	29.10				
Fuel Time Sec/ ½ lb.	46.59	47.15	63.00	60.97				
		46.44	61.80	63.05				
			63.29	61.58				
Barometer Pressure, In. Hg.	29.14		28.98					
Dry Bulb Temp., F	89		88					
Wet Bulb Temp., F/R.H.%	76	56%	76	58%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale	2.0	2.0						

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-7-81 Test No. 12 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Time	8:45	9:00	9:30	9:45	10:15	10:30	11:00	11:15
Engine RPM	2700	2700	720	720	2498	2496	1800	1800
Dyno Load (lb) Observed	6.2	6.2	2.8	2.8	201.8	200.6	258.2	257.4
BHP	5.6	5.6	0.7	0.7	168.0	166.9	154.9	154.4
1 - Coolant Out Temperature, F	192	190	185	185	190	189	187	186
2 - Coolant In Temperature, F	187	185	183	183	182	180	176	176
3 - Oil Sump Temperature, F	221	219	187	187	226	225	218	217
4 - Intake Air Temperature, F	82	81	83	82	84	86	87	87
5 - Fuel Temperature, F	100	100	96	96	98	98	97	97
6 - Intake Manifold After Turbo	137	136	91	90	258	260	227	226
7 - Ambient Air Temperature, F	79	79	80	80	83	83	85	85
8 - Exhaust Temperature Cyl. #1	581	561	222	221	935	936	983	977
9 - Exhaust Temperature Cyl. #2	619	599	219	219	1001	1003	1057	1051
10 - Exhaust Temperature Cyl. #3	588	570	228	228	958	960	1018	1011
11 - Exhaust Temperature Cyl. #4	380	394	242	243	979	981	1017	1011
12 - Exhaust Temperature Cyl. #5	382	408	185	185	987	989	1039	1031
13 - Exhaust Temperature Cyl. #6	374	379	215	214	907	911	946	941
Oil Gallery Pressure, psi	47.5	47.5	20.8	21.0	45.0	45.0	37.5	38.2
Pressure Before Fuel Filter, psi	71.0	71.0	29.2	29.5	60.0	60.5	48.0	48.5
Pressure After Fuel Filter, psi	71.0	71.0	29.1	29.0	60.0	59.5	47.5	48.0
Intake Manifold Pressure, In. Hg.	3.5	3.5	0	0	26.5	26.5	21.5	21.9
Intake Air Restriction, In. H_2O	4	4	1	1	6	6	4	4
Fuel Rate LBS/HR	18.70	17.46	1.71		65.67	64.79	56.55	56.33
Fuel Time Sec/ ½ lb.	95.17	103.23	1067.04		27.24	27.78	31.75	32.00
	101.20	102.53	1047.77		27.54		31.64	31.97
	103.50	103.51			27.45		32.11	31.90
Barometer Pressure, In. Hg.	28.98				28.98			28.98
Dry Bulb Temp., F	88				88			88
Wet Bulb Temp., F/R.H.%	78	65%		65%	78		65%	78
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-7-81 Test No. 12 Oil Code LO-7616

Fuel Code DF-2 Cell No. 14 Engine DT-436B Engine Make I.H.

Time	11.45	12.00	12:30	12:45				
Engine RPM	2500	2500	1800	1800				
Dyno Load (lb) Observed	100.8	100.0	129.2	129.2				
BHP	84.0	83.3	77.5	77.5				
1 - Coolant Out Temperature, F	185	185	185	185				
2 - Coolant In Temperature, F	179	178	177	178				
3 - Oil Sump Temperature, F	215	215	207	208				
4 - Intake Air Temperature, F	86	86	87	87				
5 - Fuel Temperature, F	99	99	100	100				
6 - Intake Manifold After Turbo	176	177	142	142				
7 - Ambient Air Temperature, F	83	85	84	84				
8 - Exhaust Temperature Cyl. #1	712	711	664	668				
9 - Exhaust Temperature Cyl. #2	759	762	710	714				
10 - Exhaust Temperature Cyl. #3	738	740	681	684				
11 - Exhaust Temperature Cyl. #4	695	699	686	688				
12 - Exhaust Temperature Cyl. #5	693	693	690	693				
13 - Exhaust Temperature Cyl. #6	643	644	647	648				
Oil Gallery Pressure, psi	47.0	47.0	42.2	42.2				
Pressure Before Fuel Filter, psi	63.5	63.5	51.5	51.5				
Pressure After Fuel Filter, psi	63.0	63.0	51.0	51.0				
Intake Manifold Pressure, In. Hg.	10.8	10.8	6.5	6.5				
Intake Air Restriction, In. H_2O	5	5	3	3				
Fuel Rate LBS/HR	36.64	36.78	28.90	28.92				
Fuel Time Sec/ ½ lb.	49.34	48.94	62.38	62.14				
	49.13	48.89	62.20	62.49				
	48.91	48.99	62.29	62.08				
Barometer Pressure, In. Hg.	28.98		28.98					
Dry Bulb Temp., F	89		89					
Wet Bulb Temp., F/R.H.%	77	58%	77	58%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

TABLE A-X

CORRECTED RESULTS FOR POWER
CURVE TESTS NUMBER 11, 12

INTENTIONALLY BLANK

TEST NO.; 11

DATE; 09-21-81 FUEL; DF-2 HV; 18704 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2778	5.7	18.5	83	29.14	0.74	1.019	5.8	3.2156	3.8	60144.4	4.23

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	170.5	67.7	94	29.14	0.79	1.035	176.4	0.3836	128.2	7174.3	35.46

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	149.7	55.4	97	29.14	0.74	1.037	155.2	0.3569	156.6	6675.6	38.11

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
728	0.9	2.5	95	29.14	0.68	1.032	0.9	2.6845	2.3	50210.1	5.07

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	85.3	38.5	96	29.14	0.77	1.037	88.4	0.4357	64.2	8148.5	31.22

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	74.4	28.9	98	28.98	0.78	1.045	77.7	0.3718	78.4	6953.9	36.59

TEST NO.; 12

DATE; 10-07-81 FUEL; DF-2 HV; 18704 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2700	5.6	17.7	82	28.98	0.87	1.027	5.8	3.0828	3.9	57660.0	4.41

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2497	167.5	65.4	85	28.98	0.87	1.032	172.8	0.3789	125.7	7086.2	35.90

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	154.7	56.4	87	28.98	0.87	1.034	160.0	0.3528	161.4	6599.1	38.55

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
720	0.7	1.7	83	28.98	0.87	1.028	0.7	2.3648	1.8	44231.1	5.75

HALF POWER STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2500	83.7	36.7	86	28.98	0.82	1.031	86.3	0.4256	62.7	7960.3	31.96

HALF TORQUE STATE CONDITIONS AND CORRECTIONS.

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	77.5	28.9	87	28.98	0.82	1.032	80.0	0.3613	80.8	6757.6	37.65

TABLE A-XI

EMISSIONS DATA FOR TEST NUMBER 11

INTENTIONALLY BLANK

EMISSION DATA

Date 9-21-81 Test No. 11

Engine I.H. DT 436B

Engine Hours

Fuel Code DF-2

Oil Code LO-7616

Engine load, lb 6.2

Rpm 2779

Gas	Rdg	Scale	Amount	
LCO	11.0	R1	0.0275	%
CO_2	29.5	R1	2.92	%
O_2	68.2	R25	17.05	%
HC	54.5	R50	273	ppm
NO	14.4	R1000	144	ppm
NOx	14.5	R1000	145	ppm

Time of Completion 11:17 AM

Remarks:

EMISSION DATA

Date 9-21-81 Test No. 11

Engine IH DT 436 B

Engine Hours 2.5

Fuel Code DF-2

Oil Code LO-7616

Engine load, lb 204.6

Rpm 2504

Gas	Rdg	Scale	Amount	
LCO	26.1	R3	0.022	%
CO_2	61.0	R1	7.97	%
O_2	39.5	R25	9.87	%
HC	42.0	R50	210	ppm
NO	44.5	R2500	1113	ppm
NOx	44.7	R2500	1118	ppm

Time of Completion 1:21 PM

Remarks:

EMISSION DATA

Date 9-21-81 Test No. 11

Engine IH DT 436B

Engine Hours 3.5

Fuel Code DF-2

Oil Code LO-7616

Engine load, lb 248.8

Rpm 1816

Gas	Rdg	Scale	Amount	
LCO	57.5	R1	0.1975	%
CO_2	68.0	R1	8.77	%
O_2	29.5	R25	7.37	%
HC	33.5	R50	168	ppm
NO	59.9	R2500	1498	ppm
NOx	60.0	R2500	1500	ppm

Time of Completion 2:08 PM

Remarks:

EMISSION DATA

Date 9-21-81 Test No. 11

Engine IH DT 436B

Engine Hours

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 3.6

Rpm 727

Gas	Rdg	Scale	Amount	
LCO	36.3	R3	0.031	%
CO_2	35.0	R3	1.36	%
O_2	73.8	R25	18.46	%
HC	54.0	R50	270	ppm
NO	75.4	R250	189	ppm
NOx	75.6	R250	189	ppm

Time of Completion 3.07 PM

Remarks:

EMISSION DATA

Date 9-21-81 Test No. 11

Engine I.H. DT436B

Engine Hours 4.5

Fuel Code DF-2

Oil Code LO 7616

Engine load, lb 102.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	21.5	R3	0.018	%
CO_2	49.0	R1	5.66	%
O_2	51.0	R25	12.75	%
HC	37.5	R50	188	ppm
NO	66.0	R1000	660	ppm
NOx	66.2	R1000	662	ppm

Time of Completion 3:37 PM.

Remarks:

EMISSION DATA

Date 9-21-81 Test No. 11

Engine I.H. DT 436 B

Engine Hours 5.5

Fuel Code DF 2

Oil Code LO-7616

Engine load, lb 124.0

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	28.0	R3	0.024	%
CO_2	54.5	R1	6.62	%
O_2	45.5	R25	11.25	%
HC	28.0	R50	140	ppm
NO	45.0	R2500	1125	ppm
NOx	45.1	R2500	1128	ppm

Time of Completion 4:32 p.m.

Remarks:

TABLE A-XII

BRAKE SPECIFIC EMISSIONS,
POWER CURVE TEST NUMBER 11

Test No.	Test Condition	Test Hrs.	RPM	HP	A/F Ratio	BSHC %	BSCO %	BSNOx %
11	Max. Power	2.5	2504	176.4	26.86	.49	.96	8.05
DF-2	Half Power	4.5	2500	88.4	36.71	.69	1.26	7.61
	Max. Torque	3.5	1816	155.2	22.71	.33	7.20	9.00
	Half Torque	5.5	1800	77.7	31.35	.38	1.23	9.47

INTENTIONALLY BLANK

FIGURE A-3: COMBUSTION AND INJECTOR PRESSURE TRACES FOR CYLINDER NUMBER 6

INTENTIONALLY BLANK

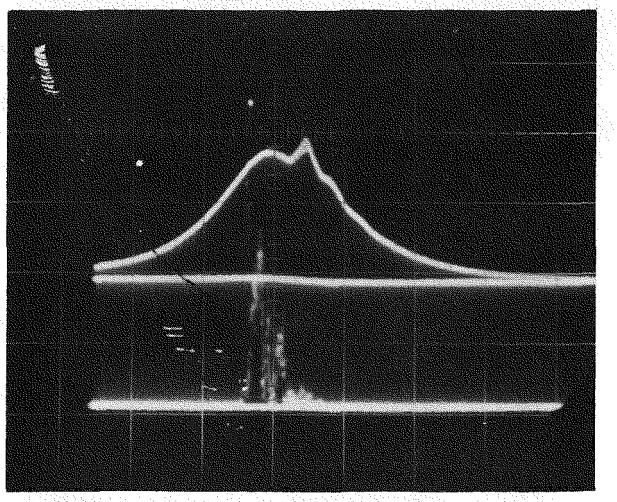


Photo 1 C: 792 psi 25°
I: 8560 psi

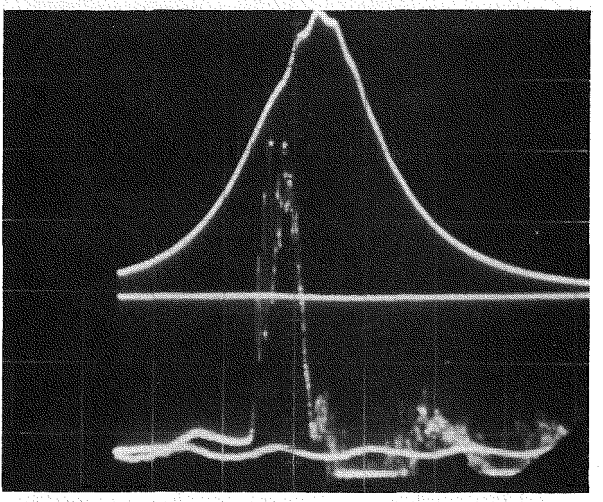


Photo 2 C: 1605 psi 25°
I: 8667 psi

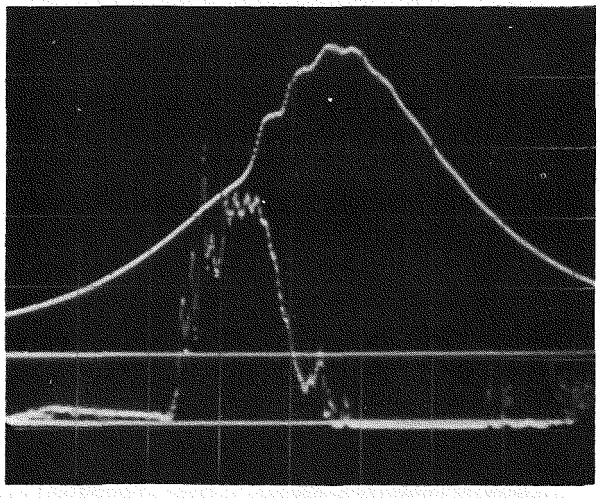


Photo 3 C: 1733 psi 12.5°
I: 7704 psi

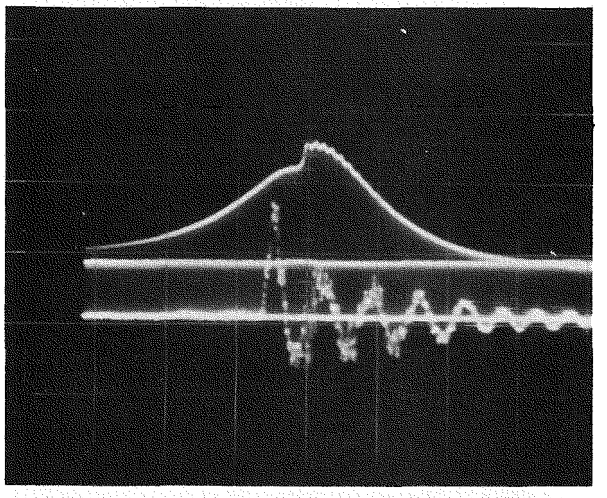


Photo 4 C: 663 psi 20°
I: 3210 psi

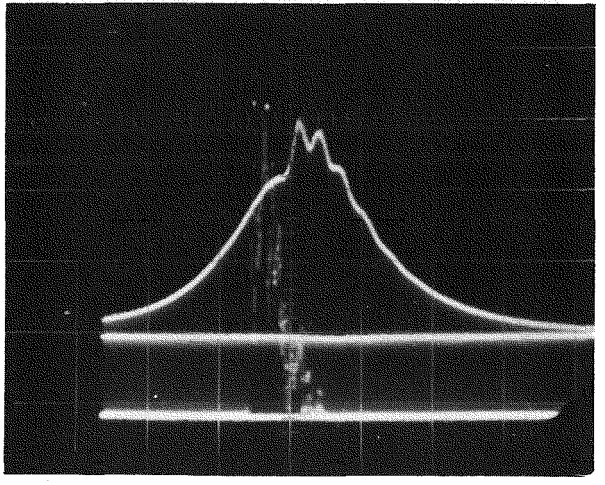


Photo 5 C: 1220 psi 25°
I: 8774 psi

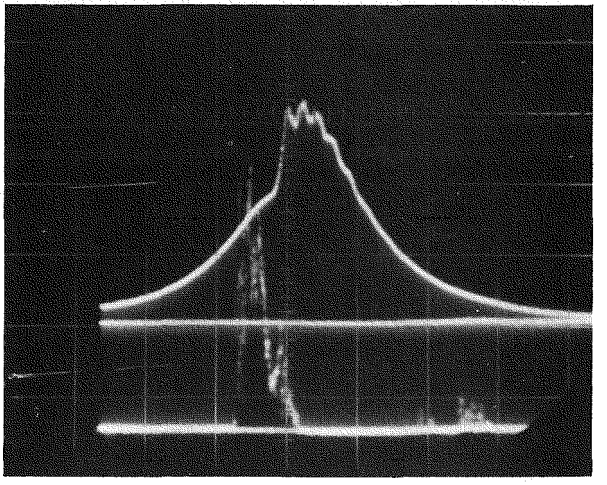


Photo 6 C: 1241 psi 25°
I: 7276 psi

Test No. 1

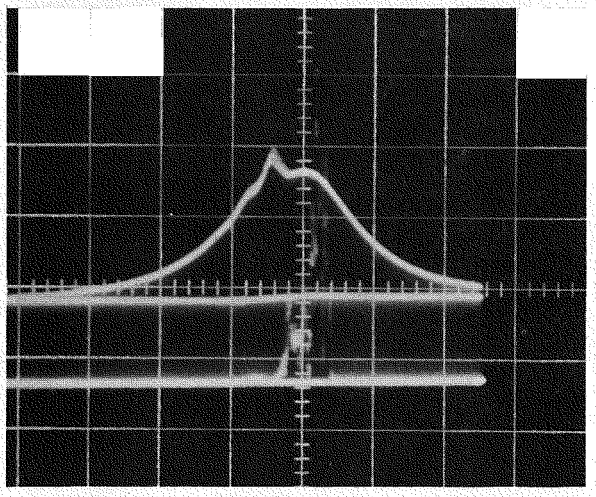


Photo 7 C: 835 psi 25°
I: 8667 psi

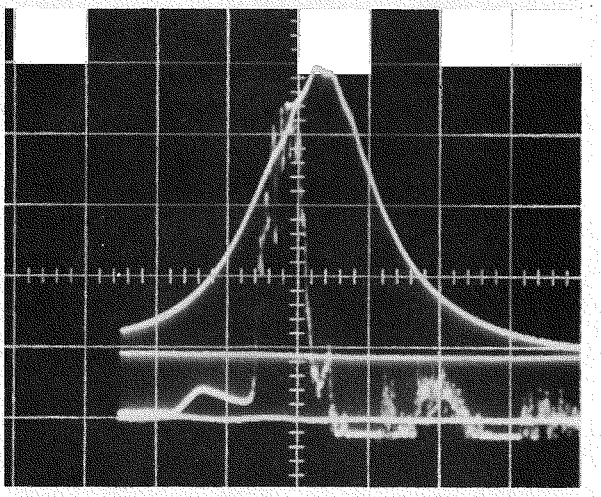


Photo 8 C: 1626 psi 25°
I: 8560 psi

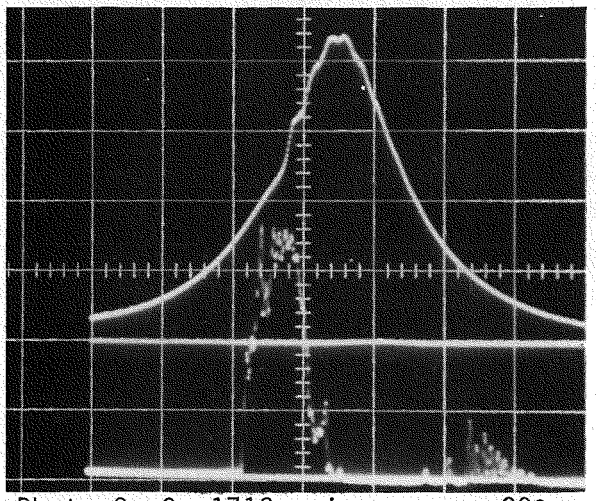


Photo 9 C: 1712 psi 20°
I: 7062 psi

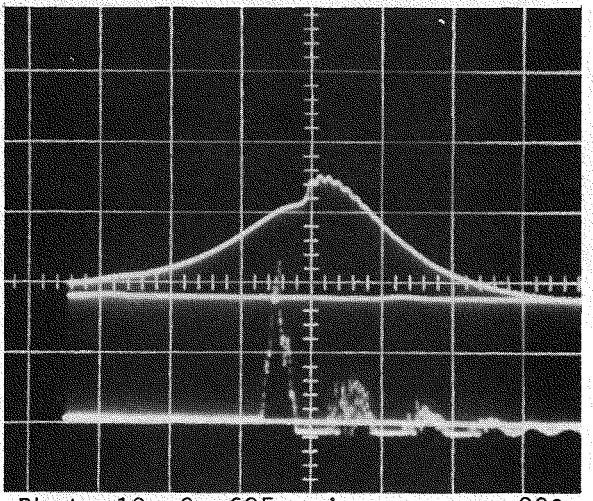


Photo 10 C: 685 psi 20°
I: 4494 psi

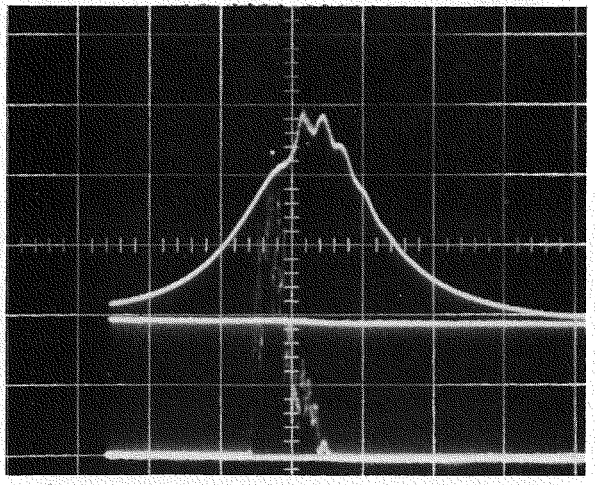


Photo 11 C: 1177 psi 25°
I: 8667 psi

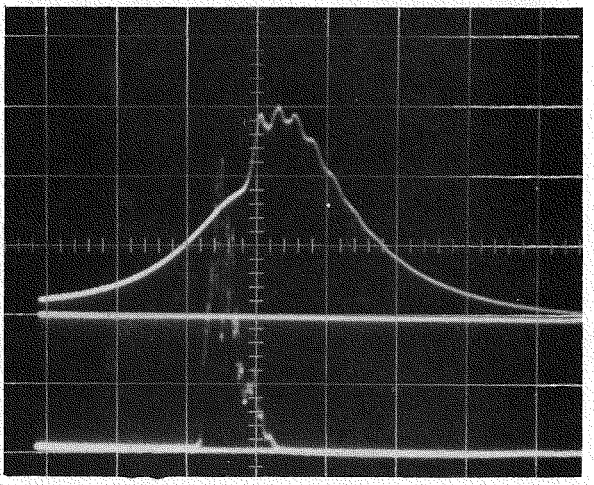


Photo 12 C: 1177 psi 20°
I: 8239 psi

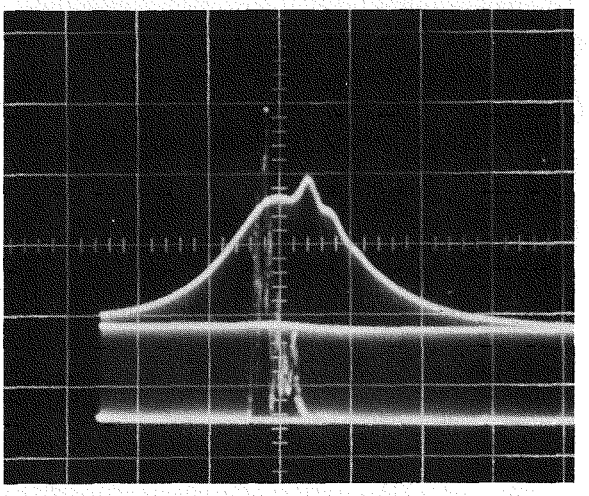


Photo 13 C: 856 psi 25°
I: 8667 psi

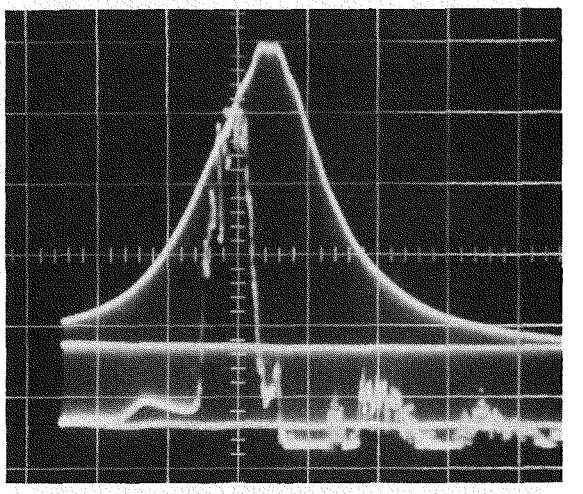


Photo 14 C: 1691 psi 25°
I: 8667 psi

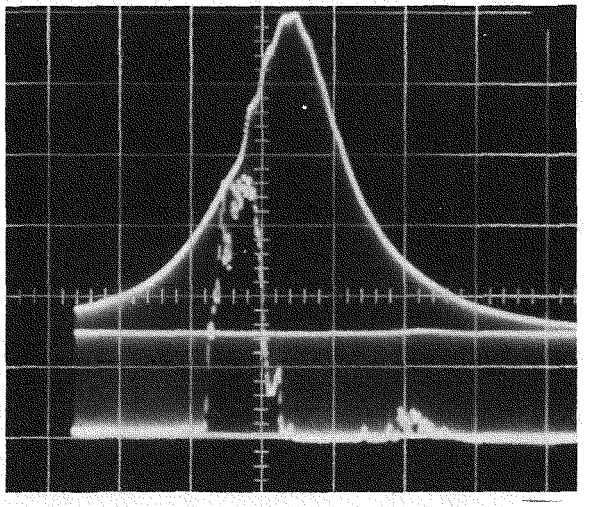


Photo 15 C: 1776 psi 25°
I: 7169 psi

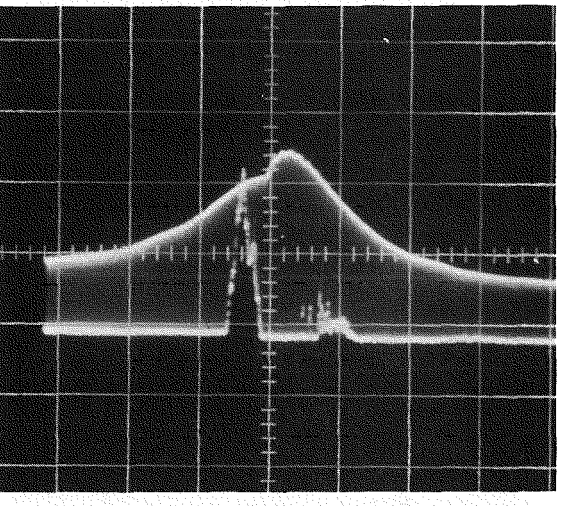


Photo 16 C: 706 psi 20°
I: 4708 psi

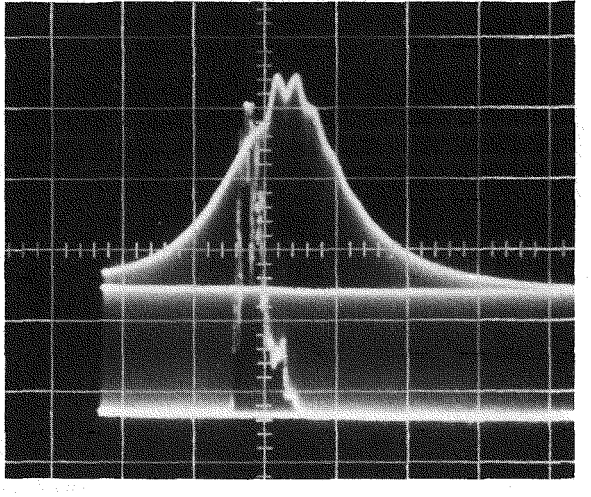


Photo 17 C: 1198 psi 25°
I: 8667 psi

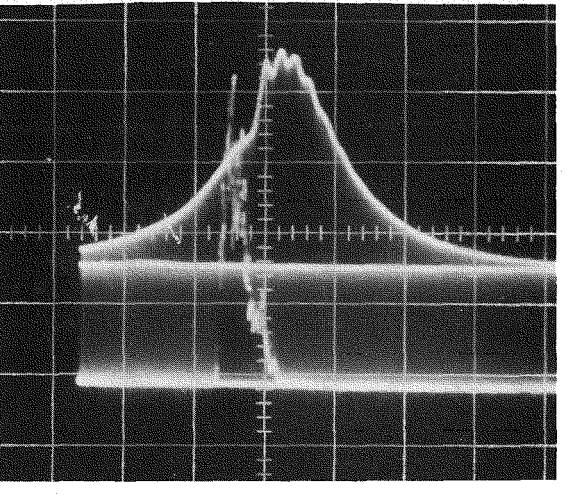


Photo 18 C: 1220 psi 25°
I: 8667 psi

Test No. 3

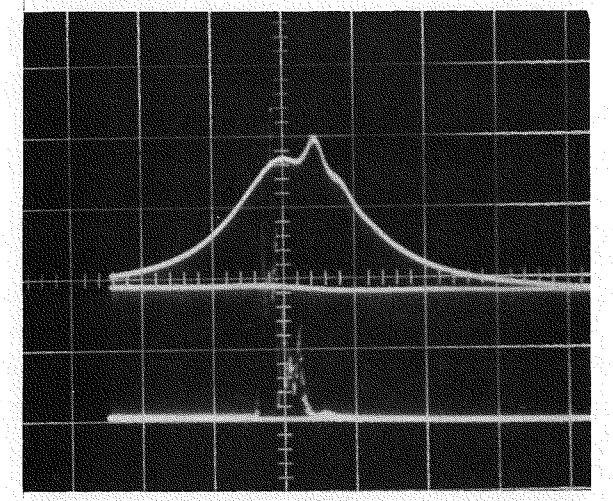


Photo 19 C: 856 psi 25°
I: 8667 psi

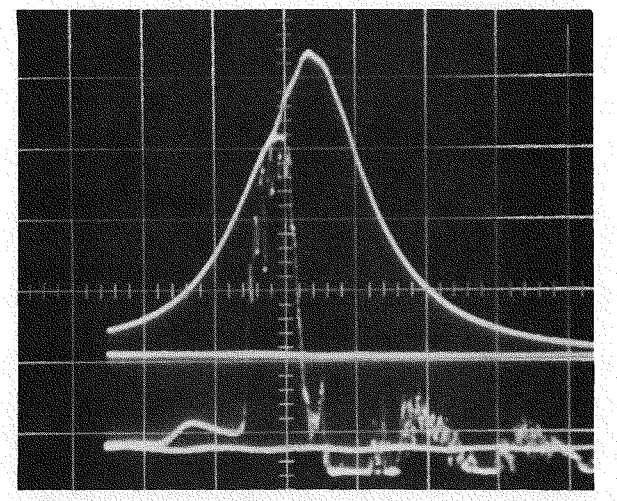


Photo 20 C: 1691 psi 25°
I: 8667 psi

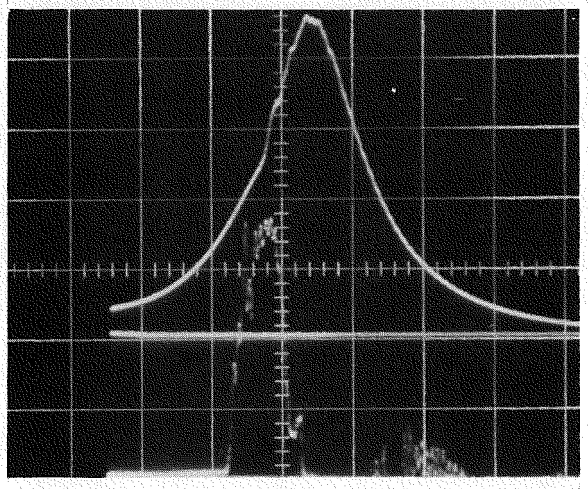


Photo 21 C: 1776 psi 25°
I: 7169 psi

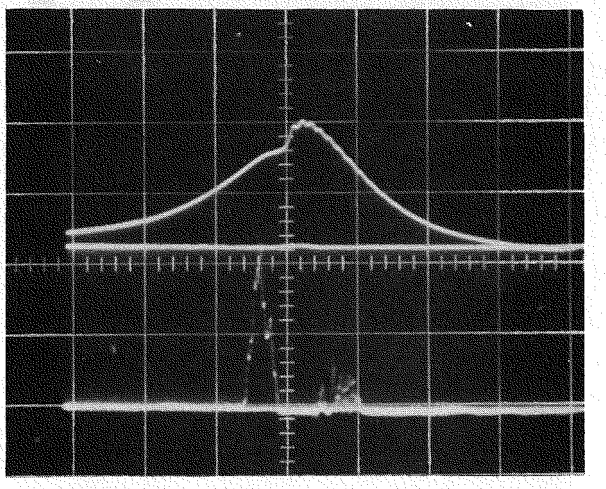


Photo 22 C: 706 psi 20°
I: 4280 psi

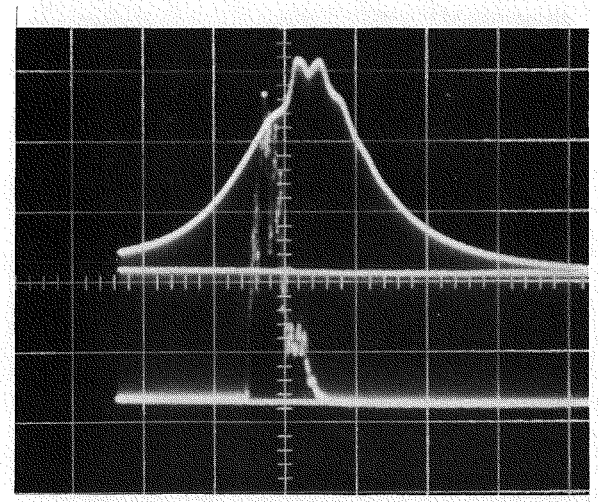


Photo 23 C: 1198 psi°
I: 8667 psi

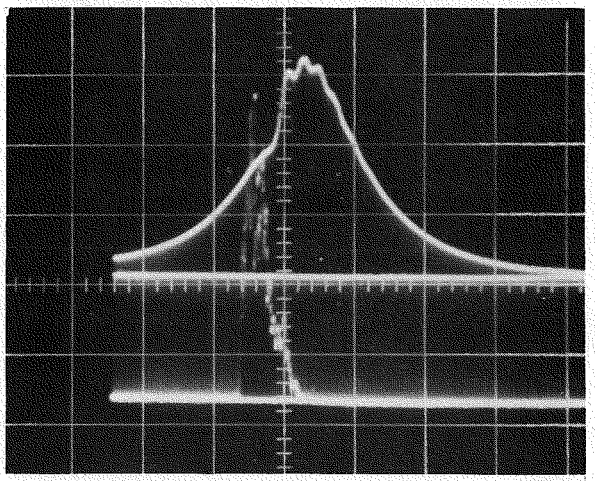


Photo 24 C: 1241 psi 25°
I: 8560 psi

Test No. 4

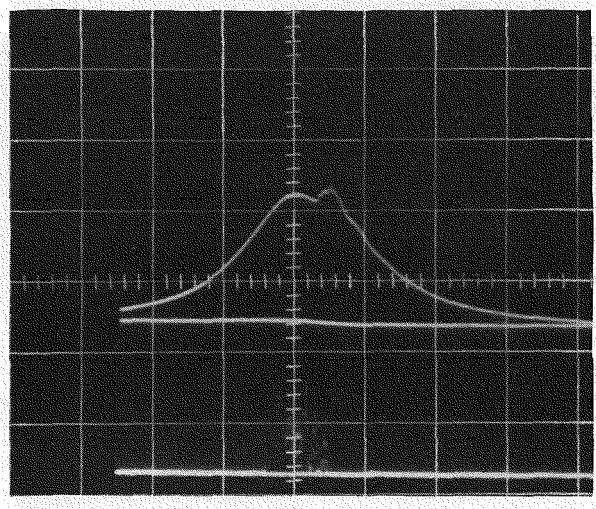


Photo 25 C: 749 psi 25°
I: 8560 psi

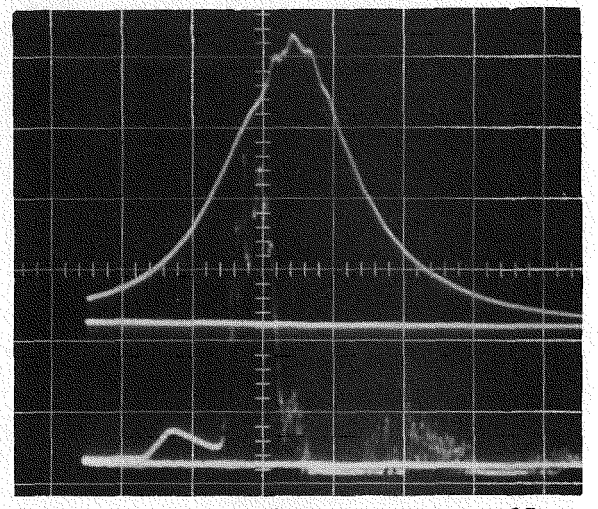


Photo 26 C: 1626 psi 25°
I: 8560 psi

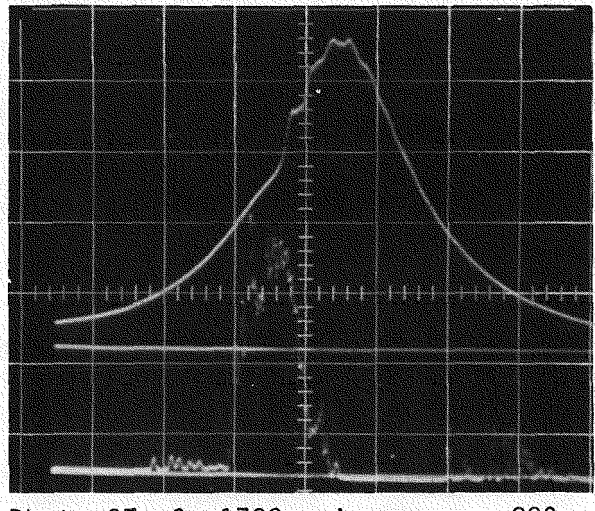


Photo 27 C: 1733 psi ~20°
I: 7383 psi

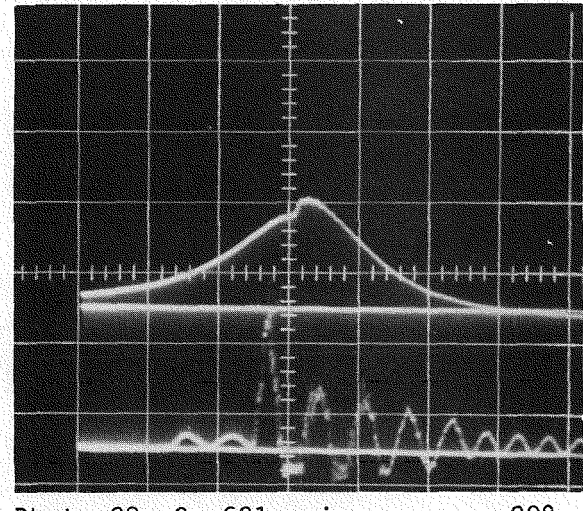


Photo 28 C: 621 psi 20°
I: 3959 psi

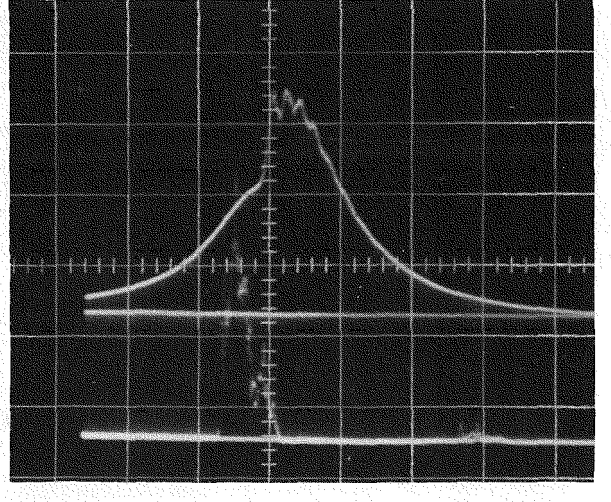


Photo 30 C: 1262 psi 25°
I: 7704 psi

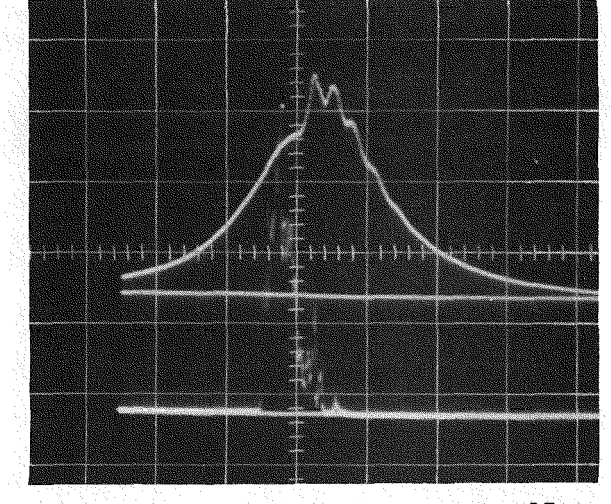


Photo 31 C: 1241 psi 25°
I: 8667 psi

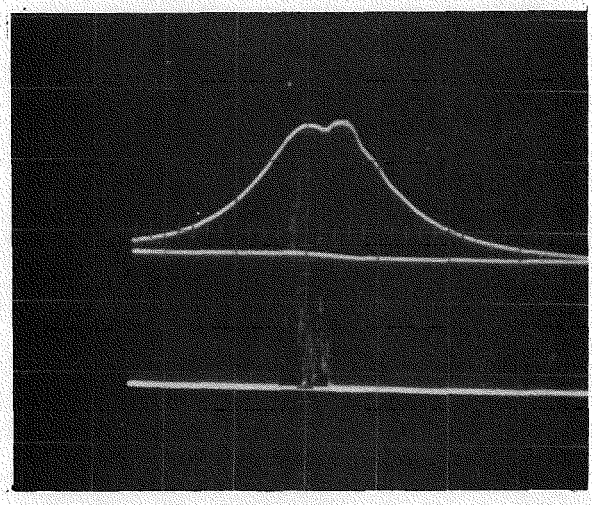


Photo 32 C: 749 psi 25°
I: 8453 psi

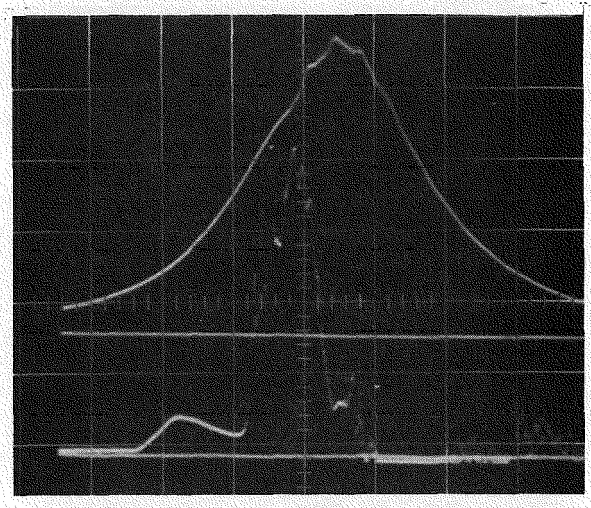


Photo 33 C: 1669 psi ~20°
I: 8560 psi

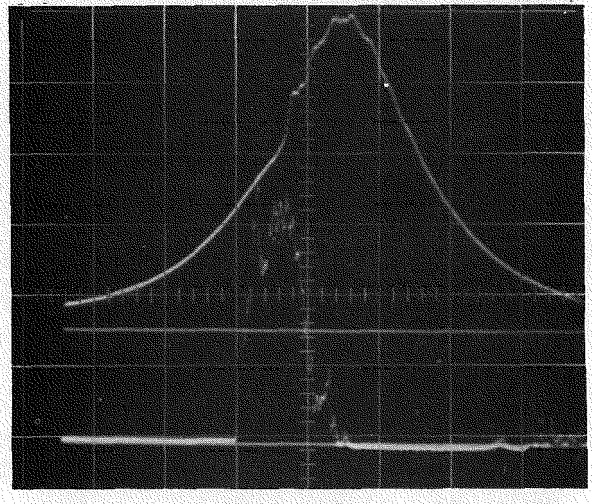


Photo 34 C: 1776 psi ~20°
I: 7169 psi

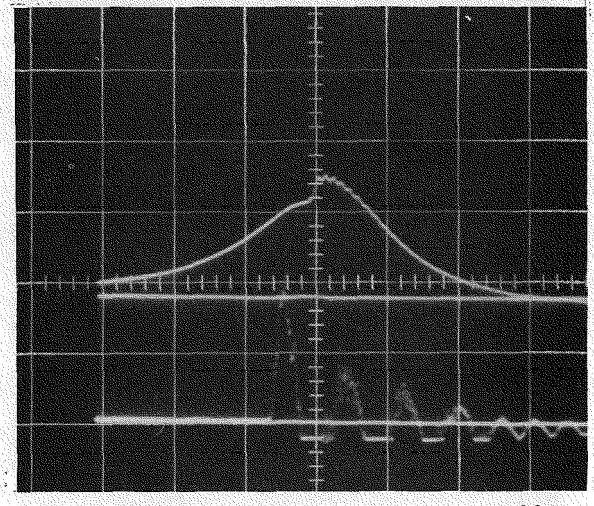


Photo 35 C: 685 psi 20°
I: 3638 psi

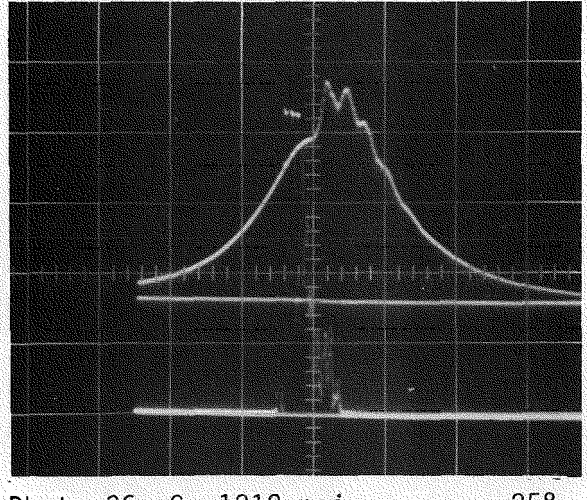


Photo 36 C: 1212 psi 25°
I: 8560 psi

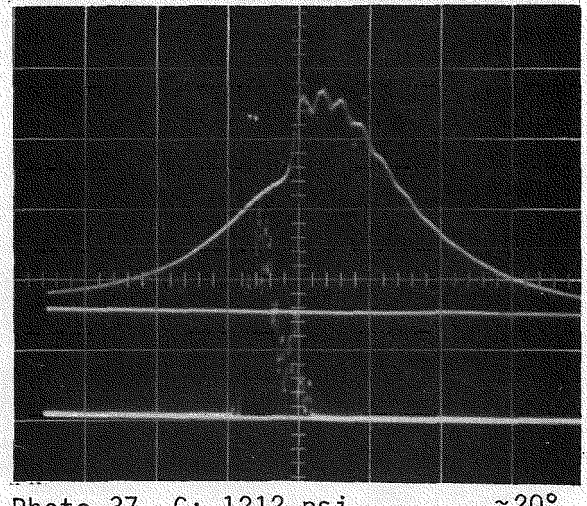


Photo 37 C: 1212 psi ~20°
I: 8560 psi

Test No. 6

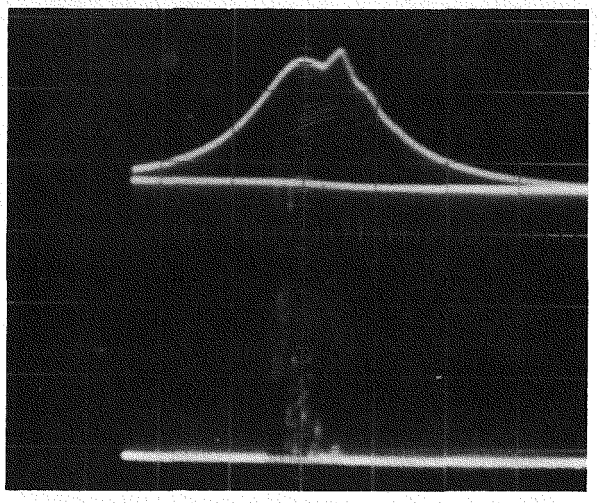


Photo 38 C: 752 psi 25°
I: 10,272 psi

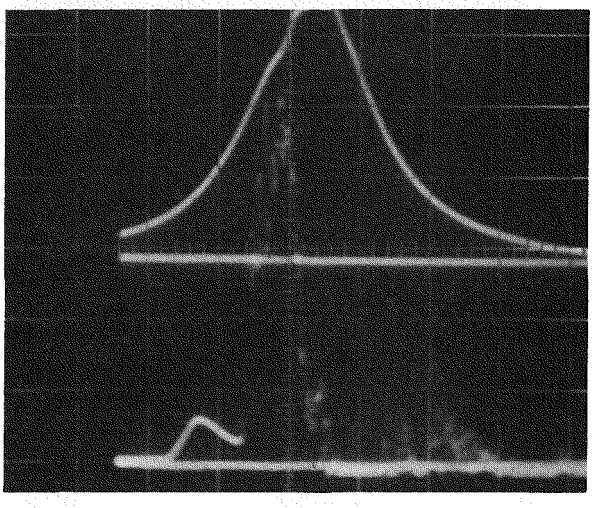


Photo 39 C: 1484 psi 25°
I: 10,058 psi

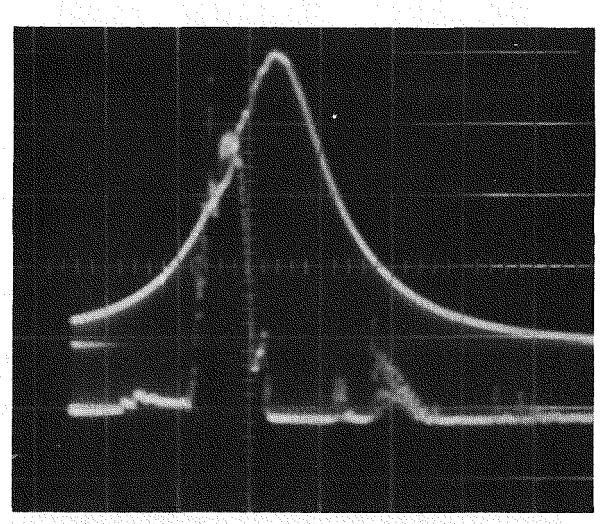


Photo 40 C: 1588 psi 25°
I: 9309 psi

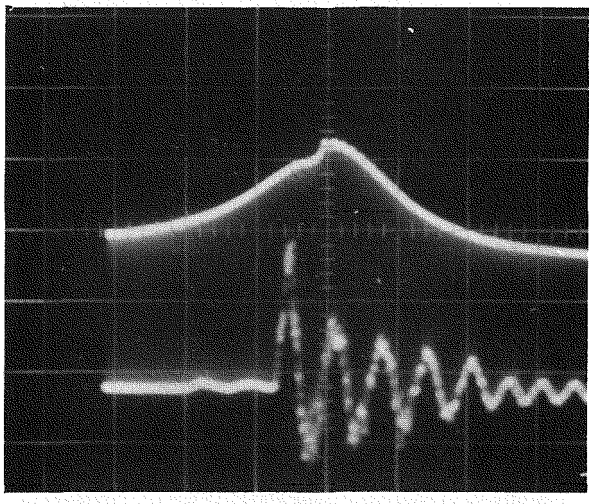


Photo 41 C: 564 20°
I: 4066

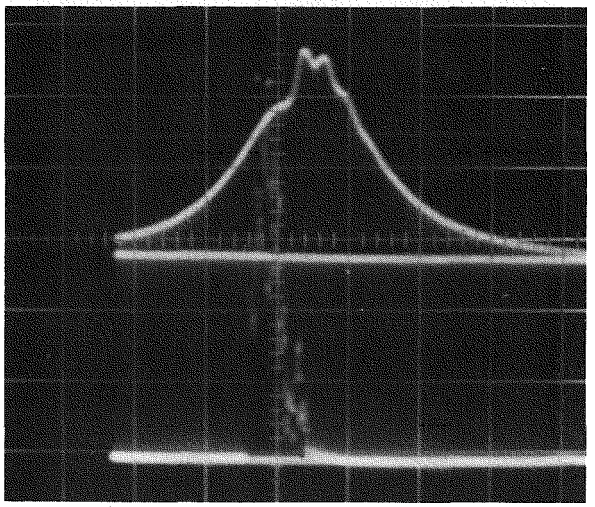


Photo 42 C: 1129 psi 25°
I: 10,700 psi

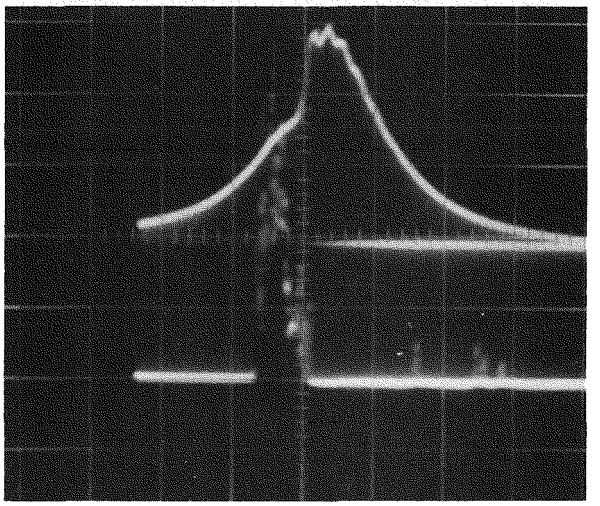


Photo 43 C: 1191 psi 25°
I: 9416 psi

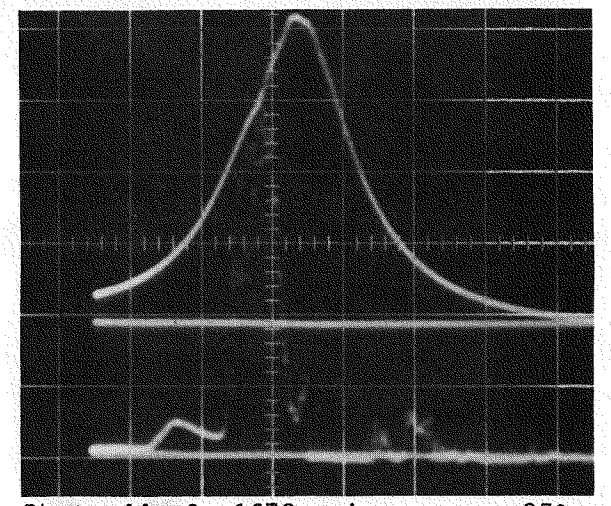


Photo 44 C: 1672 psi 25°
I: 10,058 psi

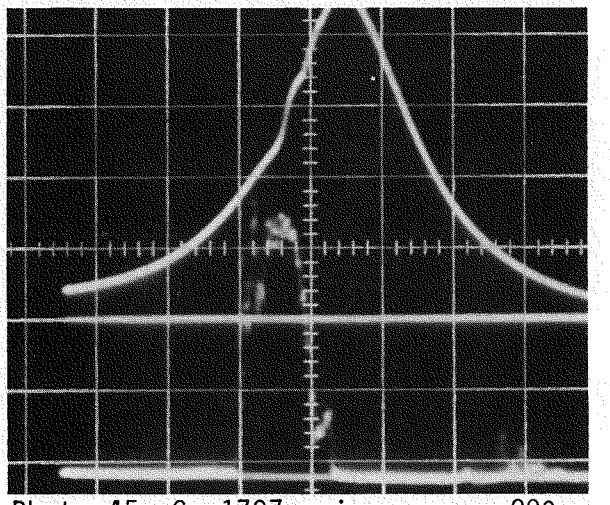


Photo 45 C: 1797 psi ~20°
I: 7704 psi

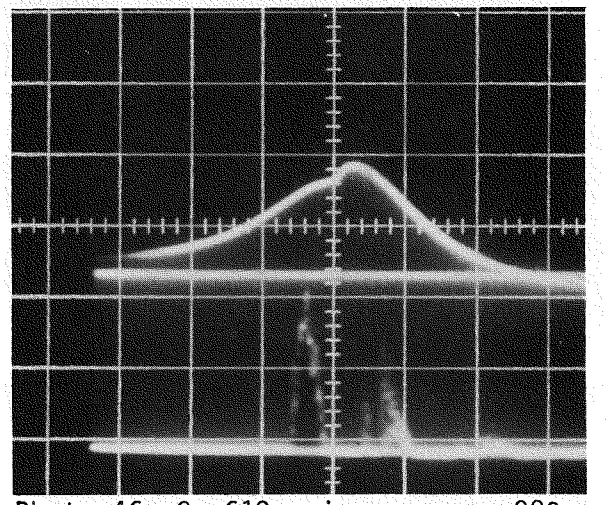


Photo 46 C: 610 psi ~20°
I: 4494 psi

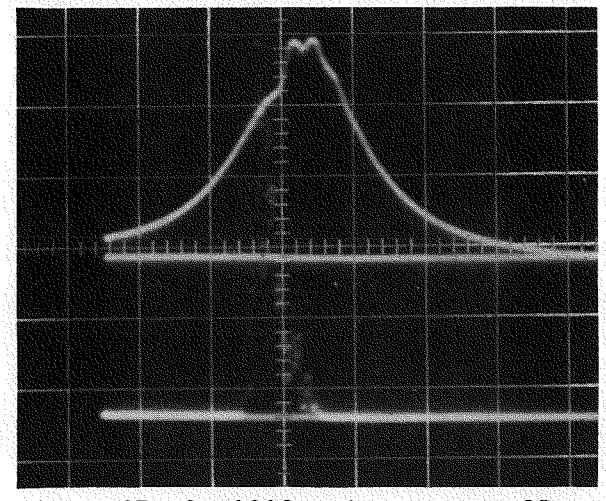


Photo 47 C: 1212 psi 25°
I: 10,593 psi

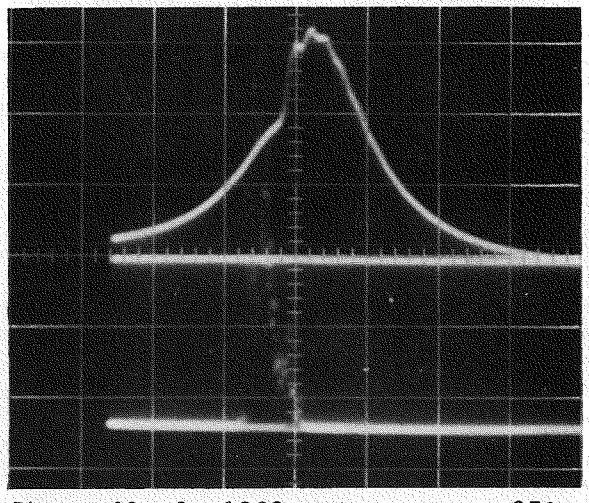


Photo 48 C: 1262 psi 25°
I: 10,486 psi

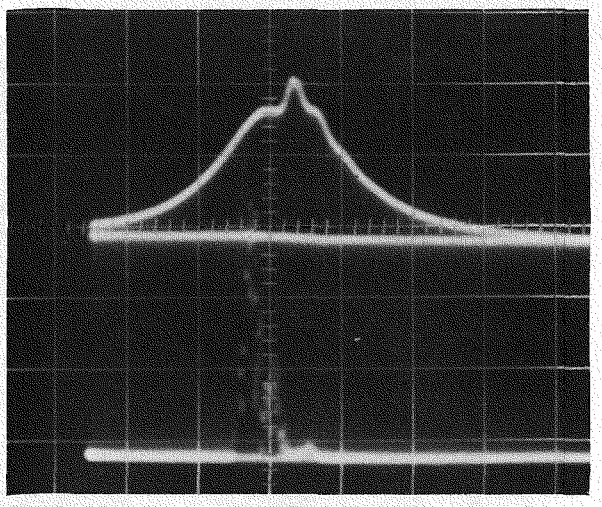


Photo 49 C: 857 psi 25°
I: 8560 psi

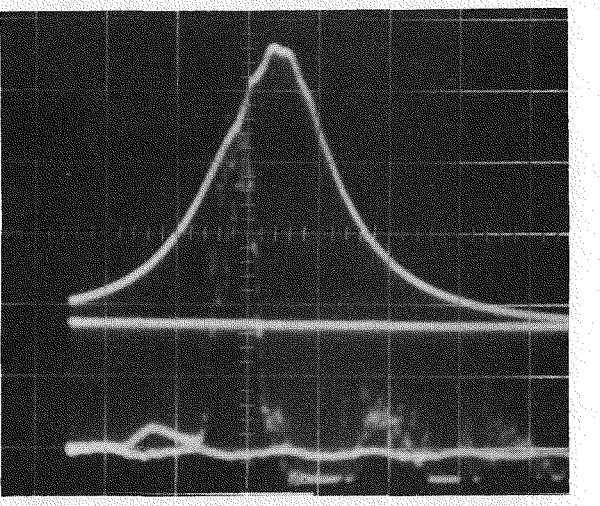


Photo 50 C: 1526 psi 25°
I: 9416 psi

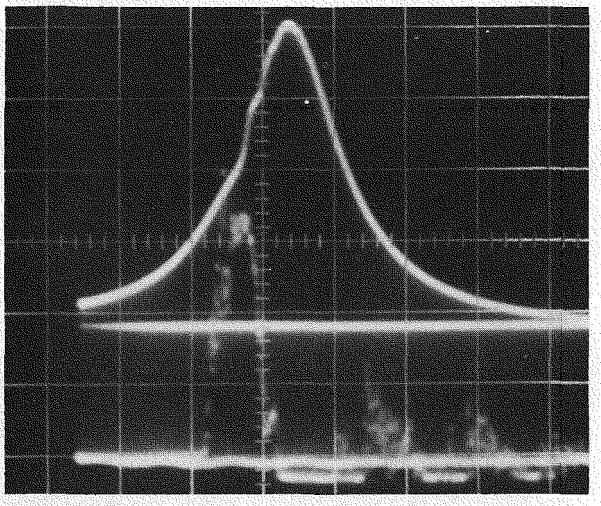


Photo 51 C: 1672 psi 25°
I: 8132 psi

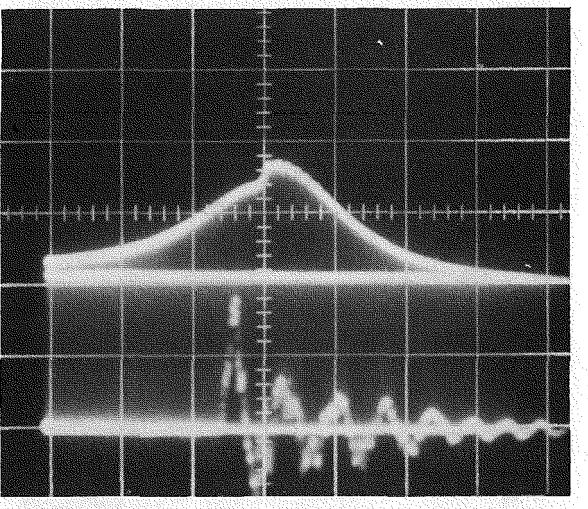


Photo 52 C: 627 psi 20°
I: 3638 psi

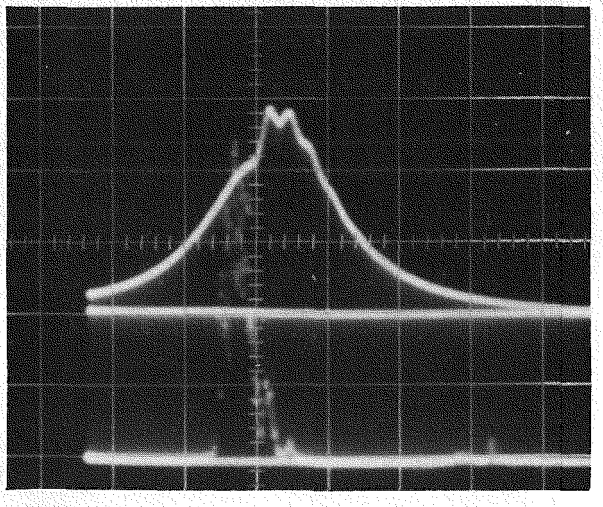


Photo 53 C: 1129 psi 25°
I: 9095 psi

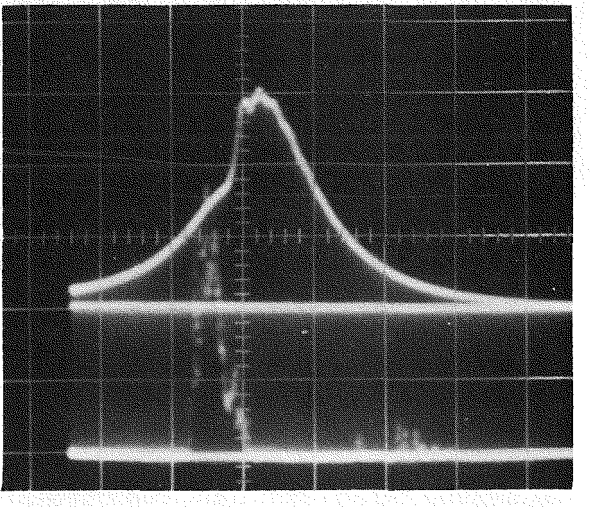


Photo 54 C: 1191 psi 25°
I: 7597 psi

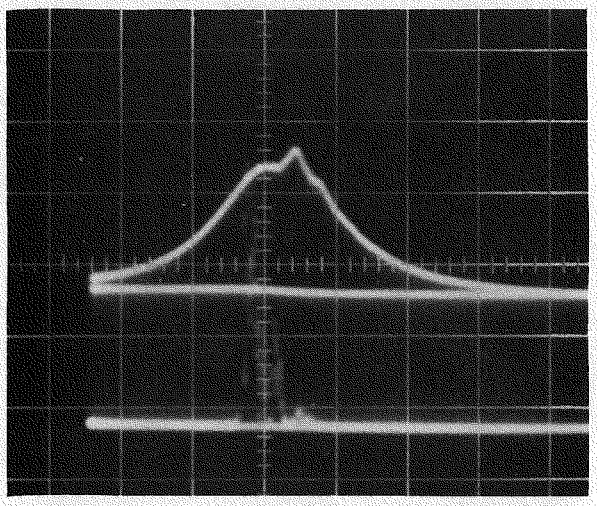


Photo 55 C: 813 psi 25°
I: 7490 psi

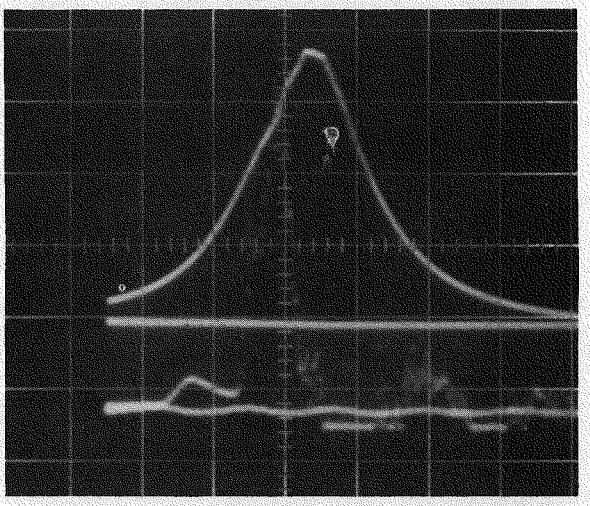


Photo 56 C: 1519 psi 25°
I: 9202 psi

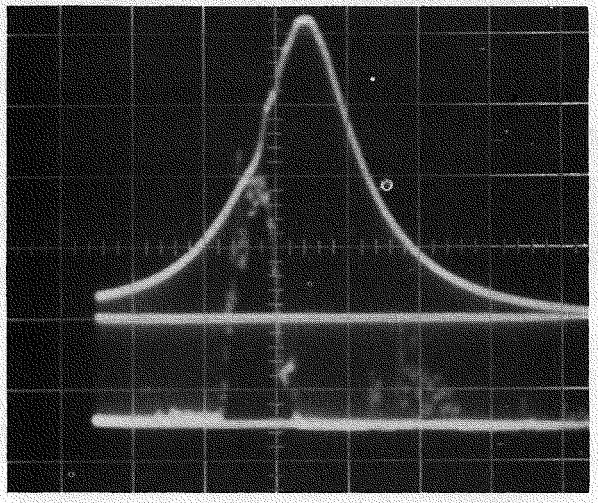


Photo 57 C: 1678 psi 25°
I: 7704 psi

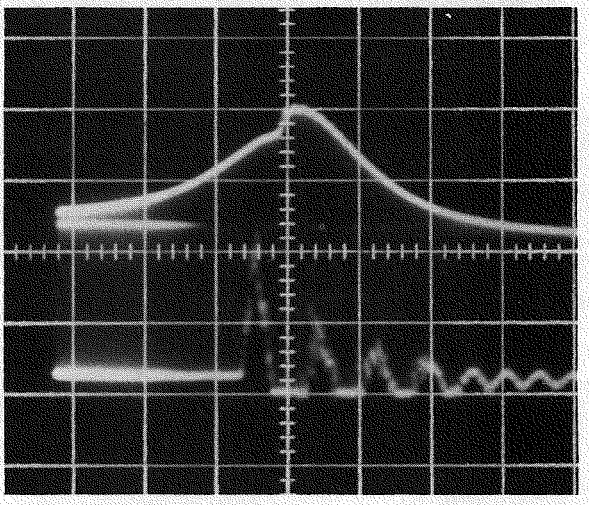


Photo 58 C: 685 psi 20°
I: 3959 psi

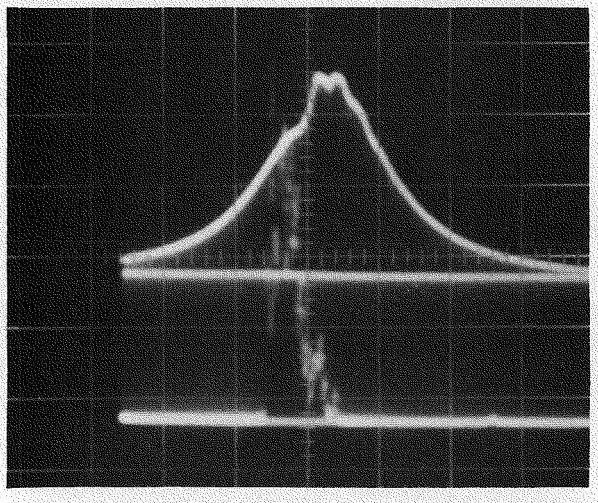


Photo 59 C: 1113 psi 25°
I: 9844 psi

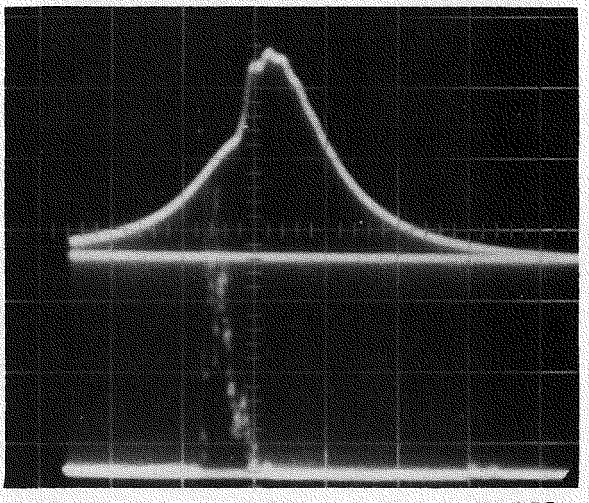


Photo 60 C: 1156 psi 25°
I: 8132 psi

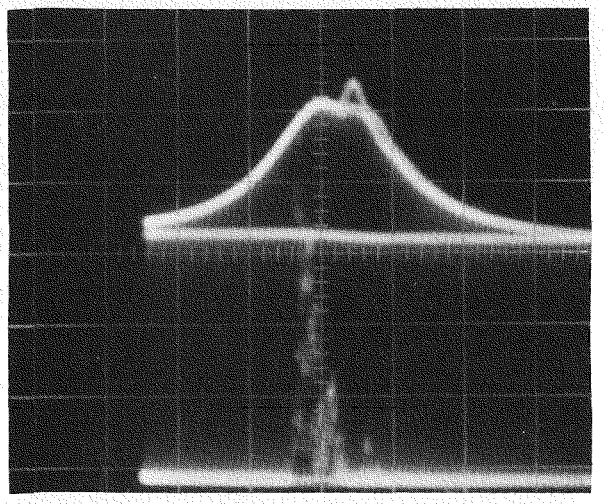


Photo 61 C: 877 I: 9630 25°

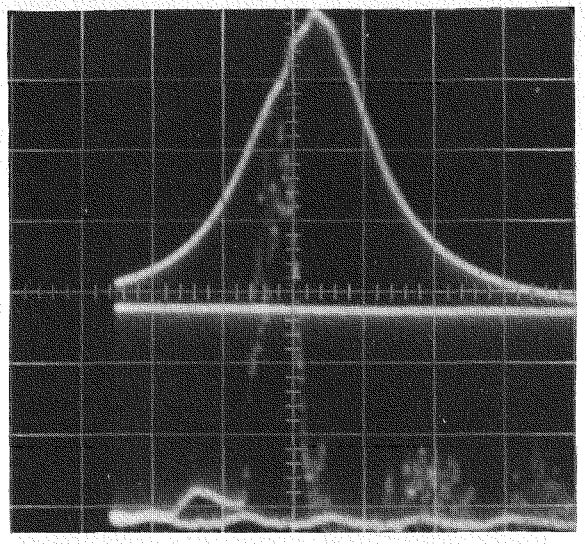


Photo 62 C: 1669 psi 25°
I: 11,770 psi

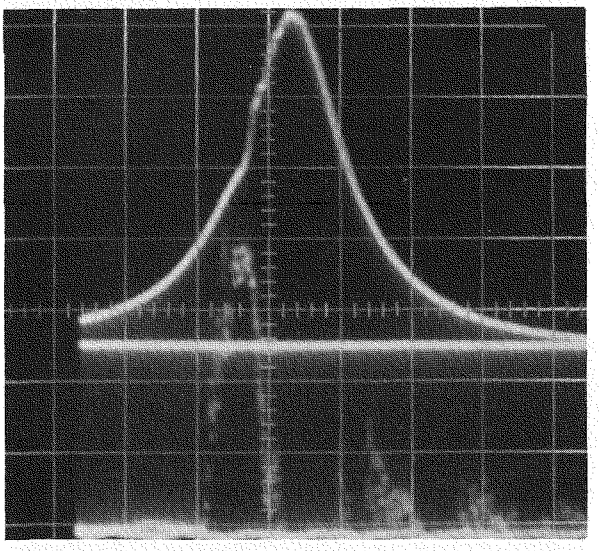


Photo 63 C: 1866 psi 25°
I: 8774 psi

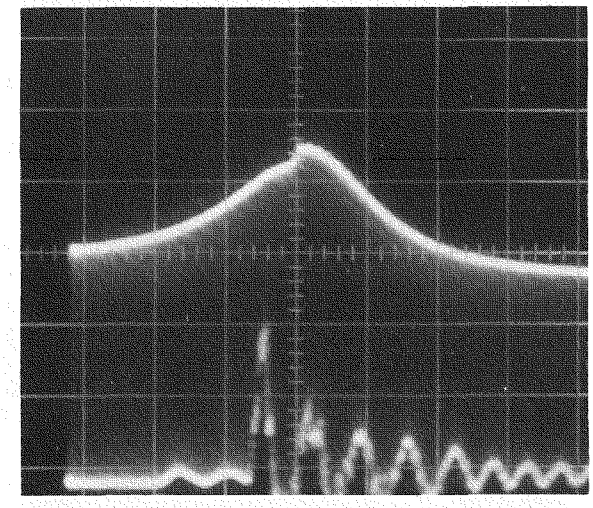


Photo 64 C: 642 psi 20°
I: 4280 psi

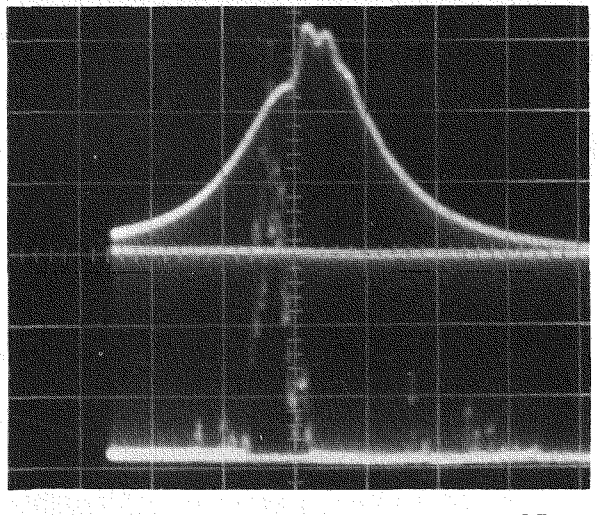


Photo 65 C: 1284 psi 25°
I: 11,770 psi

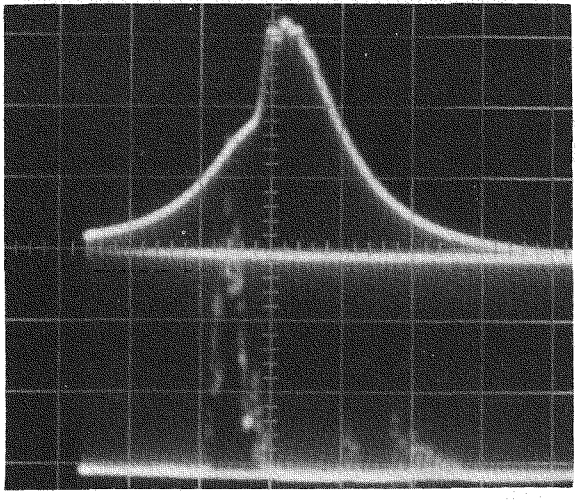


Photo 66 C: 1293 psi 25°
I: 9416 psi

INTENTIONALLY BLANK

TABLE A-XIII

USED ENGINE OIL ANALYSIS - POWER TESTS

Test No.		1	2	3	4	5	6	7	8	9	10
	New Oil	DF2	50 DF2 50 CSO	20 DF2 80 CSO	35 DF2 65 CSO	DF2	70 DF2 30 CSO	DF2	50 CSO 50 ESCO	50 DF2 50 ESCO	ESCO
Hours	0	9	7	3 1/2	6	6	5	5	5	5 1/2	4 1/2
Solids, Volume %		0.05	0.10	0.10	0.10	0.05	0.05	0.10	0.10	0.05	0.05
Kin. Vis. @ 40 C, cs	113.71	103.33	109.52	109.09	106.79	106.96	111.75	110.03	107.71	109.12	108.52
Kin. Vis. @ 100 C, cs	12.41	11.63	11.93	11.84	11.87	12.04	12.08	12.03	11.96	11.83	11.86
Viscosity Index	100	100	98	97	100	102	97	98	100	96	97
Acid No. (Neut. No.) mg KOH/g	2.88	3.49	3.66	3.48	3.31	3.65	3.48	3.22	3.10	2.90	2.96
Total Base No. mg KOH/g	11.11	13.43	14.40	14.29	13.53	13.74	13.30	11.26	11.53	11.82	11.66
Silicon, ppm	35	33	30	29	28	26	25	41	21	24	40
Sodium, ppm	20	27	26	26	27	27	25	25	24	26	29
Iron, ppm	1	7.0	4.0	3.0	4.3	9	3	11	3.6	2.7	2.6
Lead, ppm	1	3.8	3.0	3.1	3.5	1.0	<1	2.6	<1	<1	<1
Cooper, ppm	<1	3.4	1.9	1.7	1.8	2.0	<1	3.3	<1	<1	<1
Aluminum, ppm	<1	<1	<1	<1	<1	<1	<1	1.2	<1	<1	<1
Chromium, ppm	<1	2.0	1.8	1.9	1.9	2.0	1.0	1.6	1.0	1.0	1.1
Molybdenum, ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tin, ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Calcium, mass %	0.40	0.36	0.37	0.38	0.37	0.38	0.38	0.33	0.32	0.34	0.39
Phosphorus, mass %	0.15	0.18	0.18	0.19	0.19	0.16	0.16	0.15	0.14	0.14	0.15
Zinc, mass %	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.15	0.14	0.15	0.17
Sulfur, mass %	0.64	0.53	0.53	0.53	0.53	0.54	0.53	0.47	0.45	0.47	0.53

INTENTIONALLY BLANK

APPENDIX B

This Appendix contains description, data, rating sheets and photographs relating to the first of three 200 hour durability evaluations. This first durability evaluation used a 50/50 volume fuel mixture of diesel fuel and once-refined cottonseed oil.

Table B-I contains the data from the run. The TEST HOURS across the top of the data sheet represent the elapsed time from the start of the run to when the data for a specific speed/load condition were taken. Shortly after the data were taken, the speed/load condition was changed. Four speed/load conditions represent one cycle lasting three hours. A day's operation consisted of five such cycles for a total of 15 hours. At the end of the 15 hours the engine was shut down for about 8 1/2 hours, only to be restarted the next morning, warmed up for 30 minutes, and then the 15 hour test was continued. The run continued to 183 hours when excessive blowby and engine knock directed its shut-down.

A summary of the performance results of the durability run, corrected to standard dry conditions, are given in Table B-II. All data for a given power condition are presented on a daily basis for the duration of the run. For low idle conditions the fuel rate was obtained occasionally. The nature of the measuring procedure and the very low rate of fuel use made it difficult to complete the measurement during the low idle cycle.

Table B-III are the engine rating data. These data are largely descriptive, in a few cases giving a demerit valuation as a means for comparison. Except for the severe damage to cylinders 1 and 5, the engine appeared in good condition. The crownland deposits are heavily weighted toward heavy and medium carbon, much more so than would be found for a diesel fuel.

Table B-IV is a quantitative evaluation of the piston condition. This evaluation assigns demerits to the top two grooves of each piston. The demerit is based on the type of carbon (Heavy, Medium, Thin and Very Thin), the color of lacquer (BLack, BRown, Amber, Light Amber, TRace), and on the location of the ring groove. Those grooves furtherest down the piston from the top groove receive higher demerits for the same degree of deposit.

Heavy carbon is defined as that carbon in the ring groove that completely fills the grooves. It is evidenced by a smooth outer surface where the back of the ring had been in contact. Medium carbon represents substantial deposits but is not sufficient to completely fill the groove to the extent that the ring surface is evident. Thin and Very Thin are, as the name implies, two levels of light deposits.

Lacquer is rated by color since its very nature is a thin layer which shows the degree to which it is baked on a surface by its color, BLack representing higher temperatures of exposure than, for example Light Amber.

The percent of each carbon type which fills the circumference of the two top ring grooves is determined by the rater. Based on the type of carbon and the groove, a demerit is assigned. These demerits are summed to give the carbon demerits. Similarly the lacquer demerits are determined. The sum of these two values gives the total demerits.

Demerits due to proudness are obtained by summing the demerits due to the Heavy carbon. The rationale here is that heavy carbon represents the maximum amount that can fill behind the ring; i.e., the ring is at its maximum assembled proudness. The two top grooves show considerable Heavy carbon. This is in contrast to later tests with other fuels that have mainly Thin carbon in the second groove.

In Table B-IV, the total demerits are 814 and the demerits due to proudness are 195.77. These values are high as will be seen later. The high demerits for proudness reflect the considerable carbon in the second groove. It should be noted that the demerits of Table B-IV do not tell the whole story, however useful the quantitative values are. The data in Table B-III pointing out the scored pistons and cylinders are a necessary adjunct.

At the bottom of the second sheet of Table B-IV another measure of ring groove fill is given. These results, like those for the percent of Heavy carbon, etc., are obtained by visual examination of the groove. However, instead of determining the percent of groove circumference having Heavy carbon, the percent fill is an estimate of how much of the theoretical volume behind the assembled ring is filled with carbon. The values are somewhat higher than those obtained from the Heavy carbon rating. There is a rough correlation between the percent fill and the groove carbon percents although both are determined independently. The percent groove fill is approximately equal to the sum of the percent Heavy carbon plus 1/2 of the percent Medium carbon plus 1/10 of the Thin carbon. In Table B-IV, the data for piston 2, 1st groove gives 60 + 30/2 + 10/10 = 76, just one digit higher than the percent fill noted.

Figure B-1 presents photographs of selected engine parts made at the end of the evaluation. Note the legends incorrectly define the diesel fuel, DF-2, as DFZ.

The liner from cylinder Number 1, in Photo 2 is also typical of the liner from cylinder Number 5. Metal was torn out and the surface rearranged. In comparison, Photo 1 shows a liner

from an unscored cylinder, still showing the hone pattern. Photo 3 shows the thrust side of piston Number 1 while Photo 4 shows the anti-thrust side of piston Number 5, both compared to piston Number 6. The heavy carbon deposits on the ring lands of the pistons is quite evident. Photo 5 illustrates the condition of the top two rings of each piston, starting with Number 1 on the top. The rings for pistons Number 1 and 5 are completely worn. The other rings were worn but still retained a portion of their original profile.

The spray cups of pistons Number 1 and 5 had a distinct build-up at one spot as shown in Photo 6. The evidence is strong that this spot represents the impingement point of a grossly misdirected spray from the injector. Since the other pistons showed no evidence of abnormal spray patterns, and since the pistons with the abnormal pattern were those destroyed, one is led to believe the poor spray characteristics somehow were involved in the failure.

Photo 7 illustrates the injectors. They all exhibit build-up, but while none had blocked ports, it is not known if the build-up affected the spray pattern.

The connecting rod bearing inserts are in Photo 8. The upper halves are at the top of the photo, cylinder Number 1 on the left. The bottom halves have a distinct ring of erosion toward the front of the bearing.

The intake valves in Photo 9 are clean. The underside of the head in Photo 10 reveals no undue problems. The Number 1 cylinder is to the right in the photo. The pan, Photo 11, is clean. There are no deposits other than the layer of oil clinging to the surface.

INTENTIONALLY BLANK

TABLE B-I

PERFORMANCE DATA FOR 200 HOUR
DURABILITY EVALUATION: 50% DF2 + 50% CSO

INTENTIONALLY BLANK

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-12-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	½	1	2	3	3½	4	5	6
Time	11:13	11:44	12:44	1:40	2:12	2:38	3:38	4:38
Engine RPM	718	2772	2495	1800	714	2760	2495	1804
Dyno Load (lb) Observed	2.2	7.2	211.6	259.6	3.8	7.6	212.8	259.4
BHP	.5	6.7	176.0	155.8	.9	7.0	177.0	156.0
1 - Coolant Out Temperature, F	179	182	182	189	181	190	190	188
2 - Coolant In Temperature, F	177	177	173	179	179	185	180	178
3 - Oil Sump Temperature, F	183	210	220	220	189	217	228	219
4 - Intake Air Temperature, F	82	82	87	87	87	88	90	92
5 - Fuel Temperature, F	87	90	88	87	89	92	90	89
6 - Intake Manifold After Turbo	91	135	270	226	97	140	275	233
7 - Ambient Air Temperature, F	-	81	87	83	85	88	86	89
8 - Exhaust Temperature Cyl. #1	212	466	932	958	219	475	942	967
9 - Exhaust Temperature Cyl. #2	218	487	1021	1051	227	491	1033	1057
10 - Exhaust Temperature Cyl. #3	214	471	991	1026	231	478	1005	1031
11 - Exhaust Temperature Cyl. #4	217	477	1006	1031	226	488	1020	1042
12 - Exhaust Temperature Cyl. #5	208	477	992	1030	212	485	1000	1039
13 - Exhaust Temperature Cyl. #6	203	483	962	975	213	493	969	980
Oil Gallery Pressure, psi	21.0	50.0	46.8	36.2	20.0	48.2	43.8	36.3
Pressure Before Fuel Filter, psi	35.0	72.1	58.5	47.5	35.5	71.8	58.5	48.5
Pressure After Fuel Filter, psi	33.5	73.0	58.0	47.5	34.0	71.2	58.5	47.5
Intake Manifold Pressure, In. Hg.	0	3.0	29.0	21.8	0	2.8	29.0	22.0
Intake Air Restriction, In. H_2O	0	3	6	4	0	3	6	4
Fuel Rate LBS/HR	2.75	20.64	74.86	62.57	<3.36	19.00	78.40	63.35
Fuel Time Sec/ ½ lb.	655.56	81.88	25.54	28.27	>535.0	97.69	23.50	28.21
		92.55	22.55	29.27		91.81	22.42	28.62
Barometer Pressure, In. Hg.					29.05			
Dry Bulb Temp., F					86			
Wet Bulb Temp., F/R.H.%					73	55%		
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3	2.5	8.5		3.5	4.0	8.5

REMARKS: Lowest gallery pressure upon load change is 16.5 psi @ 3½ hours.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-12-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	6½	7	8	9	9½	10	11	12
Time	5:09	5:42	6:46	7:46	8:09	8:41	9:42	10:44
Engine RPM	724	2763	2496	1803	718	2760	2498	1800
Dyno Load (lb) Observed	4.0	8.0	213.2	259.4	4.6	7.0	214.8	262.6
BHP	1.0	7.1	177.4	155.9	1.1	6.4	178.8	157.6
1 - Coolant Out Temperature, F	181	189	189	189	181	189	189	188
2 - Coolant In Temperature, F	178	185	180	179	177	185	180	178
3 - Oil Sump Temperature, F	191	217	227	220	191	217	227	219
4 - Intake Air Temperature, F	89	91	90	91	85	64	84	80
5 - Fuel Temperature, F	90	92	88	88	87	90	87	85
6 - Intake Manifold After Turbo	99	142	276	231	96	136	271	222
7 - Ambient Air Temperature, F	88	89	87	89	81	82	84	82
8 - Exhaust Temperature Cyl. #1	225	480	942	962	225	471	933	942
9 - Exhaust Temperature Cyl. #2	235	493	1031	1055	230	489	1021	1033
10 - Exhaust Temperature Cyl. #3	231	479	1003	1030	229	472	994	1008
11 - Exhaust Temperature Cyl. #4	231	490	1020	1040	229	484	1011	1023
12 - Exhaust Temperature Cyl. #5	225	488	1004	1038	219	485	997	1024
13 - Exhaust Temperature Cyl. #6	224	496	977	978	227	487	962	1058
Oil Gallery Pressure, psi	19.9	48.1	43.9	36.3	19.9	48.2	43.9	36.2
Pressure Before Fuel Filter, psi	35.8	72.1	58.5	47.8	35.5	72.0	58.5	48.2
Pressure After Fuel Filter, psi	34.2	72.1	58.5	47.5	34.0	72.0	57.5	47.2
Intake Manifold Pressure, In. Hg.	0	3.0	29.1	22.0	0	3.0	30.0	22.6
Intake Air Restriction, In. H_2O	1	3	6	4	1	4	6	4
Fuel Rate LBS/HR	-	20.13	75.17	63.18	-	20.34	76.69	62.31
Fuel Time Sec/ ½ lb.		90.10	24.03	28.25		90.47	24.08	28.99
		88.76	23.86	28.73		86.52	22.86	28.79
								28.96
Barometer Pressure, In. Hg.			28.96					28.96
Dry Bulb Temp., F			83					80
Wet Bulb Temp., F/R.H.%			72	59%			65%	71
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3.8	3.0	12.0		4.0	3.8	11.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-12-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	12½	13	14	15				
Time	11:15	11:45	12:45	1:45				
Engine RPM	721	2758	2495	1807				
Dyno Load (lb) Observed	4.4	6.4	215.4	263.8				
BHP	1.1	5.9	179.1	158.9				
1 - Coolant Out Temperature, F	181	189	189	188				
2 - Coolant In Temperature, F	179	185	180	178				
3 - Oil Sump Temperature, F	186	217	227	219				
4 - Intake Air Temperature, F	80	81	80	77				
5 - Fuel Temperature, F	86	90	86	84				
6 - Intake Manifold After Turbo	89	133	267	219				
7 - Ambient Air Temperature, F	79	79	74	73				
8 - Exhaust Temperature Cyl. #1	216	476	929	936				
9 - Exhaust Temperature Cyl. #2	221	486	1014	1033				
10 - Exhaust Temperature Cyl. #3	212	466	983	1006				
11 - Exhaust Temperature Cyl. #4	222	483	1002	1014				
12 - Exhaust Temperature Cyl. #5	212	483	990	1016				
13 - Exhaust Temperature Cyl. #6	217	487	959	955				
Oil Gallery Pressure, psi	20.2	48.1	44.0	36.8				
Pressure Before Fuel Filter, psi	35.9	72.1	59.5	49.0				
Pressure After Fuel Filter, psi	34.1	72.0	58.2	47.3				
Intake Manifold Pressure, In. Hg.	0	3.0	30.1	23.1				
Intake Air Restriction, In. H_2O	1	3	7	5				
Fuel Rate LBS/HR	-	20.55	75.65	61.39				
Fuel Time Sec/ ½ lb.		87.58	23.99	29.13				
			23.96	23.51				
Barometer Pressure, In. Hg.				28.96				
Dry Bulb Temp., F				78				
Wet Bulb Temp., F/R.H.%				70	68%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-13-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	15½	16	17	18	18½	19	20	21
Time	9:15	9:48	10:40	11:40	12:20	12:43	1:50	2:50
Engine RPM	700	2762	2495	1805	729	2760	2495	1801
Dyno Load (lb) Observed	3.6	7.6	216.0	263.2	4.4	7.0	213.6	260.2
BHP	.8	7.0	179.6	158.4	1.1	6.4	177.6	156.2
1 - Coolant Out Temperature, F	125	191	188	187	180	187	187	186
2 - Coolant In Temperature, F	124	187	178	177	177	183	177	175
3 - Oil Sump Temperature, F	128	218	225	218	185	216	225	217
4 - Intake Air Temperature, F	75	79	84	88	85	87	90	93
5 - Fuel Temperature, F	78	88	87	87	88	91	90	92
6 - Intake Manifold After Turbo	79	132	271	229	93	140	276	233
7 - Ambient Air Temperature, F	75	80	85	83	82	85	87	91
8 - Exhaust Temperature Cyl. #1	199	472	926	946	215	476	936	950
9 - Exhaust Temperature Cyl. #2	188	486	1021	1039	219	489	1019	1048
10 - Exhaust Temperature Cyl. #3	179	468	995	1013	216	475	997	1018
11 - Exhaust Temperature Cyl. #4	204	483	1010	1032	222	491	1013	1037
12 - Exhaust Temperature Cyl. #5	186	483	995	1016	211	486	996	1028
13 - Exhaust Temperature Cyl. #6	203	492	964	961	215	490	965	974
Oil Gallery Pressure, psi	44.8	48.0	44.2	36.8	22.0	48.2	44.5	37.1
Pressure Before Fuel Filter, psi	35.5	72.2	57.5	48.5	36.0	72.5	58.0	48.0
Pressure After Fuel Filter, psi	33.2	71.2	56.0	46.5	34.0	71.8	56.5	46.2
Intake Manifold Pressure, In. Hg.	0	3.0	30.2	23.0	0	3.2	30.0	22.5
Intake Air Restriction, In. H_2O	0	3	6	4	0	4	7	5
Fuel Rate LBS/HR	-	20.58	76.30	63.46	-	21.06	75.28	63.73
Fuel Time Sec/ ½ lb.		88.67	23.85	28.35		83.66	24.87	26.96
		86.29	23.33	28.38		87.26	22.95	29.53
Barometer Pressure, In. Hg.						28.97		
Dry Bulb Temp., F						89		
Wet Bulb Temp., F/R.H.%						75	52%	
Blow-by, CFH			288					
Smoke RDG. % 0-20% scale		8.0	5.0	10.5		4.0	4.6	12.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-13-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	21½	22	23	24	24½	25	26	27
Time	3:20	3:50	4:50	5:50	6:20	6:50	7:50	8:50
Engine RPM	715	2758	2492	1792	724	2762	2491	1796
Dyno Load (lb) Observed	4.6	7.8	214.0	259.6	5.2	7.8	214.2	261.6
BHP	1.1	7.2	177.8	155.1	1.3	7.2	177.9	156.6
1 - Coolant Out Temperature, F	179	186	186	185	178	186	187	185
2 - Coolant In Temperature, F	177	182	177	175	176	182	177	175
3 - Oil Sump Temperature, F	183	215	225	216	185	215	225	216
4 - Intake Air Temperature, F	94	92	96	98	93	92	97	93
5 - Fuel Temperature, F	93	95	92	91	91	95	92	91
6 - Intake Manifold After Turbo	102	144	282	237	102	145	284	233
7 - Ambient Air Temperature, F	91	91	92	95	91	90	99	91
8 - Exhaust Temperature Cyl. #1	212	482	947	961	217	480	950	963
9 - Exhaust Temperature Cyl. #2	226	499	1031	1054	224	494	1038	1052
10 - Exhaust Temperature Cyl. #3	222	479	1008	1028	217	476	1010	1026
11 - Exhaust Temperature Cyl. #4	223	494	1026	1044	226	495	1031	1037
12 - Exhaust Temperature Cyl. #5	207	489	1009	1038	215	493	1014	1031
13 - Exhaust Temperature Cyl. #6	208	498	984	981	214	496	981	968
Oil Gallery Pressure, psi	21.5	48.5	44.4	37.0	20.9	48.2	44.5	37.0
Pressure Before Fuel Filter, psi	35.8	72.0	58.5	47.2	35.5	72.6	59.5	47.5
Pressure After Fuel Filter, psi	33.5	71.5	52.0	45.2	33.2	71.5	57.2	45.5
Intake Manifold Pressure, In. Hg.	0	3.0	29.8	22.0	0	3.0	29.8	22.2
Intake Air Restriction, In. H_2O	1	4	6	4	1	4	6	4
Fuel Rate LBS/HR	-	20.27	77.02	62.71	-	20.39	76.76	63.93
Fuel Time Sec/ ½ lb.		89.50	22.72	28.48		89.06	23.73	28.27
		88.11	23.95	28.93		87.46	23.17	28.04
Barometer Pressure, In. Hg.			28.95					28.94
Dry Bulb Temp., F			86					85
Wet Bulb Temp., F/R.H.%			74	58%			60%	74
Blow-by, CFH								
Smoke RDG. % 0-20% scale		4.2	3.5	11.0		4.0	6.4	10.6

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-13-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	27½	28	29	30				
Time	9:20	9:50	10:50	11:50				
Engine RPM	728	2760	2489	1800				
Dyno Load (lb) Observed	4.8	9.4	216.0	264.6				
BHP	1.2	8.6	179.2	158.8				
1 - Coolant Out Temperature, F	178	186	186	185				
2 - Coolant In Temperature, F	175	182	177	175				
3 - Oil Sump Temperature, F	184	215	224	216				
4 - Intake Air Temperature, F	82	83	85	82				
5 - Fuel Temperature, F	90	93	91	89				
6 - Intake Manifold After Turbo	92	137	272	223				
7 - Ambient Air Temperature, F	79	83	85	81				
8 - Exhaust Temperature Cyl. #1	214	477	936	942				
9 - Exhaust Temperature Cyl. #2	219	488	1018	1028				
10 - Exhaust Temperature Cyl. #3	211	469	991	991				
11 - Exhaust Temperature Cyl. #4	221	486	1010	1016				
12 - Exhaust Temperature Cyl. #5	219	484	990	1017				
13 - Exhaust Temperature Cyl. #6	210	488	965	960				
Oil Gallery Pressure, psi	21.0	48.2	44.8	37.1				
Pressure Before Fuel Filter, psi	35.9	72.2	59.5	48.1				
Pressure After Fuel Filter, psi	33.1	71.0	57.0	45.2				
Intake Manifold Pressure, In. Hg.	0	3.1	30.0	23.0				
Intake Air Restriction, In. H_2O	1	4	7	4				
Fuel Rate LBS/HR	-	22.36	74.01	63.49				
Fuel Time Sec/ ½ lb.		84.36	23.97	28.06				
		76.67	24.67	28.64				
Barometer Pressure, In. Hg.				28.95				
Dry Bulb Temp., F				88				
Wet Bulb Temp., F/R.H.%				77	61%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

Date 5-14-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	30½	31	32	33	33½	34	35	36
Time	9:45	10:15	11:15	12:15	12:45	1:15	2:15	3:15
Engine RPM	712	2762	2492	1800	718	2763	2499	1809
Dyno Load (lb) Observed	2.2	8.0	214.9	261.8	3.6	7.5	213.5	262.0
BHP	.5	7.4	178.5	157.6	.9	6.9	177.9	158.0
1 - Coolant Out Temperature, F	139	191	186	183	175	183	183	183
2 - Coolant In Temperature, F	137	187	178	173	173	179	174	173
3 - Oil Sump Temperature, F	139	217	225	215	184	213	223	216
4 - Intake Air Temperature, F	76	82	83	86	84	84	89	93
5 - Fuel Temperature, F	79	86	86	84	84	90	87	84
6 - Intake Manifold After Turbo	81	134	270	228	93	137	277	235
7 - Ambient Air Temperature, F	83	80	80	80	83	82	87	89
8 - Exhaust Temperature Cyl. #1	195	472	928	941	212	475	936	958
9 - Exhaust Temperature Cyl. #2	197	487	1017	1032	218	488	1026	1051
10 - Exhaust Temperature Cyl. #3	197	466	986	1005	215	472	1000	1020
11 - Exhaust Temperature Cyl. #4	201	485	1003	1023	223	492	1013	1044
12 - Exhaust Temperature Cyl. #5	183	483	988	1023	212	484	993	1033
13 - Exhaust Temperature Cyl. #6	183	493	954	960	216	493	969	974
Oil Gallery Pressure, psi	36.5	48.0	44.5	37.8	21.0	48.9	45.5	37.5
Pressure Before Fuel Filter, psi	36.0	72.0	59.5	49.0	36.0	72.0	59.5	48.0
Pressure After Fuel Filter, psi	33.0	70.0	56.2	48.0	33.0	70.0	57.0	45.0
Intake Manifold Pressure, In. Hg.	0	3.8	30.2	23.8	0	3.8	29.8	27.5
Intake Air Restriction, In. H_2O	1	4	6	4	1	4	6	4
Fuel Rate LBS/HR	-	21.31	73.65	63.65	-	20.97	73.11	64.22
Fuel Time Sec/ ½ lb.		85.17	24.60	28.13		85.98	24.78	28.08
		83.80	24.28	28.43		85.68	24.46	27.98
Barometer Pressure, In. Hg.				29.09				29.09
Dry Bulb Temp., F				80				90
Wet Bulb Temp., F/R.H.%				64	42%		35%	69
Blow-by, CFH								
Smoke RDG. % 0-20% scale		4.0	3.9	8.5		3.9	3.9	8.5

REMARKS: Fuel foams; leaves thick brown residue around top of beaker.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-14-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	36½	37	38	39	39½	40	41	42
Time	3:45	4:15	5:15	6:15	6:46	7:16	8:16	8:46
Engine RPM	727	2760	2499	1802	720	2757	2501	1805
Dyno Load (lb) Observed	3.4	6.0	214.2	261.6	3.5	6.0	215.0	264.2
BHP	.8	5.5	178.4	157.1	.8	5.5	179.2	159.0
1 - Coolant Out Temperature, F	177	184	184	183	177	184	185	183
2 - Coolant In Temperature, F	173	180	175	173	173	180	176	173
3 - Oil Sump Temperature, F	192	214	224	215	192	213	224	216
4 - Intake Air Temperature, F	92	92	92	91	92	86	87	84
5 - Fuel Temperature, F	86	90	87	85	86	91	85	84
6 - Intake Manifold After Turbo	88	144	280	233	88	140	276	226
7 - Ambient Air Temperature, F	88	89	89	88	83	85	85	81
8 - Exhaust Temperature Cyl. #1	227	482	945	957	227	478	938	947
9 - Exhaust Temperature Cyl. #2	238	497	1032	1045	238	495	103	1034
10 - Exhaust Temperature Cyl. #3	239	480	1003	1014	239	475	999	1007
11 - Exhaust Temperature Cyl. #4	245	495	1025	1037	245	492	1017	1024
12 - Exhaust Temperature Cyl. #5	232	493	1004	1027	232	490	995	1018
13 - Exhaust Temperature Cyl. #6	229	499	973	966	229	497	996	965
Oil Gallery Pressure, psi	20.0	48.5	44.9	37.2	20.0	48.5	44.8	37.2
Pressure Before Fuel Filter, psi	36.2	72.2	60.0	48.5	36.1	72.5	56.0	48.5
Pressure After Fuel Filter, psi	33.2	70.0	57.0	45.0	33.0	70.0	59.0	45.0
Intake Manifold Pressure, In. Hg.	0	3.0	30.0	23.0	0	3.0	30.0	23.0
Intake Air Restriction, In. H_2O	1	4	6	4	1	4	6	4
Fuel Rate LBS/HR		19.79	74.57	60.59	-	20.20	77.09	65.25
Fuel Time Sec/ ½ lb.		90.78	23.70	29.20		88.18	23.39	29.21
		91.16	24.58	30.22		90.08	23.31	25.90
Barometer Pressure, In. Hg.				29.05				29.06
Dry Bulb Temp., F				88				82
Wet Bulb Temp., F/R.H.%				69	39%		40%	65
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3.5	4.8	9.0		4.0	5.0	9.0

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-14-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	42½	43	44	45				
Time	9:45	10:16	11:16	12:16				
Engine RPM	731	2756	2496	1814				
Dyno Load (lb) Observed	3.4	6.2	214.2	264.0				
BHP	.8	5.7	178.2	159.6				
1 - Coolant Out Temperature, F	177	184	184	183				
2 - Coolant In Temperature, F	174	180	176	173				
3 - Oil Sump Temperature, F	184	213	224	215				
4 - Intake Air Temperature, F	80	80	80	78				
5 - Fuel Temperature, F	84	88	85	86				
6 - Intake Manifold After Turbo	89	133	268	221				
7 - Ambient Air Temperature, F	78	78	75	74				
8 - Exhaust Temperature Cyl. #1	209	473	931	944				
9 - Exhaust Temperature Cyl. #2	216	487	1014	1024				
10 - Exhaust Temperature Cyl. #3	210	469	989	991				
11 - Exhaust Temperature Cyl. #4	223	488	1002	1019				
12 - Exhaust Temperature Cyl. #5	212	486	986	1000				
13 - Exhaust Temperature Cyl. #6	217	493	957	957				
Oil Gallery Pressure, psi	21.5	48.5	45.0	37.5				
Pressure Before Fuel Filter, psi	36.2	72.0	60.0	48.5				
Pressure After Fuel Filter, psi	33.0	69.5	56.0	44.5				
Intake Manifold Pressure, In. Hg.	0	3.2	30.2	23.2				
Intake Air Restriction, In. H_2O	1	4	4	4				
Fuel Rate LBS/HR		19.53	80.36	61.26				
Fuel Time Sec/ ½ lb.		90.06	21.18	29.00				
		94.24	23.62	29.77				
Barometer Pressure, In. Hg.				29.06				
Dry Bulb Temp., F				79				
Wet Bulb Temp., F/R.H.%				65	48%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-15-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	45½	46	47	48	48½	49	50	51
Time	9:15	9:50	10:42	11:47	12:25	12:47	1:50	2:50
Engine RPM	700	2760	2498	1806	719	2759	2497	1816
Dyno Load (lb) Observed	2.4	7.8	216.0	262.6	3.6	8.0	215.0	262.2
BHP	.6	7.2	179.9	158.1	.9	7.4	179.0	158.7
1 - Coolant Out Temperature, F	118	189	185	185	178	185	185	183
2 - Coolant In Temperature, F	117	185	176	176	177	181	176	173
3 - Oil Sump Temperature, F	121	217	224	216	182	215	224	215
4 - Intake Air Temperature, F	71	76	79	83	80	81	81	83
5 - Fuel Temperature, F	77	89	86	86	84	90	87	87
6 - Intake Manifold After Turbo	75	129	268	226	88	134	271	227
7 - Ambient Air Temperature, F	71	73	75	80	76	81	79	81
8 - Exhaust Temperature Cyl. #1	199	473	939	949	200	479	945	954
9 - Exhaust Temperature Cyl. #2	180	486	1015	1038	214	490	1023	1036
10 - Exhaust Temperature Cyl. #3	174	467	985	997	207	472	995	1006
11 - Exhaust Temperature Cyl. #4	202	482	1005	1033	223	490	1011	1033
12 - Exhaust Temperature Cyl. #5	185	483	988	1018	206	487	992	1014
13 - Exhaust Temperature Cyl. #6	204	492	953	959	207	497	963	966
Oil Gallery Pressure, psi	45.5	48.0	44.6	37.0	21.5	48.1	44.9	38.0
Pressure Before Fuel Filter, psi	35.8	72.2	58.0	48.0	36	72.0	58.0	49.0
Pressure After Fuel Filter, psi	31.8	68.0	54.0	44.0	32.0	69.0	53.0	44.0
Intake Manifold Pressure, In. Hg.	0	3.4	30.2	28.2	0	3.5	30.0	23.0
Intake Air Restriction, In. H_2O	0	3	6	4	1	5	6	5
Fuel Rate LBS/HR	-	21.23	76.84	64.22	-	20.42	77.35	62.98
Fuel Time Sec/ ½ lb.		85.62	23.12	28.89		88.83	23.30	27.25
		83.98	23.73	27.17		87.49	23.24	29.91
Barometer Pressure, In. Hg.						29.09		
Dry Bulb Temp., F						78		
Wet Bulb Temp., F/R.H.%						69	64%	
Blow-by, CFH			288					
Smoke RDG. % 0-20% scale		5.0	7.5	10		6.0	6.2	14.4

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-15-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	51½	52	53	54	54½	55	56	57
Time	3:20	3:50	4:50	5:50	6:20	6:50	7:50	8:50
Engine RPM	726	2757	2495	1811	720	2761	2498	1808
Dyno Load (lb) Observed	3.6	7.0	213.2	261.2	4.2	6.4	213.2	262.0
BHP	.9	6.4	177.3	157.7	1.0	5.9	177.5	157.9
1 - Coolant Out Temperature, F	177	185	185	183	177	184	184	183
2 - Coolant In Temperature, F	175	181	176	173	175	180	175	173
3 - Oil Sump Temperature, F	182	215	224	215	181	214	224	215
4 - Intake Air Temperature, F	85	83	87	86	83	82	81	81
5 - Fuel Temperature, F	86	90	89	89	89	93	91	91
6 - Intake Manifold After Turbo	91	136	276	229	91	136	270	224
7 - Ambient Air Temperature, F	79	78	83	80	80	83	77	79
8 - Exhaust Temperature Cyl. #1	206	478	952	965	204	478	933	946
9 - Exhaust Temperature Cyl. #2	217	492	1027	1030	215	494	1016	1023
10 - Exhaust Temperature Cyl. #3	209	474	995	1004	205	469	987	1002
11 - Exhaust Temperature Cyl. #4	225	492	1019	1032	222	493	1003	1023
12 - Exhaust Temperature Cyl. #5	209	491	996	1013	208	489	985	1008
13 - Exhaust Temperature Cyl. #6	206	499	969	963	210	494	951	959
Oil Gallery Pressure, psi	22.0	48.1	44.8	37.5	21.5	48.5	44.5	37.5
Pressure Before Fuel Filter, psi	36.0	72.0	58.0	48.0	35.5	72.0	58.5	48.0
Pressure After Fuel Filter, psi	32.8	68.5	53.0	44.0	32.0	69.0	55.5	44.0
Intake Manifold Pressure, In. Hg.	0	3.5	30.1	23.0	0	3.5	30.1	23.1
Intake Air Restriction, In. H_2O	0	5	7	4	1	4	7	4
Fuel Rate LBS/HR		20.61	74.33	63.15		19.81	74.53	69.34
Fuel Time Sec/ ½ lb.		84.77	23.67	28.67		91.79	24.59	25.96
		89.87	24.76	28.39		89.94	23.71	
Barometer Pressure, In. Hg.			29.04				28.95	
Dry Bulb Temp., F			83				81	
Wet Bulb Temp., F/R.H.%			72	59%			74	72%
Blow-by, CFH								
Smoke RDG. % 0-20% scale		7.6	5.6	13.2		6.2	4.4	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-15-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	57½	58	59	60				
Time	9:20	9:50	10:50	11:50				
Engine RPM	713	2759	2496	1815				
Dyno Load (lb) Observed	4.2	7.8	213.4	262.6				
BHP	1.0	7.2	177.5	158.9				
1 - Coolant Out Temperature, F	177	184	184	183				
2 - Coolant In Temperature, F	175	180	175	173				
3 - Oil Sump Temperature, F	181	213	224	215				
4 - Intake Air Temperature, F	81	83	81	84				
5 - Fuel Temperature, F	90	94	90	91				
6 - Intake Manifold After Turbo	89	135	268	228				
7 - Ambient Air Temperature, F	79	83	80	79				
8 - Exhaust Temperature Cyl. #1	199	479	940	951				
9 - Exhaust Temperature Cyl. #2	212	496	1018	1032				
10 - Exhaust Temperature Cyl. #3	206	475	990	1004				
11 - Exhaust Temperature Cyl. #4	224	489	1010	1034				
12 - Exhaust Temperature Cyl. #5	208	490	988	1016				
13 - Exhaust Temperature Cyl. #6	207	497	960	965				
Oil Gallery Pressure, psi	21.5	48.5	44.8	37.5				
Pressure Before Fuel Filter, psi	35.1	72.1	58.3	46.3				
Pressure After Fuel Filter, psi	32.0	68.9	55.0	42.5				
Intake Manifold Pressure, In. Hg.	0	3.5	30.1	28.0				
Intake Air Restriction, In. H_2O	1	4	7	4				
Fuel Rate LBS/HR		20.00	74.98	62.97				
Fuel Time Sec/ ½ lb.		90.21	24.20	29.98				
		89.80	23.81	27.19				
Barometer Pressure, In. Hg.				28.95				
Dry Bulb Temp., F				82				
Wet Bulb Temp., F/R.H.%				74	69%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-16-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	60½	61	62	63	63½	64	65	66
Time	9:15	9:45	10:45	11:45	12:15	12:45	1:45	2:45
Engine RPM	701	2760	2501	1804	718	2762	2495	1800
Dyno Load (lb) Observed	3.8	6.0	214.1	264.0	4.4	6.5	213.0	259.6
BHP	.9	5.5	178.5	158.8	1.1	6.0	177.1	155.8
1 - Coolant Out Temperature, F	122	191	186	183	175	183	183	181
2 - Coolant In Temperature, F	121	187	178	173	173	179	174	170
3 - Oil Sump Temperature, F	125	219	226	215	182	212	223	213
4 - Intake Air Temperature, F	76	80	81	82	84	88	93	96
5 - Fuel Temperature, F	83	93	93	92	92	96	96	95
6 - Intake Manifold After Turbo	80	134	270	226	93	141	281	237
7 - Ambient Air Temperature, F	75	79	77	81	83	86	91	94
8 - Exhaust Temperature Cyl. #1	202	475	931	925	205	479	950	965
9 - Exhaust Temperature Cyl. #2	204	492	1015	1025	217	497	1033	1048
10 - Exhaust Temperature Cyl. #3	199	472	988	1003	211	478	1006	1027
11 - Exhaust Temperature Cyl. #4	191	490	1009	1034	225	499	1027	1060
12 - Exhaust Temperature Cyl. #5	191	486	987	1012	208	491	1007	1034
13 - Exhaust Temperature Cyl. #6	179	497	959	969	209	501	978	987
Oil Gallery Pressure, psi	44.5	47.5	44.0	37.5	22.0	48.5	45.0	38.0
Pressure Before Fuel Filter, psi	35.5	71.5	58.0	48.0	35.8	71.5	59.5	48.0
Pressure After Fuel Filter, psi	31.5	68.0	54.0	43.0	32.0	68.0	53.0	43.0
Intake Manifold Pressure, In. Hg.	0	3.5	30.5	28.0	0	3.1	29.8	22.0
Intake Air Restriction, In. H_2O	1	4	7	4	1	4	6	4
Fuel Rate LBS/HR		19.34	74.44	63.66		19.60	75.06	64.47
Fuel Time Sec/ ½ lb.		93.48	23.67	27.58		91.38	23.57	27.92
		92.69	24.69	28.97		92.28	24.39	
Barometer Pressure, In. Hg.				28.95				28.90
Dry Bulb Temp., F				80				93
Wet Bulb Temp., F/R.H.%				77	88%		46%	76
Blow-by, CFH								
Smoke RDG. % 0-20% scale						3.8	5.5	11.5

REMARKS: Could not take smoke reading at 61-63 has due to rain.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-16-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	66½	67	68	69	69½	70	71	72
Time	3:15	3:45	4:45	5:45	6:15	6:45	7:45	8:45
Engine RPM	718	2756	2496	1800	720	2758	2501	1813
Dyno Load (lb) Observed	4.6	6.8	211.2	258.6	4.2	8.0	211.1	259.2
BHP	1.1	6.2	175.7	155.2	1.0	7.4	176.0	156.6
1 - Coolant Out Temperature, F	174	182	182	187	174	182	182	181
2 - Coolant In Temperature, F	172	177	173	170	172	177	173	170
3 - Oil Sump Temperature, F	183	212	222	213	183	212	223	213
4 - Intake Air Temperature, F	96	97	98	100	96	96	94	92
5 - Fuel Temperature, F	95	98	95	95	95	98	97	95
6 - Intake Manifold After Turbo	104	149	288	241	104	148	283	234
7 - Ambient Air Temperature, F	95	96	96	98	95	95	93	93
8 - Exhaust Temperature Cyl. #1	208	492	957	967	208	488	956	958
9 - Exhaust Temperature Cyl. #2	220	501	1041	1057	220	500	1035	1042
10 - Exhaust Temperature Cyl. #3	221	488	1013	1033	221	487	1008	1018
11 - Exhaust Temperature Cyl. #4	232	503	1038	1055	232	503	1027	1035
12 - Exhaust Temperature Cyl. #5	208	502	1015	1039	208	500	1007	1027
13 - Exhaust Temperature Cyl. #6	214	509	986	983	214	507	979	967
Oil Gallery Pressure, psi	21.2	48.8	45.0	37.9	21.2	48.5	45.0	38.0
Pressure Before Fuel Filter, psi	35.2	72.0	57.0	48.5	35.2	72.2	58.0	48.0
Pressure After Fuel Filter, psi	36.8	69.8	54.5	43.5	36.8	69.8	54.0	43.2
Intake Manifold Pressure, In. Hg.	0	3.0	29.0	23.0	0	3.0	29.9	22.9
Intake Air Restriction, In. H_2O	1	4	6	4	1	4	7	4
Fuel Rate LBS/HR	2.59	19.54	75.84	65.90	-	19.96	76.22	59.26
Fuel Time Sec/ ½ lb.	694.37	92.28	23.10	26.86		87.30	23.32	30.37
		91.97	24.37	27.77		93.09	23.91	30.38
Barometer Pressure, In. Hg.				28.80				28.80
Dry Bulb Temp., F				93				86
Wet Bulb Temp., F/R.H.%				78	52%		70%	78
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3.8	5.0	12.5		4.0	7.5	11.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-16-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	72½	73	74	75				
Time	9:15	9:45	10:45	11:45				
Engine RPM	720	2754	2501	1806				
Dyno Load (lb) Observed	4.4	8.2	212.8	260.6				
BHP	1.1	7.5	177.4	156.9				
1 - Coolant Out Temperature, F	174	182	182	181				
2 - Coolant In Temperature, F	171	177	173	171				
3 - Oil Sump Temperature, F	182	212	222	213				
4 - Intake Air Temperature, F	89	89	89	87				
5 - Fuel Temperature, F	95	97	95	94				
6 - Intake Manifold After Turbo	98	141	277	229				
7 - Ambient Air Temperature, F	87	88	88	85				
8 - Exhaust Temperature Cyl. #1	208	484	948	946				
9 - Exhaust Temperature Cyl. #2	218	496	1021	1028				
10 - Exhaust Temperature Cyl. #3	215	479	998	1004				
11 - Exhaust Temperature Cyl. #4	230	498	1016	1035				
12 - Exhaust Temperature Cyl. #5	203	489	991	1018				
13 - Exhaust Temperature Cyl. #6	210	503	970	973				
Oil Gallery Pressure, psi	21.5	48.5	45.0	38.0				
Pressure Before Fuel Filter, psi	35.5	72.0	59.0	48.0				
Pressure After Fuel Filter, psi	31.5	68.5	53.5	43.0				
Intake Manifold Pressure, In. Hg.	0	3.0	30.1	23.0				
Intake Air Restriction, In. H_2O	1	4	6	4				
Fuel Rate LBS/HR	-	20.10	73.48	63.16				
Fuel Time Sec/ ½ lb.		88.89	24.20	27.30				
		90.17	24.79	29.70				
Barometer Pressure, In. Hg.				28.81				
Dry Bulb Temp., F				82				
Wet Bulb Temp., F/R.H.%				77	80%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-17-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	75½	76	77	78	78½	79	80	81
Time	9:15	9:45	10:45	11:45	12:15	12:45	1:45	2:45
Engine RPM	701	2762	2498	1794	716	2761	2492	1790
Dyno Load (lb) Observed	3.6	6.4	214.2	261.4	4.4	5.8	213.6	259.8
BHP	.8	5.9	178.4	156.3	1.1	5.3	177.4	155.0
1 - Coolant Out Temperature, F	119	188	183	180	172	180	179	180
2 - Coolant In Temperature, F	118	184	174	169	169	175	170	170
3 - Oil Sump Temperature, F	122	215	224	212	180	210	220	213
4 - Intake Air Temperature, F	78	81	87	91	90	91	93	99
5 - Fuel Temperature, F	82	92	92	92	92	95	93	93
6 - Intake Manifold After Turbo	82	135	276	231	99	144	281	240
7 - Ambient Air Temperature, F	78	81	86	90	88	89	89	98
8 - Exhaust Temperature Cyl. #1	183	477	937	951	203	481	956	975
9 - Exhaust Temperature Cyl. #2	194	490	1022	1035	218	498	1028	1046
10 - Exhaust Temperature Cyl. #3	188	475	996	1007	217	483	1006	1023
11 - Exhaust Temperature Cyl. #4	205	496	1021	1052	229	504	1027	1059
12 - Exhaust Temperature Cyl. #5	180	487	998	1029	202	492	1004	1042
13 - Exhaust Temperature Cyl. #6	185	498	969	985	201	502	977	991
Oil Gallery Pressure, psi	45.3	48.0	44.8	38.0	22.1	48.8	45.5	37.8
Pressure Before Fuel Filter, psi	35.3	72.0	59.8	48.0	35.5	72.2	59.8	48.2
Pressure After Fuel Filter, psi	30.8	68.0	54.2	42.6	31.5	68.2	54.8	42.8
Intake Manifold Pressure, In. Hg.	0	3.3	30.2	22.3	0	3.0	30.0	22.2
Intake Air Restriction, In. H_2O	1	4	6	4	1	4	6	4
Fuel Rate LBS/HR	-	19.65	76.78	63.26	-	20.59	74.86	63.58
Fuel Time Sec/ ½ lb.		92.30	22.79	28.36		84.84	24.49	27.20
		90.89	24.10	28.55		90.01	23.60	29.42
Barometer Pressure, In. Hg.				28.81				28.81
Dry Bulb Temp., F				86				91
Wet Bulb Temp., F/R.H.%				76	64%		55%	77
Blow-by, CFH								
Smoke RDG. % 0-20% scale			5.3	13.4		3.3	3.5	9.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-17-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	81½	82	83	84	84½	85	86	87
Time	3:15	3:45	4:45	5:45	6:15	6:46	7:45	8:45
Engine RPM	711	2760	2498	1791	716	2759	2500	1804
Dyno Load (lb) Observed	4.4	7.6	212.4	260.0	4.8	7.4	213.0	261.4
BHP	1.0	7.0	176.9	155.2	1.2	6.8	177.5	157.2
1 - Coolant Out Temperature, F	173	180	181	180	172	181	181	179
2 - Coolant In Temperature, F	170	176	171	179	169	176	172	169
3 - Oil Sump Temperature, F	181	211	222	213	182	211	222	212
4 - Intake Air Temperature, F	96	96	100	100	99	98	97	95
5 - Fuel Temperature, F	94	96	95	94	95	97	96	94
6 - Intake Manifold After Turbo	90	149	290	242	107	150	286	236
7 - Ambient Air Temperature, F	95	96	96	98	97	95	95	91
8 - Exhaust Temperature Cyl. #1	204	487	978	979	209	488	962	961
9 - Exhaust Temperature Cyl. #2	217	502	1042	1052	220	506	1032	1038
10 - Exhaust Temperature Cyl. #3	218	488	1016	1026	216	487	1010	1007
11 - Exhaust Temperature Cyl. #4	231	508	1042	1063	233	511	1035	1044
12 - Exhaust Temperature Cyl. #5	211	500	1012	1042	211	499	1007	1028
13 - Exhaust Temperature Cyl. #6	210	505	990	997	215	506	982	975
Oil Gallery Pressure, psi	21.8	48.8	45.0	38.0	21.2	48.5	45.2	38.2
Pressure Before Fuel Filter, psi	35.2	72.2	60.0	48.2	35.2	72.1	59.9	48.2
Pressure After Fuel Filter, psi	31.1	68.1	52.5	42.6	31.2	68.0	54.0	42.1
Intake Manifold Pressure, In. Hg.	0	3.2	3.0	2.2	0	30.0	30.0	22.5
Intake Air Restriction, In. H_2O	2	3	6	4	1	3	6	4
Fuel Rate LBS/HR	-	20.09	76.17	63.21	-	20.39	76.78	60.59
Fuel Time Sec/ ½ lb.		88.81	23.27	27.68		84.82	25.31	27.60
		90.40	23.99	29.27		91.78	21.58	31.82
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3.0	4.0	11.5		3.0	7.0	11.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-17-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	87½	88	89	90				
Time	9:15	9:46	10:45	11:46				
Engine RPM	715	2760	2497	1804				
Dyno Load (lb) Observed	5.2	6.4	213.6	261.2				
BHP	1.2	5.9	177.8	157.1				
1 - Coolant Out Temperature, F	172	180	180	179				
2 - Coolant In Temperature, F	169	176	171	169				
3 - Oil Sump Temperature, F	181	212	222	212				
4 - Intake Air Temperature, F	91	88	89	88				
5 - Fuel Temperature, F	94	96	95	94				
6 - Intake Manifold After Turbo	100	142	227	230				
7 - Ambient Air Temperature, F	89	88	88	6				
8 - Exhaust Temperature Cyl. #1	209	483	931	953				
9 - Exhaust Temperature Cyl. #2	219	497	1019	1030				
10 - Exhaust Temperature Cyl. #3	215	483	1000	1002				
11 - Exhaust Temperature Cyl. #4	228	505	1017	1028				
12 - Exhaust Temperature Cyl. #5	203	493	991	1016				
13 - Exhaust Temperature Cyl. #6	205	502	970	968				
Oil Gallery Pressure, psi	21.5	38.8	45.2	38.3				
Pressure Before Fuel Filter, psi	35.5	72.2	59.9	47.0				
Pressure After Fuel Filter, psi	31.0	67.5	52.5	42.5				
Intake Manifold Pressure, In. Hg.	0	.3	30.0	22.8				
Intake Air Restriction, In. H_2O	1	4	6	5				
Fuel Rate LBS/HR	-	19.92	76.13	68.38				
Fuel Time Sec/ ½ lb.		91.90	22.92	25.28				
		88.84	24.37	27.37				
Barometer Pressure, In. Hg.				28.80				
Dry Bulb Temp., F				82				
Wet Bulb Temp., F/R.H.%				79	88.%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-18-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	90½	91	92	93	93½	94	95	96
Time	9:15	9:45	10:45	11:45	12:15	12:45	1:45	2:45
Engine RPM	692	2760	2498	1793	703	2758	2494	1796
Dyno Load (lb) Observed	4.0	6.8	211.6	259.2	4.6	7.0	211.0	259.0
BHP	.9	6.3	176.2	154.9	1.1	6.4	175.4	155.1
1 - Coolant Out Temperature, F	129	188	183	179	171	182	184	182
2 - Coolant In Temperature, F	127	184	175	169	169	178	175	172
3 - Oil Sump Temperature, F	131	215	224	213	183	213	224	215
4 - Intake Air Temperature, F	84	88	94	95	93	97	97	100
5 - Fuel Temperature, F	85	94	94	93	94	97	95	95
6 - Intake Manifold After Turbo	88	142	282	235	103	149	285	242
7 - Ambient Air Temperature, F	84	86	90	90	92	96	97	100
8 - Exhaust Temperature Cyl. #1	179	483	956	948	208	488	963	971
9 - Exhaust Temperature Cyl. #2	196	500	1027	1038	226	504	1036	1051
10 - Exhaust Temperature Cyl. #3	188	483	1008	1007	223	487	1009	1018
11 - Exhaust Temperature Cyl. #4	214	507	1026	1043	229	517	1035	1059
12 - Exhaust Temperature Cyl. #5	185	497	999	1025	212	504	1008	1042
13 - Exhaust Temperature Cyl. #6	186	504	976	976	209	509	988	992
Oil Gallery Pressure, psi	41.0	48.0	45.0	38.5	21.0	48.5	44.8	37.2
Pressure Before Fuel Filter, psi	35.0	72.0	58.5	48.5	35.0	72.2	58.0	48.2
Pressure After Fuel Filter, psi	30.0	66.5	51.5	42.1	30.2	67.5	52.5	42.2
Intake Manifold Pressure, In. Hg.	0	3.2	30.1	22.1	0	3.2	29.6	22.2
Intake Air Restriction, In. H_2O	0	3	7	5	0	4	7	5
Fuel Rate LBS/HR	-	19.87	71.09	58.71	-	24.47	72.77	59.63
Fuel Time Sec/ ½ lb.		90.51	25.46	31.34		76.50	25.39	32.83
		90.71	25.18	29.98		70.63	24.08	27.54
Barometer Pressure, In. Hg.						28.83		
Dry Bulb Temp., F						93		
Wet Bulb Temp., F/R.H.%						78	52%	
Blow-by, CFH								
Smoke RDG. % 0-20% scale		4.5	6.0	10.5		4.0	5.0	12.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-18-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	96½	97	98	99	99½	100	101	102
Time	3:15	3:45	4:45	5:45	6:15	6:45	7:45	8:45
Engine RPM	713	2758	2493	1783	725	2758	2493	1792
Dyno Load (lb) Observed	5.0	7.0	212.3	259.4	4.8	7.3	214.4	264.0
BHP	1.2	6.4	176.4	154.2	1.2	6.7	178.2	157.7
1 - Coolant Out Temperature, F	175	184	183	182	171	183	183	181
2 - Coolant In Temperature, F	173	179	174	181	171	178	174	171
3 - Oil Sump Temperature, F	184	213	224	215	188	213	224	214
4 - Intake Air Temperature, F	98	99	97	105	103	98	98	93
5 - Fuel Temperature, F	95	98	95	92	92	92	90	86
6 - Intake Manifold After Turbo	108	152	287	245	112	152	288	234
7 - Ambient Air Temperature, F	94	94	95	101	100	95	95	92
8 - Exhaust Temperature Cyl. #1	204	494	963	975	229	493	966	965
9 - Exhaust Temperature Cyl. #2	226	505	1033	1053	238	506	1035	1042
10 - Exhaust Temperature Cyl. #3	218	490	1010	1034	231	492	1016	1003
11 - Exhaust Temperature Cyl. #4	236	514	1034	1065	240	518	1040	1055
12 - Exhaust Temperature Cyl. #5	214	501	1008	1047	224	503	1011	1033
13 - Exhaust Temperature Cyl. #6	210	510	984	990	229	507	990	970
Oil Gallery Pressure, psi	21.0	48.5	44.8	37.4	20.5	48.8	44.8	37.9
Pressure Before Fuel Filter, psi	35.0	71.5	59.5	58.0	35.8	72.0	58.0	48.8
Pressure After Fuel Filter, psi	30.5	67.5	53.0	41.0	31.3	67.0	51.0	41.8
Intake Manifold Pressure, In. Hg.	0	3.2	29.9	21.8	0	3.0	29.9	22.3
Intake Air Restriction, In. H_2O	0	4	7	4	1	4	8	5
Fuel Rate LBS/HR	-	20.88	73.92	58.48	-	18.79	73.05	59.76
Fuel Time Sec/ ½ lb.		82.55	24.79	30.26		99.69	24.79	31.76
		89.86	23.91	31.30		91.88	24.49	28.48
Barometer Pressure, In. Hg.			28.82					28.82
Dry Bulb Temp., F			97					88
Wet Bulb Temp., F/R.H.%			76	38%			32%	66
Blow-by, CFH								
Smoke RDG. % 0-20% scale		3.8	4.5	13.5		3.5	4.3	13.0

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-18-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	102½	103	104	105				
Time	9:15	9:45	10:45	11:45				
Engine RPM	701	2764	2493	1798				
Dyno Load (lb) Observed	4.4	7.3	215.8	264.0				
BHP	1.0	6.7	179.3	158.2				
1 - Coolant Out Temperature, F	175	183	183	182				
2 - Coolant In Temperature, F	172	179	174	172				
3 - Oil Sump Temperature, F	185	211	224	214				
4 - Intake Air Temperature, F	96	87	90	84				
5 - Fuel Temperature, F	87	88	86	84				
6 - Intake Manifold After Turbo	104	141	280	227				
7 - Ambient Air Temperature, F	91	85	86	84				
8 - Exhaust Temperature Cyl. #1	218	483	957	952				
9 - Exhaust Temperature Cyl. #2	230	501	1026	1025				
10 - Exhaust Temperature Cyl. #3	227	486	998	993				
11 - Exhaust Temperature Cyl. #4	232	507	1024	1042				
12 - Exhaust Temperature Cyl. #5	212	494	997	1016				
13 - Exhaust Temperature Cyl. #6	210	501	967	962				
Oil Gallery Pressure, psi	20.0	49.0	45.0	38.0				
Pressure Before Fuel Filter, psi	35.5	72.0	59.9	48.8				
Pressure After Fuel Filter, psi	31.0	66.0	52.5	41.5				
Intake Manifold Pressure, In. Hg.	0	3.3	30.5	23.0				
Intake Air Restriction, In. H_2O	1	4	8	4				
Fuel Rate LBS/HR	-	21.24	75.95	62.47				
Fuel Time Sec/ ½ lb.		80.44	23.55	30.74				
		89.02	23.85	26.89				
Barometer Pressure, In. Hg.				28.85				
Dry Bulb Temp., F				84				
Wet Bulb Temp., F/R.H.%				65	37%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-19-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	105½	106	107	108	108½	109	110	111
Time	9:15	9:45	11:15	12:15	12:45	1:15	2:15	3:15
Engine RPM	684	2764	2501	1800	717	2763	2495	1800
Dyno Load (lb) Observed	2.2	8.2	212.6	265.6	3.4	6.8	214.0	262.4
BHP	.5	7.6	177.2	159.4	.8	6.3	178.0	157.4
1 - Coolant Out Temperature, F	119	188	184	181	172	180	182	181
2 - Coolant In Temperature, F	118	184	180	175	170	175	173	171
3 - Oil Sump Temperature, F	121	216	224	214	181	209	223	214
4 - Intake Air Temperature, F	75	83	81	86	87	86	93	90
5 - Fuel Temperature, F	78	86	86	86	84	88	88	87
6 - Intake Manifold After Turbo	77	137	271	227	96	140	281	231
7 - Ambient Air Temperature, F	74	81	82	80	85	85	88	87
8 - Exhaust Temperature Cyl. #1	202	481	943	963	209	488	966	957
9 - Exhaust Temperature Cyl. #2	181	498	1015	1027	218	500	1030	1039
10 - Exhaust Temperature Cyl. #3	171	481	992	1000	212	484	1008	1012
11 - Exhaust Temperature Cyl. #4	206	504	1009	1032	228	501	1029	1038
12 - Exhaust Temperature Cyl. #5	185	492	984	1019	205	493	1003	1033
13 - Exhaust Temperature Cyl. #6	204	497	954	965	207	496	976	973
Oil Gallery Pressure, psi	45.0	48.2	45.5	38.0	21.8	49.2	45.5	38.0
Pressure Before Fuel Filter, psi	35.2	72.2	59.5	48.0	36.0	72.0	57.5	48.0
Pressure After Fuel Filter, psi	29.4	66.0	52.0	42.0	31.2	67.0	51.0	40.0
Intake Manifold Pressure, In. Hg.	0	3.8	31.0	22.8	0	3.5	30.5	22.4
Intake Air Restriction, In. H_2O	0	4	7	5	1	5	7	4
Fuel Rate LBS/HR	-	20.28	69.19	63.69	-	21.03	78.60	61.64
Fuel Time Sec/ ½ lb.		86.98	25.86	28.81		83.76	23.44	28.98
		90.57	26.17	27.71		87.43	22.36	29.42
Barometer Pressure, In. Hg.						29.03		
Dry Bulb Temp., F						81		
Wet Bulb Temp., F/R.H.%						67	49%	
Blow-by, CFH							252	
Smoke RDG. % 0-20% scale		4.5	6.0	8.5		4.0	6.0	9.0

REMARKS: Ran out of fuel @ 10.25
Back on line @ 11:05
Fuel foams: leaves a brown residue around top of beaker

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-19-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	111½	112	113	114	114½	115	116	117
Time	3:45	4:15	5:15	6:15	6:45	7:15	8:15	9:15
Engine RPM	721	2763	2498	1793	726	2760	2500	1795
Dyno Load (lb) Observed	3.6	6.8	213.2	262.6	3.8	6.3	210.8	262.0
BHP	.9	6.3	177.5	156.9	.9	5.8	175.7	156.8
1 - Coolant Out Temperature, F	178	185	185	184	177	185	185	184
2 - Coolant In Temperature, F	175	181	176	174	174	181	176	174
3 - Oil Sump Temperature, F	185	215	226	216	187	215	226	216
4 - Intake Air Temperature, F	94	91	96	97	98	94	92	87
5 - Fuel Temperature, F	88	90	89	88	89	91	88	85
6 - Intake Manifold After Turbo	102	145	285	236	106	148	281	227
7 - Ambient Air Temperature, F	94	89	92	94	96	91	87	80
8 - Exhaust Temperature Cyl. #1	208	492	970	978	224	491	960	957
9 - Exhaust Temperature Cyl. #2	222	509	1035	1050	230	510	1030	1029
10 - Exhaust Temperature Cyl. #3	220	493	1011	1022	221	495	1025	1000
11 - Exhaust Temperature Cyl. #4	238	509	1045	1053	232	514	1031	1034
12 - Exhaust Temperature Cyl. #5	209	501	1018	1042	216	504	1006	1021
13 - Exhaust Temperature Cyl. #6	209	507	986	980	223	507	973	963
Oil Gallery Pressure, psi	21.0	48.2	44.5	37.0	21.0	48.2	44.7	37.2
Pressure Before Fuel Filter, psi	36.0	72.0	59.5	48.5	36.0	72.0	60.0	58.8
Pressure After Fuel Filter, psi	31.0	66.2	52.0	40.0	30.5	66.0	51.0	39.5
Intake Manifold Pressure, In. Hg.	0	3.5	30.0	22.0	0	3.5	30.0	22.5
Intake Air Restriction, In. H_2O	1	4	8	4	1	4	8	4
Fuel Rate LBS/HR	-	20.64	81.45	62.60	-	20.32	69.30	59.14
Fuel Time Sec/ ½ lb.		85.53	21.12	27.61		86.46	25.81	29.99
		88.93	23.08	29.90		90.73	26.14	30.88
Barometer Pressure, In. Hg.			29.01					29.00
Dry Bulb Temp., F			91					83
Wet Bulb Temp., F/R.H.%			69	34%			45%	67
Blow-by, CFH								
Smoke RDG. % 0-20% scale		4.0	4.0	11.5		3.8	7.5	9.8

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-19-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	117½	118	119	120				
Time	9:45	10:15	11:15	12:15				
Engine RPM	719	2760	2501	1803				
Dyno Load (lb) Observed	3.0	5.8	211.6	264.2				
BHP	.7	5.3	176.4	158.8				
1 - Coolant Out Temperature, F	177	185	185	184				
2 - Coolant In Temperature, F	175	181	176	174				
3 - Oil Sump Temperature, F	186	215	226	216				
4 - Intake Air Temperature, F	85	84	80	82				
5 - Fuel Temperature, F	85	87	86	83				
6 - Intake Manifold After Turbo	94	138	268	223				
7 - Ambient Air Temperature, F	83	82	79	79				
8 - Exhaust Temperature Cyl. #1	210	482	943	951				
9 - Exhaust Temperature Cyl. #2	221	500	1014	1026				
10 - Exhaust Temperature Cyl. #3	217	487	1020	997				
11 - Exhaust Temperature Cyl. #4	233	506	1014	1014				
12 - Exhaust Temperature Cyl. #5	208	498	990	1011				
13 - Exhaust Temperature Cyl. #6	210	502	959	958				
Oil Gallery Pressure, psi	20.8	48.2	44.8	37.5				
Pressure Before Fuel Filter, psi	35.8	71.5	39.5	48.8				
Pressure After Fuel Filter, psi	30.0	64.5	50.0	39.0				
Intake Manifold Pressure, In. Hg.	0	3.5	30.5	23.0				
Intake Air Restriction, In. H_2O	1	4	8	4				
Fuel Rate LBS/HR	-	20.05	74.01	57.02				
Fuel Time Sec/ ½ lb.		89.15	24.51	31.20				
		90.38	24.13	31.94				
Barometer Pressure, In. Hg.				29.02				
Dry Bulb Temp., F				78				
Wet Bulb Temp., F/R.H.%				62	40%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-20-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	120½	121	122	123	123½	124	125	126
Time	10:30	11:00	12:00	1:00	1:30	2:00	3:00	4:00
Engine RPM	682	2762	2499	1799	714	2763	2501	1804
Dyno Load (lb) Observed	2.0	6.2	212.8	264.0	3.0	6.4	214.6	264.2
BHP	.5	5.7	177.3	158.3	.7	5.9	178.9	158.9
1 - Coolant Out Temperature, F	107	190	185	180	175	183	182	181
2 - Coolant In Temperature, F	105	185	176	170	173	178	173	171
3 - Oil Sump Temperature, F	111	220	225	213	182	213	223	214
4 - Intake Air Temperature, F	72	82	79	86	86	86	86	88
5 - Fuel Temperature, F	77	88	86	85	86	91	87	85
6 - Intake Manifold After Turbo	74	136	268	226	94	139	274	229
7 - Ambient Air Temperature, F	71	78	78	85	84	84	86	86
8 - Exhaust Temperature Cyl. #1	190	484	937	969	203	489	950	958
9 - Exhaust Temperature Cyl. #2	183	495	1007	1037	218	501	1021	1036
10 - Exhaust Temperature Cyl. #3	182	482	985	1002	214	489	995	1010
11 - Exhaust Temperature Cyl. #4	211	504	1010	1031	227	510	1021	1037
12 - Exhaust Temperature Cyl. #5	183	493	983	1020	204	496	991	1022
13 - Exhaust Temperature Cyl. #6	178	503	957	967	207	506	963	969
Oil Gallery Pressure, psi	47.0	47.5	45.0	38.2	21.5	48.5	45.2	38.0
Pressure Before Fuel Filter, psi	35.0	70.0	59.0	48.0	35.8	72.0	59.0	48.8
Pressure After Fuel Filter, psi	28.5	63.0	50.0	38.5	29.0	64.2	49.0	38.8
Intake Manifold Pressure, In. Hg.	0	3.8	30.5	22.5	0	3.5	30.0	22.5
Intake Air Restriction, In. H_2O	1	4	6	4	1	4	7	5
Fuel Rate LBS/HR	-	20.45	76.24	65.13	-	20.12	73.62	60.15
Fuel Time Sec/ ½ lb.		87.56	23.98	27.81		89.78	24.12	29.81
		88.48	23.24	27.46		89.12	24.78	30.04
Barometer Pressure, In. Hg.						29.14		
Dry Bulb Temp., F						83		
Wet Bulb Temp., F/R.H.%						64	36%	
Blow-by, CFH							232	
Smoke RDG. % 0-20% scale		6.0	7.0	11.5		4.0	4.5	10.5

REMARKS: Started at 10:15

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-20-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	126½	127	128	129	129½	130	131	132
Time	4:30	5:00	6:00	7:00	7:30	8:00	9:00	10:00
Engine RPM	720	2764	2500	1801	709	2765	2503	1800
Dyno Load (lb) Observed	3.2	5.6	213.6	264.2	3.4	5.8	214.8	264.6
BHP	.8	5.2	178.0	158.6	.8	5.3	179.2	158.8
1 - Coolant Out Temperature, F	174	182	182	181	174	182	182	181
2 - Coolant In Temperature, F	171	178	173	171	171	178	173	171
3 - Oil Sump Temperature, F	187	213	223	213	183	210	223	213
4 - Intake Air Temperature, F	89	88	87	86	84	82	82	81
5 - Fuel Temperature, F	86	90	86	84	85	88	86	86
6 - Intake Manifold After Turbo	99	142	277	227	94	137	272	222
7 - Ambient Air Temperature, F	87	85	86	83	83	83	79	79
8 - Exhaust Temperature Cyl. #1	216	490	950	956	207	485	944	948
9 - Exhaust Temperature Cyl. #2	228	504	1023	1036	219	503	1016	1025
10 - Exhaust Temperature Cyl. #3	227	489	999	1004	216	487	990	992
11 - Exhaust Temperature Cyl. #4	239	510	1024	1037	231	507	1015	1027
12 - Exhaust Temperature Cyl. #5	215	496	996	1015	206	497	988	1010
13 - Exhaust Temperature Cyl. #6	218	506	968	965	207	500	963	961
Oil Gallery Pressure, psi	20.9	48.6	45.2	38.2	21.0	49.0	45.5	38.5
Pressure Before Fuel Filter, psi	35.8	72.0	58.5	48.5	35.5	72.0	58.2	48.2
Pressure After Fuel Filter, psi	28.9	63.5	47.5	38.0	28.5	63.0	47.2	37.2
Intake Manifold Pressure, In. Hg.	0	3.4	30.1	22.3	0	3.5	30.5	22.8
Intake Air Restriction, In. H_2O	1	4	7	4	1	4	7	4
Fuel Rate LBS/HR	-	20.84	81.26	65.21	-	20.40	76.97	65.44
Fuel Time Sec/ ½ lb.		85.87	21.87	27.78		88.27	24.00	29.46
		86.90	22.43	27.43		88.16	22.77	25.55
Barometer Pressure, In. Hg.			29.12					29.12
Dry Bulb Temp., F			83					78
Wet Bulb Temp., F/R.H.%			67	42%			48%	65
Blow-by, CFH								
Smoke RDG. % 0-20% scale		2.6	4.3	8.3		4.0		

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-20-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	132½	133	134	135				
Time	10:30	11:00	12:00	1:00				
Engine RPM	710	2766	2500	1801				
Dyno Load (lb) Observed	3.2	6.2	216.0	265.4				
BHP	.8	5.7	180.0	159.3				
1 - Coolant Out Temperature, F	175	182	182	181				
2 - Coolant In Temperature, F	170	178	173	171				
3 - Oil Sump Temperature, F	199	206	223	214				
4 - Intake Air Temperature, F	79	78	79	79				
5 - Fuel Temperature, F	86	87	86	85				
6 - Intake Manifold After Turbo	100	132	269	220				
7 - Ambient Air Temperature, F	78	77	78	77				
8 - Exhaust Temperature Cyl. #1	253	481	941	946				
9 - Exhaust Temperature Cyl. #2	280	500	1009	1022				
10 - Exhaust Temperature Cyl. #3	291	487	985	989				
11 - Exhaust Temperature Cyl. #4	293	503	1011	1020				
12 - Exhaust Temperature Cyl. #5	270	496	984	1017				
13 - Exhaust Temperature Cyl. #6	255	497	959	964				
Oil Gallery Pressure, psi	19.1	49.2	45.5	38.5				
Pressure Before Fuel Filter, psi	35.3	72.0	59.2	47.5				
Pressure After Fuel Filter, psi	28.2	62.0	46.9	37.0				
Intake Manifold Pressure, In. Hg.	0	3.6	30.5	23.0				
Intake Air Restriction, In. H_2O	1	4	7	5				
Fuel Rate LBS/HR	-	23.2	82.5	62.7				
Fuel Time Sec/ ½ lb.		77.13	22.78	28.57				
		77.85	20.86	28.85				
Barometer Pressure, In. Hg.				29.14				
Dry Bulb Temp., F				82				
Wet Bulb Temp., F/R.H.%				68	49%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-21-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	135½	136	137	138	138½	139	140	141
Time	9:15	9:45	10:45	11:45	12:15	12:45	1:45	2:45
Engine RPM	686	2767	2501	1799	715	2766	2494	1806
Dyno Load (lb) Observed	2.8	4.2	212.4	259.8	3.4	6.0	214.0	260.6
BHP	.6	3.9	177.0	155.7	.8	5.5	177.9	156.8
1 - Coolant Out Temperature, F	114	191	187	183	174	183	183	181
2 - Coolant In Temperature, F	112	187	178	173	170	179	175	171
3 - Oil Sump Temperature, F	118	219	227	215	188	212	223	214
4 - Intake Air Temperature, F	74	79	81	83	89	83	86	84
5 - Fuel Temperature, F	76	91	87	87	85	89	88	87
6 - Intake Manifold After Turbo	77	133	270	224	98	138	276	225
7 - Ambient Air Temperature, F	73	76	79	83	87	82	83	83
8 - Exhaust Temperature Cyl. #1	180	482	944	952	215	489	956	950
9 - Exhaust Temperature Cyl. #2	187	496	1008	1029	228	504	1019	1029
10 - Exhaust Temperature Cyl. #3	174	486	986	1001	227	490	1001	1000
11 - Exhaust Temperature Cyl. #4	206	501	1014	1026	238	511	1024	1031
12 - Exhaust Temperature Cyl. #5	195	497	985	1016	216	502	994	1014
13 - Exhaust Temperature Cyl. #6	195	504	960	958	218	507	967	960
Oil Gallery Pressure, psi	46.0	47.8	44.6	38.0	20.8	48.8	45.2	38.2
Pressure Before Fuel Filter, psi	35.4	71.2	59.0	48.5	35.8	71.9	69.0	48.0
Pressure After Fuel Filter, psi	28.1	62.9	46.8	37.8	28.6	62.0	44.0	37.1
Intake Manifold Pressure, In. Hg.	0	3.8	30.4	28.0	0	3.8	30.4	27.8
Intake Air Restriction, In. H_2O	1	4	8	5	1	4	8	5
Fuel Rate LBS/HR	-	22.20	77.70	67.72	-	19.96	76.74	62.43
Fuel Time Sec/ ½ lb.		73.01	22.17	28.56		89.91	22.75	29.95
		89.15	24.16	27.94		90.46	24.16	27.71
Barometer Pressure, In. Hg.					29.11			
Dry Bulb Temp., F					81			
Wet Bulb Temp., F/R.H.%					72	66%		
Blow-by, CFH					410			
Smoke RDG. % 0-20% scale		6.6	9.1	15.8		5.0	10.6	12.2

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-21-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	141½	142	143	144	144½	145	146	147
Time	3:15	3:45	4:45	5:45	6:15	6:45	7:45	8:45
Engine RPM	726	2765	2501	1812	715	2764	2501	1805
Dyno Load (lb) Observed	4.2	6.6	213.4	262.6	4.2	8.9	207.6	259.2
BHP	1.0	6.1	177.9	158.6	1.0	8.2	173.1	156.0
1 - Coolant Out Temperature, F	174	182	182	181	174	182	182	181
2 - Coolant In Temperature, F	171	178	173	171	172	178	173	171
3 - Oil Sump Temperature, F	193	212	223	214	181	213	227	215
4 - Intake Air Temperature, F	84	82	84	83	85	83	89	88
5 - Fuel Temperature, F	89	90	90	88	89	92	90	89
6 - Intake Manifold After Turbo	98	137	274	226	94	138	277	229
7 - Ambient Air Temperature, F	82	80	82	81	83	81	86	84
8 - Exhaust Temperature Cyl. #1	228	486	948	952	204	490	977	959
9 - Exhaust Temperature Cyl. #2	242	502	1019	1034	215	505	1028	1038
10 - Exhaust Temperature Cyl. #3	256	489	995	1003	208	493	1003	1007
11 - Exhaust Temperature Cyl. #4	261	508	1023	1025	225	508	1035	1041
12 - Exhaust Temperature Cyl. #5	223	500	994	1015	204	496	1014	1036
13 - Exhaust Temperature Cyl. #6	224	504	965	955	209	508	976	973
Oil Gallery Pressure, psi	20.0	48.8	45.2	38.5	21.9	48.5	45.0	38.5
Pressure Before Fuel Filter, psi	35.4	71.9	58.5	48.0	35.0	71.0	59.0	48.0
Pressure After Fuel Filter, psi	28.5	62.0	41.5	37.2	28.0	61.5	46.5	37.0
Intake Manifold Pressure, In. Hg.	0	3.8	30.5	22.9	0	3.4	30.0	22.4
Intake Air Restriction, In. H_2O	1	5	7	5	1	5	7	4
Fuel Rate LBS/HR	-	23.62	76.03	63.18	-	20.17	75.17	61.53
Fuel Time Sec/ ½ lb.		70.48	23.22	28.40		87.22	23.82	28.77
		81.91	24.13	28.58		91.28	24.07	29.74
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH								
Smoke RDG. % 0-20% scale		8	7.5	9.5		6.5	7.5	11.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-21-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	147½	148	149	150				
Time	9:15	9:45	10:45	11:45				
Engine RPM	706	2769	2501	1813				
Dyno Load (lb) Observed	4.0	7.0	212.6	261.8				
BHP	.9	6.5	177.2	158.2				
1 - Coolant Out Temperature, F	174	182	182	181				
2 - Coolant In Temperature, F	171	178	173	171				
3 - Oil Sump Temperature, F	182	214	224	214				
4 - Intake Air Temperature, F	84	83	86	83				
5 - Fuel Temperature, F	88	91	89	88				
6 - Intake Manifold After Turbo	92	137	275	224				
7 - Ambient Air Temperature, F	83	81	84	80				
8 - Exhaust Temperature Cyl. #1	207	484	959	954				
9 - Exhaust Temperature Cyl. #2	219	502	1023	1032				
10 - Exhaust Temperature Cyl. #3	216	490	1002	1000				
11 - Exhaust Temperature Cyl. #4	235	513	1032	1043				
12 - Exhaust Temperature Cyl. #5	208	510	1020	1045				
13 - Exhaust Temperature Cyl. #6	208	508	973	962				
Oil Gallery Pressure, psi	21.5	48.5	45.5	39.0				
Pressure Before Fuel Filter, psi	35.0	71.5	59.0	43.0				
Pressure After Fuel Filter, psi	28.0	61.5	45.5	36.0				
Intake Manifold Pressure, In. Hg.	0	3.5	30.0	22.5				
Intake Air Restriction, In. H_2O	1	4	7	5				
Fuel Rate LBS/HR	-	20.41	75.63	65.60				
Fuel Time Sec/ ½ lb.		87.91	23.95	29.88				
		88.48	23.65	25.00				
Barometer Pressure, In. Hg.				29.08				
Dry Bulb Temp., F				82				
Wet Bulb Temp., F/R.H.%				72	60%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-22-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	150½	151	152	153	153½	154	155	156
Time	9:15	9:45	10:50	11:45	12:15	12:45	1:45	2:45
Engine RPM	677	2774	2496	1801	713	2768	2497	1801
Dyno Load (lb) Observed	3.8	6.6	213.4	258.8	5.0	7.6	213.6	258.6
BHP	.9	6.1	177.5	155.4	1.2	7.0	177.7	155.7
1 - Coolant Out Temperature, F	118	189	186	187	179	187	187	185
2 - Coolant In Temperature, F	116	185	177	177	175	182	178	175
3 - Oil Sump Temperature, F	121	219	224	219	197	217	227	218
4 - Intake Air Temperature, F	78	82	86	87	89	88	93	96
5 - Fuel Temperature, F	81	92	91	92	93	95	94	94
6 - Intake Manifold After Turbo	81	136	274	229	103	141	284	237
7 - Ambient Air Temperature, F	77	82	85	85	86	88	90	96
8 - Exhaust Temperature Cyl. #1	178	483	963	965	239	488	980	982
9 - Exhaust Temperature Cyl. #2	190	497	1022	1050	254	501	1034	1056
10 - Exhaust Temperature Cyl. #3	179	485	1004	1015	251	492	1016	1030
11 - Exhaust Temperature Cyl. #4	211	505	1031	1051	257	516	1045	1068
12 - Exhaust Temperature Cyl. #5	191	507	1026	1053	243	511	1038	1059
13 - Exhaust Temperature Cyl. #6	200	504	975	976	232	508	993	991
Oil Gallery Pressure, psi	45.5	48.0	45.2	37.3	19.8	48.1	44.9	38.0
Pressure Before Fuel Filter, psi	35.0	71.5	55.0	48.0	34.9	71.0	58.0	48.0
Pressure After Fuel Filter, psi	27.0	61.5	42.0	38.8	28.2	67.0	47.2	38.0
Intake Manifold Pressure, In. Hg.	0	3.8	30.1	22.0	0	3.4	29.9	22.0
Intake Air Restriction, In. H_2O	2	5	6	5	2	5	8	5
Fuel Rate LBS/HR	-	19.97	76.58	61.69	-	20.05	73.50	59.63
Fuel Time Sec/ ½ lb.		88.86	24.40	28.24		88.33	24.32	29.71
		91.44	22.61	30.12		91.20	24.66	30.66
Barometer Pressure, In. Hg.						29.08		
Dry Bulb Temp., F						91		
Wet Bulb Temp., F/R.H.%						77	54%	
Blow-by, CFH						178		
Smoke RDG. % 0-20% scale			4.8	10.8		4.0	8.4	11.9

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-22-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	156½	157	158	159	159½	160	161	162
Time	3:15	3:45	4:45	5:45	6:15	6:45	7:45	8:45
Engine RPM	723	2771	2498	1809	698	2772	2496	1810
Dyno Load (lb) Observed	4.8	6.8	210.8	256.6	5.0	6.8	208.2	237.4
BHP	1.2	6.3	175.5	154.7	1.2	6.3	173.2	155.3
1 - Coolant Out Temperature, F	178	186	186	185	178	186	186	185
2 - Coolant In Temperature, F	174	182	177	175	174	182	177	174
3 - Oil Sump Temperature, F	191	214	226	217	191	215	226	217
4 - Intake Air Temperature, F	92	96	96	97	95	94	91	93
5 - Fuel Temperature, F	95	96	96	95	95	96	95	94
6 - Intake Manifold After Turbo	105	148	286	238	107	147	280	235
7 - Ambient Air Temperature, F	90	95	95	94	92	93	91	93
8 - Exhaust Temperature Cyl. #1	238	490	981	978	228	492	1026	980
9 - Exhaust Temperature Cyl. #2	250	508	1040	1060	242	505	1044	1058
10 - Exhaust Temperature Cyl. #3	231	495	1020	1036	245	494	1020	1030
11 - Exhaust Temperature Cyl. #4	241	517	1053	1065	258	517	1051	1061
12 - Exhaust Temperature Cyl. #5	234	515	1046	1073	236	514	1043	1067
13 - Exhaust Temperature Cyl. #6	238	515	997	990	228	511	993	988
Oil Gallery Pressure, psi	20.2	48.4	45.5	38.0	20.0	48.5	45.5	38.5
Pressure Before Fuel Filter, psi	35.0	71.2	58.5	48.0	34.2	70.5	54.5	47.5
Pressure After Fuel Filter, psi	28.8	67.8	48.0	38.0	28.0	62.0	47.0	38.0
Intake Manifold Pressure, In. Hg.	0	3.0	28.9	21.9	0	3.0	29.2	22.0
Intake Air Restriction, In. H_2O	2	5	8	5	1	5	8	4
Fuel Rate LBS/HR	-	20.69	76.13	66.57	-	19.75	76.43	61.79
Fuel Time Sec/ ½ lb.		83.13	23.09	28.19		91.54	23.79	28.60
		90.86	24.20	25.89		90.70	23.31	29.66
Barometer Pressure, In. Hg.			28.96					28.94
Dry Bulb Temp., F			95					88
Wet Bulb Temp., F/R.H.%			77	45%			58%	76
Blow-by, CFH								
Smoke RDG. % 0-20% scale		4.2	4.2	13.8		5.5	9.0	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-22-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	162½	163	164	165				
Time	9:15	9:45	10:45	11:45				
Engine RPM	705	2769	2499	1814				
Dyno Load (lb) Observed	4.4	6.6	210.4	257.6				
BHP	1.0	6.1	175.3	155.8				
1 - Coolant Out Temperature, F	178	186	186	185				
2 - Coolant In Temperature, F	176	182	177	175				
3 - Oil Sump Temperature, F	180	216	226	217				
4 - Intake Air Temperature, F	88	90	88	85				
5 - Fuel Temperature, F	93	96	94	92				
6 - Intake Manifold After Turbo	96	143	278	228				
7 - Ambient Air Temperature, F	84	90	87	80				
8 - Exhaust Temperature Cyl. #1	213	487	1014	962				
9 - Exhaust Temperature Cyl. #2	218	504	1040	1043				
10 - Exhaust Temperature Cyl. #3	215	494	1017	1039				
11 - Exhaust Temperature Cyl. #4	229	515	1048	1051				
12 - Exhaust Temperature Cyl. #5	208	515	1040	1059				
13 - Exhaust Temperature Cyl. #6	215	508	987	978				
Oil Gallery Pressure, psi	21.5	48.5	45.0	38.5				
Pressure Before Fuel Filter, psi	34.5	71.5	54.5	45.0				
Pressure After Fuel Filter, psi	28.2	63.0	45.0	36.5				
Intake Manifold Pressure, In. Hg.	0	3.0	29.5	22.5				
Intake Air Restriction, In. H_2O	1	5	8	5				
Fuel Rate LBS/HR	-	19.72	77.60	62.35				
Fuel Time Sec/ ½ lb.		91.73	22.21	29.36				
		90.83	24.18	28.42				
Barometer Pressure, In. Hg.				28.95				
Dry Bulb Temp., F				85				
Wet Bulb Temp., F/R.H.%				76	67%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-23-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	165½	166	167	168	168½	169	170	171
Time	9:15	9:45	10:45	11:45	12:15	12:45	1:45	2:45
Engine RPM	679	2774	2497	1809	691	2767	2499	1806
Dyno Load (lb) Observed	3.6	5.8	208.2	257.2	4.2	8.8	209.8	255.4
BHP	.8	5.4	173.3	155.1	1.2	8.1	174.8	153.8
1 - Coolant Out Temperature, F	123	193	186	182	174	182	182	180
2 - Coolant In Temperature, F	122	189	176	170	170	177	172	170
3 - Oil Sump Temperature, F	127	223	227	216	191	213	223	215
4 - Intake Air Temperature, F	79	83	90	91	90	91	98	98
5 - Fuel Temperature, F	84	95	94	94	95	97	96	95
6 - Intake Manifold After Turbo	83	137	277	232	103	144	289	238
7 - Ambient Air Temperature, F	77	84	87	88	89	90	97	97
8 - Exhaust Temperature Cyl. #1	191	483	1038	960	227	490	988	973
9 - Exhaust Temperature Cyl. #2	203	500	1047	1042	245	510	1045	1061
10 - Exhaust Temperature Cyl. #3	191	486	1019	1021	252	500	1029	1037
11 - Exhaust Temperature Cyl. #4	204	512	1048	1059	262	520	1060	1069
12 - Exhaust Temperature Cyl. #5	184	513	1039	1061	241	516	1059	1089
13 - Exhaust Temperature Cyl. #6	187	512	987	988	228	514	1004	1006
Oil Gallery Pressure, psi	44.5	47.8	45.1	38.2	18.8	48.8	45.5	38.0
Pressure Before Fuel Filter, psi	33.5	71.0	58.2	47.8	34.0	71.3	58.8	47.8
Pressure After Fuel Filter, psi	27.1	63.0	47.2	39.0	28.0	62.8	48.0	38.2
Intake Manifold Pressure, In. Hg.	0	4.0	29.2	22.0	0	3.0	29.2	21.5
Intake Air Restriction, In. H_2O	2	3	5	4	2	4	6	4
Fuel Rate LBS/HR	-	24.89	75.84	63.20	-	20.42	74.50	62.49
Fuel Time Sec/ ½ lb.		72.93	23.89	29.66		93.63	24.04	28.39
		71.70	23.58	27.30		82.65	24.28	29.22
Barometer Pressure, In. Hg.			28.94					
Dry Bulb Temp., F			81					
Wet Bulb Temp., F/R.H.%			76	64%				
Blow-by, CFH								
Smoke RDG. % 0-20% scale							3.6	11.6

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-23-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	171½	172	173	174	174½	175	176	177
Time	3:15	3:45	4:45	5:45	6:15	6:45	7:45	8:45
Engine RPM	686	2767	2498	1812	694	2768	2500	1810
Dyno Load (lb) Observed	4.8	7.6	200.0	251.6	4.2	5.2	208.0	253.6
BHP	1.1	7.0	166.5	152.0	1.0	4.8	173.3	153.0
1 - Coolant Out Temperature, F	173	181	190	178	173	180	182	179
2 - Coolant In Temperature, F	169	176	180	167	170	175	173	168
3 - Oil Sump Temperature, F	184	213	240	216	180	217	227	215
4 - Intake Air Temperature, F	98	98	103	99	97	94	98	92
5 - Fuel Temperature, F	96	97	97	94	94	97	96	94
6 - Intake Manifold After Turbo	106	150	295	241	105	149	288	235
7 - Ambient Air Temperature, F	97	96	102	98	96	92	96	93
8 - Exhaust Temperature Cyl. #1	218	500	1139	1033	223	522	1029	1030
9 - Exhaust Temperature Cyl. #2	229	514	1081	1080	233	532	1058	1067
10 - Exhaust Temperature Cyl. #3	231	506	1041	1046	229	515	1031	1032
11 - Exhaust Temperature Cyl. #4	237	527	1067	1073	246	537	1066	1072
12 - Exhaust Temperature Cyl. #5	219	524	1066	1088	221	531	1064	1085
13 - Exhaust Temperature Cyl. #6	219	522	1012	1010	217	528	1012	994
Oil Gallery Pressure, psi	19.0	48.5	45.5	44.5	25.0	48.5	45.0	41.5
Pressure Before Fuel Filter, psi	34.0	71.8	58.5	47.5	34.5	71.0	58.5	46.5
Pressure After Fuel Filter, psi	28.0	63.0	47.5	38.0	28.2	62.5	47.0	37.5
Intake Manifold Pressure, In. Hg.	0	2.8	29.9	21.5	0	3.0	29.2	21.5
Intake Air Restriction, In. H_2O	2	4	8	5	1	5	8	5
Fuel Rate LBS/HR	-	20.65	75.35	63.50	-	22.17	76.55	62.74
Fuel Time Sec/ ½ lb.		92.42	22.95	29.62		81.52	23.14	28.76
		82.09	24.83	27.07		80.83	23.89	28.62
Barometer Pressure, In. Hg.				28.9				
Dry Bulb Temp., F				91				
Wet Bulb Temp., F/R.H.%				77	54%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale		4.2	6.8	12.2		3.8	6.4	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-23-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	177½	178	179	180				
Time	9:15	9:45	10:45	11:45				
Engine RPM	689	2766	2505	1814				
Dyno Load (lb) Observed	4.4	6.4	208.0	254.8				
BHP	1.0	5.9	173.7	154.1				
1 - Coolant Out Temperature, F	173	181	181	179				
2 - Coolant In Temperature, F	170	176	172	169				
3 - Oil Sump Temperature, F	180	216	226	216				
4 - Intake Air Temperature, F	91	89	89	87				
5 - Fuel Temperature, F	93	96	95	92				
6 - Intake Manifold After Turbo	98	143	280	229				
7 - Ambient Air Temperature, F	90	89	89	86				
8 - Exhaust Temperature Cyl. #1	224	526	1023	1012				
9 - Exhaust Temperature Cyl. #2	234	531	1047	1057				
10 - Exhaust Temperature Cyl. #3	224	511	1020	1024				
11 - Exhaust Temperature Cyl. #4	241	524	1050	1056				
12 - Exhaust Temperature Cyl. #5	222	523	1047	1067				
13 - Exhaust Temperature Cyl. #6	218	525	996	992				
Oil Gallery Pressure, psi	24.0	48.5	45.5	41.0				
Pressure Before Fuel Filter, psi	34.0	68.5	58.5	42.5				
Pressure After Fuel Filter, psi	28.0	60.5	47.1	38.0				
Intake Manifold Pressure, In. Hg.	0	4.5	29.2	22.0				
Intake Air Restriction, In. H_2O	1	3	8	5				
Fuel Rate LBS/HR	-	20.73	78.65	66.67				
Fuel Time Sec/ ½ lb.		87.84	21.73	26.58				
		85.85	24.04	27.42				
Barometer Pressure, In. Hg.	28.90							
Dry Bulb Temp., F	86							
Wet Bulb Temp., F/R.H.%	74	58%						
Blow-by, CFH								
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 5-24-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 50% DF2 + 50% CSO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	180½	181	182	183				
Time	9:15	9:45	10:55	11:45				
Engine RPM	670	2776	2505	1812				
Dyno Load (lb) Observed	3.2	5.6	209.4	254.6				
BHP	.7	5.2	174.8	153.8				
1 - Coolant Out Temperature, F	121	189	187	185				
2 - Coolant In Temperature, F	119	185	178	175				
3 - Oil Sump Temperature, F	123	222	229	220				
4 - Intake Air Temperature, F	72	79	89	87				
5 - Fuel Temperature, F	76	90	92	86				
6 - Intake Manifold After Turbo	75	132	281	229				
7 - Ambient Air Temperature, F	72	74	82	86				
8 - Exhaust Temperature Cyl. #1	200	516	1034	1020				
9 - Exhaust Temperature Cyl. #2	199	521	1052	1056				
10 - Exhaust Temperature Cyl. #3	204	502	1019	1017				
11 - Exhaust Temperature Cyl. #4	215	515	1051	1059				
12 - Exhaust Temperature Cyl. #5	183	517	1049	987				
13 - Exhaust Temperature Cyl. #6	186	519	992	943				
Oil Gallery Pressure, psi	45.1	48.1	45.0	39.0				
Pressure Before Fuel Filter, psi	34.9	69.5	58.5	47.2				
Pressure After Fuel Filter, psi	26.5	61.0	45.0	36.0				
Intake Manifold Pressure, In. Hg.	.0	3.5	30.0	22.2				
Intake Air Restriction, In. H_2O	1	5	7	5				
Fuel Rate LBS/HR	-	21.82	79.4	61.88				
Fuel Time Sec/ ½ lb.		82.95	22.41	29.20				
		82.02	22.93	28.98				
Barometer Pressure, In. Hg.				29.00				
Dry Bulb Temp., F				75				
Wet Bulb Temp., F/R.H.%				72	86%			
Blow-by, CFH								
Smoke RDG. % 0-20% scale		Raining						

REMARKS:

INTENTIONALLY BLANK

TABLE B-II

CORRECTED PERFORMANCE RESULTS FOR
200 HR DURABILITY EVALUATION:
50% DF-2 AND 50% CSO

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL; 50% DF2 + 50% CSO HV; 17017 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE; 05-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
718	0.5	2.8	82	29.05	0.84	1.024	0.5	5.3709	1.3	91396.3	2.78
714	0.9	3.4	87	29.05	0.84	1.031	0.9	3.6223	2.4	61641.2	4.13
724	1.0	0.0	89	28.96	0.83	1.036	1.0	0.0000	2.6	0.0	0.00
718	1.1	0.0	85	28.96	0.83	1.031	1.1	0.0000	2.9	0.0	0.00
721	1.1	0.0	80	28.96	0.81	1.024	1.1	0.0000	2.8	0.0	0.00
DATE; 05-13-81											
700	0.8	0.0	75	28.97	0.89	1.019	0.8	0.0000	2.1	0.0	0.00
729	1.1	0.0	85	28.97	0.89	1.033	1.1	0.0000	2.8	0.0	0.00
715	1.1	0.0	94	28.95	0.88	1.045	1.1	0.0000	2.9	0.0	0.00
724	1.3	0.0	93	28.94	0.90	1.045	1.4	0.0000	3.4	0.0	0.00
728	1.2	0.0	82	28.95	0.99	1.033	1.2	0.0000	3.1	0.0	0.00
DATE; 05-14-81											
712	0.5	0.0	76	29.09	0.56	1.005	0.5	0.0000	1.3	0.0	0.00
718	0.9	0.0	84	29.09	0.64	1.018	0.9	0.0000	2.3	0.0	0.00
727	0.8	0.0	92	29.05	0.66	1.031	0.8	0.0000	2.1	0.0	0.00
720	0.8	0.0	92	29.06	0.57	1.027	0.8	0.0000	2.1	0.0	0.00
731	0.8	0.0	80	29.06	0.60	1.012	0.8	0.0000	2.0	0.0	0.00
DATE; 05-15-81											
700	0.6	0.0	71	29.09	0.76	1.005	0.6	0.0000	1.6	0.0	0.00
719	0.9	0.0	80	29.09	0.76	1.017	0.9	0.0000	2.3	0.0	0.00
726	0.9	0.0	85	29.04	0.83	1.028	0.9	0.0000	2.3	0.0	0.00
720	1.0	0.0	83	28.95	0.94	1.033	1.0	0.0000	2.6	0.0	0.00
713	1.0	0.0	81	28.95	0.93	1.030	1.0	0.0000	2.6	0.0	0.00
DATE; 05-16-81											
701	0.9	0.0	76	28.95	0.88	1.021	0.9	0.0000	2.4	0.0	0.00
718	1.1	0.0	84	28.90	0.90	1.034	1.1	0.0000	2.9	0.0	0.00
718	1.1	2.6	96	28.80	0.99	1.057	1.2	2.2266	2.9	37883.4	6.71
720	1.0	0.0	96	28.80	1.06	1.060	1.1	0.0000	2.7	0.0	0.00
720	1.1	0.0	89	28.81	1.06	1.050	1.2	0.0000	2.9	0.0	0.00

200 HR DURABILITY TEST

FUEL: 50% DF2 + 50% CSO HV: 17017 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 05-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
701	0.8	0.0	78	28.81	0.97	1.032	0.8	0.0000	2.1	0.0	0.00
716	1.1	0.0	90	28.81	0.96	1.048	1.2	0.0000	2.9	0.0	0.00
711	1.0	0.0	96	28.81	0.96	1.056	1.1	0.0000	2.7	0.0	0.00
716	1.2	0.0	99	28.81	0.96	1.060	1.3	0.0000	3.2	0.0	0.00
715	1.2	0.0	91	28.80	0.28	1.025	1.2	0.0000	3.1	0.0	0.00
DATE: 05-18-81											
692	0.9	0.0	84	28.83	0.99	1.040	0.9	0.0000	2.5	0.0	0.00
703	1.1	0.0	93	28.83	0.99	1.052	1.2	0.0000	3.0	0.0	0.00
713	1.2	0.0	98	28.82	0.86	1.054	1.3	0.0000	3.2	0.0	0.00
725	1.2	0.0	103	28.82	0.55	1.049	1.3	0.0000	3.2	0.0	0.00
701	1.0	0.0	96	28.85	0.55	1.039	1.0	0.0000	2.7	0.0	0.00
DATE: 05-19-81											
684	0.5	0.0	75	29.03	0.66	1.009	0.5	0.0000	1.3	0.0	0.00
717	0.8	0.0	87	29.03	0.66	1.025	0.8	0.0000	2.1	0.0	0.00
721	0.9	0.0	94	29.01	0.63	1.034	0.9	0.0000	2.3	0.0	0.00
726	0.9	0.0	98	29.00	0.64	1.040	0.9	0.0000	2.3	0.0	0.00
719	0.7	0.0	85	29.02	0.52	1.018	0.7	0.0000	1.8	0.0	0.00
DATE: 05-20-81											
682	0.5	0.0	72	29.14	0.53	0.997	0.5	0.0000	1.3	0.0	0.00
714	0.7	0.0	86	29.14	0.53	1.015	0.7	0.0000	1.8	0.0	0.00
720	0.8	0.0	89	29.12	0.64	1.023	0.8	0.0000	2.1	0.0	0.00
709	0.8	0.0	84	29.12	0.61	1.016	0.8	0.0000	2.1	0.0	0.00
710	0.8	0.0	79	29.14	0.69	1.011	0.8	0.0000	2.1	0.0	0.00
DATE: 05-21-81											
686	0.6	0.0	74	29.11	0.85	1.012	0.6	0.0000	1.6	0.0	0.00
715	0.8	0.0	89	29.11	0.85	1.031	0.8	0.0000	2.1	0.0	0.00
726	1.0	0.0	84	29.11	0.85	1.025	1.0	0.0000	2.6	0.0	0.00
715	1.0	0.0	85	29.11	0.85	1.026	1.0	0.0000	2.6	0.0	0.00
706	0.9	0.0	84	29.08	0.84	1.026	0.9	0.0000	2.4	0.0	0.00

200 HR DURABILITY TEST

FUEL: 50% DF2 + 50% CSO HV: 17017 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 05-22-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
677	0.9	0.0	78	29.08	0.96	1.022	0.9	0.0000	2.5	0.0	0.00
713	1.2	0.0	89	29.08	0.96	1.037	1.2	0.0000	3.2	0.0	0.00
723	1.2	0.0	92	28.96	0.92	1.044	1.3	0.0000	3.1	0.0	0.00
698	1.2	0.0	95	28.94	0.95	1.049	1.3	0.0000	3.3	0.0	0.00
705	1.0	0.0	88	28.95	0.98	1.041	1.0	0.0000	2.7	0.0	0.00
DATE: 05-23-81											
679	0.8	0.0	79	28.94	1.02	1.031	0.8	0.0000	2.2	0.0	0.00
691	1.2	0.0	90	28.94	1.02	1.045	1.3	0.0000	3.3	0.0	0.00
686	1.1	0.0	98	28.90	0.96	1.055	1.2	0.0000	3.1	0.0	0.00
694	1.0	0.0	97	28.90	0.96	1.054	1.1	0.0000	2.8	0.0	0.00
689	1.0	0.0	91	28.90	0.88	1.043	1.0	0.0000	2.7	0.0	0.00
DATE: 05-24-81											
670	0.7	0.0	72	29.00	0.88	1.014	0.7	0.0000	1.9	0.0	0.00

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL: 50% DF2 + 50% CSO HV: 17017 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 05-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2772	6.7	20.6	82	29.05	0.84	1.024	6.9	3.0083	4.5	51191.9	4.97
2760	7.0	19.0	88	29.05	0.84	1.032	7.2	2.6302	4.8	44758.4	5.68
2763	7.1	20.1	91	28.96	0.83	1.039	7.4	2.7292	4.8	46442.1	5.48
2760	6.4	20.3	64	28.96	0.83	1.003	6.4	3.1688	4.2	53922.7	4.72
2758	5.9	20.6	81	28.96	0.81	1.025	6.0	3.3984	4.0	57831.3	4.40
DATE: 05-13-81											
2762	7.0	20.6	79	28.97	0.89	1.025	7.2	2.8689	4.7	48819.7	5.21
2760	6.4	21.1	87	28.97	0.89	1.035	6.6	3.1781	4.4	54081.3	4.70
2758	7.2	20.3	92	28.95	0.88	1.042	7.5	2.7008	4.9	45958.8	5.54
2762	7.2	20.4	92	28.94	0.90	1.044	7.5	2.7138	4.9	46181.5	5.51
2760	8.6	22.4	83	28.95	0.99	1.035	8.9	2.5132	5.9	42767.4	5.95
DATE: 05-14-81											
2762	7.4	21.3	82	29.09	0.56	1.013	7.5	2.8440	4.9	48396.8	5.26
2763	6.9	21.0	84	29.09	0.64	1.018	7.0	2.9853	4.6	50801.3	5.01
2760	5.5	19.8	92	29.05	0.66	1.031	5.7	3.4912	3.7	59409.2	4.28
2757	5.5	20.2	86	29.06	0.57	1.019	5.6	3.6035	3.7	61320.9	4.15
2756	5.7	19.5	80	29.06	0.60	1.012	5.8	3.3843	3.8	57590.3	4.42
DATE: 05-15-81											
2760	7.2	21.2	76	29.09	0.76	1.012	7.3	2.9143	4.8	49592.0	5.13
2759	7.4	20.4	81	29.09	0.76	1.018	7.5	2.7096	5.0	46110.0	5.52
2757	6.4	20.6	83	29.04	0.83	1.025	6.6	3.1407	4.3	53444.6	4.76
2761	5.9	19.8	82	28.95	0.94	1.031	6.1	3.2556	4.0	55399.9	4.59
2759	7.2	20.0	83	28.95	0.93	1.032	7.4	2.6908	4.9	45789.7	5.56
DATE: 05-16-81											
2760	5.5	19.3	80	28.95	0.88	1.026	5.6	3.4262	3.7	58304.3	4.36
2762	6.0	19.6	88	28.90	0.90	1.040	6.2	3.1419	4.1	53466.2	4.76
2756	6.2	19.5	97	28.80	0.99	1.059	6.6	2.9766	4.3	50652.1	5.02
2758	7.4	20.0	96	28.80	1.06	1.060	7.8	2.5443	5.2	43295.8	5.88
2754	7.5	20.1	89	28.81	1.06	1.050	7.9	2.5514	5.2	43417.0	5.86

200 HR DURABILITY TEST

FUEL: 50% DF2 + 50% CSO HV: 17017 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 05-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2762	5.9	19.7	81	28.81	0.97	1.036	6.1	3.2138	4.0	54689.5	4.65
2761	5.3	20.6	91	28.81	0.96	1.049	5.6	3.7024	3.7	63003.1	4.04
2760	7.0	20.1	96	28.81	0.96	1.056	7.4	2.7179	4.9	46250.6	5.50
2759	6.8	20.4	98	28.81	0.96	1.059	7.2	2.8325	4.7	48200.6	5.28
2760	5.9	19.9	88	28.80	0.28	1.021	6.0	3.3077	4.0	56286.3	4.52
DATE: 05-18-81											
2760	6.3	19.9	88	28.83	0.99	1.046	6.6	3.0162	4.3	51326.6	4.96
2758	6.4	24.5	97	28.83	0.99	1.058	6.8	3.6150	4.5	61515.9	4.14
2758	6.4	20.9	99	28.82	0.86	1.056	6.8	3.0901	4.5	52585.0	4.84
2758	6.7	18.8	98	28.82	0.55	1.043	7.0	2.6891	4.6	45761.1	5.56
2764	6.7	21.2	87	28.85	0.55	1.027	6.9	3.0857	4.5	52509.5	4.85
DATE: 05-19-81											
2764	7.6	20.3	83	29.03	0.66	1.020	7.7	2.6172	5.1	44536.5	5.71
2763	6.3	21.0	86	29.03	0.66	1.024	6.4	3.2614	4.2	55499.1	4.58
2763	6.3	20.6	91	29.01	0.63	1.030	6.5	3.1817	4.3	54142.5	4.70
2760	5.8	20.3	94	29.00	0.64	1.034	6.0	3.3871	3.9	57637.9	4.41
2760	5.3	20.1	84	29.02	0.52	1.016	5.4	3.7226	3.5	63347.1	4.02
DATE: 05-20-81											
2762	5.7	20.5	82	29.14	0.53	1.010	5.8	3.5532	3.8	60464.3	4.21
2763	5.9	20.1	86	29.14	0.53	1.015	6.0	3.3600	3.9	57177.0	4.45
2764	5.2	20.8	88	29.12	0.64	1.022	5.3	3.9207	3.5	66719.2	3.81
2765	5.3	20.4	82	29.12	0.61	1.013	5.4	3.7987	3.5	64642.0	3.94
2766	5.7	23.2	78	29.14	0.69	1.010	5.8	4.0293	3.8	68566.2	3.71
DATE: 05-21-81											
2767	3.9	22.2	79	29.11	0.85	1.018	4.0	5.5902	2.6	95128.6	2.67
2766	5.5	20.0	83	29.11	0.85	1.024	5.6	3.5456	3.7	60335.5	4.22
2765	6.1	23.6	82	29.11	0.85	1.022	6.2	3.7879	4.1	64459.2	3.95
2764	8.2	20.2	83	29.11	0.85	1.024	8.4	2.4032	5.5	40894.7	6.22
2769	6.5	20.4	83	29.08	0.84	1.024	6.7	3.0656	4.4	52167.1	4.88

200 HR DURABILITY TEST

FUEL: 50% DF2 + 50% CSO HV: 17017 BTU/LB.

HIGH IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 05-22-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2774	6.1	20.0	82	29.08	0.96	1.027	6.3	3.1867	4.1	54228.4	4.69
2768	7.0	20.1	88	29.08	0.96	1.035	7.2	2.7667	4.8	47081.2	5.40
2771	6.3	20.7	96	28.96	0.92	1.049	6.6	3.1313	4.3	53285.4	4.77
2772	6.3	19.8	94	28.94	0.95	1.048	6.6	2.9912	4.3	50902.0	5.00
2769	6.1	19.7	90	28.95	0.98	1.043	6.4	3.0981	4.2	52720.3	4.83
DATE: 05-23-81											
2774	5.4	24.9	83	28.94	1.02	1.036	5.6	4.4490	3.7	75709.3	3.36
2767	8.1	20.4	91	28.94	1.02	1.047	8.5	2.4086	5.6	40986.7	6.21
2767	7.0	20.7	98	28.90	0.96	1.055	7.4	2.7957	4.8	47573.7	5.35
2766	5.9	20.7	89	28.90	0.88	1.040	6.1	3.3775	4.0	57474.8	4.43
DATE: 05-24-81											
2776	5.2	21.8	79	29.00	0.88	1.023	5.3	4.1012	3.5	69790.2	3.65

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL; 50% DF2 50% CSO HV; 17017 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 05-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2495	176.0	74.9	87	29.05	0.84	1.031	181.4	0.4127	132.1	7022.8	36.23
2495	177.0	78.4	90	29.05	0.84	1.035	183.1	0.4281	133.3	7285.4	34.92
2496	177.4	75.2	90	28.96	0.83	1.038	184.1	0.4084	134.0	6949.8	36.61
2498	178.8	76.7	84	28.96	0.83	1.030	184.1	0.4166	133.9	7089.0	35.89
2495	179.1	75.7	80	28.96	0.81	1.024	183.3	0.4127	133.5	7022.3	36.23
DATE; 05-13-81											
2495	179.6	76.3	84	28.97	0.89	1.031	185.2	0.4119	134.9	7009.0	36.30
2495	177.6	75.3	90	28.97	0.89	1.039	184.6	0.4078	134.4	6939.7	36.66
2492	177.8	77.0	96	28.95	0.88	1.048	186.3	0.4135	135.8	7036.0	36.16
2491	177.9	76.8	97	28.94	0.90	1.050	186.8	0.4109	136.2	6992.0	36.39
2489	179.2	74.0	85	28.95	0.99	1.037	185.9	0.3982	135.6	6776.0	37.55
DATE; 05-14-81											
2492	178.5	73.7	83	29.09	0.56	1.014	181.0	0.4070	131.9	6925.3	36.74
2499	177.9	73.1	89	29.09	0.64	1.025	182.3	0.4011	132.5	6825.7	37.27
2499	178.4	74.6	92	29.05	0.66	1.031	183.9	0.4056	133.7	6901.4	36.86
2501	179.2	77.1	87	29.06	0.57	1.021	182.9	0.4215	132.8	7173.4	35.47
2496	178.2	80.4	80	29.06	0.60	1.012	180.4	0.4454	131.3	7579.7	33.56
DATE; 05-15-81											
2498	179.9	76.8	79	29.09	0.76	1.016	182.7	0.4205	132.9	7155.7	35.55
2497	179.0	77.4	81	29.09	0.76	1.018	182.3	0.4243	132.6	7220.7	35.23
2495	177.3	74.3	87	29.04	0.83	1.031	182.7	0.4068	133.0	6922.0	36.75
2498	177.5	74.5	81	28.95	0.94	1.030	182.8	0.4076	133.0	6937.0	36.67
2496	177.5	75.0	81	28.95	0.93	1.030	182.8	0.4103	133.0	6981.4	36.44
DATE; 05-16-81											
2501	178.5	74.4	81	28.95	0.88	1.028	183.4	0.4058	133.2	6905.8	36.84
2495	177.1	75.1	93	28.90	0.90	1.046	185.3	0.4051	134.9	6892.9	36.91
2496	175.7	75.8	98	28.80	0.99	1.060	186.3	0.4072	135.6	6928.6	36.72
2501	176.0	76.2	94	28.80	1.06	1.057	186.1	0.4095	135.2	6969.0	36.51
2501	177.4	73.5	89	28.81	1.06	1.050	186.3	0.3943	135.3	6710.3	37.91

200 HR DURABILITY TEST

FUEL; 50% DF2 + 50% CSO HV; 17017 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 05-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2498	178.4	76.8	87	28.81	0.97	1.044	186.3	0.4121	135.5	7012.8	36.28
2492	177.4	74.9	93	28.81	0.96	1.052	186.6	0.4011	136.0	6826.2	37.27
2498	176.9	76.2	100	28.81	0.96	1.061	187.7	0.4057	136.5	6904.2	36.85
2500	177.5	76.8	97	28.81	0.96	1.057	187.7	0.4091	136.4	6962.1	36.54
2497	177.8	76.1	89	28.80	0.28	1.022	181.7	0.4189	132.2	7129.1	35.69
DATE; 05-18-81											
2498	176.2	71.1	94	28.83	0.99	1.054	185.7	0.3829	135.0	6515.9	39.04
2494	175.4	72.8	97	28.83	0.99	1.058	185.5	0.3923	135.1	6675.1	38.11
2493	176.4	73.9	97	28.82	0.86	1.053	185.8	0.3979	135.4	6771.2	37.57
2493	178.2	73.1	98	28.82	0.55	1.043	185.8	0.3931	135.4	6688.9	38.03
2493	179.3	76.0	90	28.85	0.55	1.031	184.9	0.4107	134.7	6989.4	36.40
DATE; 05-19-81											
2501	177.2	69.2	81	29.03	0.66	1.017	180.2	0.3840	130.9	6533.8	38.94
2495	178.0	78.6	93	29.03	0.66	1.033	183.8	0.4276	133.8	7276.4	34.96
2498	177.5	81.5	96	29.01	0.63	1.036	183.9	0.4428	133.8	7535.6	33.76
2500	175.7	69.3	92	29.00	0.64	1.032	181.3	0.3823	131.7	6505.4	39.11
2501	176.4	74.0	80	29.02	0.52	1.011	178.3	0.4150	129.5	7061.9	36.03
DATE; 05-20-81											
2499	177.3	76.2	79	29.14	0.53	1.006	178.3	0.4275	129.6	7275.2	34.97
2501	178.9	73.6	86	29.14	0.53	1.015	181.6	0.4055	131.9	6899.7	36.87
2500	178.0	81.3	87	29.12	0.64	1.021	181.7	0.4472	132.0	7609.7	33.43
2503	179.2	77.0	82	29.12	0.61	1.013	181.6	0.4239	131.8	7213.5	35.27
2500	180.0	82.5	79	29.14	0.69	1.011	182.1	0.4531	132.3	7711.1	32.99
DATE; 05-21-81											
2501	177.0	77.7	81	29.11	0.85	1.021	180.7	0.4300	131.2	7317.2	34.77
2494	177.9	76.7	86	29.11	0.85	1.028	182.8	0.4198	133.1	7144.1	35.61
2501	177.9	76.0	84	29.11	0.85	1.025	182.3	0.4170	132.4	7096.2	35.85
2501	173.1	75.2	89	29.11	0.85	1.031	178.5	0.4210	129.7	7164.4	35.51
2501	177.2	75.6	86	29.08	0.84	1.028	182.2	0.4151	132.3	7063.5	36.02

200 HR DURABILITY TEST

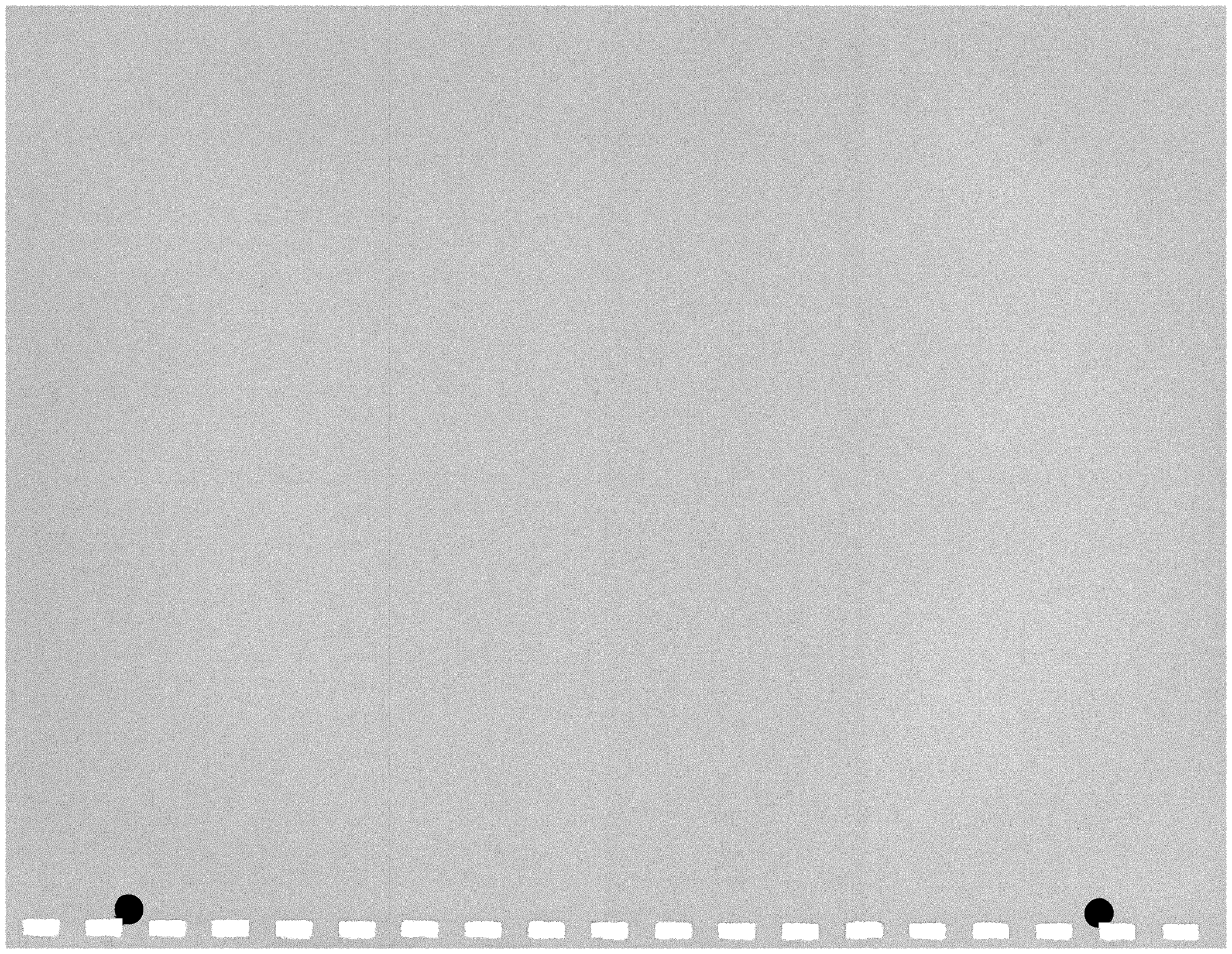
FUEL; 50% DF2 + 50% CSO HV; 17017 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 05-22-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2496	177.5	76.6	86	29.08	0.96	1.033	183.3	0.4178	133.4	7109.8	35.78
2497	177.7	73.5	93	29.09	0.96	1.041	185.1	0.3971	134.6	6758.1	37.65
2498	175.5	76.1	96	28.96	0.92	1.049	184.1	0.4136	133.8	7038.3	36.15
2496	173.2	76.4	91	28.94	0.95	1.044	180.8	0.4227	131.6	7192.4	35.37
2499	175.3	77.6	88	28.95	0.98	1.041	182.5	0.4253	132.6	7237.5	35.15
DATE; 05-23-81											
2497	173.3	75.8	90	28.94	1.02	1.045	181.2	0.4186	131.8	7124.0	35.71
2499	174.8	74.5	98	28.94	1.02	1.056	184.6	0.4036	134.2	6868.3	37.04
2498	166.5	75.4	103	28.90	0.96	1.062	176.8	0.4262	128.6	7252.7	35.08
2500	173.3	76.6	98	28.90	0.96	1.055	182.9	0.4186	132.9	7123.5	35.71
2505	173.7	78.7	89	28.90	0.88	1.040	180.7	0.4353	131.0	7406.8	34.35
DATE; 05-24-81											
2505	174.8	79.4	89	29.00	0.88	1.036	181.2	0.4383	131.4	7458.2	34.11

INTENTIONALLY BLANK



200 HR DURABILITY TEST

FUEL: 50% DF2 + 50% CSO HV: 17017 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE: 05-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	155.8	62.6	87	29.05	0.84	1.031	160.6	0.3897	162.0	6630.9	38.37
1804	156.0	63.4	92	29.05	0.84	1.037	161.8	0.3915	162.9	6662.4	38.19
1803	155.9	63.2	91	28.96	0.83	1.039	162.0	0.3901	163.2	6638.3	38.32
1800	157.6	62.3	80	28.96	0.83	1.024	161.4	0.3860	162.9	6568.4	38.73
1807	158.9	61.4	77	28.96	0.81	1.020	162.0	0.3789	162.9	6448.1	39.46
DATE: 05-13-81											
1805	158.4	63.5	88	28.97	0.89	1.037	164.2	0.3864	165.3	6575.9	38.69
1801	156.2	63.7	93	28.97	0.89	1.043	163.0	0.3910	164.4	6654.5	38.23
1792	155.1	62.7	98	28.95	0.88	1.050	162.9	0.3849	165.1	6550.7	38.84
1796	156.6	63.9	93	28.94	0.90	1.045	163.6	0.3907	165.5	6648.8	38.26
1800	158.8	63.5	82	28.95	0.99	1.033	164.1	0.3870	165.6	6585.0	38.64
DATE: 05-14-81											
1800	157.6	63.7	86	29.09	0.56	1.018	160.4	0.3968	161.9	6752.6	37.68
1809	158.0	64.2	93	29.09	0.64	1.030	162.7	0.3947	163.4	6716.6	37.88
1802	157.1	60.6	91	29.05	0.66	1.029	161.7	0.3747	163.0	6376.0	39.90
1805	159.0	65.3	84	29.06	0.57	1.017	161.6	0.4037	162.7	6869.4	37.04
1814	159.6	61.3	78	29.06	0.60	1.010	161.2	0.3801	161.4	6468.4	39.33
DATE: 05-15-81											
1806	158.1	64.2	83	29.09	0.76	1.021	161.4	0.3978	162.4	6770.0	37.58
1816	158.7	63.0	83	29.09	0.76	1.021	162.0	0.3887	162.1	6614.2	38.46
1811	157.7	63.2	86	29.04	0.83	1.029	162.3	0.3890	162.8	6620.2	38.43
1808	157.9	69.3	81	28.95	0.94	1.030	162.6	0.4263	163.4	7255.0	35.07
1815	158.9	63.0	84	28.95	0.93	1.034	164.2	0.3834	164.4	6524.1	39.00
DATE: 05-16-81											
1804	158.8	63.7	82	28.95	0.88	1.029	163.4	0.3896	164.5	6629.8	38.37
1800	155.8	64.5	96	28.90	0.90	1.050	163.6	0.3940	165.1	6704.4	37.95
1800	155.2	65.9	100	28.80	0.99	1.063	164.9	0.3995	166.5	6798.7	37.42
1813	156.6	59.3	92	28.80	1.06	1.055	165.2	0.3588	165.5	6104.9	41.67
1806	156.9	63.2	87	28.81	1.06	1.048	164.4	0.3842	165.3	6538.1	38.91

200 HR DURABILITY TEST

FUEL; 50% DF2 + 50% CSO HV; 17017 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE; 05-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1794	156.3	63.3	91	28.81	0.97	1.050	164.1	0.3856	166.1	6561.4	38.77
1790	155.0	63.6	99	28.81	0.96	1.060	164.3	0.3870	166.7	6585.5	38.63
1791	155.2	63.2	100	28.81	0.96	1.061	164.7	0.3838	167.1	6530.6	38.96
1804	157.2	60.6	95	28.81	0.96	1.055	165.8	0.3655	166.9	6219.2	40.91
1804	157.1	68.4	88	28.80	0.28	1.021	160.4	0.4264	161.5	7256.4	35.06
DATE; 05-18-81											
1793	154.9	58.7	95	28.83	0.99	1.055	163.4	0.3593	165.6	6113.5	41.62
1796	155.1	59.6	100	28.83	0.99	1.062	164.7	0.3621	166.5	6162.4	41.28
1783	154.2	58.5	105	28.82	0.86	1.064	164.0	0.3565	167.1	6067.2	41.93
1792	157.7	59.8	93	28.82	0.55	1.036	163.4	0.3657	165.7	6222.4	40.90
1798	158.2	62.5	84	28.85	0.55	1.023	161.9	0.3858	163.6	6565.9	38.75
DATE; 05-19-81											
1800	159.4	63.7	86	29.03	0.66	1.024	163.1	0.3904	164.6	6643.1	38.30
1800	157.4	61.6	90	29.03	0.66	1.029	161.9	0.3807	163.4	6477.8	39.27
1793	156.9	62.6	97	29.01	0.63	1.038	162.8	0.3845	164.9	6543.8	38.88
1795	156.8	59.1	87	29.00	0.64	1.025	160.8	0.3679	162.7	6260.6	40.64
1803	158.8	57.0	82	29.02	0.52	1.014	161.0	0.3542	162.2	6028.2	42.20
DATE; 05-20-81											
1799	158.3	65.1	86	29.14	0.53	1.015	160.7	0.4054	162.2	6898.4	36.88
1804	158.9	60.2	88	29.14	0.53	1.018	161.7	0.3720	162.8	6330.6	40.19
1801	158.6	65.2	86	29.12	0.64	1.020	161.7	0.4033	163.1	6862.4	37.07
1800	158.8	65.4	81	29.12	0.61	1.012	160.7	0.4072	162.2	6929.7	36.71
1801	159.3	62.7	79	29.14	0.69	1.011	161.1	0.3891	162.5	6621.9	38.42
DATE; 05-21-81											
1799	155.7	67.7	83	29.11	0.85	1.024	159.4	0.4249	160.9	7231.1	35.18
1806	156.8	62.4	84	29.11	0.85	1.025	160.7	0.3885	161.6	6610.9	38.48
1812	158.6	63.2	83	29.11	0.85	1.024	162.3	0.3892	162.7	6622.9	38.41
1805	156.0	61.5	88	29.11	0.85	1.030	160.7	0.3829	161.7	6515.5	39.05
1813	158.2	65.6	83	29.08	0.84	1.024	162.0	0.4048	162.4	6889.1	36.93

200 HR DURABILITY TEST

FUEL; 50% DF2 + 50% CSO HV; 17017 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE; 05-22-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1801	155.4	61.7	87	29.08	0.96	1.034	160.7	0.3839	162.1	6533.6	38.94
1801	155.7	59.6	96	29.08	0.96	1.046	162.8	0.3662	164.2	6231.6	40.83
1809	154.7	66.6	97	28.96	0.92	1.050	162.5	0.4098	163.1	6973.2	36.48
1810	155.3	61.8	93	28.94	0.95	1.047	162.6	0.3801	163.1	6468.5	39.33
1814	155.8	62.4	85	28.95	0.98	1.037	161.5	0.3860	161.8	6568.2	38.73
DATE; 05-23-81											
1809	155.1	63.2	91	28.94	1.02	1.047	162.3	0.3893	163.0	6624.9	38.40
1806	153.8	62.5	98	28.94	1.02	1.056	162.4	0.3848	163.4	6547.7	38.86
1812	152.0	63.5	99	28.90	0.96	1.057	160.6	0.3954	161.0	6728.7	37.81
1810	153.0	62.7	92	28.90	0.96	1.047	160.2	0.3916	160.8	6663.2	38.18
1814	154.1	66.7	87	28.90	0.88	1.038	159.9	0.4170	160.1	7095.2	35.86
DATE; 05-24-81											
1812	153.8	61.9	87	29.00	0.88	1.034	159.0	0.3892	159.4	6623.0	38.41

TABLE B-III

ENGINE RATING RESULTS, 200 HOURS
DURABILITY EVALUATION: 50% DF-2 + 50 CSO

Test: 200 Hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 50% DF-2, 50% CSO
Oil: I.H. No. 1 SAE 30, L.O. 7616

LINERS

Condition of Cylinder Liners (% Heavy Polish)

Cyl. No.	Thrust	Antithrust
1	100% scored*	100% scored
2	<1%	<1%
3	<1%	<1%
4	<1%	<1%
5	100% scored	100% scored
6	<1%	<1%

* Evidence of collapsed top piston ring

BEARINGS

Condition of Connecting Rod Bearings

Cyl. No.	Upper
1	Good condition with light pitting and light embedment.
2	Good condition with light pitting and light embedment.
3	Good condition with light pitting and light embedment.
*4	Good condition with light pitting and light embedment.
*5	Good condition with light pitting and light embedment.
**6	Good condition with light pitting and light embedment.

Cyl. No.	Lower
**1	Good condition with light pitting and light embedment.
2	Good condition with light pitting and light embedment.
**3	Good condition with light pitting and light embedment.
4	Good condition with light pitting and light embedment.
**5	Good condition with light pitting and light embedment.
**6	Good condition with light pitting and light embedment.

---

* Light debris scratches
** Medium debris scraches

TABLE B-III (Con't)

ENGINE RATING RESULTS, 200 HOURS
DURABILITY EVALUATION: 50% DF-2 + 50 CSO

VALVE TRAIN

Condition of Push Tubes: Good condition, no apparent distress.

Condition of Rocker Arm Levers: Good condition, no apparent distress.

Condition of Valves:

Valve Seats: Good condition, no apparent distress
Valve Faces: Good condition, no apparent distress
Valve Tulips: Intakes- 1.0 to 1.5 demerits, average 1.2
Exhaust are all 1.0 demerits
Valve Tips: Good condition, no apparent distress
Valve Heads: All valves have trace carbon with dark brown lacquer to black laquer, except #5 exhaust has 80% trace carbon and 20% medium carbon

Cylinder Head Combustion Deposits:

Cyl. No.	Deck % Area Covered	Intake Port Plugging, %
1	85% light carbon, 15% medium carbon	5% plugged
2	85% light carbon, 15% medium carbon	5% plugged
3	90% light carbon, 10% medium carbon	5% plugged
4	85% light carbon, 15% medium carbon	5% plugged
5	80% light carbon, 20% medium carbon	5% plugged
6	80% light carbon, 20% medium carbon	5% plugged

ENGINE SLUDGE DEPOSITS

Oil Pan:	20% @ 1/2A, 80% @ A	=	.63 demerits
Valve Covers:	100% @ 3/4A	=	.54 demerits
Valve Deck:	100% @ A	=	.65 demerits
Oil Screen:	0% plugging		

PISTON CROWNLAND DEPOSITS

Piston No.	% Heavy Carbon	% Medium Carbon	% Light Carbon	Demerits
1	10	70	20	50.00
2	5	85	10	50.00
3	5	80	15	48.75
4	15	80	5	56.25
5	40	55	5	68.75
6	15	75	10	55.00
			Average	54.79

TABLE B-IV

CHART FOR PISTON DEMERITS

SPONSOR CODE 50 DF2, 50 CSO SWRI CODE LO-7616 HOURS 183 DATE 5-26-81

PISTON NO.		CARBON H %	CARBON H D	CARBON M %	CARBON M D	CARBON T %	CARBON T D	VT %	VT D	BL %	BL D	BR %	BR D	LACQUER A %	LACQUER A D	LACQUER LA %	LACQUER LA D	LACQUER TR %	LACQUER TR D
	1G	10	2.25	30	5.25	10	1.20	50	3.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	85	44.63	15	5.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	100	9.00	0	0.00
1	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	65	14.63	35	6.13	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	5	5.25	65	46.80	20	9.00	0	0.00	5	1.14	0	0.00	5	.45	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	35	1.75	35	1.33	10	.25	20	.30	0	0.00
	1G	60	13.50	30	5.25	10	1.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	30	20.25	70	36.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	60	5.40	40	1.20
2	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	15	3.38	85	14.88	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	10	4.50	10	3.00	10	2.28	5	.75	65	5.85	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	30	1.14	30	.75	40	.60	0	0.00
	1G	85	19.13	5	.88	10	1.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	15	10.13	85	44.63	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	100	9.00	0	0.00
3	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	10	2.25	90	15.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	20	14.40	50	22.50	10	3.00	5	1.14	5	.75	10	.90	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	.57	30	.75	55	.83	0	0.00
	1G	80	18.00	15	2.63	5	.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	60	40.50	40	21.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	100	9.00	0	0.00
4	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	20	4.50	80	14.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	20	14.40	20	9.00	5	1.50	0	0.00	5	.75	50	4.50	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	.76	30	.75	50	.75	0	0.00
	1G	60	13.50	10	1.75	30	3.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	35	23.63	55	28.88	10	3.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	80	7.20	20	.60
5	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	20	4.50	80	14.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	20	9.00	10	3.00	10	2.28	10	1.50	50	4.50	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	1.52	20	.50	40	.60	0	0.00
	1G	95	21.38	0	0.00	5	.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	20	13.50	80	42.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	80	7.20	20	.60
6	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	15	3.38	85	14.88	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	10	4.50	5	1.50	0	0.00	10	1.50	75	6.75	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	5	.25	25	.95	15	.38	55	.83	0	0.00

TABLE B-IV (Con't)

PISTON DEMERIT SUMMARY

SPONSOR CODE 50 DF2, 50 CS0 SWRI CODE LO-7616 HOURS 183 DATE 5-26-81

	PISTON NO. 1	PISTON NO. 2	PISTON NO. 3	PISTON NO. 4	PISTON NO. 5	PISTON NO. 6
CARBON (GROOVES)	62.48	76.95	75.97	82.73	74.96	77.48
CARBON (LANDS)	81.81	22.76	54.90	41.90	27.50	22.76
CARBON (UNDERCROWN)	0.00	0.00	0.00	0.00	0.00	0.00
LACQUER (GROOVES)	9.00	6.60	9.00	9.00	7.80	7.80
LACQUER (LANDS)	1.59	11.88	5.79	6.75	11.28	9.75
LACQUER (UNDERCROWN)	3.63	2.49	2.15	2.26	2.62	2.41
TOTAL DEMERIT	158.51	120.68	147.81	142.64	124.16	120.20

TOTAL DEMERITS	814.00
DEMERITS DUE TO PROUDNESS	195.77
DEMERITS DUE TO CARBON	702.20
DEMERITS DUE TO LACQUER	111.80

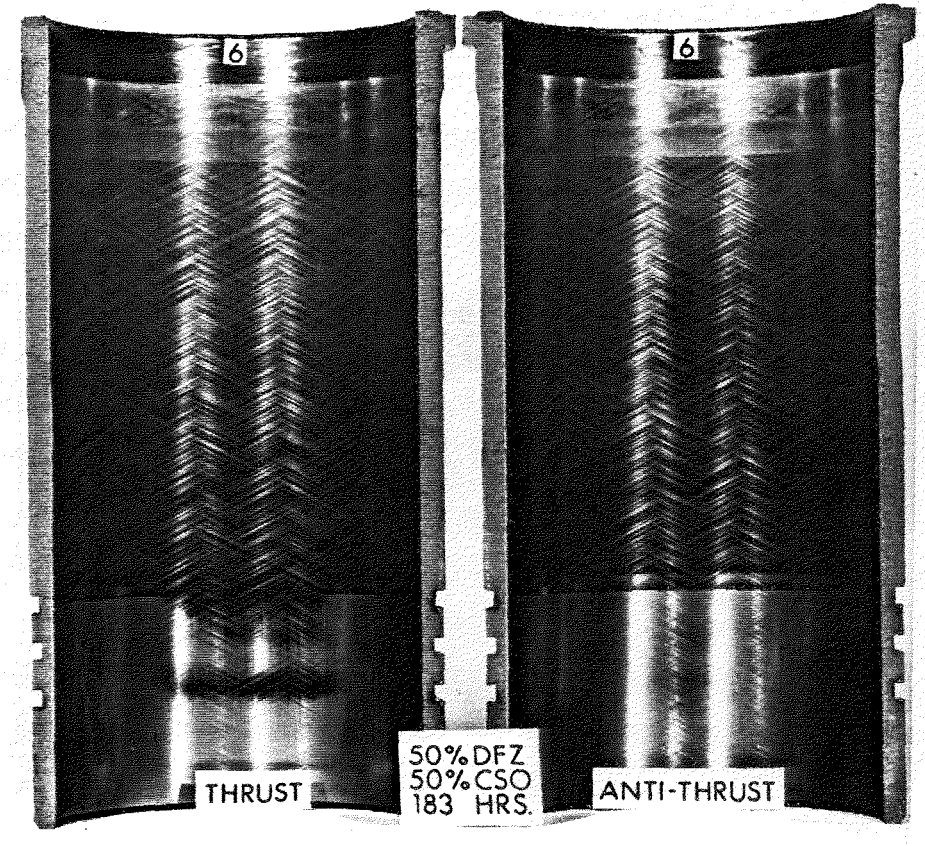
GROOVE FILL, %

	PISTON NO. 1	PISTON NO. 2	PISTON NO. 3	PISTON NO. 4	PISTON NO. 5	PISTON NO.6
TOP GROOVE	40	75	88	88	67	95
2nd GROOVE	43	65	57	80	61	60

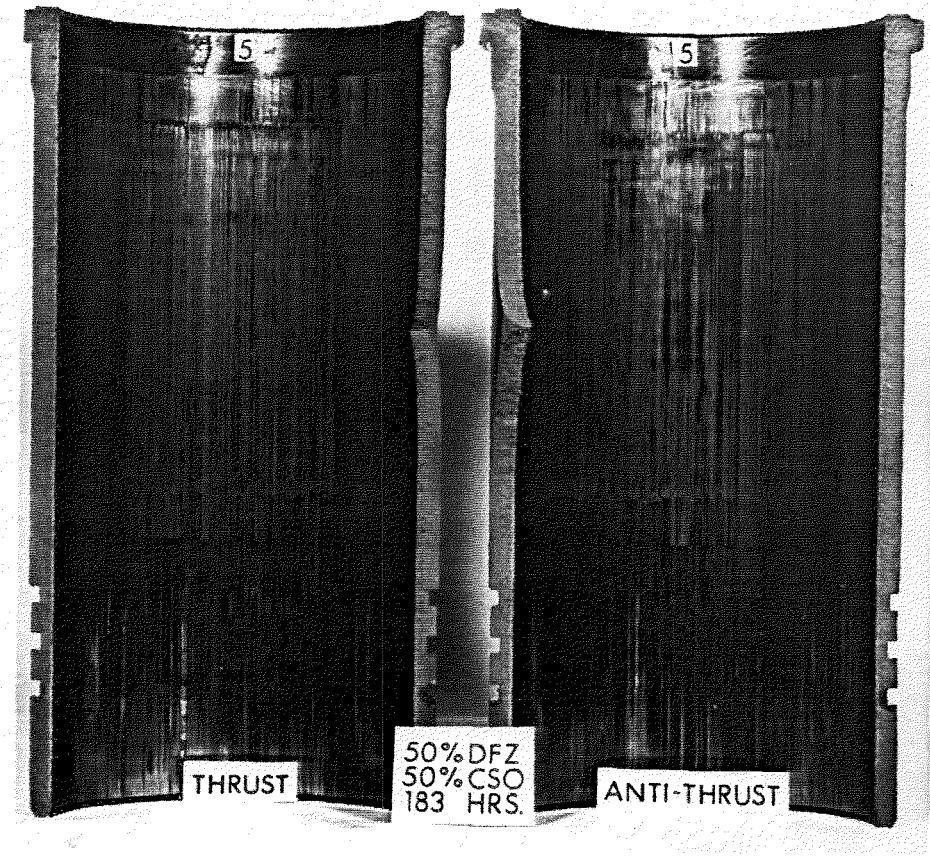
INTENTIONALLY BLANK

FIGURE B-1. PHOTOGRAPHS OF ENGINE AT END OF DURABILITY EVALUATION USING 50/50 BLEND OF DF-2 & CSO

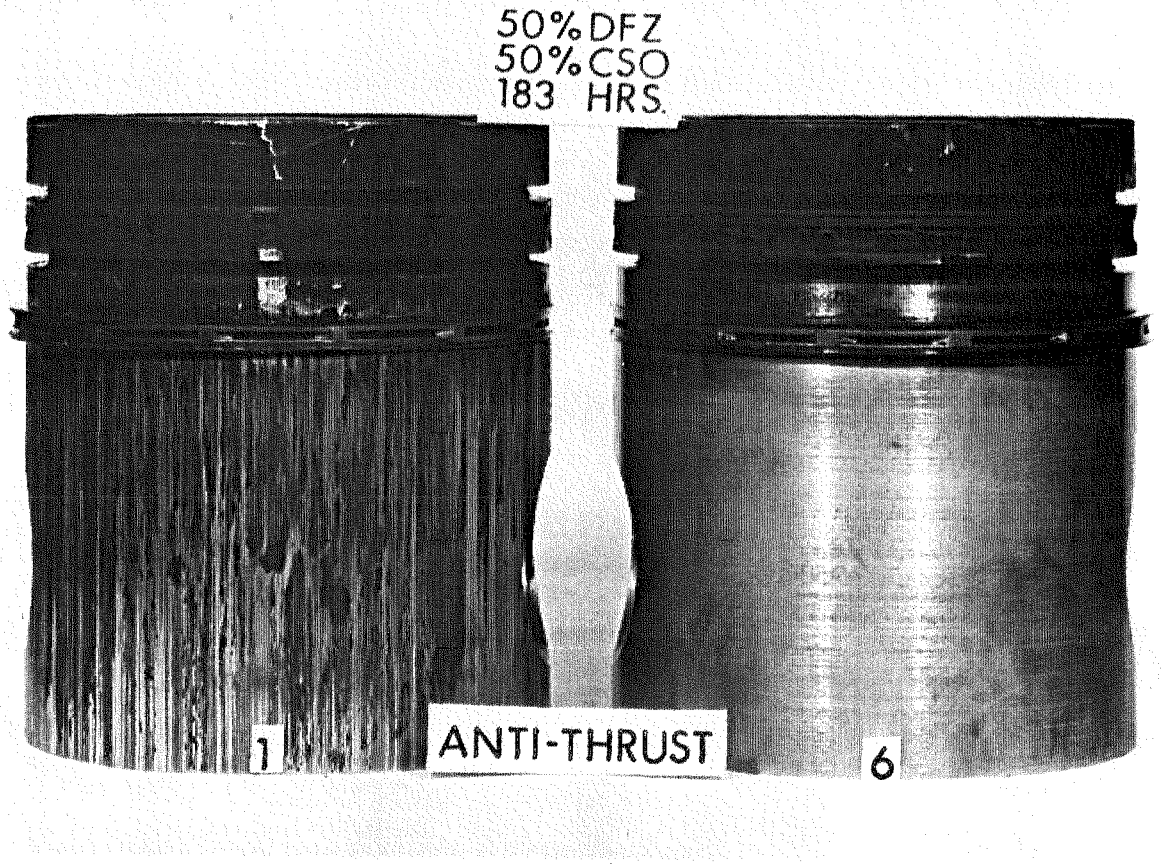
Photo 1	Unscored Cylinder Liner
2	Scoring on No. 1 Cylinder Liner
3	Comparison of Piston 1 with Undamaged Piston
4	Comparison of Piston 5 with Undamaged Piston
5	Top Two Piston Rings
6	Spot on Spray Cup, Piston 5
7	Injectors
8	Connecting Rod Bearings
9	Intake Valves
10	Underside of Head
11	Pan


6
6
THRUST
50% DFZ
50% CSO
183 HRS.
ANTI-THRUST

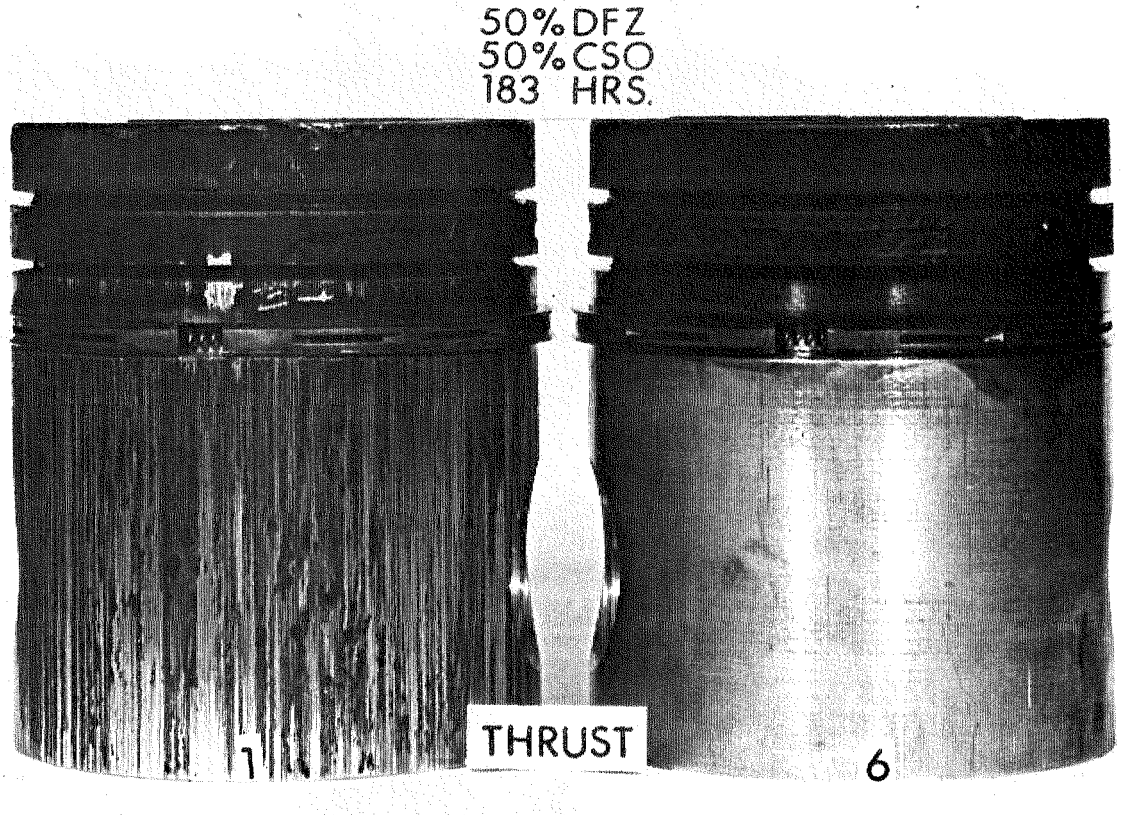
1


5
5
THRUST
50% DFZ
50% CSO
183 HRS.
ANTI-THRUST

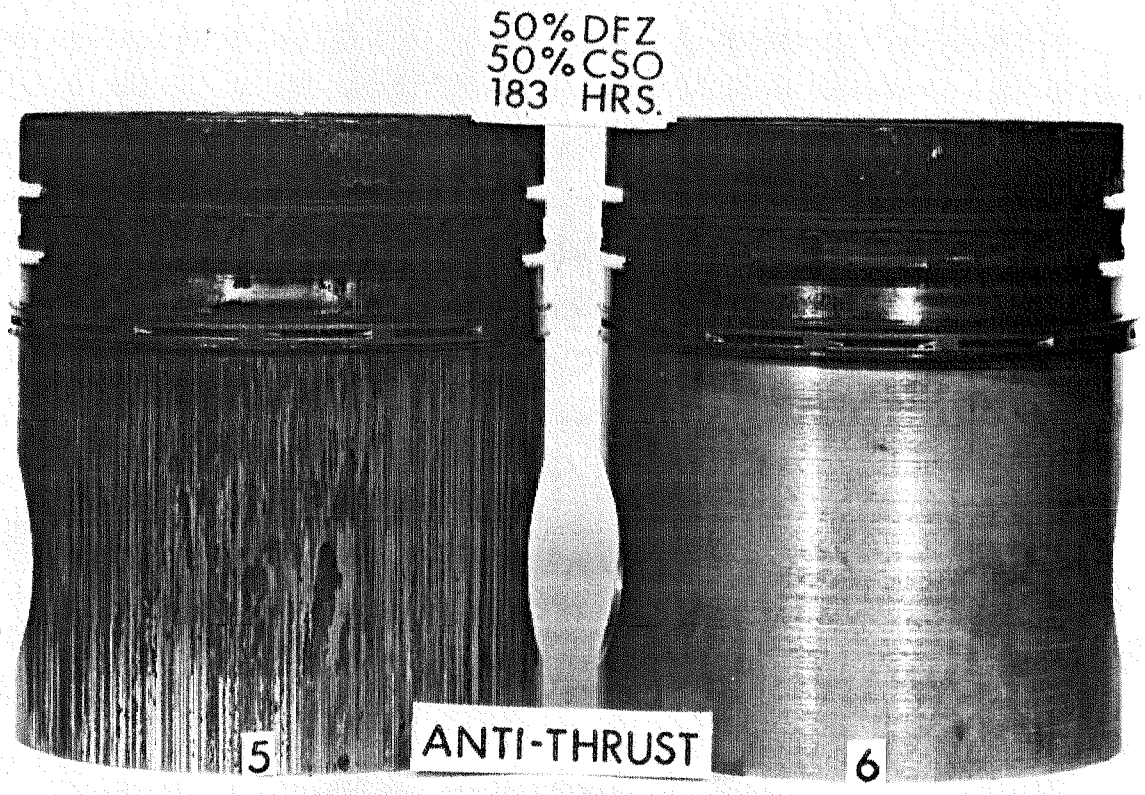
2


50% DFZ
50% CSO
183 HRS.
1
ANTI-THRUST
6

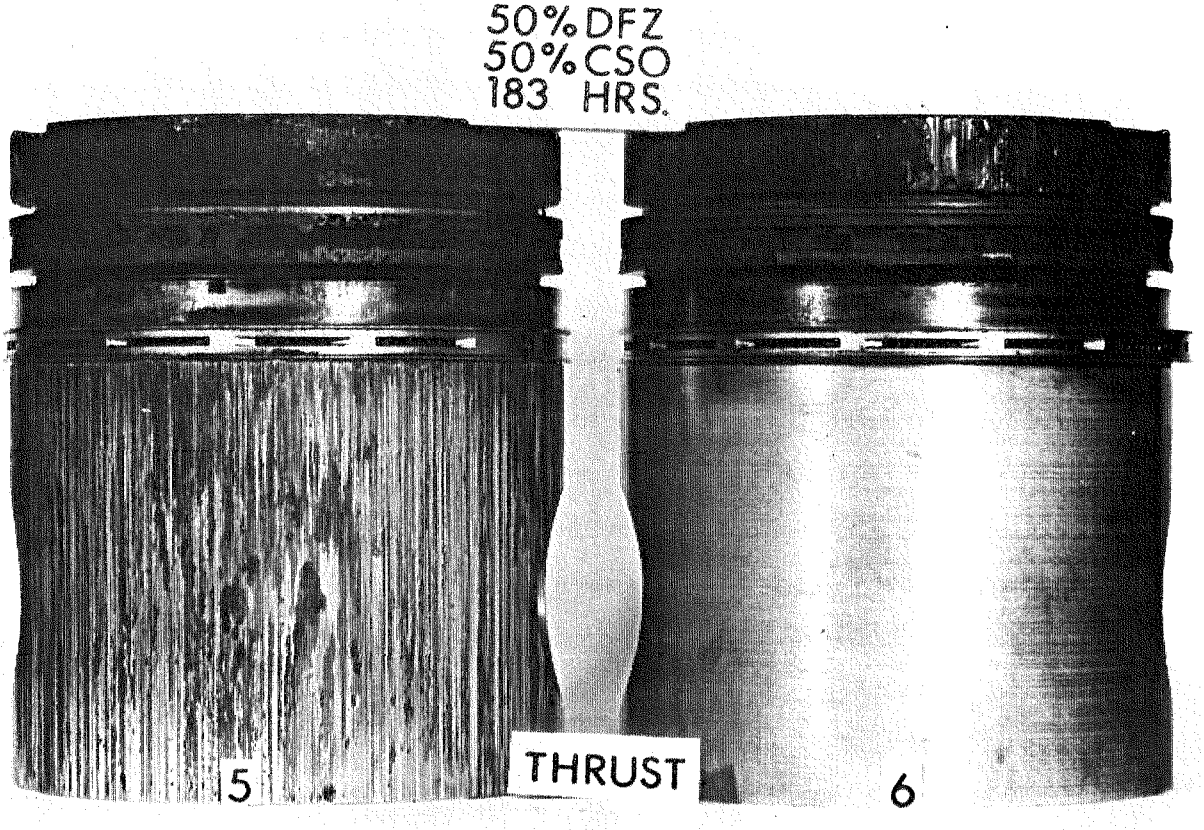
3a


50% DFZ
50% CSO
183 HRS.
1
THRUST
6

3b


50% DFZ
50% CSO
183 HRS.
5
ANTI-THRUST
6

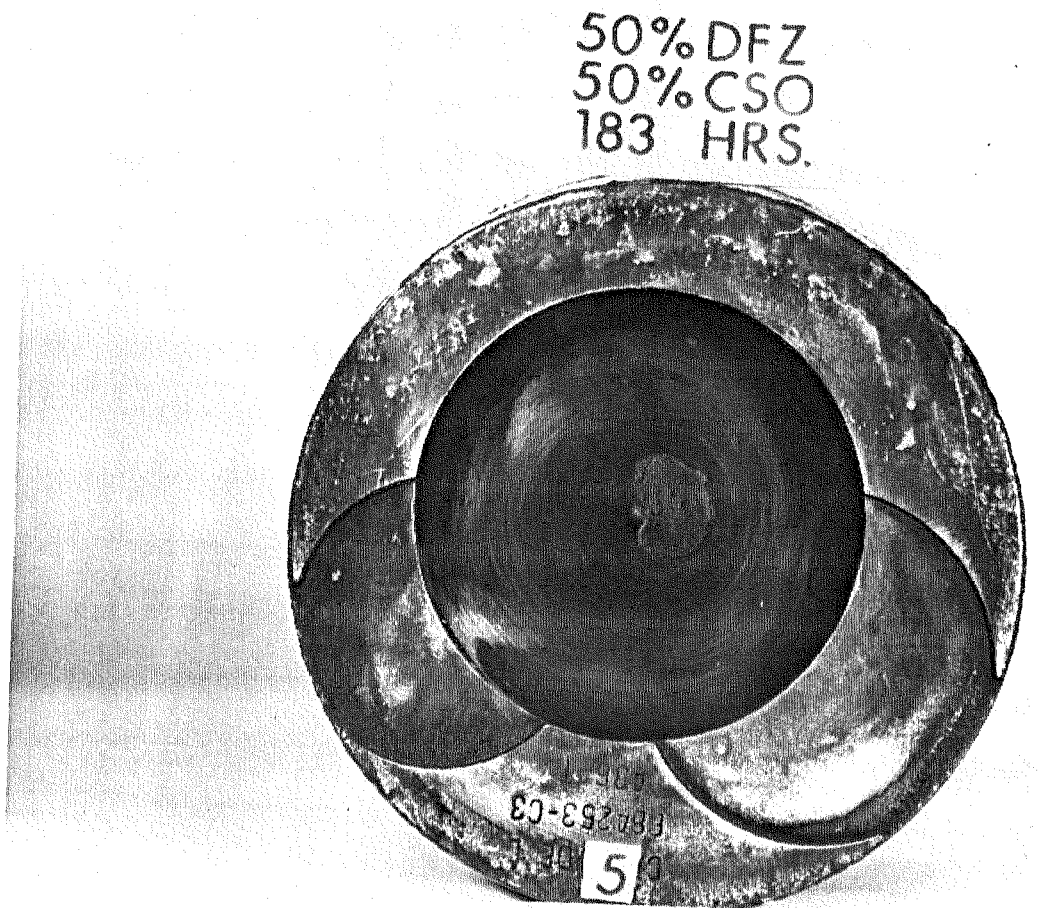
4a


50% DFZ
50% CSO
183 HRS.
5
THRUST
6

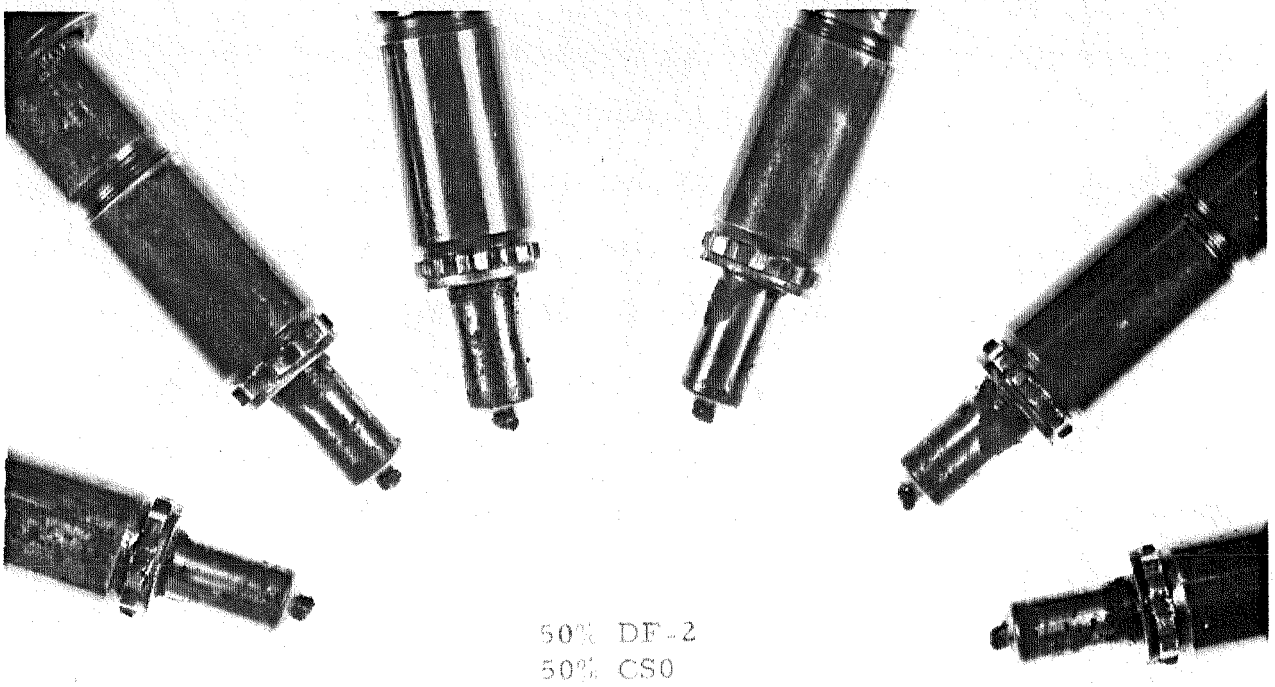
4b



5



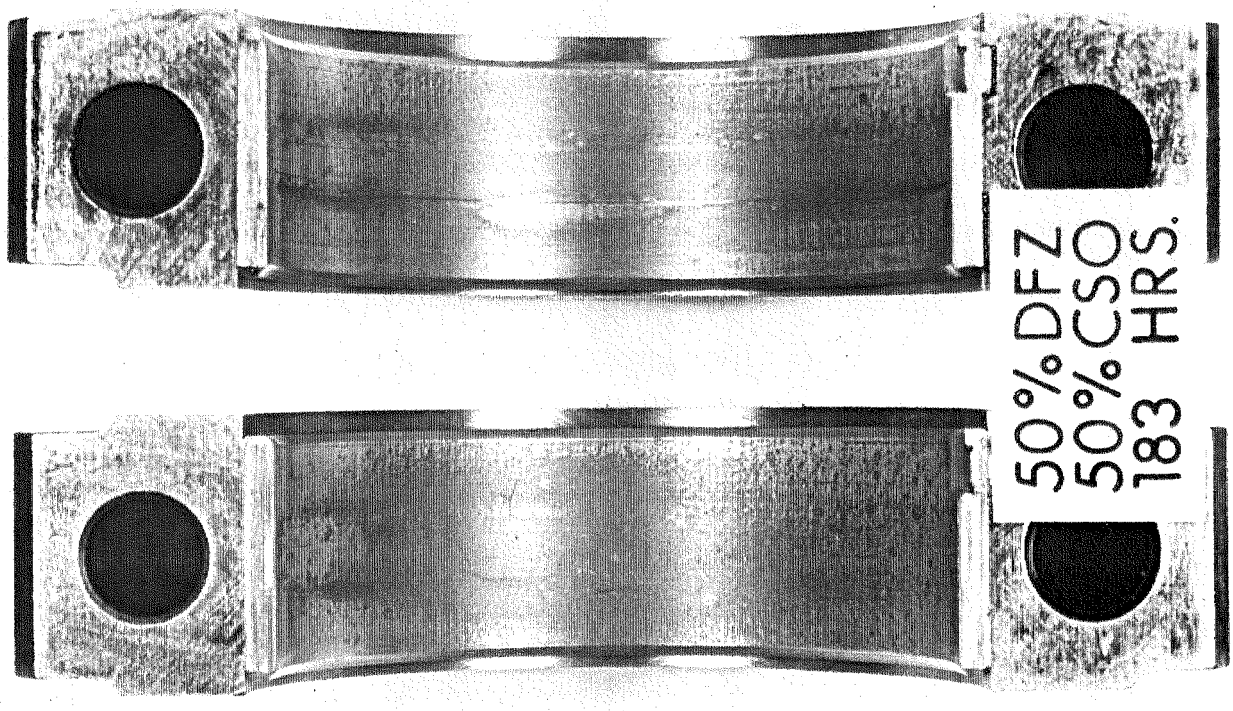
6



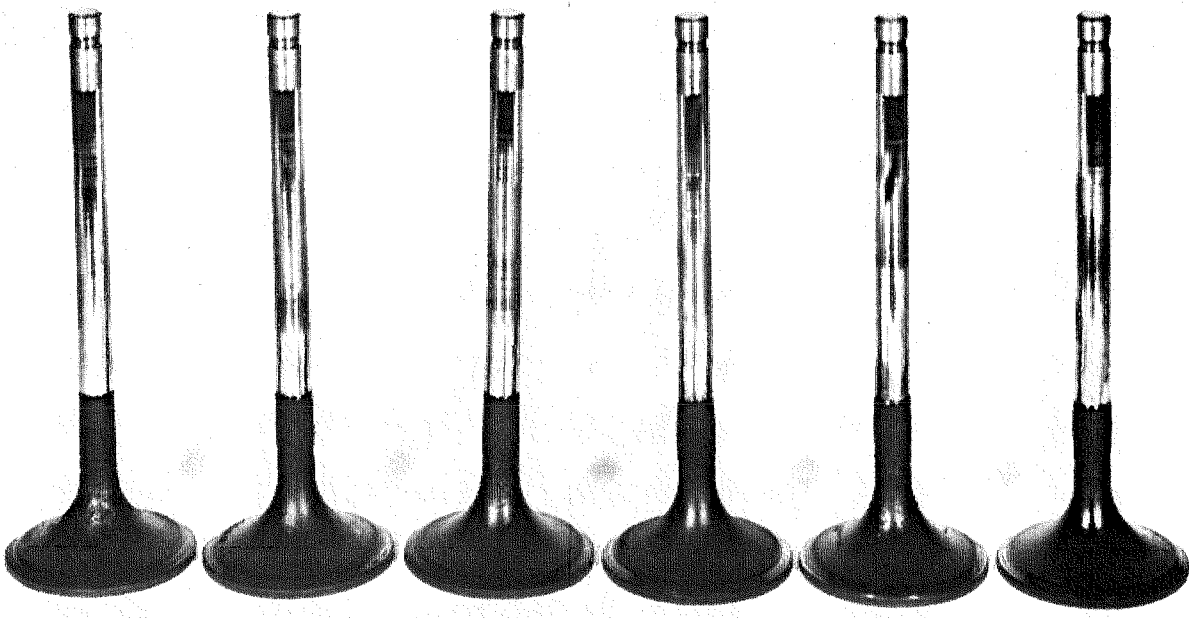
50% DF-2
50% CSO
183 Hrs.

1 6

7

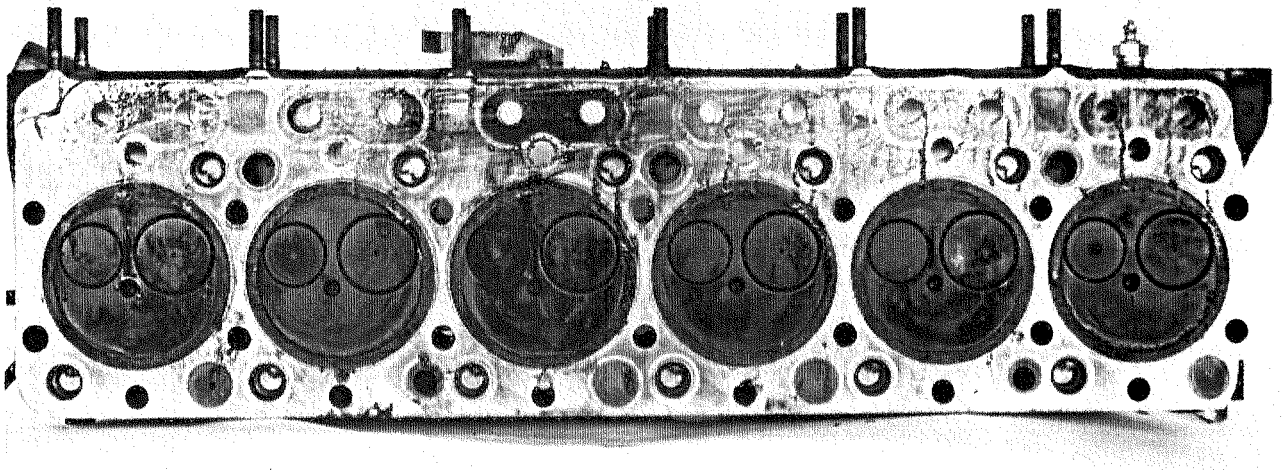


8

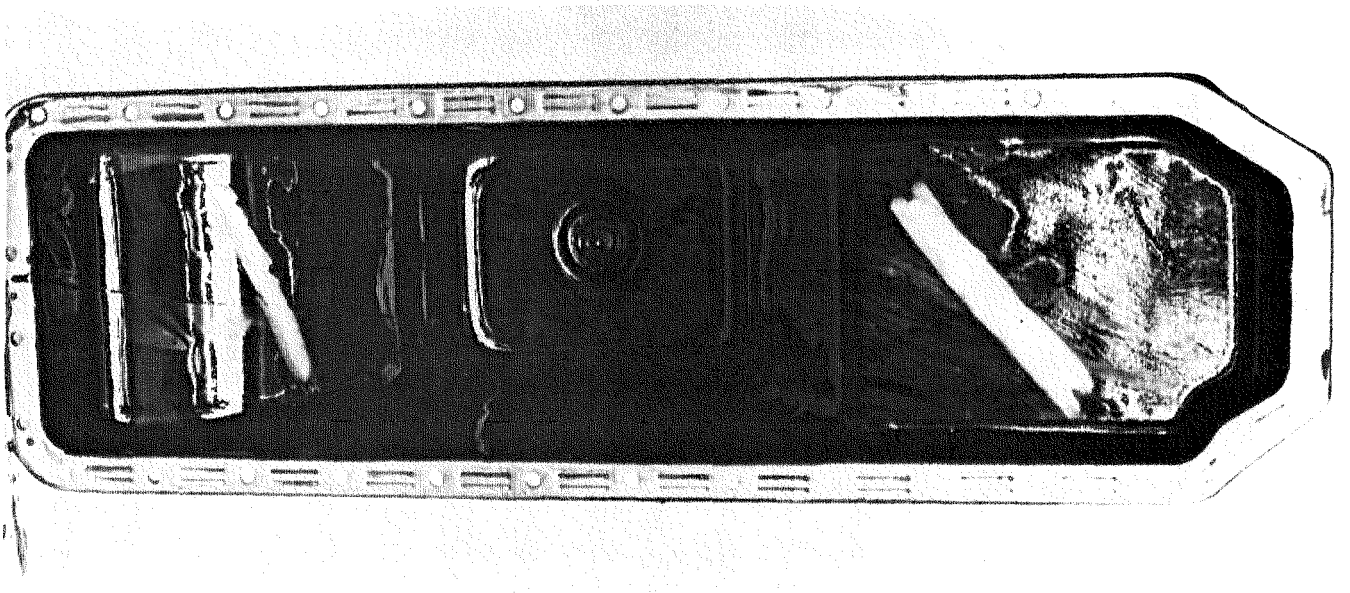


50% DFZ
50% CSO
183 HRS.

9



10



11

APPENDIX C

This Appendix contains description, performance and emissions data, rating sheets, and photographs relating to the 200 hours durability evaluation using 100 percent ESCO for fuel.

This evaluation completed the 200 hours without any problems. Table C-1 contains the performance data. It may be noted that although the same 3-hour 4-cycle program repeated five times for 15 hours per day was followed, the 4 cycles were different. For this program, the first cycle was at low idle conditions, the second cycle was maximum power at 2500 rpm, the third cycle was maximum torque at 1800 rpm, and the fourth cycle was at approximately 1/4 power at 2000 rpm.

Table C-II gives a summary of the performance results corrected to standard dry conditions. All of the data obtained during the durability evaluation for a particular speed/load condition are shown in chronological order. The results for each speed/load condition are separated from each other by colored interleaves.

Table C-III presents the results of exhaust gas emission measurements. The measurements were made at irregular intervals during the 201 hours of operation. It is possible to relate the emission data to the performance data by comparing "Engine Hours" on the emission data sheet to "TEST HOURS" at the top of the performance data sheet.

Table C-IV gives the brake specific emissions based on the exhaust emissions data in Table C-III.

Table C-V are the rating results. In general, the engine rating results indicate no problems using the ESCO fuel. Notice that the crownland deposits are mostly Light carbon, in contrast to the results for the 50% DF-2 + 50% CSO fuel blend, where most of the carbon deposits were Heavy and Medium.

Table C-VI shows the initial and final proudness measurements of the top two piston rings determined in a special measuring fixture. These measurements were not made for the previous test because the engine was not disassembled initially and after the test the carbon deposits were too hard to remove. Note that although the top ring has an average initial proudness of almost one-third that of the second ring, the final average proudness of the top ring is 23 percent higher than that of the second ring.

Table C-VII is a quantitative evaluation of the piston condition. This table is similar to Table B-IV in the previous section and the general comments made there apply here also.

The transesterified cottonseed oil (ESCO) received far fewer demerits than did the 50/50 blend of DF2 and CSO, meaning that the pistons (and the rest of the engine for that matter) were cleaner after using the ESCO fuel.

The percent Heavy carbon for the top groove of all of the pistons is high, and piston 4 is rated at 100 percent Heavy carbon. This means that all of the circumference of the groove was filled with carbon to the extent that the surface was smoothed by the back of the piston ring. The second groove had very little of the circumference filled with any but Thin carbon. These results are disturbing but in the light of later tests, may not be significant.

At the bottom of the second sheet of Table C-VII the percent of ring groove fill is given. These results are obtained by visual examination of the groove as are the results for the percent of Heavy carbon, etc. However, as described earlier, instead of determining the percent of groove circumference having Heavy carbon, the percent fill is an estimate of how much of the theroetical volume behind the assembled ring is filled with carbon. The values are somewhat higher than those obtained from the Heavy carbon rating.

Only the fill for the top groove is given since the second groove had only light deposits. This contrasts with the previous test using 50/50 blend of DF-2 + CSO where the second groove percent fill was about as high as the first groove fill.

Figure C-1 presents some photographs of the engine after testing. Photo 1 shows views of three pistons. The skirts show some burnish but are not scored. A close up of a typical piston in Photo 2 shows the ring land deposits. These deposits were soft and easily removed. Note the cleanliness of the oil ring groove. A close-up of a piston spray cup (Photo 3) shows a slight build-up where the spray impinges but the pattern is uniform. Photo 4 shows the injectors. The deposit build-up is slight, certainly not enough to interfere with the spray pattern.

Photo 5 shows extremes in connecting rod insert wear. The upper half of the insert is at the top. The best insert had a few small scratches while the worst insert had many light to medium scratches. No erosion as seen in the previous test was present.

The intake valves were clean except for Number 1 shown to the left in Photo 6. This deposit is attributed to a cracked valve seal which allowed oil to get past it.

Photo 7 shows the underside of the head on a cylinder. Note the wetness. This was typical of all except cylinder Number 4 which was dry. The pan in Photo 8 is clean except for the undrained oil film.

TABLE C-I

PERFORMANCE DATA FOR 200 HOUR
DURABILITY EVALUATION: 100% ESCO

INTENTIONALLY BLANK

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 7, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	1/2	1 1/2	2 1/2	3	3 1/2	4 1/2	5 1/2	6
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	686	2502	1804	2000	712	2504	1800	2000
Dyno Load (lb) Observed	2.6	190.8	240.0	55.0	3.8	190.6	239.6	55.2
BHP	0.6	159.1	144.3	36.7	0.9	159.1	143.7	36.8
1 - Coolant Out Temperature, F	122	188	185	183	175	185	184	182
2 - Coolant In Temperature, F	120	178	174	176	172	175	173	176
3 - Oil Sump Temperature, F	124	225	215	204	183	223	216	204
4 - Intake Air Temperature, F	77	88	87	87	86	90	92	91
5 - Fuel Temperature, F	79	87	86	88	88	90	90	93
6 - Intake Manifold After Turbo	82	254	215	123	95	257	220	127
7 - Ambient Air Temperature, F	78	85	86	85	84	89	93	93
8 - Exhaust Temperature Cyl. #1	207	885	919	489	734	896	928	479
9 - Exhaust Temperature Cyl. #2	214	985	1013	516	238	985	1026	512
10 - Exhaust Temperature Cyl. #3	197	959	989	493	219	964	995	493
11 - Exhaust Temperature Cyl. #4	190	970	1004	512	213	974	1010	508
12 - Exhaust Temperature Cyl. #5	172	962	1000	511	209	966	1006	506
13 - Exhaust Temperature Cyl. #6	199	889	948	498	228	899	952	494
Oil Gallery Pressure, psi	43.5	44.0	36.0	45.5	20.5	44.8	36.5	45.5
Pressure Before Fuel Filter, psi	31.0	59.0	47.0	54.0	31.5	59.0	46.0	54.0
Pressure After Fuel Filter, psi	30.0	59.0	47.0	54.0	31.0	59.0	46.0	54.0
Intake Manifold Pressure, In. Hg.	0	24.0	19.2	3.0	0	24.2	18.8	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	72.2	61.1	21.3	-	72.2	60.8	22.2
Fuel Time Sec/ ½ lb.		24.79	29.47	84.66		24.92	29.60	80.96
		25.07						
Barometer Pressure, In. Hg.			28.96				28.98	
Dry Bulb Temp., F			83				83	
Wet Bulb Temp., F/R.H.%		76%	77			79%	78	
Blow-by, CFH		313				318		
Smoke RDG. % 0-20% scale		6	8.5			5.5	7.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 7, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	6 1/2	7 1/2	8 1/2	9	9 1/2	10 1/2	11 1/2	12
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	715	2502	1798	1994	711	2500	1803	2004
Dyno Load (lb) Observed	3.0	191.6	238.6	54.6	3.6	190.4	240.4	55.2
BHP	0.7	159.8	143.0	36.3	0.9	158.7	144.5	36.9
1 - Coolant Out Temperature, F	177	185	187	186	185	188	188	185
2 - Coolant In Temperature, F	174	176	176	181	182	176	177	179
3 - Oil Sump Temperature, F	182	224	218	207	190	225	219	207
4 - Intake Air Temperature, F	94	94	98	95	95	91	93	89
5 - Fuel Temperature, F	90	93	93	94	93	92	90	92
6 - Intake Manifold After Turbo	102	262	225	131	104	258	221	126
7 - Ambient Air Temperature, F	94	92	94	97	95	93	95	87
8 - Exhaust Temperature Cyl. #1	236	903	934	498	240	900	932	490
9 - Exhaust Temperature Cyl. #2	236	992	1033	524	243	987	1025	518
10 - Exhaust Temperature Cyl. #3	216	968	1003	503	220	963	996	496
11 - Exhaust Temperature Cyl. #4	220	982	1019	523	224	974	1013	514
12 - Exhaust Temperature Cyl. #5	210	981	1017	526	216	974	1004	513
13 - Exhaust Temperature Cyl. #6	228	909	963	512	233	901	952	504
Oil Gallery Pressure, psi	20.2	44.2	35.9	45.0	19.0	43.9	35.8	45.0
Pressure Before Fuel Filter, psi	31.5	59.0	46.5	53.9	31.3	59.0	47.0	54.0
Pressure After Fuel Filter, psi	31.5	59.0	46.5	53.9	31.0	59.0	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	24.1	18.8	3.2	0	24.0	18.9	3.2
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	72.4	60.9	21.8	-	71.7	60.8	22.3
Fuel Time Sec/ ½ lb.		24.86	29.58	82.48		25.11	29.63	80.79
Barometer Pressure, In. Hg.			29.98				28.99	
Dry Bulb Temp., F			87				86	
Wet Bulb Temp., F/R.H.%		67%	78			64%	76	
Blow-by, CFH		313				313		
Smoke RDG. % 0-20% scale		4.0	6.0			7.0	8.2	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 7, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	12 1/2	13 1/2	14 1/2	15				
Time	9:20	10:20	11:20	11:50	12:00			
Engine RPM	715	2505	1803	2002	soak			
Dyno Load (lb) Observed	2.8	190.4	240.6	55.6				
BHP	0.7	159.0	144.6	37.1				
1 - Coolant Out Temperature, F	181	186	187	186				
2 - Coolant In Temperature, F	179	177	177	181				
3 - Oil Sump Temperature, F	184	223	217	207				
4 - Intake Air Temperature, F	87	89	85	84				
5 - Fuel Temperature, F	90	91	90	91				
6 - Intake Manifold After Turbo	96	254	213	121				
7 - Ambient Air Temperature, F	85	85	84	86				
8 - Exhaust Temperature Cyl. #1	231	890	913	487				
9 - Exhaust Temperature Cyl. #2	234	981	1010	514	ENGINE DOWN @ 12:00			
10 - Exhaust Temperature Cyl. #3	215	955	980	493				
11 - Exhaust Temperature Cyl. #4	217	967	998	513				
12 - Exhaust Temperature Cyl. #5	210	968	988	512				
13 - Exhaust Temperature Cyl. #6	226	894	936	501				
Oil Gallery Pressure, psi	20.0	44.9	36.0	45.0				
Pressure Before Fuel Filter, psi	31.5	59.0	47.0	54.0				
Pressure After Fuel Filter, psi	31.2	59.3	47.0	54.0				
Intake Manifold Pressure, In. Hg.	0	24.0	19.0	3.2				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR	-	72.4	61.2	21.4				
Fuel Time Sec/ ½ lb.		24.86	29.40	84.07				
Barometer Pressure, In. Hg.			29.00					
Dry Bulb Temp., F			84					
Wet Bulb Temp., F/R.H.%		69%	76					
Blow-by, CFH		318						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 8, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	15 1/2	16 1/2	17 1/2	18	18 1/2	19 1/2	20 1/2	21
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	708	2504	1800	2000	711	2505	1799	1998
Dyno Load (lb) Observed	3.0	189.2	240.6	55.0	1.6	189.8	240.0	55.4
BHP	0.7	157.9	144.4	36.7	0.4	158.5	143.9	36.9
1 - Coolant Out Temperature, F	135	186	182	180	173	181	180	177
2 - Coolant In Temperature, F	134	177	171	174	170	172	169	172
3 - Oil Sump Temperature, F	137	224	214	202	179	220	212	200
4 - Intake Air Temperature, F	81	86	86	85	86	90	90	90
5 - Fuel Temperature, F	83	88	86	88	87	89	89	91
6 - Intake Manifold After Turbo	86	250	213	122	94	255	216	126
7 - Ambient Air Temperature, F	81	86	86	86	86	87	87	90
8 - Exhaust Temperature Cyl. #1	213	884	913	482	229	892	919	493
9 - Exhaust Temperature Cyl. #2	214	972	1005	510	232	978	1007	517
10 - Exhaust Temperature Cyl. #3	196	949	979	488	211	952	982	495
11 - Exhaust Temperature Cyl. #4	195	961	1000	506	210	965	1002	518
12 - Exhaust Temperature Cyl. #5	182	960	986	504	201	963	993	521
13 - Exhaust Temperature Cyl. #6	206	887	938	487	221	893	942	503
Oil Gallery Pressure, psi	37.8	44.5	37.0	46.0	21.0	45.5	37.5	46.1
Pressure Before Fuel Filter, psi	31.2	59.0	46.5	54.0	31.8	59.1	46.8	53.7
Pressure After Fuel Filter, psi	31.2	59.0	46.5	54.0	31.8	59.1	46.8	53.7
Intake Manifold Pressure, In. Hg.	0	24.0	19.0	3.0	0	24.0	18.9	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	71.7	61.2	21.8	-	71.9	60.9	21.8
Fuel Time Sec/ ½ lb.		25.11	29.41	82.64		25.01	29.56	82.53
Barometer Pressure, In. Hg.			29.16				29.16	
Dry Bulb Temp., F			91				96	
Wet Bulb Temp., F/R.H.%		63%	80			58%	83	
Blow-by, CFH		333				298		
Smoke RDG. % 0-20% scale		4.5	6.0			3.8	5.0	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 8, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	21 1/2	22 1/2	23 1/2	24	24 1/2	25 1/2	26 1/2	27
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	710	2500	1801	2000	721	2504	1801	1999
Dyno Load (lb) Observed	2.2	192.0	238.9	55.0	1.8	189.4	239.8	55.2
BHP	0.5	160.0	143.4	36.7	0.4	158.1	144.0	36.8
1 - Coolant Out Temperature, F	173	181	180	172	173	182	180	177
2 - Coolant In Temperature, F	170	171	169	171	171	172	169	171
3 - Oil Sump Temperature, F	178	220	212	201	178	220	213	200
4 - Intake Air Temperature, F	89	91	92	92	93	92	92	87
5 - Fuel Temperature, F	90	92	91	93	91	92	91	92
6 - Intake Manifold After Turbo	97	258	219	129	100	259	219	124
7 - Ambient Air Temperature, F	88	91	90	90	92	93	90	86
8 - Exhaust Temperature Cyl. #1	231	899	922	494	233	900	921	488
9 - Exhaust Temperature Cyl. #2	233	983	1016	521	240	986	1016	512
10 - Exhaust Temperature Cyl. #3	210	960	986	500	213	962	987	490
11 - Exhaust Temperature Cyl. #4	213	972	1005	524	207	974	1006	514
12 - Exhaust Temperature Cyl. #5	203	971	997	527	199	972	999	517
13 - Exhaust Temperature Cyl. #6	222	904	946	508	230	904	948	498
Oil Gallery Pressure, psi	21.5	45.5	37.3	46.0	21.9	45.1	37.2	46.1
Pressure Before Fuel Filter, psi	31.5	59.0	46.5	53.3	32.0	59.0	46.5	53.6
Pressure After Fuel Filter, psi	31.0	59.0	46.4	53.7	31.8	59.0	46.5	53.8
Intake Manifold Pressure, In. Hg.	0	24.0	18.9	3.0	0	24.0	18.9	3.2
Intake Air Restriction, In. H_2O	1	6	4	3	2	6	4	3
Fuel Rate LBS/HR	-	72.2	61.0	22.6	-	72.4	60.9	21.9
Fuel Time Sec/ ½ lb.		24.93	29.50	79.70		24.85	29.58	82.32
Barometer Pressure, In. Hg.			29.14				29.12	
Dry Bulb Temp., F			85				82	
Wet Bulb Temp., F/R.H.%		74%	78			69%	74	
Blow-by, CFH		303				313		
Smoke RDG. % 0-20% scale		4.5						

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 8, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	27 1/2	28 1/2	29 1/2	30				
Time	9:20	10:20	11:20	11:50	12:00			
Engine RPM	731	2497	1797	2000	soak			
Dyno Load (lb) Observed	2.8	192.6	242.3	55.4				
BHP	0.7	160.3	145.1	36.9				
1 - Coolant Out Temperature, F	172	181	180	177				
2 - Coolant In Temperature, F	168	172	169	172				
3 - Oil Sump Temperature, F	182	219	212	199				
4 - Intake Air Temperature, F	87	87	86	83				
5 - Fuel Temperature, F	91	92	91	91				
6 - Intake Manifold After Turbo	96	254	213	120				
7 - Ambient Air Temperature, F	86	91	84	82				
8 - Exhaust Temperature Cyl. #1	234	896	913	480	ENGINE DOWN @ 12:00			
9 - Exhaust Temperature Cyl. #2	241	979	1008	506				
10 - Exhaust Temperature Cyl. #3	218	955	977	487				
11 - Exhaust Temperature Cyl. #4	212	967	975	511				
12 - Exhaust Temperature Cyl. #5	203	964	987	514				
13 - Exhaust Temperature Cyl. #6	230	896	936	495				
Oil Gallery Pressure, psi	21.0	45.2	37.4	46.2				
Pressure Before Fuel Filter, psi	32.0	58.9	46.3	53.5				
Pressure After Fuel Filter, psi	31.9	59.0	46.7	53.8				
Intake Manifold Pressure, In. Hg.	0	24.1	19.0	4.1				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR	-	72.2	61.1	23.9				
Fuel Time Sec/ ½ lb.		24.92	29.46	75.46				
Barometer Pressure, In. Hg.			29.14					
Dry Bulb Temp., F			83					
Wet Bulb Temp., F/R.H.%		76%	77					
Blow-by, CFH		313						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 9, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	30 1/2	31 1/2	32 1/2	33	33 1/2	34 1/2	35 1/2	36
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	707	2504	1793	1998	709	2498	1800	1992
Dyno Load (lb) Observed	2.0	189.8	239.4	55.6	2.6	192.6	241.0	55.6
BHP	0.5	158.4	143.1	37.0	0.6	160.4	144.6	36.9
1 - Coolant Out Temperature, F	140	189	184	180	174	183	181	178
2 - Coolant In Temperature, F	138	179	172	175	172	173	170	173
3 - Oil Sump Temperature, F	142	225	215	203	180	220	213	201
4 - Intake Air Temperature, F	82	89	92	91	90	89	95	94
5 - Fuel Temperature, F	85	93	91	94	91	93	93	95
6 - Intake Manifold After Turbo	87	253	219	128	99	255	222	130
7 - Ambient Air Temperature, F	83	85	92	93	88	88	96	93
8 - Exhaust Temperature Cyl. #1	213	890	924	495	229	896	926	490
9 - Exhaust Temperature Cyl. #2	214	971	1016	522	234	977	1023	519
10 - Exhaust Temperature Cyl. #3	197	949	989	501	212	954	992	496
11 - Exhaust Temperature Cyl. #4	199	964	1007	527	213	966	1008	523
12 - Exhaust Temperature Cyl. #5	183	957	997	528	202	963	1001	526
13 - Exhaust Temperature Cyl. #6	205	888	948	508	223	897	951	507
Oil Gallery Pressure, psi	34.0	43.5	36.2	45.2	20.1	45.0	37.0	46.0
Pressure Before Fuel Filter, psi	31.0	59.0	46.0	53.5	31.2	58.5	46.0	53.5
Pressure After Fuel Filter, psi	31.0	59.0	46.0	53.5	31.2	58.5	46.0	53.5
Intake Manifold Pressure, In. Hg.	0	28.8	18.8	3.0	0	24.2	18.8	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	71.2	60.9	21.4	-	72.4	61.0	21.8
Fuel Time Sec/ ½ lb.		25.27	29.54	83.97		24.87	29.50	82.60
Barometer Pressure, In. Hg.			29.19				29.18	
Dry Bulb Temp., F			88				83	
Wet Bulb Temp., F/R.H.%		64%	78			79%	78	
Blow-by, CFH		333				318		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 9, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	36 1/2	37 1/2	38 1/2	39	39 1/2	40 1/2	41 1/2	42
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	727	2501	1794	1999	717	2500	1798	2000
Dyno Load (lb) Observed	2.2	191.0	240.0	55.0	2.4	192.2	241.3	55.8
BHP	0.5	159.2	143.5	36.6	0.6	160.2	144.6	37.2
1 - Coolant Out Temperature, F	174	183	181	178	174	182	181	178
2 - Coolant In Temperature, F	171	173	170	173	171	172	170	174
3 - Oil Sump Temperature, F	179	220	213	200	179	220	213	201
4 - Intake Air Temperature, F	96	99	95	93	91	91	91	91
5 - Fuel Temperature, F	93	95	94	96	93	93	92	93
6 - Intake Manifold After Turbo	103	265	222	129	99	258	219	130
7 - Ambient Air Temperature, F	94	97	93	93	91	91	89	89
8 - Exhaust Temperature Cyl. #1	235	909	929	486	230	900	921	491
9 - Exhaust Temperature Cyl. #2	240	993	1025	515	237	984	1020	519
10 - Exhaust Temperature Cyl. #3	215	968	993	495	211	960	989	499
11 - Exhaust Temperature Cyl. #4	211	982	1010	520	208	972	1002	524
12 - Exhaust Temperature Cyl. #5	199	978	1002	520	198	968	997	523
13 - Exhaust Temperature Cyl. #6	227	912	951	503	228	901	945	509
Oil Gallery Pressure, psi	21.0	45.0	37.1	46.1	21.2	45.1	36.9	46.0
Pressure Before Fuel Filter, psi	31.5	58.5	46.2	53.4	31.6	58.8	46.5	53.5
Pressure After Fuel Filter, psi	31.5	58.5	46.2	53.6	31.5	59.1	46.8	53.5
Intake Manifold Pressure, In. Hg.	0	28.8	19.0	3.0	0	24.1	18.9	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	2	5	4	3
Fuel Rate LBS/HR	-	71.7	60.9	21.6	-	72.6	60.9	21.7
Fuel Time Sec/ ½ lb.		25.10	29.56	83.29		24.79	29.55	82.97
Barometer Pressure, In. Hg.			29.15				29.16	
Dry Bulb Temp., F			85				85	
Wet Bulb Temp., F/R.H.%		78%	79			63%	75	
Blow-by, CFH		328				318		
Smoke RDG. % 0-20% scale		-	-			-	-	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 9, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	42 1/2	43 1/2	44 1/2	45				
Time	9:20	10:20	11:20	11:50	12:20			
Engine RPM	713	2501	1802	1998	soak			
Dyno Load (lb) Observed	1.6	192.0	241.8	58.2				
BHP	0.4	160.1	145.2	38.8				
1 - Coolant Out Temperature, F	173	182	181	178				
2 - Coolant In Temperature, F	171	173	170	172				
3 - Oil Sump Temperature, F	179	220	212	201				
4 - Intake Air Temperature, F	87	87	85	83				
5 - Fuel Temperature, F	91	92	91	92				
6 - Intake Manifold After Turbo	95	253	212	121				
7 - Ambient Air Temperature, F	85	84	82	82				
8 - Exhaust Temperature Cyl. #1	226	893	913	497	ENGINE DOWN @ 12:00			
9 - Exhaust Temperature Cyl. #2	229	976	1005	519				
10 - Exhaust Temperature Cyl. #3	211	954	976	499				
11 - Exhaust Temperature Cyl. #4	210	964	992	528				
12 - Exhaust Temperature Cyl. #5	201	961	985	529				
13 - Exhaust Temperature Cyl. #6	219	893	932	510				
Oil Gallery Pressure, psi	21.0	45.0	37.0	45.8				
Pressure Before Fuel Filter, psi	31.2	59.0	46.3	53.3				
Pressure After Fuel Filter, psi	31.2	59.2	46.8	53.8				
Intake Manifold Pressure, In. Hg.	0	24.1	19.1	3.1				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR	-	73.3	61.2	22.6				
Fuel Time Sec/ ½ lb.		24.56	29.42	79.80				
Barometer Pressure, In. Hg.			29.19					
Dry Bulb Temp., F			82					
Wet Bulb Temp., F/R.H.%		72%	75					
Blow-by, CFH		318						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 10, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	45 1/2	46 1/2	47 1/2	48	48 1/2	49 1/2	50 1/2	51
Time	9:35	10:35	11:35	12:05	12:35	1:35	2:35	3:35
Engine RPM	700	2499	1793	1997	710	2502	1790	1996
Dyno Load (lb) Observed	0.8	188.9	237.0	54.6	2.2	189.0	238.8	54.6
BHP	0.2	157.3	141.6	36.3	0.5	157.6	142.5	36.3
1 - Coolant Out Temperature, F	154	188	181	180	174	183	182	178
2 - Coolant In Temperature, F	152	179	170	175	172	173	170	173
3 - Oil Sump Temperature, F	154	224	212	202	181	220	213	200
4 - Intake Air Temperature, F	84	87	90	92	94	95	98	98
5 - Fuel Temperature, F	89	93	92	95	92	93	92	94
6 - Intake Manifold After Turbo	90	251	223	127	102	259	224	133
7 - Ambient Air Temperature, F	84	90	91	92	93	95	95	95
8 - Exhaust Temperature Cyl. #1	202	888	924	481	224	898	936	478
9 - Exhaust Temperature Cyl. #2	215	972	1016	516	231	981	1026	518
10 - Exhaust Temperature Cyl. #3	211	948	988	489	218	960	999	494
11 - Exhaust Temperature Cyl. #4	212	964	1003	516	219	976	1013	524
12 - Exhaust Temperature Cyl. #5	181	958	997	517	203	969	1004	514
13 - Exhaust Temperature Cyl. #6	200	890	944	498	223	898	951	494
Oil Gallery Pressure, psi	28.0	43.5	31.8	45.8	20.0	45.0	32.0	46.0
Pressure Before Fuel Filter, psi	30.5	59.0	46.5	53.5	31.5	59.2	47.0	53.8
Pressure After Fuel Filter, psi	30.0	59.0	46.5	53.5	31.5	59.2	47.0	53.8
Intake Manifold Pressure, In. Hg.	0	23.8	18.5	3.0	0	23.2	18.5	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	71.2	60.4	21.4	-	71.1	60.7	21.2
Fuel Time Sec/ ½ lb.		25.28	29.78	84.10		25.33	29.67	84.83
Barometer Pressure, In. Hg.			29.18			29.18		
Dry Bulb Temp., F			84			91		
Wet Bulb Temp., F/R.H.%		81%	79		68%	82		
Blow-by, CFH		318				323		
Smoke RDG. % 0-20% scale		2.0	3.8			1.2	4.2	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 10, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	51 1/2	52 1/2	53 1/2	54	54 1/2	55 1/2	56 1/2	57
Time	3:05	4:35	5:35	6:05	6:35	7:35	8:35	9:05
Engine RPM	716	2503	1796	1992	730	2498	1794	1995
Dyno Load (lb) Observed	2.2	187.2	233.8	57.1	2.6	189.0	239.2	55.6
BHP	0.5	156.2	140.0	37.9	0.6	157.4	143.0	37.0
1 - Coolant Out Temperature, F	174	183	181	178	173	182	181	178
2 - Coolant In Temperature, F	171	173	170	172	170	172	170	172
3 - Oil Sump Temperature, F	180	220	212	201	180	220	212	201
4 - Intake Air Temperature, F	99	100	99	98	97	97	95	92
5 - Fuel Temperature, F	92	95	94	95	94	95	93	94
6 - Intake Manifold After Turbo	106	265	223	135	105	262	221	128
7 - Ambient Air Temperature, F	98	100	95	98	97	98	93	91
8 - Exhaust Temperature Cyl. #1	226	905	930	504	233	904	931	485
9 - Exhaust Temperature Cyl. #2	234	990	1019	536	239	989	1020	519
10 - Exhaust Temperature Cyl. #3	220	968	985	517	214	965	991	496
11 - Exhaust Temperature Cyl. #4	217	985	1002	546	216	981	1011	522
12 - Exhaust Temperature Cyl. #5	201	978	995	541	199	973	999	517
13 - Exhaust Temperature Cyl. #6	226	910	942	528	228	904	951	502
Oil Gallery Pressure, psi	20.5	44.8	36.9	45.8	21.1	45.0	37.1	46.0
Pressure Before Fuel Filter, psi	31.8	59.1	46.8	53.6	31.9	59.0	47.0	53.6
Pressure After Fuel Filter, psi	31.8	59.5	47.0	53.8	31.8	59.4	47.0	53.9
Intake Manifold Pressure, In. Hg.	0	23.0	18.0	3.0	0	23.2	18.8	3.0
Intake Air Restriction, In. H_2O	1	6	4	4	1	5	4	4
Fuel Rate LBS/HR	-	70.9	59.6	21.8	-	71.1	60.4	21.6
Fuel Time Sec/ ½ lb.		25.38	30.19	82.71		25.32	29.81	83.19
Barometer Pressure, In. Hg.			29.12			29.09		
Dry Bulb Temp., F			87			88		
Wet Bulb Temp., F/R.H.%		67%	78		64%	78		
Blow-by, CFH		318				318		
Smoke RDG. % 0-20% scale		1.6	3.4			1.5	4.2	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 10, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	57 1/2	58 1/2	59 1/2	60				
Time	9:35	10:35	11:35	12:05				
Engine RPM	716	2495	1796	1985	soak			
Dyno Load (lb) Observed	1.8	192.0	240.4	55.8				
BHP	0.4	159.7	143.9	36.9				
1 - Coolant Out Temperature, F	173	182	181	178				
2 - Coolant In Temperature, F	170	172	170	172				
3 - Oil Sump Temperature, F	181	220	212	201				
4 - Intake Air Temperature, F	90	89	89	89				
5 - Fuel Temperature, F	92	92	91	92				
6 - Intake Manifold After Turbo	99	256	217	214				
7 - Ambient Air Temperature, F	88	88	87	88				
8 - Exhaust Temperature Cyl. #1	227	904	926	484				
9 - Exhaust Temperature Cyl. #2	235	982	1014	518				
10 - Exhaust Temperature Cyl. #3	212	958	985	496				
11 - Exhaust Temperature Cyl. #4	215	972	1002	522				
12 - Exhaust Temperature Cyl. #5	204	965	995	517				
13 - Exhaust Temperature Cyl. #6	224	900	942	499				
Oil Gallery Pressure, psi	21.0	45.0	37.0	45.8				
Pressure Before Fuel Filter, psi	31.5	59.0	46.9	53.7				
Pressure After Fuel Filter, psi	31.6	59.2	47.0	53.8				
Intake Manifold Pressure, In. Hg.	10	24.0	19.0	3.1				
Intake Air Restriction, In. H_2O	1	6	5	4				
Fuel Rate LBS/HR	-	72.0	61.0	21.5				
Fuel Time Sec/ ½ lb.		24.99	29.51	83.55				
Barometer Pressure, In. Hg.			29.10					
Dry Bulb Temp., F			84					
Wet Bulb Temp., F/R.H.%		66%	75					
Blow-by, CFH		328						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 11, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	60 1/2	61 1/2	62 1/2	63	63 1/2	64 1/2	65 1/2	66
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:30
Engine RPM	705	2501	1796	1994	711	2498	1793	1993
Dyno Load (lb) Observed	2.0	190.6	237.4	56.4	3.2	190.6	236.6	54.8
BHP	0.47	158.9	142.1	37.5	0.8	158.7	141.4	36.4
1 - Coolant Out Temperature, F	144	188	183	181	174	183	181	178
2 - Coolant In Temperature, F	142	178	173	175	171	173	170	173
3 - Oil Sump Temperature, F	144	224	214	203	180	220	212	200
4 - Intake Air Temperature, F	83	87	91	91	91	97	96	95
5 - Fuel Temperature, F	85	92	92	94	93	93	91	93
6 - Intake Manifold After Turbo	88	253	215	129	100	262	220	131
7 - Ambient Air Temperature, F	84	89	93	88	92	96	96	95
8 - Exhaust Temperature Cyl. #1	198	893	923	505	223	906	928	477
9 - Exhaust Temperature Cyl. #2	212	975	1009	537	228	987	1017	521
10 - Exhaust Temperature Cyl. #3	208	952	977	508	218	963	983	493
11 - Exhaust Temperature Cyl. #4	209	968	991	542	222	979	1001	522
12 - Exhaust Temperature Cyl. #5	178	961	984	538	197	968	991	506
13 - Exhaust Temperature Cyl. #6	194	892	933	517	217	902	940	490
Oil Gallery Pressure, psi	31.7	43.0	36.2	45.2	20.0	44.9	37.0	46.0
Pressure Before Fuel Filter, psi	31.0	59.0	47.0	53.7	31.2	59.2	47.0	54.0
Pressure After Fuel Filter, psi	31.2	59.0	47.0	53.9	31.2	59.2	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	23.9	18.0	2.5	0	23.8	18.0	2.5
Intake Air Restriction, In. H_2O	0	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	71.5	59.7	21.5	-	72.4	59.7	21.1
Fuel Time Sec/ ½ lb.		25.16	30.14	83.67		24.86	30.13	85.25
Barometer Pressure, In. Hg.			29.10				29.10	
Dry Bulb Temp., F			82				85	
Wet Bulb Temp., F/R.H.%		83%	78			70%	77	
Blow-by, CFH		328				333		
Smoke RDG. % 0-20% scale		1.5	2.5			1.5	4.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 11, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	66 1/2	67 1/2	68 1/2	69	69 1/2	70 1/2	71 1/2	72
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	709	2499	1795	1998	710	2500	1797	1994
Dyno Load (lb) Observed	3.2	189.4	235.0	55.6	3.0	189.6	240.6	55.8
BHP	0.8	157.8	140.6	37.0	0.7	158.0	144.1	37.1
1 - Coolant Out Temperature, F	173	182	181	177	173	187	185	182
2 - Coolant In Temperature, F	171	172	169	172	170	177	174	177
3 - Oil Sump Temperature, F	179	220	212	200	179	223	216	204
4 - Intake Air Temperature, F	97	98	99	98	97	96	93	91
5 - Fuel Temperature, F	92	93	92	94	92	93	92	93
6 - Intake Manifold After Turbo	104	264	223	134	104	261	221	128
7 - Ambient Air Temperature, F	97	97	97	99	95	95	91	89
8 - Exhaust Temperature Cyl. #1	225	904	932	483	225	903	934	482
9 - Exhaust Temperature Cyl. #2	230	990	1019	524	230	986	1024	520
10 - Exhaust Temperature Cyl. #3	218	968	989	503	214	965	998	500
11 - Exhaust Temperature Cyl. #4	220	985	1006	527	219	984	1007	525
12 - Exhaust Temperature Cyl. #5	199	975	994	518	202	974	1002	518
13 - Exhaust Temperature Cyl. #6	221	908	943	501	220	905	946	503
Oil Gallery Pressure, psi	21.0	45.0	36.7	45.8	20.2	43.2	35.2	44.9
Pressure Before Fuel Filter, psi	31.2	59.2	47.0	53.9	31.1	59.2	46.9	53.8
Pressure After Fuel Filter, psi	31.2	59.2	47.2	54.0	31.2	59.6	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	23.5	18.0	3.0	0	23.5	18.8	3.0
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	4
Fuel Rate LBS/HR	-	71.5	59.7	21.2	-	71.3	60.7	21.4
Fuel Time Sec/ ½ lb.		25.18	30.14	84.98		25.23	29.68	84.27
Barometer Pressure, In. Hg.			29.05				29.04	
Dry Bulb Temp., F			87				84	
Wet Bulb Temp., F/R.H.%		65%	77			72%	77	
Blow-by, CFH		323				323		
Smoke RDG. % 0-20% scale		1.5	4.0			1.9	4.0	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 11, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	72 1/2	73 1/2	74 1/2	75				
Time	9:20	10:20	11:20	11:50	12:00			
Engine RPM	733	2504	1796	1995	soak			
Dyno Load (lb) Observed	2.4	192.6	243.1	55.5				
BHP	0.6	160.8	145.5	36.9				
1 - Coolant Out Temperature, F	178	187	181	183				
2 - Coolant In Temperature, F	176	177	169	177				
3 - Oil Sump Temperature, F	183	223	215	204				
4 - Intake Air Temperature, F	89	89	94	85				
5 - Fuel Temperature, F	91	92	92	92				
6 - Intake Manifold After Turbo	98	258	222	123				
7 - Ambient Air Temperature, F	88	88	90	85				
8 - Exhaust Temperature Cyl. #1	231	905	933	479				
9 - Exhaust Temperature Cyl. #2	239	986	1022	518				
10 - Exhaust Temperature Cyl. #3	210	962	996	496				
11 - Exhaust Temperature Cyl. #4	214	977	1005	521				
12 - Exhaust Temperature Cyl. #5	200	970	1000	512				
13 - Exhaust Temperature Cyl. #6	226	907	945	493				
Oil Gallery Pressure, psi	20.1	43.2	35.2	44.9				
Pressure Before Fuel Filter, psi	32.0	59.1	46.9	53.9				
Pressure After Fuel Filter, psi	32.1	59.5	47.0	54.0				
Intake Manifold Pressure, In. Hg.	0	24.1	18.5	3.0				
Intake Air Restriction, In. H_2O	2	7	4	4				
Fuel Rate LBS/HR	-	72.4	60.1	21.5				
Fuel Time Sec/ ½ lb.		24.87	29.97	83.68				
Barometer Pressure, In. Hg.			29.04					
Dry Bulb Temp., F			80					
Wet Bulb Temp., F/R.H.%		84%	76					
Blow-by, CFH		318						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 12, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	75 1/2	76 1/2	77 1/2	78	78 1/2	79 1/2	80 1/2	81
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	700	2505	1799	2002	713	2500	1799	1999
Dyno Load (lb) Observed	2.2	190.0	238.5	56.0	3.0	189.8	237.0	54.0
BHP	0.5	158.7	143.0	37.4	0.7	158.2	142.1	36.0
1 - Coolant Out Temperature, F	140	188	187	185	178	186	185	182
2 - Coolant In Temperature, F	138	178	176	179	176	176	174	177
3 - Oil Sump Temperature, F	141	206	216	205	183	222	215	203
4 - Intake Air Temperature, F	81	88	89	91	92	95	94	94
5 - Fuel Temperature, F	85	92	92	93	91	93	92	94
6 - Intake Manifold After Turbo	86	254	214	128	100	258	219	130
7 - Ambient Air Temperature, F	82	88	87	88	90	92	94	93
8 - Exhaust Temperature Cyl. #1	197	890	917	484	223	902	924	477
9 - Exhaust Temperature Cyl. #2	210	977	1001	525	228	982	1012	522
10 - Exhaust Temperature Cyl. #3	208	952	973	498	218	957	982	492
11 - Exhaust Temperature Cyl. #4	211	971	993	522	222	976	1000	516
12 - Exhaust Temperature Cyl. #5	176	960	988	513	201	963	990	504
13 - Exhaust Temperature Cyl. #6	196	894	938	491	221	901	939	485
Oil Gallery Pressure, psi	34.0	42.8	35.5	44.5	19.9	43.2	35.5	45.0
Pressure Before Fuel Filter, psi	31.8	59.5	46.8	54.0	31.2	59.5	42.0	54.0
Pressure After Fuel Filter, psi	32.0	59.9	47.0	54.2	31.2	59.5	42.0	54.0
Intake Manifold Pressure, In. Hg.	0	24.0	18.3	3.0	0	23.5	18.0	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	71.5	59.7	21.3	-	71.4	59.7	21.0
Fuel Time Sec/ ½ lb.		25.16	30.17	84.55		25.20	30.15	85.61
Barometer Pressure, In. Hg.			29.07				29.07	
Dry Bulb Temp., F			83				84	
Wet Bulb Temp., F/R.H.%		80%	78			69%	76	
Blow-by, CFH		328				338		
Smoke RDG. % 0-20% scale		1.5	3.5					

REMARKS:

Date July 12, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	81 1/2	82 1/2	83 1/2	84	84 1/2	85 1/2	86 1/2	87
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	708	2502	1800	1993	709	2500	1802	2009
Dyno Load (lb) Observed	3.2	190.4	236.0	55.6	3.2	190.2	236.4	55.2
BHP	0.8	158.8	141.6	36.9	0.8	158.5	142.0	37.0
1 - Coolant Out Temperature, F	177	186	184	181	177	186	184	185
2 - Coolant In Temperature, F	175	176	173	176	175	176	173	180
3 - Oil Sump Temperature, F	182	222	215	203	182	222	214	205
4 - Intake Air Temperature, F	95	95	95	97	97	95	92	88
5 - Fuel Temperature, F	92	93	92	93	92	94	91	93
6 - Intake Manifold After Turbo	103	260	220	133	105	261	217	125
7 - Ambient Air Temperature, F	95	93	94	95	95	94	91	82
8 - Exhaust Temperature Cyl. #1	231	903	929	484	223	909	920	484
9 - Exhaust Temperature Cyl. #2	232	985	1015	528	230	989	1008	523
10 - Exhaust Temperature Cyl. #3	218	962	985	501	221	965	980	500
11 - Exhaust Temperature Cyl. #4	222	981	1003	526	225	983	998	523
12 - Exhaust Temperature Cyl. #5	203	967	994	518	202	967	992	515
13 - Exhaust Temperature Cyl. #6	222	907	943	493	222	908	942	492
Oil Gallery Pressure, psi	19.9	43.0	35.9	45.0	20.0	43.1	36.0	44.9
Pressure Before Fuel Filter, psi	31.2	59.5	47.1	54.0	31.1	59.1	47.1	54.4
Pressure After Fuel Filter, psi	31.2	59.8	47.1	54.0	31.2	59.6	47.2	54.6
Intake Manifold Pressure, In. Hg.	0	23.4	18.1	3.0	0	23.2	18.2	1.8
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	3
Fuel Rate LBS/HR	-	71.26	59.56	21.46	-	71.23	59.94	21.47
Fuel Time Sec/ ½ lb.		25.26	30.22	83.87		25.27	30.03	83.83
Barometer Pressure, In. Hg.			29.02				29.03	
Dry Bulb Temp., F			94				89	
Wet Bulb Temp., F/R.H.%		53%	79			56%	76	
Blow-by, CFH		313				329		
Smoke RDG. % 0-20% scale		2.0	3.8			1.8	4.2	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 12, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	87 1/2	88 1/2	89 1/2	90				
Time	9:20	10:20	11:20	11:50	12:00			
Engine RPM	719	2505	1806	1993	soak			
Dyno Load (lb) Observed	3.2	190.4	241.0	56.0				
BHP	0.8	159.0	145.1	37.2				
1 - Coolant Out Temperature, F	181	192	190	187				
2 - Coolant In Temperature, F	178	182	179	182				
3 - Oil Sump Temperature, F	188	226	219	207				
4 - Intake Air Temperature, F	87	87	85	84				
5 - Fuel Temperature, F	92	92	90	92				
6 - Intake Manifold After Turbo	96	253	215	121				
7 - Ambient Air Temperature, F	85	83	85	81	ENGINE DOWN @ 12:00			
8 - Exhaust Temperature Cyl. #1	223	897	925	477				
9 - Exhaust Temperature Cyl. #2	235	978	1012	521				
10 - Exhaust Temperature Cyl. #3	220	953	991	495				
11 - Exhaust Temperature Cyl. #4	223	971	999	520				
12 - Exhaust Temperature Cyl. #5	205	956	992	511				
13 - Exhaust Temperature Cyl. #6	233	896	941	488				
Oil Gallery Pressure, psi	18.7	41.4	34.1	43.5				
Pressure Before Fuel Filter, psi	31.4	59.4	47.1	53.9				
Pressure After Fuel Filter, psi	31.5	59.8	47.2	54.0				
Intake Manifold Pressure, In. Hg.	0	23.8	19.0	3.1				
Intake Air Restriction, In. H_2O	1	6	4	4				
Fuel Rate LBS/HR	-	71.3	59.6	21.1				
Fuel Time Sec/ ½ lb.		25.25	30.21	85.19				
Barometer Pressure, In. Hg.			29.02					
Dry Bulb Temp., F			85					
Wet Bulb Temp., F/R.H.%		77%	79					
Blow-by, CFH		322						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 13, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	90 1/2	91 1/2	92 1/2	93	93 1/2	94 1/2	95 1/2	96
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	702	2500	1803	1996	712	2498	1798	1998
Dyno Load (lb) Observed	2.0	189.6	239.4	54.0	2.4	189.8	236.0	55.0
BHP	0.5	158.0	143.9	35.9	0.6	158.0	141.4	36.6
1 - Coolant Out Temperature, F	146	189	185	182	176	185	184	183
2 - Coolant In Temperature, F	139	180	174	177	173	175	172	178
3 - Oil Sump Temperature, F	142	225	215	203	183	221	214	203
4 - Intake Air Temperature, F	83	89	92	93	93	96	100	99
5 - Fuel Temperature, F	86	94	93	94	93	95	94	95
6 - Intake Manifold After Turbo	88	254	219	129	101	259	223	134
7 - Ambient Air Temperature, F	83	89	92	91	91	96	99	97
8 - Exhaust Temperature Cyl. #1	197	897	914	476	221	899	933	481
9 - Exhaust Temperature Cyl. #2	209	979	1014	514	230	985	1017	523
10 - Exhaust Temperature Cyl. #3	204	955	990	492	220	963	989	498
11 - Exhaust Temperature Cyl. #4	210	975	1005	518	224	980	1011	525
12 - Exhaust Temperature Cyl. #5	177	961	999	507	200	968	1000	513
13 - Exhaust Temperature Cyl. #6	195	896	948	482	220	903	949	495
Oil Gallery Pressure, psi	32.8	42.0	35.0	44.9	20.0	43.5	35.9	44.9
Pressure Before Fuel Filter, psi	31.1	59.2	41.9	53.9	31.0	59.2	47.0	53.9
Pressure After Fuel Filter, psi	31.1	59.2	41.9	54.0	31.1	59.4	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	23.9	18.9	3.0	0	23.2	18.0	3.0
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	4
Fuel Rate LBS/HR	-	71.3	60.8	20.9	-	71.1	59.7	22.0
Fuel Time Sec/ ½ lb.		25.23	29.67	85.97		25.31	30.15	85.88
Barometer Pressure, In. Hg.			29.09				29.08	
Dry Bulb Temp., F			92				98	
Wet Bulb Temp., F/R.H.%		59%	80			56%	84	
Blow-by, CFH		328				308		
Smoke RDG. % 0-20% scale		3.5	2.6			3.6	2.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 13, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	96 1/2	97 1/2	98 1/2	99	99 1/2	100 1/2	101 1/2	102
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	715	2502	1802	1999	724	2500	1809	1996
Dyno Load (lb) Observed	2.6	188.6	234.6	55.6	2.2	189.4	235.4	54.8
BHP	0.6	157.3	140.9	37.0	0.5	157.8	141.9	36.5
1 - Coolant Out Temperature, F	180	190	188	183	181	190	188	185
2 - Coolant In Temperature, F	177	180	177	178	178	180	177	180
3 - Oil Sump Temperature, F	184	225	218	204	188	225	217	205
4 - Intake Air Temperature, F	99	101	100	100	97	98	95	94
5 - Fuel Temperature, F	95	96	94	94	95	95	93	94
6 - Intake Manifold After Turbo	106	266	225	132	105	264	221	130
7 - Ambient Air Temperature, F	98	99	100	96	96	97	98	93
8 - Exhaust Temperature Cyl. #1	225	916	938	480	229	915	930	481
9 - Exhaust Temperature Cyl. #2	232	996	1024	520	240	995	1020	522
10 - Exhaust Temperature Cyl. #3	222	973	997	496	218	972	993	499
11 - Exhaust Temperature Cyl. #4	226	992	1014	524	224	991	1008	521
12 - Exhaust Temperature Cyl. #5	201	977	1006	513	205	977	1000	506
13 - Exhaust Temperature Cyl. #6	223	916	957	494	237	919	950	493
Oil Gallery Pressure, psi	19.0	41.9	34.4	44.9	19.0	41.9	34.5	44.1
Pressure Before Fuel Filter, psi	31.2	59.2	47.1	53.9	31.5	59.3	47.1	54.0
Pressure After Fuel Filter, psi	31.2	59.4	42.7	54.0	31.5	59.7	47.2	54.2
Intake Manifold Pressure, In. Hg.	0	23.0	18.0	3.0	0	23.0	18.0	1.5
Intake Air Restriction, In. H_2O	1	6	.4	4	1	6	4	3
Fuel Rate LBS/HR	-	71.9	60.0	21.0	-	71.1	60.0	20.9
Fuel Time Sec/ ½ lb.		25.37	29.99	85.92		25.31	30.01	86.23
Barometer Pressure, In. Hg.			29.04				29.04	
Dry Bulb Temp., F			98				90	
Wet Bulb Temp., F/R.H.%		44%	79			54%	76	
Blow-by, CFH		313				303		
Smoke RDG. % 0-20% scale		3.0	4.4			2.2	4.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 13, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	102 1/2	103 1/2	104 1/2	105				
Time	9:20	10:20	11:20	11:50				
Engine RPM	715	2505	1817	1994				
Dyno Load (lb) Observed	2.6	189.0	239.2	55.4				
BHP	0.6	157.8	144.9	36.8				
1 - Coolant Out Temperature, F	181	190	188	185				
2 - Coolant In Temperature, F	179	180	177	180				
3 - Oil Sump Temperature, F	185	225	218	206				
4 - Intake Air Temperature, F	91	91	92	89				
5 - Fuel Temperature, F	93	95	94	95				
6 - Intake Manifold After Turbo	99	256	221	126				
7 - Ambient Air Temperature, F	88	92	89	87	ENGINE DOWN @ 12:00			
8 - Exhaust Temperature Cyl. #1	222	904	935	480				
9 - Exhaust Temperature Cyl. #2	231	986	1024	522				
10 - Exhaust Temperature Cyl. #3	217	962	997	502				
11 - Exhaust Temperature Cyl. #4	222	980	1007	526				
12 - Exhaust Temperature Cyl. #5	202	968	1001	513				
13 - Exhaust Temperature Cyl. #6	223	910	948	494				
Oil Gallery Pressure, psi	19.0	42.0	34.6	44.0				
Pressure Before Fuel Filter, psi	31.2	59.2	47.1	53.7				
Pressure After Fuel Filter, psi	31.3	59.6	47.2	53.9				
Intake Manifold Pressure, In. Hg.	0	23.1	18.8	1.9				
Intake Air Restriction, In. H_2O	2	6	4	3				
Fuel Rate LBS/HR	-	71.1	59.8	21.1				
Fuel Time Sec/ ½ lb.		25.31	30.11	85.45				
Barometer Pressure, In. Hg.			29.02					
Dry Bulb Temp., F			83					
Wet Bulb Temp., F/R.H.%		84%	79					
Blow-by, CFH		313						
Smoke RDG. % 0-20% scale		night						

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 14, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	105 1/2	106 1/2	107 1/2	108	108 1/2	109 1/2	110 1/2	111
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	700	2499	1804	2000	717	2500	1803	2000
Dyno Load (lb) Observed	1.6	189.8	233.6	55.0	2.8	188.4	232.4	56.8
BHP	0.4	158.1	140.5	36.7	0.7	157.0	139.7	37.9
1 - Coolant Out Temperature, F	131	193	188	183	179	187	186	183
2 - Coolant In Temperature, F	130	184	177	176	176	178	174	177
3 - Oil Sump Temperature, F	133	227	217	204	184	223	215	204
4 - Intake Air Temperature, F	83	90	94	98	94	99	102	99
5 - Fuel Temperature, F	87	95	94	97	94	96	95	97
6 - Intake Manifold After Turbo	88	255	219	134	102	263	226	136
7 - Ambient Air Temperature, F	83	90	92	99	93	99	100	99
8 - Exhaust Temperature Cyl. #1	197	904	927	488	222	914	938	489
9 - Exhaust Temperature Cyl. #2	210	988	1016	531	232	996	1027	531
10 - Exhaust Temperature Cyl. #3	201	965	986	512	217	975	999	511
11 - Exhaust Temperature Cyl. #4	208	982	1006	534	222	993	1017	535
12 - Exhaust Temperature Cyl. #5	173	969	999	518	202	978	1009	519
13 - Exhaust Temperature Cyl. #6	192	905	949	506	221	918	957	505
Oil Gallery Pressure, psi	36.1	41.1	35.0	44.7	19.5	43.0	35.0	44.8
Pressure Before Fuel Filter, psi	30.8	59.1	47.0	54.0	31.0	59.1	47.0	53.9
Pressure After Fuel Filter, psi	30.8	59.1	47.0	54.0	31.0	59.1	47.0	53.9
Intake Manifold Pressure, In. Hg.	0	23.1	18.0	2.8	0	23.0	17.9	2.8
Intake Air Restriction, In. H_2O	1	6	3	4	1	6	4	4
Fuel Rate LBS/HR	-	71.4	59.7	21.3	-	71.5	59.6	21.3
Fuel Time Sec/ ½ lb.		25.21	30.15	84.68		25.19	30.21	84.68
Barometer Pressure, In. Hg.			29.07				29.10	
Dry Bulb Temp., F			88				99	
Wet Bulb Temp., F/R.H.%		67%	79			44%	80	
Blow-by, CFH		328				318		
Smoke RDG. % 0-20% scale		2.0	4.0			1.9	4.0	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 7-14-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	111 1/2	112 1/2	113 1/2	114	114 1/2	115 1/2	116 1/2	117
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	724	2499	1795	2000	727	2505	1793	1998
Dyno Load (lb) Observed	2.2	189.4	237.2	56.2	2.8	191.3	238.4	56.0
BHP	0.5	157.8	141.9	37.5	0.7	159.7	142.5	37.3
1 - Coolant Out Temperature, F	178	187	186	185	178	186	185	182
2 - Coolant In Temperature, F	175	177	174	176	175	177	174	177
3 - Oil Sump Temperature, F	183	223	215	204	184	222	215	203
4 - Intake Air Temperature, F	100	100	102	99	99	99	95	94
5 - Fuel Temperature, F	96	96	94	97	95	96	94	95
6 - Intake Manifold After Turbo	108	265	230	135	107	267	224	130
7 - Ambient Air Temperature, F	98	97	102	99	98	98	93	92
8 - Exhaust Temperature Cyl. #1	229	919	957	488	225	927	943	478
9 - Exhaust Temperature Cyl. #2	239	1003	1047	531	241	1007	1038	517
10 - Exhaust Temperature Cyl. #3	213	980	1018	512	213	985	1010	508
11 - Exhaust Temperature Cyl. #4	223	997	1032	535	223	1005	1022	534
12 - Exhaust Temperature Cyl. #5	200	983	1021	518	205	988	1015	524
13 - Exhaust Temperature Cyl. #6	231	922	973	506	233	932	960	510
Oil Gallery Pressure, psi	20.0	42.9	35.0	44.8	19.8	42.8	35.1	44.9
Pressure Before Fuel Filter, psi	31.1	69.1	47.0	54.0	31.8	59.1	46.8	53.8
Pressure After Fuel Filter, psi	31.1	69.1	47.0	54.0	31.8	59.4	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	22.8	18.0	2.8	0	23.2	18.1	2.7
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	4
Fuel Rate LBS/HR	-	71.2	60.8	21.3	-	72.5	60.9	21.5
Fuel Time Sec/ ½ lb.		25.27	29.59	84.56		24.82	29.58	83.66
Barometer Pressure, In. Hg.			29.00				29.00	
Dry Bulb Temp., F			90				90	
Wet Bulb Temp., F/R.H.%		54%	76			56%	77	
Blow-by, CFH		308				318		
Smoke RDG. % 0-20% scale		2.0	5.0			2.0	5.0	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 14, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	117 1/2	118 1/2	119 1/2	120				
Time	9:20	10:20	11:20	11:50				
Engine RPM	717	2502	1806	1993				
Dyno Load (lb) Observed	2.4	191.6	239.6	54.6				
BHP	0.6	159.8	144.2	36.3				
1 - Coolant Out Temperature, F	177	186	185	182				
2 - Coolant In Temperature, F	175	177	175	177				
3 - Oil Sump Temperature, F	183	222	215	203				
4 - Intake Air Temperature, F	92	92	92	89				
5 - Fuel Temperature, F	94	96	94	95				
6 - Intake Manifold After Turbo	100	260	221	126				
7 - Ambient Air Temperature, F	91	93	93	87				
8 - Exhaust Temperature Cyl. #1	221	913	938	476				
9 - Exhaust Temperature Cyl. #2	230	999	1031	516				
10 - Exhaust Temperature Cyl. #3	217	976	1002	505				
11 - Exhaust Temperature Cyl. #4	223	993	1011	530				
12 - Exhaust Temperature Cyl. #5	203	980	1007	514				
13 - Exhaust Temperature Cyl. #6	222	923	956	503				
Oil Gallery Pressure, psi	19.8	43.0	35.5	45.0				
Pressure Before Fuel Filter, psi	31.2	59.0	47.0	53.5				
Pressure After Fuel Filter, psi	31.5	59.3	47.1	54.0				
Intake Manifold Pressure, In. Hg.	0	23.8	18.8	2.8				
Intake Air Restriction, In. H_2O	1	7	4	3				
Fuel Rate LBS/HR	-	72.7	61.5	21.9				
Fuel Time Sec/ ½ lb.		24.77	29.26	82.18				
Barometer Pressure, In. Hg.			29.00					
Dry Bulb Temp., F			87					
Wet Bulb Temp., F/R.H.%		67%	78					
Blow-by, CFH		318						
Smoke RDG. % 0-20% scale		night	time					

REMARKS:

Date July 15, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	120 1/2	121 1/2	122 1/2	123	123 1/2	124 1/2	125 1/2	126
Time	9:20	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	694	2504	1802	2000	715	2504	1812	1999
Dyno Load (lb) Observed	1.2	192.8	240.2	54.0	2.8	190.2	238.2	52.0
BHP	0.3	160.9	144.3	36.0	0.7	158.8	143.9	34.6
1 - Coolant Out Temperature, F	129	185	181	177	172	180	178	175
2 - Coolant In Temperature, F	127	175	170	172	169	171	167	170
3 - Oil Sump Temperature, F	131	221	211	199	177	217	210	197
4 - Intake Air Temperature, F	83	90	93	94	94	98	100	99
5 - Fuel Temperature, F	87	95	93	95	93	95	94	95
6 - Intake Manifold After Turbo	87	258	221	130	101	265	229	134
7 - Ambient Air Temperature, F	82	91	95	94	92	97	97	98
8 - Exhaust Temperature Cyl. #1	191	911	241	478	219	920	948	474
9 - Exhaust Temperature Cyl. #2	208	996	1026	515	228	1002	1040	514
10 - Exhaust Temperature Cyl. #3	200	972	1003	504	212	980	1012	503
11 - Exhaust Temperature Cyl. #4	209	990	1017	526	219	998	1021	523
12 - Exhaust Temperature Cyl. #5	171	976	1008	509	198	983	1015	503
13 - Exhaust Temperature Cyl. #6	191	915	960	499	219	929	964	489
Oil Gallery Pressure, psi	37.8	43.5	36.5	45.5	20.5	44.5	37.2	46.0
Pressure Before Fuel Filter, psi	31.0	58.5	46.5	53.5	31.0	59.0	47.0	53.5
Pressure After Fuel Filter, psi	31.0	58.5	47.0	53.5	31.0	59.0	47.0	53.9
Intake Manifold Pressure, In. Hg.	0	23.5	18.5	2.9	0	23.2	18.5	2.9
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	4
Fuel Rate LBS/HR	-	72.6	62.1	21.1	2.7	72.7	61.2	20.8
Fuel Time Sec/ ½ lb.		24.79	29	85.16	667.38	24.76	29.41	86.47
Barometer Pressure, In. Hg.			29.02				29.02	
Dry Bulb Temp., F			87				93	
Wet Bulb Temp., F/R.H.%		67%	78			55%	79	
Blow-by, CFH		333	298			313	298	
Smoke RDG. % 0-20% scale		1	4			1.9	5.2	

REMARKS: Down at 9:35: Ran out of fuel, started at 9:45.

Date 7-15-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	126 1/2	127 1/2	128 1/2	129	129 1/2	130 1/2	131 1/2	132
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	709	2503	1797	1993	724	2503	1802	1993
Dyno Load (lb) Observed	2.8	190.6	238.4	53.6	2.8	191.6	237.8	55.0
BHP	0.7	159.0	142.8	35.6	0.7	159.9	142.8	36.5
1 - Coolant Out Temperature, F	172	180	178	175	170	179	178	175
2 - Coolant In Temperature, F	169	171	167	170	167	169	167	169
3 - Oil Sump Temperature, F	177	218	209	197	177	217	209	198
4 - Intake Air Temperature, F	93	101	100	99	98	97	96	94
5 - Fuel Temperature, F	93	96	94	95	94	94	94	95
6 - Intake Manifold After Turbo	100	270	228	133	106	265	225	130
7 - Ambient Air Temperature, F	94	102	98	97	96	98	96	93
8 - Exhaust Temperature Cyl. #1	222	925	945	471	223	919	941	477
9 - Exhaust Temperature Cyl. #2	230	1009	1038	515	238	1003	1035	517
10 - Exhaust Temperature Cyl. #3	214	987	1012	503	208	982	1009	505
11 - Exhaust Temperature Cyl. #4	220	1004	1025	526	218	999	1019	529
12 - Exhaust Temperature Cyl. #5	200	990	1019	507	197	983	1009	510
13 - Exhaust Temperature Cyl. #6	221	933	971	492	228	926	961	495
Oil Gallery Pressure, psi	21.0	44.5	37.0	46.0	21.0	44.8	37.2	46.0
Pressure Before Fuel Filter, psi	31.2	59.0	47.0	53.8	31.5	59.2	47.0	53.8
Pressure After Fuel Filter, psi	31.0	59.3	47.0	53.8	31.5	59.5	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	23.0	18.2	2.5	0	23.2	18.3	2.8
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	72.2	60.9	21.0	-	72.3	61.2	21.1
Fuel Time Sec/ ½ lb.		24.92	29.56	85.87		24.89	29.41	85.40
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		323	292			318	292	
Smoke RDG. % 0-20% scale		1.5	5.3			1.8	5.0	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 15, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	132 1/2	133 1/2	134 1/2	135				
Time	9:30	10:30	11:30	12:00				
Engine RPM	714	2503	1809	1993				
Dyno Load (lb) Observed	2.6	192.3	240.6	56.4				
BHP	0.6	160.4	145.1	37.5				
1 - Coolant Out Temperature, F	171	179	178	175				
2 - Coolant In Temperature, F	168	170	167	170				
3 - Oil Sump Temperature, F	176	217	209	198				
4 - Intake Air Temperature, F	92	90	89	87				
5 - Fuel Temperature, F	94	94	92	94				
6 - Intake Manifold After Turbo	100	258	219	124				
7 - Ambient Air Temperature, F	92	91	88	88				
8 - Exhaust Temperature Cyl. #1	215	910	933	476				
9 - Exhaust Temperature Cyl. #2	226	992	1020	515				
10 - Exhaust Temperature Cyl. #3	210	973	997	505				
11 - Exhaust Temperature Cyl. #4	219	987	1006	531				
12 - Exhaust Temperature Cyl. #5	197	973	997	514				
13 - Exhaust Temperature Cyl. #6	217	916	947	499				
Oil Gallery Pressure, psi	21.0	45.0	37.2	45.9				
Pressure Before Fuel Filter, psi	31.2	59.2	47.1	53.8				
Pressure After Fuel Filter, psi	31.2	59.5	47.3	54.0				
Intake Manifold Pressure, In. Hg.	0	23.5	18.8	2.7				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR	-	72.4	61.1	21.7				
Fuel Time Sec/ ½ lb.		24.86	29.48	82.81				
Barometer Pressure, In. Hg.		28.98						
Dry Bulb Temp., F		97						
Wet Bulb Temp., F/R.H.%	54%	82						
Blow-by, CFH		323	292					
Smoke RDG. % 0-20% scale		night	time					

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 16, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	135 1/2	136 1/2	137 1/2	138	138 1/2	139 1/2	140 1/2	141
Time	9:20	10:42	1:20	1:50	2:20	3:20	4:20	4:50
Engine RPM	693	2516	1802	1996	720	2508	1808	2000
Dyno Load (lb) Observed	1.2	190.8	239.2	53.6	2.6	189.4	236.2	55.2
BHP	0.3	160.0	143.7	35.7	0.6	158.3	142.3	36.8
1 - Coolant Out Temperature, F	127	186	190	184	177	189	178	175
2 - Coolant In Temperature, F	125	177	180	179	174	179	167	170
3 - Oil Sump Temperature, F	129	222	218	204	182	224	209	197
4 - Intake Air Temperature, F	82	90	96	97	98	100	101	99
5 - Fuel Temperature, F	87	90	88	93	93	95	93	94
6 - Intake Manifold After Turbo	86	257	225	132	105	268	229	135
7 - Ambient Air Temperature, F	82	90	94	97	97	99	101	98
8 - Exhaust Temperature Cyl. #1	195	910	947	475	219	923	947	479
9 - Exhaust Temperature Cyl. #2	208	991	1031	519	233	1005	1035	525
10 - Exhaust Temperature Cyl. #3	200	971	1012	502	217	987	1011	512
11 - Exhaust Temperature Cyl. #4	205	986	1029	526	225	1002	1024	540
12 - Exhaust Temperature Cyl. #5	172	972	1017	502	200	986	1011	520
13 - Exhaust Temperature Cyl. #6	192	911	966	483	227	931	963	495
Oil Gallery Pressure, psi	38.0	42.0	34.0	44.0	20.0	42.0	37.0	45.8
Pressure Before Fuel Filter, psi	30.5	59.9	47.0	54.0	31.5	59.5	47.0	54.0
Pressure After Fuel Filter, psi	31.0	60.0	47.0	54.0	31.5	59.5	47.0	54.1
Intake Manifold Pressure, In. Hg.	0	23.9	18.3	3.0	0	23.0	18.2	4.0
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	3
Fuel Rate LBS/HR	-	71.3	60.9	21.7	-	69.3	61.3	21.4
Fuel Time Sec/ ½ lb.		25.26	29.56	82.94		25.98	29.34	84.30
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		308	292			313	292	
Smoke RDG. % 0-20% scale		1.9	4.2			1.8	5.0	

REMARKS:

Date July 16, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	141 1/2	142 1/2	143 1/2	144	144 1/2	145 1/2	146 1/2	147
Time	5:20	6:20	7:20	7:50	8:20	9:20	10:20	10:50
Engine RPM	712	2503	1807	1998	725	2513	1817	2001
Dyno Load (lb) Observed	2.6	190.2	238.0	55.8	2.6	188.6	239.6	55.2
BHP	0.6	158.7	143.4	37.2	0.6	158.0	145.1	36.8
1 - Coolant Out Temperature, F	172	181	179	179	174	186	185	182
2 - Coolant In Temperature, F	169	171	168	173	171	176	174	177
3 - Oil Sump Temperature, F	177	217	210	200	180	222	214	202
4 - Intake Air Temperature, F	99	100	98	95	95	94	92	89
5 - Fuel Temperature, F	93	94	94	95	94	95	94	95
6 - Intake Manifold After Turbo	106	266	226	132	103	261	221	126
7 - Ambient Air Temperature, F	99	98	95	96	94	95	91	89
8 - Exhaust Temperature Cyl. #1	217	916	942	478	219	911	940	474
9 - Exhaust Temperature Cyl. #2	229	1001	1033	527	232	994	1027	521
10 - Exhaust Temperature Cyl. #3	216	984	1007	515	216	976	1000	510
11 - Exhaust Temperature Cyl. #4	226	998	1021	542	230	990	1013	535
12 - Exhaust Temperature Cyl. #5	198	982	1011	521	196	975	1002	515
13 - Exhaust Temperature Cyl. #6	217	925	960	495	224	919	954	491
Oil Gallery Pressure, psi	20.1	44.1	36.5	45.2	20.0	42.8	35.2	44.8
Pressure Before Fuel Filter, psi	31.0	59.3	47.0	54.0	31.3	59.5	47.0	53.9
Pressure After Fuel Filter, psi	31.1	59.7	47.2	54.0	31.6	59.9	47.2	54.2
Intake Manifold Pressure, In. Hg.	0	23.0	18.1	2.8	0	23.1	18.6	2.6
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	3
Fuel Rate LBS/HR	-	70.2	60.9	22.9	-	71.8	61.2	21.6
Fuel Time Sec/ ½ lb.		25.64	29.57	79.07		25.08	29.42	83.27
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		318	298			318	298	
Smoke RDG. % 0-20% scale		2.0	4.3					

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 16, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	147 1/2	148 1/2	149 1/2	150				
Time	11:20	12:20	1:20	1:50	2:00			
Engine RPM	717	2509	1810	1995	15			
Dyno Load (lb) Observed	2.4	189.4	238.3	58.5				
BHP	0.6	158.4	143.8	38.9				
1 - Coolant Out Temperature, F	178	186	185	182				
2 - Coolant In Temperature, F	175	177	175	177				
3 - Oil Sump Temperature, F	181	221	214	203				
4 - Intake Air Temperature, F	88	88	89	86				
5 - Fuel Temperature, F	93	94	94	95				
6 - Intake Manifold After Turbo	97	254	216	124				
7 - Ambient Air Temperature, F	86	88	88	84				
8 - Exhaust Temperature Cyl. #1	213	902	927	480				
9 - Exhaust Temperature Cyl. #2	227	985	1014	526				
10 - Exhaust Temperature Cyl. #3	213	964	989	515				
11 - Exhaust Temperature Cyl. #4	223	979	1002	546				
12 - Exhaust Temperature Cyl. #5	197	967	993	529				
13 - Exhaust Temperature Cyl. #6	220	908	946	506				
Oil Gallery Pressure, psi	19.7	42.5	35.5	44.5				
Pressure Before Fuel Filter, psi	31.2	59.2	47.0	53.5				
Pressure After Fuel Filter, psi	31.5	59.8	47.1	53.8				
Intake Manifold Pressure, In. Hg.	0	23.3	18.8	3.0				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR	-	71.8	60.8	22.2				
Fuel Time Sec/ ½ lb.		25.12	29.63	80.91				
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		323	298					
Smoke RDG. % 0-20% scale								

ENGINE DOWN @ 12:00 - soak

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 17, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	150 1/2	151 1/2	152 1/2	153	153 1/2	154 1/2	155 1/2	156
Time	9:20	10:20	11:20	11:50	12:20	1 :20	2:20	3:50
Engine RPM	702	2499	1804	2002	714	2503	1805	2002
Dyno Load (lb) Observed	1.2	190.0	238.0	55.8	2.6	189.8	238.0	54.8
BHP	0.3	158.3	143.1	37.2	0.6	158.4	143.2	36.6
1 - Coolant Out Temperature, F	138	188	183	180	175	185	186	178
2 - Coolant In Temperature, F	136	179	172	175	172	174	170	173
3 - Oil Sump Temperature, F	139	223	212	201	181	219	211	200
4 - Intake Air Temperature, F	85	91	95	94	95	97	103	102
5 - Fuel Temperature, F	89	95	94	97	95	96	95	96
6 - Intake Manifold After Turbo	90	257	222	131	103	263	230	137
7 - Ambient Air Temperature, F	84	90	96	93	95	97	99	101
8 - Exhaust Temperature Cyl. #1	193	914	937	480	216	916	951	471
9 - Exhaust Temperature Cyl. #2	211	995	1022	530	230	999	1035	523
10 - Exhaust Temperature Cyl. #3	203	971	998	520	218	977	1011	512
11 - Exhaust Temperature Cyl. #4	213	984	1015	547	226	990	1027	536
12 - Exhaust Temperature Cyl. #5	174	971	1005	531	197	978	1014	510
13 - Exhaust Temperature Cyl. #6	193	917	954	509	221	923	970	490
Oil Gallery Pressure, psi	32.8	42.0	35.5	45.0	20.0	43.5	35.8	45.0
Pressure Before Fuel Filter, psi	30.8	59.0	46.9	54.0	31.2	59.2	47.1	54.0
Pressure After Fuel Filter, psi	31.0	59.0	46.9	54.0	31.2	59.2	47.1	54.0
Intake Manifold Pressure, In. Hg.	0	23.5	18.8	2.0	0	23.0	18.3	3.0
Intake Air Restriction, In. H_2O	0	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	71.7	60.7	21.4	-	71.8	61.0	21.2
Fuel Time Sec/ ½ lb.		25.09	29.64	84.03		25.07	29.49	85.10
Barometer Pressure, In. Hg.			29.02				29.02	
Dry Bulb Temp., F			85				92	
Wet Bulb Temp., F/R.H.%		70%	77			59%	80	
Blow-by, CFH		323				313		
Smoke RDG. % 0-20% scale		2.0	4.0			1.5	4.0	1.0

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 17, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	156 1/2	157 1/2	158 1/2	159	159 1/2	160 1/2	161 1/2	162
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	723	2496	1796	2003	726	2500	1804	2001
Dyno Load (lb) Observed	3.0	193.4	238.2	52.4	2.6	193.0	240.2	51.8
BHP	0.7	160.9	142.6	35.0	0.6	160.8	144.4	34.6
1 - Coolant Out Temperature, F	174	184	185	181	177	187	185	182
2 - Coolant In Temperature, F	171	173	173	176	173	177	174	177
3 - Oil Sump Temperature, F	179	219	214	202	184	222	214	202
4 - Intake Air Temperature, F	101	102	104	100	101	100	97	97
5 - Fuel Temperature, F	95	95	95	97	96	96	95	96
6 - Intake Manifold After Turbo	108	271	232	136	109	269	226	132
7 - Ambient Air Temperature, F	99	101	103	101	98	101	95	95
8 - Exhaust Temperature Cyl. #1	217	935	954	466	223	930	941	463
9 - Exhaust Temperature Cyl. #2	235	1016	1042	521	243	1010	1034	518
10 - Exhaust Temperature Cyl. #3	213	989	1017	509	215	988	1007	502
11 - Exhaust Temperature Cyl. #4	225	1006	1033	530	228	1001	1019	526
12 - Exhaust Temperature Cyl. #5	200	993	1021	504	204	991	1010	499
13 - Exhaust Temperature Cyl. #6	227	939	975	488	232	936	966	484
Oil Gallery Pressure, psi	20.0	43.2	35.0	44.5	19.2	42.0	34.8	44.5
Pressure Before Fuel Filter, psi	31.3	59.0	46.9	54.0	31.5	59.0	46.9	54.0
Pressure After Fuel Filter, psi	31.3	59.0	47.0	54.1	31.5	59.3	47.0	54.1
Intake Manifold Pressure, In. Hg.	0	23.5	18.2	2.7	0	23.5	18.5	2.8
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR	-	72.6	61.4	20.9	-	72.8	61.7	20.9
Fuel Time Sec/ ½ lb.		24.79	29.34	86.06		24.74	29.19	86.11
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		323				323	298	
Smoke RDG. % 0-20% scale		1.5	4.3	2.8		1.5	4.0	2.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 17, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	162 1/2	163 1/2	164 1/2	165				
Time	9:20	10:20	11:20	11:50				
Engine RPM	725	2498	1805	2000				
Dyno Load (lb) Observed	2.4	193.8	241.2	52.6				
BHP	0.6	161.4	145.1	35.1				
1 - Coolant Out Temperature, F	178	187	186	183				
2 - Coolant In Temperature, F	175	177	175	178				
3 - Oil Sump Temperature, F	182	221	214	203				
4 - Intake Air Temperature, F	95	94	93	90				
5 - Fuel Temperature, F	96	96	94	96				
6 - Intake Manifold After Turbo	104	262	222	126				
7 - Ambient Air Temperature, F	95	96	92	88				
8 - Exhaust Temperature Cyl. #1	216	920	938	459				
9 - Exhaust Temperature Cyl. #2	235	1000	1027	513				
10 - Exhaust Temperature Cyl. #3	214	976	998	497				
11 - Exhaust Temperature Cyl. #4	226	989	1011	520				
12 - Exhaust Temperature Cyl. #5	199	980	1002	496				
13 - Exhaust Temperature Cyl. #6	226	925	958	476				
Oil Gallery Pressure, psi	19.5	42.1	34.8	44.3				
Pressure Before Fuel Filter, psi	31.5	59.0	46.9	54.0				
Pressure After Fuel Filter, psi	31.5	59.1	47.0	54.2				
Intake Manifold Pressure, In. Hg.	0	24.0	19.0	2.8				
Intake Air Restriction, In. H_2O	1	6	4	4				
Fuel Rate LBS/HR	-	72.7	61.4	21.1				
Fuel Time Sec/ ½ lb.		24.76	29.34	85.49				
Barometer Pressure, In. Hg.		28.96						
Dry Bulb Temp., F		85						
Wet Bulb Temp., F/R.H.%	70%	77						
Blow-by, CFH		323	303					
Smoke RDG. % 0-20% scale		night	time					

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 18, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	165 1/2	166 1/2	167 1/2	168	168 1/2	169 1/2	170 1/2	171
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	704	2500	1802	2000	718	2499	1800	2000
Dyno Load (lb) Observed	1.2	193.4	240.0	55.6	2.2	192.4	238.2	54.8
BHP	0.3	161.2	144.2	37.1	0.5	160.3	142.9	36.5
1 - Coolant Out Temperature, F	137	185	181	178	172	186	183	180
2 - Coolant In Temperature, F	135	175	171	173	169	176	172	175
3 - Oil Sump Temperature, F	138	220	211	200	179	217	212	201
4 - Intake Air Temperature, F	87	94	96	94	97	98	101	99
5 - Fuel Temperature, F	90	95	94	96	95	96	95	97
6 - Intake Manifold After Turbo	92	262	223	131	104	265	229	135
7 - Ambient Air Temperature, F	87	92	94	94	95	96	101	100
8 - Exhaust Temperature Cyl. #1	186	921	939	472	213	922	949	471
9 - Exhaust Temperature Cyl. #2	209	1000	1027	521	230	1005	1036	524
10 - Exhaust Temperature Cyl. #3	203	976	999	510	217	976	1011	508
11 - Exhaust Temperature Cyl. #4	218	988	1011	536	227	990	1021	531
12 - Exhaust Temperature Cyl. #5	176	976	1005	520	198	981	1015	507
13 - Exhaust Temperature Cyl. #6	192	921	959	503	222	927	970	491
Oil Gallery Pressure, psi	33.5	42.8	36.0	45.0	20.0	43.5	35.5	35.0
Pressure Before Fuel Filter, psi	80.5	58.8	46.8	53.3	31.0	58.9	46.8	53.5
Pressure After Fuel Filter, psi	30.5	58.8	46.8	53.3	31.0	58.9	46.8	53.5
Intake Manifold Pressure, In. Hg.	0	24.0	18.8	2.5	0	24.0	18.5	2.5
Intake Air Restriction, In. H_2O	1	1	4	3	1	6	4	3
Fuel Rate LBS/HR	-	72.4	60.5	21.4	-	72.0	60.6	21.1
Fuel Time Sec/ ½ lb.		24.85	29.73	84.04		24.99	29.71	85.50
Barometer Pressure, In. Hg.			29.00				29.00	
Dry Bulb Temp., F			85				89	
Wet Bulb Temp., F/R.H.%		80%	80			75%	82	
Blow-by, CFH		318				318		
Smoke RDG. % 0-20% scale		1.0	4.0	2.5		1.5	4.5	1.0

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 18, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	171 1/2	172 1/2	173 1/2	174	174 1/2	175 1/2	176 1/2	177
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	722	2497	1802	2006	724	2500	1804	1999
Dyno Load (lb) Observed	2.4	192.4	239.2	55.0	2.4	192.8	240.0	55.4
BHP	0.6	160.1	143.7	36.8	0.6	160.7	144.3	36.9
1 - Coolant Out Temperature, F	176	185	189	187	185	190	189	188
2 - Coolant In Temperature, F	173	175	178	182	182	180	178	183
3 - Oil Sump Temperature, F	181	221	217	207	189	224	217	206
4 - Intake Air Temperature, F	99	101	101	102	101	100	99	95
5 - Fuel Temperature, F	96	97	96	98	97	97	95	96
6 - Intake Manifold After Turbo	107	269	229	139	110	269	228	131
7 - Ambient Air Temperature, F	98	102	99	100	101	99	95	95
8 - Exhaust Temperature Cyl. #1	216	928	951	485	223	927	943	473
9 - Exhaust Temperature Cyl. #2	236	1010	1038	530	241	1008	1034	520
10 - Exhaust Temperature Cyl. #3	217	982	1013	517	217	982	1007	503
11 - Exhaust Temperature Cyl. #4	229	996	1021	546	233	996	1017	534
12 - Exhaust Temperature Cyl. #5	199	988	1017	519	205	987	1010	508
13 - Exhaust Temperature Cyl. #6	223	935	972	503	230	934	965	491
Oil Gallery Pressure, psi	20.0	42.8	34.0	42.9	18.9	41.2	34.1	43.1
Pressure Before Fuel Filter, psi	31.1	58.9	46.9	53.8	31.1	58.9	46.8	53.9
Pressure After Fuel Filter, psi	31.1	58.9	47.0	54.0	31.2	59.0	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	23.8	18.9	2.8	0	24.0	19.0	2.8
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	5	4
Fuel Rate LBS/HR	-	72.1	60.8	21.1	-	72.1	60.7	20.7
Fuel Time Sec/ ½ lb.		24.95	29.61	85.46		24.97	29.67	86.87
Barometer Pressure, In. Hg.			28.96				28.94	
Dry Bulb Temp., F			88				90	
Wet Bulb Temp., F/R.H.%		55%	75			54%	76	
Blow-by, CFH		318				333		
Smoke RDG. % 0-20% scale		1.8	4.5	2.2		2.0	4.2	1.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 18, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	177 1/2	178 1/2	179 1/2	180				
Time	9:20	10:20	11:20	11:50	12:00			
Engine RPM	725	2503	1803	2001	soak			
Dyno Load (lb) Observed	2.6	193.0	240.8	55.2				
BHP	0.6	161.0	144.7	36.8				
1 - Coolant Out Temperature, F	186	190	189	189				
2 - Coolant In Temperature, F	183	181	178	184				
3 - Oil Sump Temperature, F	189	224	218	207				
4 - Intake Air Temperature, F	94	95	93	90				
5 - Fuel Temperature, F	96	96	95	97				
6 - Intake Manifold After Turbo	103	264	222	127				
7 - Ambient Air Temperature, F	93	99	94	94				
8 - Exhaust Temperature Cyl. #1	224	919	935	469	ENGINE DOWN @ 12:00			
9 - Exhaust Temperature Cyl. #2	238	1002	1024	520				
10 - Exhaust Temperature Cyl. #3	214	976	1000	501				
11 - Exhaust Temperature Cyl. #4	230	989	1006	528				
12 - Exhaust Temperature Cyl. #5	201	981	1000	503				
13 - Exhaust Temperature Cyl. #6	227	926	955	485				
Oil Gallery Pressure, psi	18.8	41.4	34.1	42.8				
Pressure Before Fuel Filter, psi	31.2	58.9	46.8	53.9				
Pressure After Fuel Filter, psi	31.2	59.1	47.0	54.0				
Intake Manifold Pressure, In. Hg.	0	24.3	19.0	2.9				
Intake Air Restriction, In. H_2O	1	7	5	4				
Fuel Rate LBS/HR	-	73.1	60.7	20.8				
Fuel Time Sec/ ½ lb.		24.62	29.66	86.50				
Barometer Pressure, In. Hg.			28.97					
Dry Bulb Temp., F			86					
Wet Bulb Temp., F/R.H.%		67%	77					
Blow-by, CFH		313						
Smoke RDG. % 0-20% scale		to dark	for reading					

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 19, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	180 1/2	181 1/2	182 1/2	183	183 1/2	184 1/2	185 1/2	186
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	705	2503	1803	2008	724	2501	1810	2002
Dyno Load (lb) Observed	1.6	191.0	239.4	54.4	2.4	190.4	238.0	51.2
BHP	0.4	159.4	143.9	36.4	0.6	158.7	143.6	34.2
1 - Coolant Out Temperature, F	143	186	185	184	177	187	185	185
2 - Coolant In Temperature, F	141	175	171	179	174	177	174	177
3 - Oil Sump Temperature, F	143	220	210	203	188	222	214	203
4 - Intake Air Temperature, F	87	93	95	95	96	99	103	102
5 - Fuel Temperature, F	90	96	96	98	97	97	96	98
6 - Intake Manifold After Turbo	92	259	223	131	106	265	230	137
7 - Ambient Air Temperature, F	86	94	97	96	96	101	101	100
8 - Exhaust Temperature Cyl. #1	192	909	931	469	222	914	947	470
9 - Exhaust Temperature Cyl. #2	214	988	1019	523	242	997	1030	520
10 - Exhaust Temperature Cyl. #3	206	964	995	504	226	973	1005	502
11 - Exhaust Temperature Cyl. #4	217	975	1001	530	238	986	1016	530
12 - Exhaust Temperature Cyl. #5	174	968	994	504	208	977	1003	502
13 - Exhaust Temperature Cyl. #6	191	914	948	485	232	925	957	486
Oil Gallery Pressure, psi	30.5	43.0	36.0	44.1	18.5	42.1	35.0	44.2
Pressure Before Fuel Filter, psi	30.9	59.0	47.0	53.9	31.1	59.0	47.0	54.0
Pressure After Fuel Filter, psi	30.9	59.0	47.0	54.0	31.1	59.1	47.1	54.1
Intake Manifold Pressure, In. Hg.	0	23.9	18.9	3.0	0	23.4	18.8	3.0
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	4
Fuel Rate LBS/HR	-	71.5	60.6	20.7	-	71.3	60.5	20.4
Fuel Time Sec/ ½ lb.		25.18	29.71	86.94		25.26	29.77	88.44
Barometer Pressure, In. Hg.			28.96				29.10	
Dry Bulb Temp., F			88				89	
Wet Bulb Temp., F/R.H.%		58%	76			89%	86	
Blow-by, CFH		313				313		
Smoke RDG. % 0-20% scale	2.5	2.5	4.8	2.5		2.5	4.6	2.3

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 19, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	186 1/2	187 1/2	188 1/2	189	189 1/2	190 1/2	191 1/2	192
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	724	2500	1807	2001	721	2502	1807	2007
Dyno Load (lb) Observed	218	190.0	237.2	52.4	3.2	189.8	238.2	52.2
BHP	0.7	158.3	142.9	35.0	0.8	158.3	143.5	34.9
1 - Coolant Out Temperature, F	178	186	184	181	176	183	184	181
2 - Coolant In Temperature, F	174	176	173	176	173	174	173	176
3 - Oil Sump Temperature, F	184	221	213	202	183	220	213	202
4 - Intake Air Temperature, F	102	103	104	103	102	100	100	96
5 - Fuel Temperature, F	97	97	96	98	97	96	96	98
6 - Intake Manifold After Turbo	110	268	230	138	110	267	227	132
7 - Ambient Air Temperature, F	100	104	104	102	101	99	100	98
8 - Exhaust Temperature Cyl. #1	217	922	944	466	212	921	935	460
9 - Exhaust Temperature Cyl. #2	237	1002	1032	514	239	1001	1025	513
10 - Exhaust Temperature Cyl. #3	221	979	1007	499	223	977	1001	494
11 - Exhaust Temperature Cyl. #4	233	992	1018	531	234	990	1007	520
12 - Exhaust Temperature Cyl. #5	199	980	1011	501	200	979	1005	492
13 - Exhaust Temperature Cyl. #6	225	927	962	487	218	928	957	479
Oil Gallery Pressure, psi	19.0	42.2	35.0	44.5	19.2	42.4	30.0	44.8
Pressure Before Fuel Filter, psi	31.0	59.0	46.8	53.9	31.0	59.2	46.8	53.8
Pressure After Fuel Filter, psi	31.1	59.1	47.0	54.1	31.1	59.6	47.0	54.1
Intake Manifold Pressure, In. Hg.	0	23.2	18.2	2.0	0	23.2	18.4	2.0
Intake Air Restriction, In. H_2O	1	6	4	3	2	6	4	3
Fuel Rate LBS/HR	-	71.3	60.5	20.0	-	71.5	60.3	20.0
Fuel Time Sec/ ½ lb.		25.24	29.74	90.03		25.18	29.87	90.07
Barometer Pressure, In. Hg.			28.96				28.96	
Dry Bulb Temp., F			91				93	
Wet Bulb Temp., F/R.H.%		63%	80			60%	81	
Blow-by, CFH		313				318		
Smoke RDG. % 0-20% scale		2.7	4.5	2.1		2.6	4.8	2.8

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 19, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	192 1/2	193 1/2	194 1/2	195				
Time	9:20	10:20	11:20	11:50	soak			
Engine RPM	723	2502	1809	2006				
Dyno Load (lb) Observed	2.8	190.6	239.0	52.8				
BHP	0.7	159.0	144.1	35.3				
1 - Coolant Out Temperature, F	176	186	184	181				
2 - Coolant In Temperature, F	173	176	174	176				
3 - Oil Sump Temperature, F	183	221	213	202				
4 - Intake Air Temperature, F	95	95	94	92				
5 - Fuel Temperature, F	96	96	95	97				
6 - Intake Manifold After Turbo	104	261	222	128				
7 - Ambient Air Temperature, F	94	95	97	92	ENGINE DOWN @ 12:00			
8 - Exhaust Temperature Cyl. #1	214	911	929	461				
9 - Exhaust Temperature Cyl. #2	233	990	1014	514				
10 - Exhaust Temperature Cyl. #3	219	966	991	497				
11 - Exhaust Temperature Cyl. #4	230	979	999	524				
12 - Exhaust Temperature Cyl. #5	198	969	994	493				
13 - Exhaust Temperature Cyl. #6	222	917	944	478				
Oil Gallery Pressure, psi	19.2	42.6	35.1	44.6				
Pressure Before Fuel Filter, psi	31.1	59.2	47.0	53.8				
Pressure After Fuel Filter, psi	31.2	59.5	47.1	54.0				
Intake Manifold Pressure, In. Hg.	0	23.8	19.0	1.8				
Intake Air Restriction, In. H_2O	1	7	4	3				
Fuel Rate LBS/HR	-	71.5	60.6	20.5				
Fuel Time Sec/ ½ lb.		25.16	29.69	88.02				
Barometer Pressure, In. Hg.			29.00					
Dry Bulb Temp., F			88					
Wet Bulb Temp., F/R.H.%		70%	80					
Blow-by, CFH		323						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date July 20, 1981 Test No. 200 Hr. Oil Code LO-7616

Fuel Code 100% ESCO Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	195 1/2	196 1/2	197 1/2	198	198 1/2	199 1/2	200 1/2	201
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	699	2500	1807	2002	721	2496	1808	2004
Dyno Load (lb) Observed	1.4	190.0	239.2	55.0	2.4	190.2	240.0	54.2
BHP	0.3	158.3	144.1	36.7	0.6	158.2	144.6	36.2
1 - Coolant Out Temperature, F	136	185	186	185	177	186	185	185
2 - Coolant In Temperature, F	134	176	175	177	174	176	173	176
3 - Oil Sump Temperature, F	137	221	214	203	183	221	213	201
4 - Intake Air Temperature, F	87	98	95	94	96	98	96	100
5 - Fuel Temperature, F	90	96	96	97	96	97	96	97
6 - Intake Manifold After Turbo	91	261	222	130	104	263	225	136
7 - Ambient Air Temperature, F	87	98	94	92	94	97	96	101
8 - Exhaust Temperature Cyl. #1	188	913	931	469	217	915	934	471
9 - Exhaust Temperature Cyl. #2	208	990	1013	521	235	988	1018	524
10 - Exhaust Temperature Cyl. #3	201	965	992	506	275	968	996	507
11 - Exhaust Temperature Cyl. #4	219	978	1002	529	230	981	1005	529
12 - Exhaust Temperature Cyl. #5	176	969	991	506	198	965	1000	505
13 - Exhaust Temperature Cyl. #6	190	916	945	492	221	922	953	489
Oil Gallery Pressure, psi	34.0	43.0	35.0	44.1	19.9	42.5	35.0	44.9
Pressure Before Fuel Filter, psi	31.0	59.0	47.0	53.9	31.0	59.0	47.0	54.0
Pressure After Fuel Filter, psi	31.0	59.1	47.0	54.0	31.0	59.1	47.0	54.0
Intake Manifold Pressure, In. Hg.	0	23.9	19.0	2.8	0	23.5	19.0	2.5
Intake Air Restriction, In. H_2O	1	6	4	4	1	6	4	4
Fuel Rate LBS/HR	-	71.4	61.2	21.7	-	71.8	61.1	21.1
Fuel Time Sec/ ½ lb.		25.21	29.40	82.78		25.07	29.45	85.44
Barometer Pressure, In. Hg.			29.05				29.05	
Dry Bulb Temp., F			88				92	
Wet Bulb Temp., F/R.H.%		85%	84			78%	86	
Blow-by, CFH		313				333		
Smoke RDG. % 0-20% scale		2.5	4.8	2.0		3.8	4.7	2.5

REMARKS:

TABLE C-II

CORRECTED PERFORMANCE RESULTS FOR 200 HR
DURABILITY EVALUATION: 100% ESCO

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 07-07-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
686	0.6	0.0	77	28.96	1.05	1.028	0.6	0.0000	1.6	0.0	0.00
712	0.9	0.0	86	28.98	1.09	1.041	0.9	0.0000	2.4	0.0	0.00
715	0.7	0.0	94	29.98	1.05	1.014	0.7	0.0000	1.8	0.0	0.00
711	0.9	0.0	95	28.99	0.97	1.048	0.9	0.0000	2.4	0.0	0.00
715	0.7	0.0	87	29.00	0.99	1.038	0.7	0.0000	1.8	0.0	0.00
DATE: 07-08-81											
708	0.7	0.0	81	29.16	0.22	0.997	0.7	0.0000	1.8	0.0	0.00
711	0.4	0.0	86	29.16	0.00	0.996	0.4	0.0000	1.0	0.0	0.00
710	0.5	0.0	89	29.14	1.07	1.038	0.5	0.0000	1.3	0.0	0.00
721	0.4	0.0	93	29.12	0.93	1.039	0.4	0.0000	1.0	0.0	0.00
731	0.7	0.0	87	29.14	1.05	1.035	0.7	0.0000	1.8	0.0	0.00
DATE: 07-09-81											
707	0.5	0.0	82	29.19	1.04	1.026	0.5	0.0000	1.3	0.0	0.00
709	0.6	0.0	90	29.18	1.09	1.039	0.6	0.0000	1.6	0.0	0.00
727	0.5	0.0	96	29.15	0.25	1.018	0.5	0.0000	1.3	0.0	0.00
717	0.6	0.0	91	29.16	0.94	1.036	0.6	0.0000	1.6	0.0	0.00
713	0.4	0.0	87	29.19	0.97	1.030	0.4	0.0000	1.0	0.0	0.00
DATE: 07-10-81											
700	0.2	0.0	84	29.18	0.26	1.001	0.2	0.0000	0.5	0.0	0.00
710	0.5	0.0	94	29.18	0.29	1.015	0.5	0.0000	1.3	0.0	0.00
716	0.5	0.0	99	29.12	1.05	1.052	0.5	0.0000	1.3	0.0	0.00
730	0.6	0.0	97	29.09	1.04	1.050	0.6	0.0000	1.6	0.0	0.00
716	0.4	0.0	90	29.10	0.95	1.037	0.4	0.0000	1.1	0.0	0.00
DATE: 07-11-81											
705	0.5	0.0	83	29.10	1.11	1.033	0.5	0.0000	1.3	0.0	0.00
711	0.8	0.0	91	29.10	1.03	1.041	0.8	0.0000	2.1	0.0	0.00
709	0.8	0.0	97	29.05	1.00	1.050	0.8	0.0000	2.2	0.0	0.00
710	0.7	0.0	97	29.04	1.04	1.052	0.7	0.0000	1.9	0.0	0.00
733	0.6	0.0	89	29.04	1.03	1.041	0.6	0.0000	1.5	0.0	0.00

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 07-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
700	0.5	0.0	81	29.07	1.09	1.031	0.5	0.0000	1.3	0.0	0.00
713	0.7	0.0	92	29.07	0.99	1.042	0.7	0.0000	1.9	0.0	0.00
708	0.8	0.0	95	29.02	0.16	1.018	0.8	0.0000	2.1	0.0	0.00
709	0.8	0.0	97	29.03	0.94	1.048	0.8	0.0000	2.1	0.0	0.00
719	0.8	0.0	87	29.02	0.25	1.011	0.8	0.0000	2.0	0.0	0.00
DATE: 07-13-81											
702	0.5	0.0	83	29.09	0.21	1.002	0.5	0.0000	1.3	0.0	0.00
712	0.6	0.0	93	29.08	0.00	1.007	0.6	0.0000	1.5	0.0	0.00
715	0.6	0.0	99	29.04	0.12	1.021	0.6	0.0000	1.6	0.0	0.00
724	0.5	0.0	97	29.04	0.93	1.048	0.5	0.0000	1.3	0.0	0.00
715	0.6	0.0	91	29.02	0.27	1.016	0.6	0.0000	1.5	0.0	0.00
DATE: 07-14-81											
700	0.4	0.0	83	29.07	0.22	1.003	0.4	0.0000	1.0	0.0	0.00
717	0.7	0.0	94	29.10	0.14	1.013	0.7	0.0000	1.8	0.0	0.00
724	0.5	0.0	100	29.00	0.93	1.053	0.5	0.0000	1.3	0.0	0.00
727	0.7	0.0	99	29.00	0.97	1.053	0.7	0.0000	1.8	0.0	0.00
717	0.6	0.0	92	29.00	1.05	1.047	0.6	0.0000	1.6	0.0	0.00
DATE: 07-15-81											
694	0.3	0.0	83	29.02	1.05	1.034	0.3	0.0000	0.8	0.0	0.00
715	0.7	2.7	94	29.02	0.17	1.017	0.7	3.7934	1.8	61252.8	4.15
709	0.7	0.0	93	29.02	0.17	1.016	0.7	0.0000	1.8	0.0	0.00
724	0.7	0.0	98	29.02	0.17	1.022	0.7	0.0000	1.8	0.0	0.00
714	0.6	0.0	92	28.98	0.22	1.017	0.6	0.0000	1.6	0.0	0.00
DATE: 07-16-81											
693	0.3	0.0	82	28.98	0.22	1.004	0.3	0.0000	0.8	0.0	0.00
720	0.6	0.0	98	28.98	0.22	1.025	0.6	0.0000	1.6	0.0	0.00
712	0.6	0.0	99	28.98	0.22	1.026	0.6	0.0000	1.6	0.0	0.00
725	0.6	0.0	95	28.98	0.22	1.021	0.6	0.0000	1.5	0.0	0.00
717	0.6	0.0	88	28.98	0.22	1.012	0.6	0.0000	1.5	0.0	0.00

200 HR DURABILITY TEST

FUEL; 100% ESCO HV; 16147 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE; 07-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
702	0.3	0.0	85	29.02	1.03	1.036	0.3	0.0000	0.8	0.0	0.00
714	0.6	0.0	95	29.02	0.21	1.019	0.6	0.0000	1.6	0.0	0.00
723	0.7	0.0	101	29.02	0.21	1.027	0.7	0.0000	1.8	0.0	0.00
726	0.6	0.0	101	29.02	0.21	1.027	0.6	0.0000	1.5	0.0	0.00
725	0.6	0.0	95	28.96	1.03	1.052	0.6	0.0000	1.6	0.0	0.00
DATE; 07-18-81											
704	0.3	0.0	87	29.00	0.29	1.013	0.3	0.0000	0.8	0.0	0.00
718	0.5	0.0	97	29.00	0.31	1.026	0.5	0.0000	1.3	0.0	0.00
722	0.6	0.0	99	28.96	0.91	1.052	0.6	0.0000	1.6	0.0	0.00
724	0.6	0.0	101	28.94	0.93	1.057	0.6	0.0000	1.6	0.0	0.00
725	0.6	0.0	94	28.97	1.02	1.050	0.6	0.0000	1.6	0.0	0.00
DATE; 07-19-81											
705	0.4	0.0	87	28.96	0.95	1.038	0.4	0.0000	1.1	0.0	0.00
724	0.6	0.0	96	29.10	0.00	1.011	0.6	0.0000	1.5	0.0	0.00
724	0.7	0.0	102	28.96	0.22	1.031	0.7	0.0000	1.8	0.0	0.00
721	0.8	0.0	102	28.96	0.23	1.031	0.8	0.0000	2.1	0.0	0.00
723	0.7	0.0	95	29.00	0.25	1.022	0.7	0.0000	1.8	0.0	0.00
DATE; 07-20-81											
699	0.3	0.0	87	29.05	0.00	1.001	0.3	0.0000	0.8	0.0	0.00
721	0.6	0.0	96	29.05	0.00	1.012	0.6	0.0000	1.5	0.0	0.00

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 07-07-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2502	159.1	72.2	88	28.96	1.05	1.043	165.9	0.4351	120.5	7025.1	36.21
2504	159.1	72.2	90	28.98	1.09	1.046	166.5	0.4337	120.8	7002.2	36.33
2502	159.8	72.4	94	29.98	1.05	1.014	162.0	0.4468	117.6	7214.8	35.26
2500	158.7	71.7	91	28.99	0.97	1.043	165.5	0.4332	120.3	6994.8	36.37
2505	159.0	72.4	89	29.00	0.99	1.041	165.5	0.4376	120.0	7065.2	36.01
DATE: 07-08-81											
2504	157.9	71.7	86	29.16	0.22	1.003	158.4	0.4526	114.9	7307.6	34.81
2505	158.5	71.9	90	29.16	0.00	1.001	158.6	0.4532	115.0	7318.2	34.76
2500	160.0	72.2	91	29.14	1.07	1.041	166.6	0.4334	121.0	6998.8	36.35
2504	158.1	72.4	92	29.12	0.93	1.038	164.1	0.4412	119.0	7123.9	35.71
2497	160.3	72.2	87	29.14	1.05	1.035	165.9	0.4352	120.7	7026.4	36.21
DATE: 07-09-81											
2504	158.4	71.2	89	29.19	1.04	1.035	164.0	0.4341	119.0	7009.3	36.30
2498	160.4	72.4	89	29.18	1.09	1.038	166.4	0.4350	121.0	7023.6	36.22
2501	159.2	71.7	99	29.15	0.25	1.021	162.6	0.4409	118.1	7119.6	35.73
2500	160.2	72.6	91	29.16	0.94	1.036	165.9	0.4376	120.5	7066.4	36.00
2501	160.1	73.3	87	29.19	0.97	1.030	164.9	0.4444	119.8	7175.5	35.46
DATE: 07-10-81											
2499	157.3	71.2	87	29.18	0.26	1.005	158.1	0.4502	115.0	7269.9	35.00
2502	157.6	71.1	95	29.18	0.29	1.017	160.2	0.4437	116.3	7165.2	35.51
2503	156.2	70.9	100	29.12	1.05	1.053	164.5	0.4311	119.4	6960.6	36.55
2498	157.4	71.1	97	29.09	1.04	1.050	165.2	0.4303	120.2	6948.2	36.62
2495	159.7	72.0	89	29.10	0.95	1.035	165.4	0.4354	120.4	7030.3	36.19
DATE: 07-11-81											
2501	158.9	71.5	87	29.10	1.11	1.039	165.1	0.4332	119.9	6994.6	36.37
2498	158.7	72.4	97	29.10	1.03	1.049	166.5	0.4349	121.1	7022.3	36.23
2499	157.8	71.5	98	29.05	1.00	1.051	165.9	0.4311	120.6	6960.8	36.55
2500	158.0	71.3	96	29.04	1.04	1.050	165.9	0.4297	120.6	6937.6	36.67
2504	160.8	72.4	89	29.04	1.03	1.041	167.3	0.4327	121.4	6986.1	36.42

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 07-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2505	158.7	71.5	88	29.07	1.09	1.040	165.1	0.4330	119.7	6992.0	36.39
2500	158.2	71.4	95	29.07	0.99	1.046	165.5	0.4315	120.2	6967.2	36.52
2502	158.8	71.3	95	29.02	0.16	1.018	161.6	0.4409	117.3	7119.6	35.73
2500	158.5	71.2	95	29.03	0.94	1.046	165.7	0.4298	120.4	6939.9	36.66
2505	159.0	71.3	87	29.02	0.25	1.011	160.7	0.4437	116.5	7164.9	35.51
DATE: 07-13-81											
2500	158.0	71.3	89	29.09	0.21	1.009	159.5	0.4471	115.9	7219.4	35.24
2498	158.0	71.1	96	29.08	0.00	1.011	159.8	0.4450	116.2	7185.0	35.41
2502	157.3	71.9	101	29.04	0.12	1.023	161.0	0.4467	116.9	7212.7	35.27
2500	157.8	71.1	98	29.04	0.93	1.049	165.5	0.4296	120.3	6936.7	36.68
2505	157.8	71.1	91	29.02	0.27	1.016	160.4	0.4433	116.3	7157.6	35.54
DATE: 07-14-81											
2499	158.1	71.4	90	29.07	0.22	1.012	159.9	0.4464	116.3	7208.2	35.29
2500	157.0	71.5	99	29.10	0.14	1.019	160.0	0.4468	116.3	7214.2	35.27
2499	157.8	71.2	100	29.00	0.93	1.053	166.2	0.4285	120.8	6919.2	36.77
2505	159.7	72.5	99	29.00	0.97	1.053	168.2	0.4311	122.0	6960.5	36.55
2502	159.8	72.7	92	29.00	1.05	1.047	167.3	0.4346	121.5	7017.0	36.26
DATE: 07-15-81											
2504	160.9	72.6	90	29.02	1.05	1.043	167.9	0.4324	121.8	6982.2	36.44
2504	158.8	72.7	98	29.02	0.17	1.022	162.3	0.4480	117.7	7233.6	35.17
2503	159.0	72.2	101	29.02	0.17	1.026	163.1	0.4427	118.4	7148.0	35.59
2503	159.9	72.3	97	29.02	0.17	1.021	163.2	0.4430	118.4	7153.3	35.57
2503	160.4	72.4	90	28.98	0.22	1.015	162.8	0.4448	118.1	7181.9	35.42
DATE: 07-16-81											
2516	160.0	71.3	90	28.98	0.22	1.015	162.4	0.4391	117.2	7090.5	35.88
2508	158.3	69.3	100	28.98	0.22	1.028	162.7	0.4260	117.8	6878.3	36.99
2503	158.7	70.2	100	28.98	0.22	1.028	163.1	0.4304	118.4	6950.1	36.61
2513	158.0	71.8	94	28.98	0.22	1.020	161.2	0.4455	116.5	7194.0	35.36
2509	158.4	71.8	88	28.98	0.22	1.012	160.3	0.4478	116.1	7230.7	35.18

200 HR DURABILITY TEST

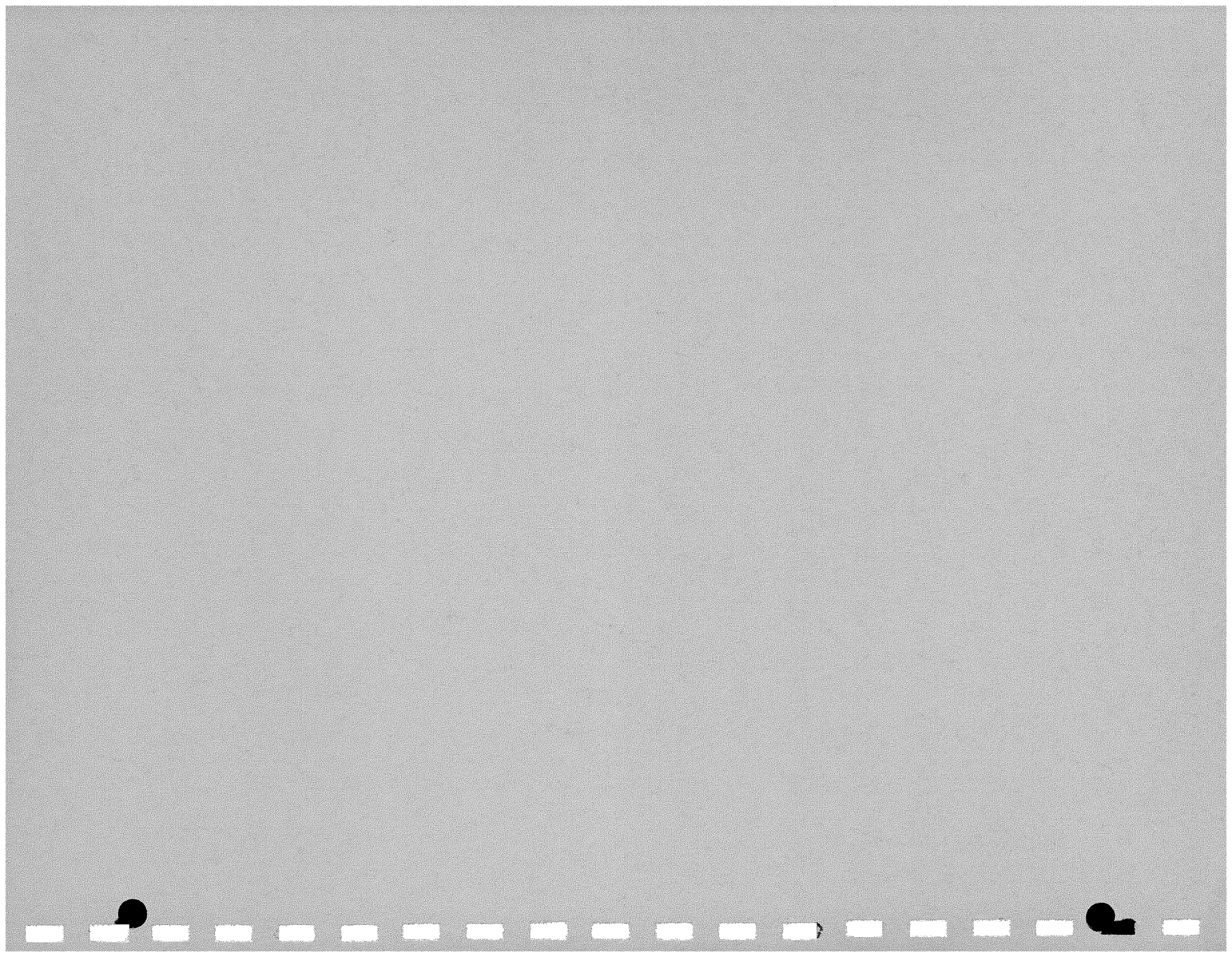
FUEL: 100% ESCO HV: 16147 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 07-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2499	158.3	71.7	91	29.02	1.03	1.044	165.3	0.4338	120.1	7005.0	36.32
2503	158.4	71.8	97	29.02	0.21	1.022	161.9	0.4435	117.5	7161.2	35.53
2496	160.9	72.6	102	29.02	0.21	1.028	165.5	0.4387	120.4	7084.0	35.91
2500	160.8	72.8	100	29.02	0.21	1.026	165.0	0.4413	119.9	7125.7	35.70
2498	161.4	72.7	94	28.96	1.03	1.050	169.5	0.4289	123.3	6924.9	36.74
DATE: 07-18-81											
2500	161.2	72.4	94	29.00	0.29	1.022	164.7	0.4396	119.7	7097.8	35.84
2499	160.3	72.0	98	29.00	0.31	1.028	164.7	0.4371	119.7	7057.6	36.05
2497	160.1	72.1	101	28.96	0.91	1.055	168.9	0.4269	122.9	6892.5	36.91
2500	160.7	72.1	100	28.94	0.93	1.055	169.6	0.4252	123.2	6865.5	37.06
2503	161.0	73.1	95	28.97	1.02	1.051	169.2	0.4321	122.8	6976.5	36.47
DATE: 07-19-81											
2503	159.4	71.5	93	28.96	0.95	1.046	166.7	0.4288	121.0	6924.6	36.74
2501	158.7	71.3	99	29.10	0.00	1.014	161.0	0.4429	116.9	7151.4	35.58
2500	158.3	71.3	103	28.96	0.22	1.032	163.4	0.4363	118.7	7045.5	36.11
2502	158.3	71.5	100	28.96	0.23	1.029	162.9	0.4390	118.2	7089.3	35.89
2502	159.0	71.5	95	29.00	0.25	1.022	162.4	0.4402	117.9	7107.4	35.80
DATE: 07-20-81											
2500	158.3	71.4	98	29.05	0.00	1.015	160.7	0.4444	116.7	7176.1	35.45
2496	158.2	71.8	98	29.05	0.00	1.015	160.6	0.4472	116.8	7220.9	35.23

INTENTIONALLY BLANK



200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE: 07-07-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1804	144.3	61.1	87	28.96	1.05	1.042	150.3	0.4065	151.4	6563.2	38.76
1800	143.7	60.8	92	28.98	1.09	1.049	150.8	0.4033	152.1	6511.9	39.07
1798	143.0	60.9	98	29.98	1.05	1.019	145.7	0.4179	147.2	6747.7	37.70
1803	144.5	60.8	93	28.99	0.97	1.046	151.1	0.4024	152.2	6497.8	39.15
1803	144.6	61.2	85	29.00	0.99	1.035	149.7	0.4088	150.8	6600.7	38.54
DATE: 07-08-81											
1800	144.4	61.2	86	29.16	0.22	1.003	144.9	0.4224	146.2	6820.5	37.30
1799	143.9	60.9	90	29.16	0.00	1.001	144.0	0.4228	145.4	6827.5	37.26
1801	143.4	61.0	92	29.14	1.07	1.042	149.5	0.4081	150.8	6589.3	38.61
1801	144.0	60.9	92	29.12	0.93	1.038	149.5	0.4074	150.8	6579.1	38.67
1797	145.1	61.1	86	29.14	1.05	1.034	150.0	0.4074	151.6	6577.5	38.68
DATE: 07-09-81											
1793	143.1	60.9	92	29.19	1.04	1.039	148.7	0.4094	150.7	6611.0	38.48
1800	144.6	61.0	95	29.18	1.09	1.046	151.2	0.4034	152.6	6514.5	39.05
1794	143.5	60.9	95	29.15	0.25	1.016	145.8	0.4176	147.7	6742.6	37.73
1798	144.6	60.9	91	29.16	0.94	1.036	149.7	0.4067	151.3	6567.1	38.74
1802	145.2	61.2	85	29.19	0.97	1.028	149.2	0.4102	150.4	6622.7	38.42
DATE: 07-10-81											
1793	141.6	60.4	90	29.18	0.26	1.009	142.9	0.4227	144.8	6824.8	37.28
1790	142.5	60.7	98	29.18	0.29	1.021	145.4	0.4174	147.6	6739.8	37.75
1796	140.0	59.6	99	29.12	1.05	1.052	147.2	0.4048	148.9	6536.5	38.92
1794	143.0	60.4	95	29.09	1.04	1.047	149.7	0.4034	151.6	6513.3	39.06
1796	143.9	61.0	89	29.10	0.95	1.035	149.0	0.4094	150.7	6610.3	38.49
DATE: 07-11-81											
1796	142.1	59.7	91	29.10	1.11	1.044	148.4	0.4024	150.1	6497.5	39.16
1793	141.4	59.7	96	29.10	1.03	1.048	148.1	0.4030	150.1	6507.1	39.10
1795	140.6	59.7	99	29.05	1.00	1.052	148.0	0.4035	149.7	6514.9	39.05
1797	144.1	60.7	93	29.04	1.04	1.046	150.8	0.4026	152.4	6500.5	39.14
1796	145.5	60.1	94	29.04	1.03	1.047	152.4	0.3944	154.1	6368.5	39.95

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE: 07-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1799	143.0	59.7	89	29.07	1.09	1.042	149.0	0.4007	150.4	6470.8	39.32
1799	142.1	59.7	94	29.07	0.99	1.045	148.4	0.4022	149.9	6493.7	39.18
1800	141.6	59.6	95	29.02	0.16	1.018	144.1	0.4133	145.4	6673.5	38.12
1802	142.0	59.9	92	29.03	0.94	1.042	147.9	0.4052	149.1	6543.3	38.88
1806	145.1	59.6	85	29.02	0.25	1.008	146.3	0.4075	147.1	6579.8	38.67
DATE: 07-13-81											
1803	143.9	60.8	92	29.09	0.21	1.013	145.8	0.4170	146.9	6733.7	37.78
1798	141.4	59.7	100	29.08	0.00	1.016	143.7	0.4154	145.2	6707.5	37.93
1802	140.9	60.0	100	29.04	0.12	1.022	144.0	0.4167	145.2	6727.9	37.81
1809	141.9	60.0	95	29.04	0.93	1.045	148.3	0.4047	148.9	6534.3	38.94
1817	144.9	59.8	92	29.02	0.27	1.018	147.5	0.4055	147.4	6547.6	38.86
DATE: 07-14-81											
1804	140.5	59.7	94	29.07	0.22	1.017	142.9	0.4179	143.8	6747.7	37.70
1803	139.7	59.6	102	29.10	0.14	1.023	142.9	0.4170	144.0	6732.9	37.79
1795	141.9	60.8	102	29.00	0.93	1.056	149.8	0.4059	151.6	6554.2	38.82
1793	142.5	60.9	95	29.00	0.97	1.048	149.3	0.4078	151.3	6585.5	38.63
1806	144.2	61.5	92	29.00	1.05	1.047	151.0	0.4074	151.8	6578.2	38.68
DATE: 07-15-81											
1802	144.3	62.1	93	29.02	1.05	1.047	151.1	0.4109	152.4	6634.1	38.35
1812	143.9	61.2	100	29.02	0.17	1.024	147.4	0.4151	147.8	6703.1	37.95
1797	142.8	60.9	100	29.02	0.17	1.024	146.3	0.4163	147.9	6721.6	37.85
1802	142.8	61.2	96	29.02	0.17	1.019	145.6	0.4204	146.7	6788.7	37.48
1809	145.1	61.1	89	28.98	0.22	1.014	147.1	0.4155	147.7	6708.6	37.92
DATE: 07-16-81											
1802	143.7	60.9	96	28.98	0.22	1.023	146.9	0.4145	148.1	6692.2	38.02
1808	142.3	61.3	101	28.98	0.22	1.029	146.4	0.4186	147.1	6759.9	37.64
1807	143.4	60.9	98	28.98	0.22	1.025	147.0	0.4143	147.8	6689.4	38.03
1817	145.1	61.2	92	28.98	0.22	1.017	147.6	0.4146	147.6	6694.0	38.01
1810	143.8	60.8	89	28.98	0.22	1.014	145.7	0.4172	146.3	6736.0	37.77

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE: 07-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1804	143.1	60.7	95	29.02	1.03	1.049	150.2	0.4042	151.2	6527.1	38.98
1805	143.2	61.0	103	29.02	0.21	1.030	147.5	0.4137	148.4	6679.5	38.09
1796	142.6	61.4	104	29.02	0.21	1.031	147.0	0.4176	148.7	6743.2	37.73
1804	144.4	61.7	97	29.02	0.21	1.022	147.6	0.4181	148.6	6750.5	37.69
1805	145.1	61.4	93	28.96	1.03	1.049	152.2	0.4034	153.2	6513.8	39.06
DATE: 07-18-81											
1802	144.2	60.5	96	29.00	0.29	1.024	147.7	0.4096	148.9	6613.7	38.47
1800	142.9	60.6	101	29.00	0.31	1.031	147.4	0.4111	148.8	6638.5	38.32
1802	143.7	60.8	101	28.96	0.91	1.055	151.6	0.4010	152.8	6475.6	39.29
1804	144.3	60.7	99	28.94	0.93	1.054	152.1	0.3991	153.1	6444.9	39.47
1803	144.7	60.7	93	28.97	1.02	1.048	151.7	0.4002	152.8	6462.0	39.37
DATE: 07-19-81											
1803	143.9	60.6	95	28.96	0.95	1.049	150.9	0.4016	152.0	6484.7	39.23
1810	143.6	60.5	103	29.10	0.00	1.019	146.4	0.4133	146.9	6672.8	38.13
1807	142.9	60.5	104	28.96	0.22	1.034	147.7	0.4096	148.5	6614.3	38.46
1807	143.5	60.3	100	28.96	0.23	1.029	147.6	0.4085	148.4	6595.4	38.57
1809	144.1	60.6	94	29.00	0.25	1.020	147.0	0.4122	147.6	6655.2	38.23
DATE: 07-20-81											
1807	144.1	61.2	95	29.05	0.00	1.011	145.7	0.4201	146.5	6782.7	37.51
1808	144.6	61.1	96	29.05	0.00	1.012	146.4	0.4174	147.1	6739.7	37.75

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

REDUCED POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 07-07-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2000	36.7	21.3	87	28.96	1.05	1.042	38.2	0.5571	34.7	8996.1	28.28
2000	36.8	22.2	91	28.98	1.09	1.048	38.6	0.5757	35.0	9296.5	27.37
1994	36.3	21.8	95	29.98	1.05	1.015	36.9	0.5915	33.6	9551.3	26.64
2004	36.9	22.3	89	28.99	0.97	1.040	38.4	0.5809	34.8	9380.3	27.12
2002	37.1	21.4	84	29.00	0.99	1.034	38.4	0.5578	34.8	9007.5	28.24
DATE: 07-08-81											
2000	36.7	21.8	85	29.16	0.22	1.002	36.8	0.5928	33.4	9571.6	26.58
1998	36.9	21.8	90	29.16	0.00	1.001	36.9	0.5903	33.6	9530.9	26.69
2000	36.7	22.6	92	29.14	1.07	1.042	38.3	0.5908	34.7	9538.9	26.67
1999	36.8	21.9	87	29.12	0.93	1.031	38.0	0.5770	34.5	9316.9	27.31
2000	36.9	23.9	83	29.14	1.05	1.030	38.0	0.6290	34.5	10156.3	25.05
DATE: 07-09-81											
1998	37.0	21.4	91	29.19	1.04	1.038	38.4	0.5571	34.9	8996.1	28.28
1992	36.9	21.8	94	29.18	1.09	1.044	38.5	0.5657	35.1	9134.7	27.85
1999	36.6	21.6	93	29.15	0.25	1.014	37.1	0.5822	33.7	9400.1	27.06
2000	37.2	21.7	91	29.16	0.94	1.036	38.5	0.5633	35.0	9095.8	27.97
1998	38.8	22.6	83	29.19	0.97	1.025	39.8	0.5683	36.2	9175.8	27.73
DATE: 07-10-81											
1997	36.3	21.4	92	29.18	0.26	1.012	36.7	0.5827	33.4	9408.5	27.04
1996	36.3	21.2	98	29.18	0.29	1.021	37.0	0.5723	33.7	9240.7	27.53
1992	37.9	21.8	98	29.12	1.05	1.050	39.8	0.5476	36.3	8842.7	28.77
1995	37.0	21.6	92	29.09	1.04	1.043	38.6	0.5596	35.1	9036.5	28.15
1985	36.9	21.5	89	29.10	0.95	1.035	38.2	0.5627	35.0	9085.8	28.00
DATE: 07-11-81											
1994	37.5	21.5	91	29.10	1.11	1.044	39.2	0.5491	35.7	8867.0	28.69
1993	36.4	21.1	95	29.10	1.03	1.046	38.1	0.5540	34.7	8945.2	28.44
1998	37.0	21.2	98	29.05	1.00	1.051	38.9	0.5451	35.4	8802.3	28.90
1994	37.1	21.4	91	29.04	1.04	1.044	38.7	0.5527	35.3	8924.1	28.51
1995	36.9	21.5	85	29.04	1.03	1.035	38.2	0.5628	34.8	9087.0	28.00

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

REDUCED POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 07-12-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2002	37.4	21.3	91	29.07	1.09	1.044	39.1	0.5453	35.4	8804.8	28.89
1999	36.0	21.0	94	29.07	0.99	1.045	37.6	0.5584	34.2	9016.3	28.22
1993	36.9	21.5	97	29.02	0.16	1.020	37.6	0.5700	34.3	9203.9	27.64
2009	37.0	21.5	88	29.03	0.94	1.036	38.3	0.5599	34.7	9040.8	28.14
1993	37.2	21.1	84	29.02	0.25	1.007	37.4	0.5634	34.1	9097.7	27.96
DATE: 07-13-81											
1996	35.9	20.9	93	29.09	0.21	1.014	36.4	0.5739	33.1	9266.4	27.46
1998	36.6	22.0	99	29.08	0.00	1.015	37.2	0.5921	33.8	9561.3	26.61
1999	37.0	21.0	100	29.04	0.12	1.022	37.8	0.5553	34.4	8967.2	28.37
1996	36.5	20.9	94	29.04	0.93	1.044	38.1	0.5487	34.7	8859.9	28.71
1994	36.8	21.1	89	29.02	0.27	1.014	37.3	0.5655	34.0	9131.5	27.86
DATE: 07-14-81											
2000	36.7	21.3	98	29.07	0.22	1.022	37.5	0.5679	34.1	9170.4	27.74
2000	37.9	21.3	99	29.10	0.14	1.019	38.6	0.5514	35.1	8902.7	28.58
2000	37.5	21.3	99	29.00	0.93	1.052	39.4	0.5401	35.8	8721.2	29.17
1998	37.3	21.5	94	29.00	0.97	1.047	39.0	0.5508	35.5	8893.4	28.61
1993	36.3	21.9	89	29.00	1.05	1.043	37.9	0.5785	34.5	9340.9	27.24
DATE: 07-15-81											
2000	36.0	21.1	94	29.02	1.05	1.049	37.8	0.5589	34.3	9023.8	28.19
1999	34.6	20.8	99	29.02	0.17	1.023	35.4	0.5875	32.2	9486.7	26.82
1993	35.6	21.0	99	29.02	0.17	1.023	36.4	0.5765	33.2	9308.9	27.33
1993	36.5	21.1	94	29.02	0.17	1.017	37.1	0.5685	33.8	9180.2	27.71
1993	37.5	21.7	87	28.98	0.22	1.011	37.9	0.5724	34.6	9242.7	27.53
DATE: 07-16-81											
1996	35.7	21.7	97	28.98	0.22	1.024	36.6	0.5937	33.3	9586.4	26.54
2000	36.8	21.4	99	28.98	0.22	1.026	37.8	0.5666	34.3	9148.3	27.81
1998	37.2	22.9	95	28.98	0.22	1.021	38.0	0.6028	34.5	9733.0	26.14
2001	36.8	21.6	89	28.98	0.22	1.014	37.3	0.5791	33.9	9351.2	27.21
1995	38.9	22.2	86	28.98	0.22	1.010	39.3	0.5652	35.8	9127.0	27.87

200 HR DURABILITY TEST

FUEL: 100% ESCO HV: 16147 BTU/LB.

REDUCED POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 07-17-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2002	37.2	21.4	94	29.02	1.03	1.048	39.0	0.5489	35.4	8863.2	28.70
2002	36.6	21.2	96	29.02	0.21	1.021	37.4	0.5674	33.9	9162.6	27.77
2003	35.0	20.9	100	29.02	0.21	1.026	35.9	0.5821	32.6	9398.6	27.07
2001	34.6	20.9	97	29.02	0.21	1.022	35.4	0.5910	32.1	9543.0	26.66
2000	35.1	21.1	90	28.96	1.03	1.045	36.7	0.5753	33.3	9288.9	27.39

DATE: 07-18-81

2000	37.1	21.4	94	29.00	0.29	1.022	37.9	0.5645	34.4	9115.7	27.91
2000	36.5	21.1	99	29.00	0.31	1.029	37.6	0.5618	34.1	9072.0	28.04
2006	36.8	21.1	102	28.96	0.91	1.056	38.9	0.5428	35.2	8764.4	29.03
1999	36.9	20.7	95	28.94	0.93	1.049	38.7	0.5350	35.2	8638.2	29.45
2001	36.8	20.8	90	28.97	1.02	1.044	38.4	0.5413	34.9	8740.1	29.11

DATE: 07-19-81

2008	36.4	20.7	95	28.96	0.95	1.049	38.2	0.5423	34.5	8756.9	29.05
2002	34.2	20.4	102	29.10	0.00	1.018	34.8	0.5858	31.6	9459.2	26.90
2001	35.0	20.0	103	28.96	0.22	1.032	36.1	0.5536	32.8	8938.5	28.46
2007	34.9	20.0	96	28.96	0.23	1.024	35.7	0.5598	32.3	9039.8	28.14
2006	35.3	20.5	92	29.00	0.25	1.018	35.9	0.5706	32.5	9213.6	27.61

DATE: 07-20-81

2002	36.7	21.7	94	29.05	0.00	1.010	37.1	0.5855	33.6	9454.8	26.91
2004	36.2	21.1	100	29.05	0.00	1.017	36.8	0.5729	33.4	9250.4	27.50

INTENTIONALLY BLANK

TABLE C-III

EXHAUST GAS EMISSIONS DATA FOR 200 HOUR DURABILITY EVALUATION: 100% ESCO

INTENTIONALLY BLANK

EMISSION DATA

Date 7-8-81 Test No. _____

Engine IH DT 436 B

Engine Hours 15.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 1.8

Rpm 702

Gas	Rdg	Scale	Amount	
LCO	23.7	R1	0.064	%
CO_2	15.0	R1	1.5	%
O_2	73.6	R25	18.5	%
HC	67.5	R100	675	ppm
NO	34.0	R250	85	ppm
NOx	46.9	R250	117	ppm

Time of Completion 9:15

Remarks:

EMISSION DATA

Date 7-8-81 Test No. _____

Engine IH DT 436 B

Engine Hours 16.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 189.2

Rpm 2505

Gas	Rdg	Scale	Amount	
LCO	14.0	R3	0.012	%
CO_2	57.5	R1	7.6	%
O_2	45.4	R25	11.25	%
HC	69.0	R50	345	ppm
NO	465	R2500	1163	ppm
NOx	52.0	R2500	1300	ppm

Time of Completion 10:01

Remarks:

EMISSION DATA

Date 7-8-81 Test No. _____

Engine IH DT 436 B

Engine Hours 17.5

Fuel Code ECSO

Oil Code LO-7616

Engine load, lb 240.2

Rpm 1802

Gas	Rdg	Scale	Amount	
LCO	85.8	R3	0.084	%
CO_2	67.5	R1	9.8	%
O_2	33.6	R25	8.5	%
HC	64.0	R50	320	ppm
NO	62.5	R2500	1563	ppm
NOx	70.5	R2500	1763	ppm

Time of Completion 11:01

Remarks:

EMISSION DATA

Date 7-8-81 Test No. _____

Engine IH DT 436B

Engine Hours 18

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 53.8

Rpm 2005

Gas	Rdg	Scale	Amount	
LCO	24.5	R3	0.021	%
CO_2	39.7	R1	4.6	%
O_2	62.0	R25	15.5	%
HC	29.1	R100	291	ppm
NO	52.0	R1000	520	ppm
NOx	58.5	R1000	585	ppm

Time of Completion 11:46

Remarks:

EMISSION DATA

Date 7-10-81 Test No. _____

Engine IH DT 436 B

Engine Hours 46.5

Fuel Code ECSO

Oil Code LO-7616

Engine load, lb 188.0

Rpm 2503

Gas	Rdg	Scale	Amount	
LCO	9.0	R3	0.008	%
CO_2	59.6	R1	8.0	%
O_2	42.1	R25	10.5	%
HC	16.5	R100	165	ppm
NO	44.9	R2500	1123	ppm
NOx	49.9	R2500	1248	ppm

Time of Completion 10:13

Remarks:

EMISSION DATA

Date 7-10-81 Test No. _____

Engine IH DT 436 B

Engine Hours 47.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 239.0

Rpm 1796

Gas	Rdg	Scale	Amount	
LCO	79.6	R3	0.076	%
CO_2	68.6	R1	10.2	%
O_2	77.7	R10	7.77	%
HC	12.1	R100	121	ppm
NO	60.0	R2500	1500	ppm
NOx	67.1	R2500	1677	ppm

Time of Completion 11:21

Remarks:

EMISSION DATA

Date 7-10-81 Test No. _____

Engine IH DT 436 B

Engine Hours 48

Fuel Code EC 50

Oil Code LO-7616

Engine load, lb 2.4

Rpm 711

Gas	Rdg	Scale	Amount	
LCO	13.8	R3	0.012	%
CO_2	18.2	R1	1.9	%
O_2	73.7	R25	18.4	%
HC	16.0	R100	160	ppm
NO	62.8	R250	157	ppm
NOx	77.4	R250	194	ppm

Time of Completion 12:27

Remarks:

EMISSION DATA

Date 7-10-81 Test No. _____

Engine IH DT 436B

Engine Hours 50.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 50.6

Rpm 1990

Gas	Rdg	Scale	Amount	
LCO	18.7	R3	0.016	%
CO_2	38.2	R1	4.5	%
O_2	62.3	R25	15.6	%
HC	17.5	R100	175	ppm
NO	47.4	R1000	474	ppm
NOx	51.6	R1000	516	ppm

Time of Completion 2:45

Remarks:

EMISSION DATA

Date 7-13-81 Test No. _____

Engine 1H DT 436 B

Engine Hours 91.5

Fuel Code ECSO

Oil Code LO-7616

Engine load, lb 192.0

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	8.0	R3	0.007	%
CO_2	60.5	R1	8.20	%
O_2	95.5	R10	9.55	%
HC	17.4	R100	174	ppm
NO	44.3	R2500	1110	ppm
NOx	48.4	R2500	1210	ppm

Time of Completion 10:01

Remarks:

EMISSION DATA

Date 7-13-81 Test No. _____

Engine IH DT 436 B

Engine Hours 92.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 239.0

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	72.1	R3	0.068	%
CO_2	68.6	R1	10.1	%
O_2	83.4	R10	8.34	%
HC	17.3	R100	173	ppm
NO	62.0	R2500	1550	ppm
NOx	67.6	R2500	1690	ppm

Time of Completion 11.05

Remarks:

EMISSION DATA

Date 7-13-81 Test No. _____

Engine IH DT 436 B

Engine Hours 93

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 53.6

Rpm 1996

Gas	Rdg	Scale	Amount	
LCO	3.0	R3	0.003	%
CO_2	39.3	R1	4.6	%
O_2	65.1	R25	16.3	%
HC	15.3	R100	153	ppm
NO	49.6	R1000	496	ppm
NOx	56.0	R1000	560	ppm

Time of Completion 11:48

Remarks:

EMISSION DATA

Date 7-13-81 Test No. _____

Engine IH DT 436 B

Engine Hours 93.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 3.0

Rpm 711

Gas	Rdg	Scale	Amount	
LCO	6.5	R3	0.006	%
CO_2	18.3	R1	1.9	%
O_2	79.3	R25	19.8	%
HC	19.0	R100	190	ppm
NO	60.4	R250	151	ppm
NOx	73.0	R250	183	ppm

Time of Completion 12:21

Remarks:

EMISSION DATA

Date 7-15-81 Test No. _____

Engine IH DT 436 B

Engine Hours 121.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 194.0

Rpm 2504

Gas	Rdg	Scale	Amount	
LCO	10.0	R3	0.008	%
CO_2	61.0	R1	8.30	%
O_2	99.4	R10	9.94	%
HC	17.3	R100	173	ppm
NO	47.2	R2500	1180	ppm
NOx	51.9	R2500	1298	ppm

Time of Completion 10:03

Remarks:

EMISSION DATA

Date 7-15-81 Test No. _____

Engine IH DT 436 B

Engine Hours 122.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 240.6

Rpm 1790

Gas	Rdg	Scale	Amount	
LCO	84.0	R3	0.082	%
CO_2	69.3	R1	10.2	%
O_2	78.9	R10	7.89	%
HC	13.1	R100	131	ppm
NO	61.3	R2500	1533	ppm
NOx	67.7	R2500	1693	ppm

Time of Completion 11:01

Remarks:

EMISSION DATA

Date 7-15-81 Test No. _____

Engine IH DT436B

Engine Hours 123

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 55.0

Rpm 1998

Gas	Rdg	Scale	Amount	
LCO	2.9	R3	0.003	%
CO_2	40.4	R1	4.8	%
O_2	60.4	R25	15.1	%
HC	13.5	R100	135	ppm
NO	20.2	R2500	505	ppm
NOx	22.6	R2500	565	ppm

Time of Completion 11:48

Remarks:

EMISSION DATA

Date 7-15-81 Test No. _____

Engine IH DT 436B

Engine Hours 123.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 3.2

Rpm 711

Gas	Rdg	Scale	Amount	
LCO	7.0	R3	0.006	%
CO_2	18.3	R1	0.19	%
O_2	76.5	R25	19.1	%
HC	17.6	R100	176	ppm
NO	57.0	R250	143	ppm
NOx	72.2	R250	181	ppm

Time of Completion 12:22

Remarks:

EMISSION DATA

Date 7-21-81 Test No. _____

Engine IH DT 436B

Engine Hours 139.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 213.2

Rpm 2500

Gas	Rdg	Scale	Amount	
LCO	17.0	R3	0.014	%
CO_2	58.0	R1	7.70	%
O_2	39.5	R25	9.87	%
HC	42.0	R50	210	ppm
NO	85.1	R1000	851	ppm
NOx	85.0	R1000	850	ppm

Time of Completion 1:30.

Remarks:

EMISSION DATA

Date 7-21-81 Test No. _____

Engine IH DT 436 B

Engine Hours 140.5

Fuel Code EC50

Oil Code LO-7616

Engine load, lb 260.2

Rpm 1800

Gas	Rdg	Scale	Amount	
LCO	43.5	R1	0.128	%
CO_2	66.5	R1	9.55	%
O_2	30.5	R25	7.63	%
HC	34.5	R50	172	ppm
NO	51.0	R2500	1275	ppm
NOx	50.9	R2500	1270	ppm

Time of Completion 2:35

Remarks:

TABLE C-IV

BRAKE SPECIFIC EMISSIONS, 200 HOUR
DURABILITY EVALUATION: ESCO FUEL

Test Condition	Test Hrs.	RPM	HP	A/F Ratio	BSHC %	BSCO %	BSNOx %
Max. Power	16.5	2505	158.4	29.77	.99	.57	10.21
MP	46.5	2503	158.1	28.41	.45	.36	9.30
MP	91.5	2500	159.5	27.14	.46	.31	8.73
MP	121.5	2504	167.9	27.42	.44	.34	8.95
MP	139.5	2500	162.7	28.11	.56	.62	6.21
Max. Torque	17.5	1802	144.9	24.44	.67	2.89	9.97
MT	47.5	1796	142.9	23.54	.25	2.52	9.15
MT	92.5	1800	145.8	24.15	.35	2.25	9.18
MT	122.5	1790	151.1	23.69	.26	2.65	8.97
MT	140.5	1800	146.4	23.83	.37	4.47	7.28
Quarter Power	18	2005	36.8	45.81	1.76	2.16	9.89
QP	50.5	1990	37.0	46.79	1.05	1.63	8.66
QP	93	1996	36.4	47.59	.90	.30	9.24
QP	123	1998	37.8	44.19	.74	.28	8.69

TABLE C-V

ENGINE RATING RESULTS, 200 HOUR
DURABILITY EVALUATION: 100% ESCO

Test: 200 hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 100% ESCO
Oil: I.H. No. 1 SAE 30, L.O. 7616

LINERS

Condition of Cylinder Liners (% Heavy Polish)

Cyl. No.	Thrust	Antithrust
1	Good condition with trace polishing.	
2	Good condition with trace polishing.	
3	Good condition with trace polishing.	
4	Good condition with trace polishing.	
5	Good condition with trace polishing.	
6	Good condition with trace polishing.	

BEARINGS

Condition of Connecting Rod Bearings:

Cyl. No.	Upper
**1	Good condition with light embedment and light wear.
*2	Good condition.
**3	Good condition with light embedment.
**4	Good condition with light embedment and light pitting.
**5	Good condition with light embedment.
*6	Good condition with light embedment and light wear.

Cyl. No.	Lower
*1	Good condition with light embedment and light wear.
*2	Good condition with light embedment and light pitting.
**3	Good condition with light embedment and light pitting.
**4	Good condition with light embedment.
**5	Good condition with light embedment.
*6	Good condition with light wear.

---

* Light debris scratches
** Medium debris scratches

TABLE C-V (Con't)

ENGINE RATING RESULTS, 200 HOUR
DURABILITY EVALUATION: 100% ESCO

VALVE TRAIN

Condition of Push Tubes: Good condition, no apparent distress.

Condition of Rockers Arm Levers: Good condition, no apparent distress.

Condition of Valves:

Valve seats: Good condition with no apparent distress.
Valve Faces: Good condition with no apparent distress.
Valve Tulips: Intakes - 1.0 to 3.0 demerits,
Exhaust - 1.0 demerits each
Valve Tips: Good condition with no apparent distress.
Valve Heads: Good condition with trace carbon and dark brown to black lacquer.

Cylinder Head Combustion Deposits:

Cyl. No.	Deck % Area Covered	Intake Port Plugging, %
1	100% light carbon	2% plugged
2	100% light carbon	2% plugged
3	100% light carbon	2% plugged
4	100% light carbon	2% plugged
5	100% light carbon	2% plugged
6	100% light carbon	2% plugged

ENGINE SLUDGE DEPOSITS

Oil Pan:	80% @ 1/2 A, 20% @ 3/4 A	= .45 demerits
Valve Covers:	100% @ 1/2 A	= .41 demerits
Valve Deck:	100% @ 1/2 A	= .41 demerits
Oil Screen:	0% plugged	

PISTON CROWNLAND DEPOSITS

Piston No.	% Heavy Carbon	% Medium Carbon	% Light Carbon	Demerits
1	5	5	90	30.00
2	0	5	95	26.25
3	0	0	100	25.00
4	0	5	95	26.25
5	0	5	95	26.25
6	0	0	100	25.00
			Average	26.46

TABLE C-VI

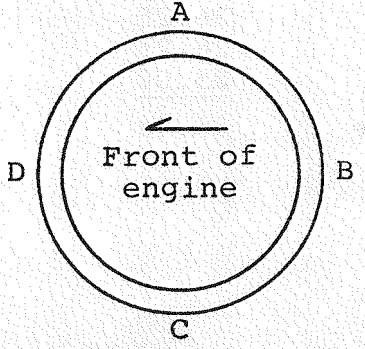
PISTON RING PROUDNESS

Test: 200 hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 100% ESCO
Oil: I.H. No. 1 SAE, L.O. 7616
Hours: 0

\+ Ring extends above piston surface
\- Ring lies below piston surface

		POSITION			
Piston No.	Ring No.	A	B	C	D
1	1 2 3	+40(1) +80	+45 +60	+15 +80	+25 +90
2	1 2 3	+25 +85	+30 +85	+35 +90	+40 +70
3	1 2 3	+10 +80	+25 +80	+20 +80	+20 +80
4	1 2 3	+30 +90	+20 +85	+35 +100	+20 +80
5	1 2 3	+50 +120	+40 +110	+40 +115	+50 +90
6	1 2 3	+50 +90	+40 +90	+35 +70	+30 +60

Average: 32.1
85.8



(1) XX = 0.00XX
XXX = 0.0XXX

TABLE C-VI (Con't)

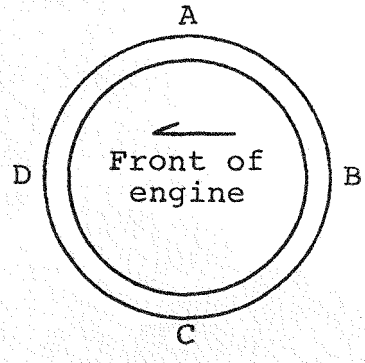
PISTON RING PROUDNESS

Test: 200 hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 100% ESCO
Oil: I.H. No. 1 SAE, L.O. 7616
Hours: 201

\+ Ring extends above piston surface
\- Ring lies below piston surface

		POSITION			
Piston No.	Ring No.	A	B	C	D
1	1	+150 (1)	+170	+115	+120
	2	+110	+130	+120	+100
	3				
2	1	+150	+155	+160	+160
	2	+140	+100	+150	+120
	3				
3	1	+160	+150	+170	+130
	2	+120	+110	+130	+100
	3				
4	1	+170	+150	+150	+160
	2	+80	+100	+180	+100
	3				
5	1	+180	+170	+160	+180
	2	+180	+130	+160	+130
	3				
6	1	+200	+170	+165	+130
	2	+170	+160	+170	+80
	3				

Average: 157.3
127.9



(1) XX = 0.00XX
XXX = 0.0XXX

TABLE C-VII

CHART FOR PISTON DEMERITS

SPONSOR CODE ESCO — SWRI CODE LO-7616 — HOURS 200 — DATE 07-21-81

PISTON NO.		CARBON H %	CARBON H D	CARBON M %	CARBON M D	CARBON T %	CARBON T D	LACQUER VT %	LACQUER VT D	LACQUER BL %	LACQUER BL D	LACQUER BR %	LACQUER BR D	LACQUER A %	LACQUER A D	LACQUER LA %	LACQUER LA D	TR %	TR D	CLEAN %	CLEAN D
	1G	60	13.50	15	2.63	25	3.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	30	10.80	20	4.50	0	0.00	5	.57	5	.38	40	1.80	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	10	.30	85	0.00
1	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	5	1.13	0	0.00	25	3.00	40	3.00	0	0.00	5	.19	0	0.00	25	.38	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.90	90	2.70	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	1.05	30	.15	0	0.00
	1G	80	18.00	10	1.75	10	1.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	35	12.60	30	6.75	0	0.00	0	0.00	0	0.00	35	1.58	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	10	.30	85	0.00
2	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	15	3.38	10	1.75	45	5.40	30	2.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	95	2.85	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	1.05	30	.15	0	0.00
	1G	85	19.13	10	1.75	5	.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	15	5.40	40	9.00	0	0.00	0	0.00	5	.38	40	1.80	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.30	10	0.00
3	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	0	0.00	5	.88	65	7.80	30	2.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.90	85	2.55	5	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	90	1.35	10	.05	0	0.00
	1G	100	22.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	20	7.20	30	6.75	0	0.00	5	.57	0	0.00	45	2.03	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.30	90	0.00
4	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	5	1.13	0	0.00	65	7.80	30	2.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.90	85	2.55	5	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	1.05	30	.15	0	0.00
	1G	85	19.13	5	.88	10	1.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	20	7.20	30	6.75	0	0.00	10	1.14	5	.38	35	1.58	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.15	95	0.00
5	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	5	1.13	0	0.00	65	7.80	30	2.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	90	2.70	5	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	80	.40	20	0.00
	1G	95	21.38	5	.88	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	5	2.63	55	19.80	20	4.50	0	0.00	5	.57	0	0.00	15	.68	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.90	30	.90	60	0.00
6	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	0	0.00	0	0.00	70	8.40	30	2.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	95	2.85	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	65	.98	35	.18	0	0.00

TABLE C-VII (Con't)

PISTON DEMERIT SUMMARY

SPONSOR CODE ESCO SWRI CODE LO-7616 HOURS 200 DATE 07-21-81

	PISTON NO. 1	PISTON NO. 2	PISTON NO. 3	PISTON NO. 4	PISTON NO. 5	PISTON NO. 6
CARBON (GROOVES)	34.43	40.30	35.88	36.45	35.16	49.19
CARBON (LANDS)	7.13	12.78	10.93	11.18	11.18	10.65
CARBON (UNDERCROWN)	0.00	0.00	0.00	0.00	0.00	0.00
LACQUER (GROOVES)	3.50	2.33	2.48	2.90	3.25	3.05
LACQUER (LANDS)	4.17	3.30	3.45	3.45	3.15	3.30
LACQUER (UNDERCROWN)	1.20	1.20	1.40	1.20	.40	1.16
TOTAL DEMERIT	50.43	59.91	54.14	55.18	53.14	67.35

TOTAL DEMERITS	340.15
DEMERITS DUE TO PROUDNESS	113.64
DEMERITS DUE TO CARBON	295.26
DEMERITS DUE TO LACQUER	44.89

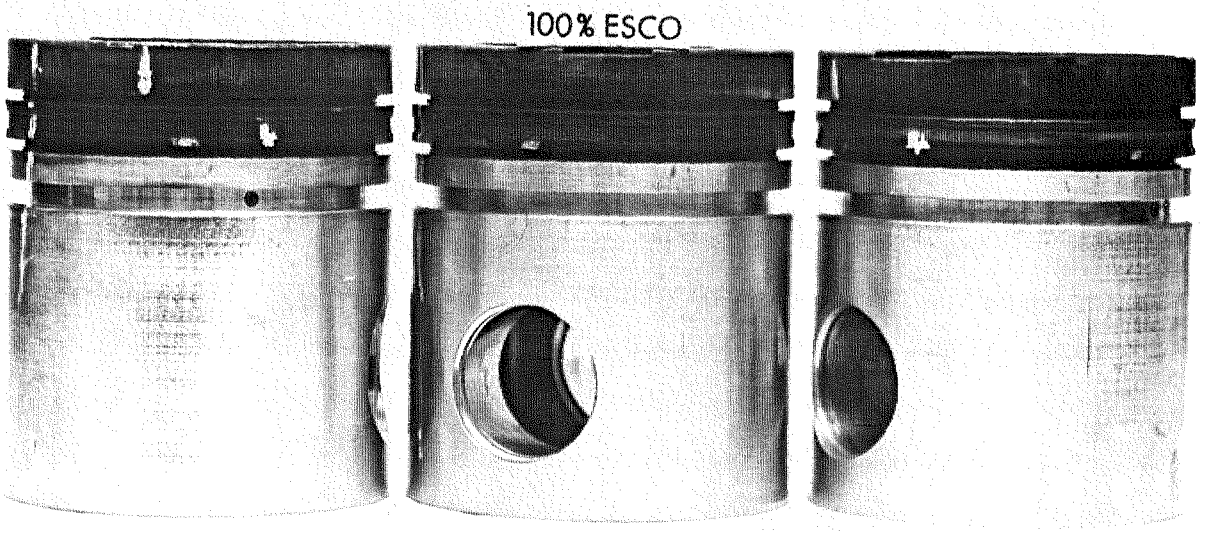
GROOVE FILL, %

	PISTON NO. 1	PISTON NO. 2	PISTON NO. 3	PISTON NO. 4	PISTON NO. 5	PISTON NO. 6
(TOP GROOVE)	70	85	95	100	90	95

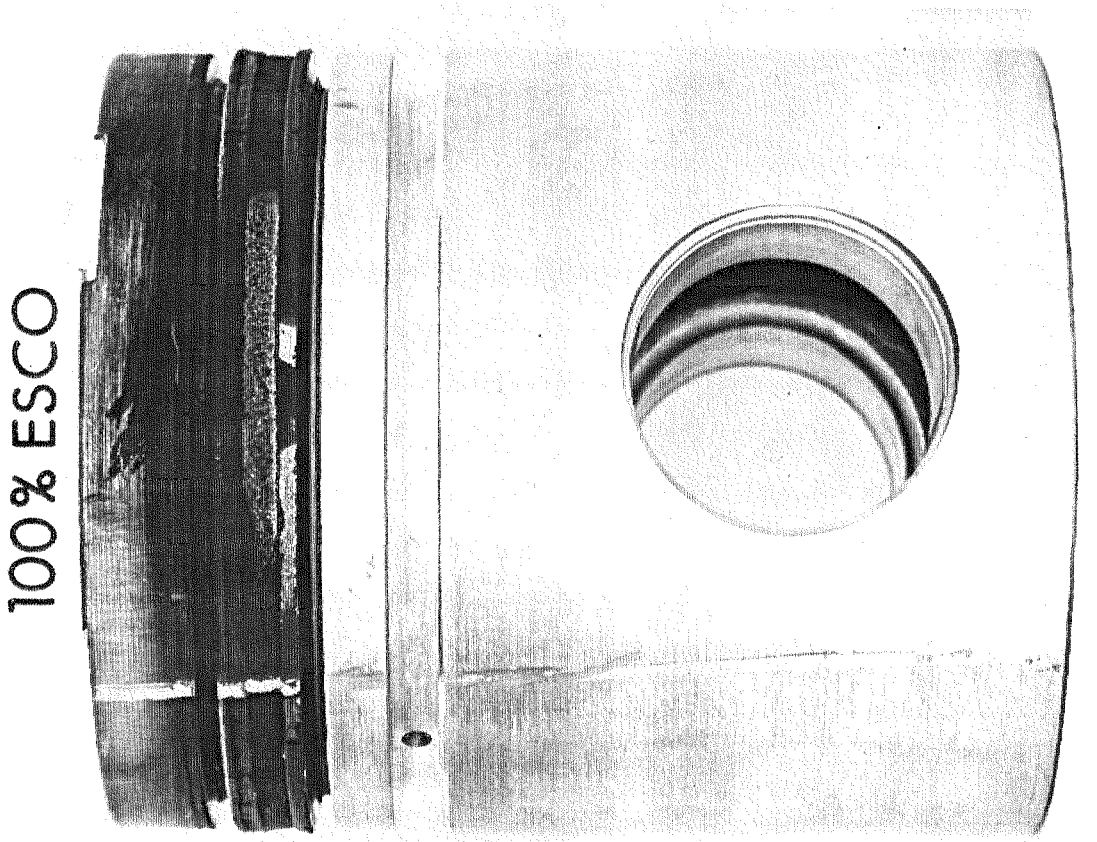
INTENTIONALLY BLANK

FIGURE C-1. PHOTOGRAPHS OF ENGINE AT END OF DURABILITY EVALUATION USING 100% ESCO

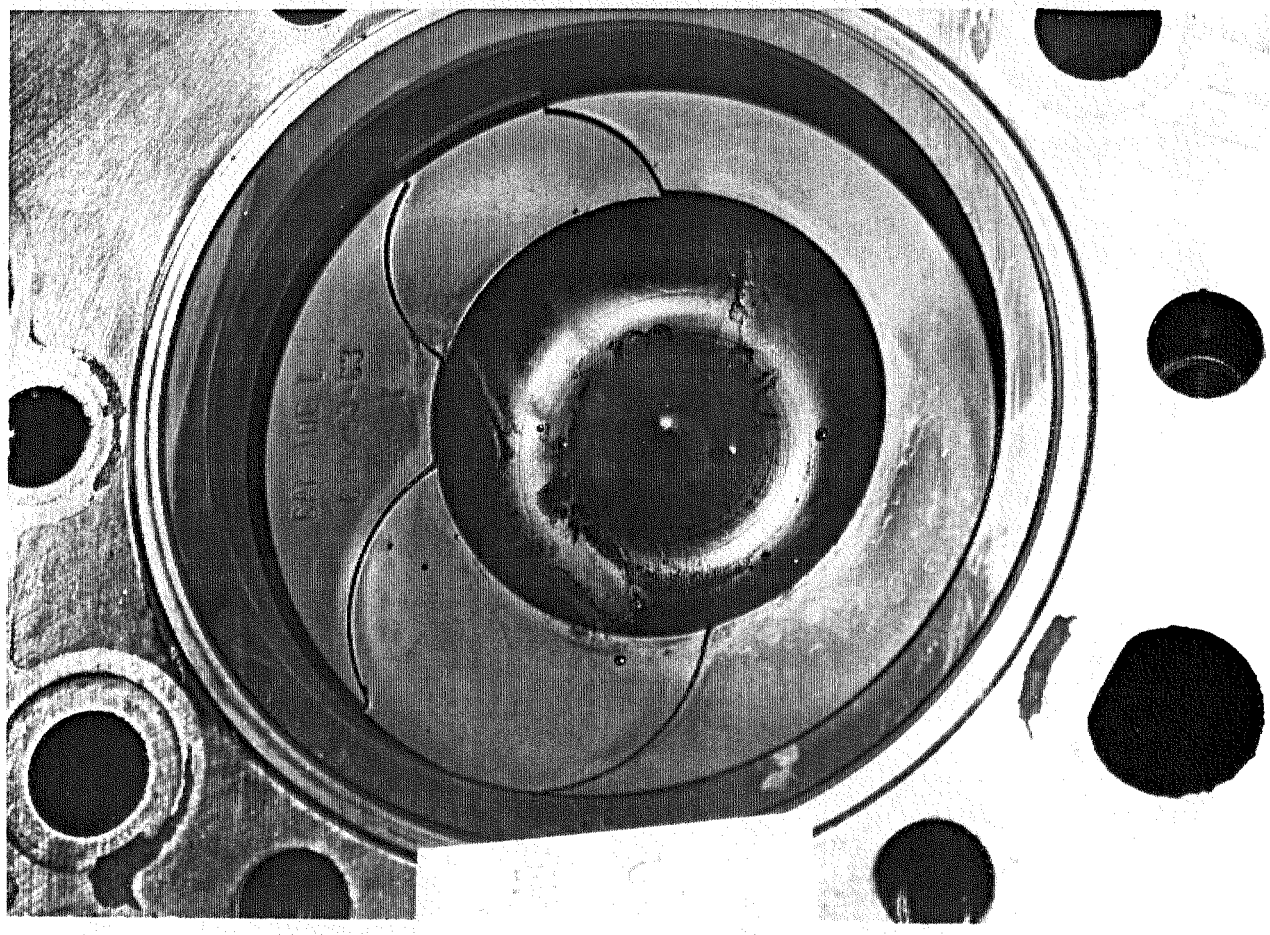
Photo 1 Pistons
2 Close-Up of Ring Land Deposits
3 Spray Cup
4 Injectors
5 Extremes in Connecting Rod Bearing Wear
6 Intake Valves
7 Wetness on Underside of Head
8 Pan



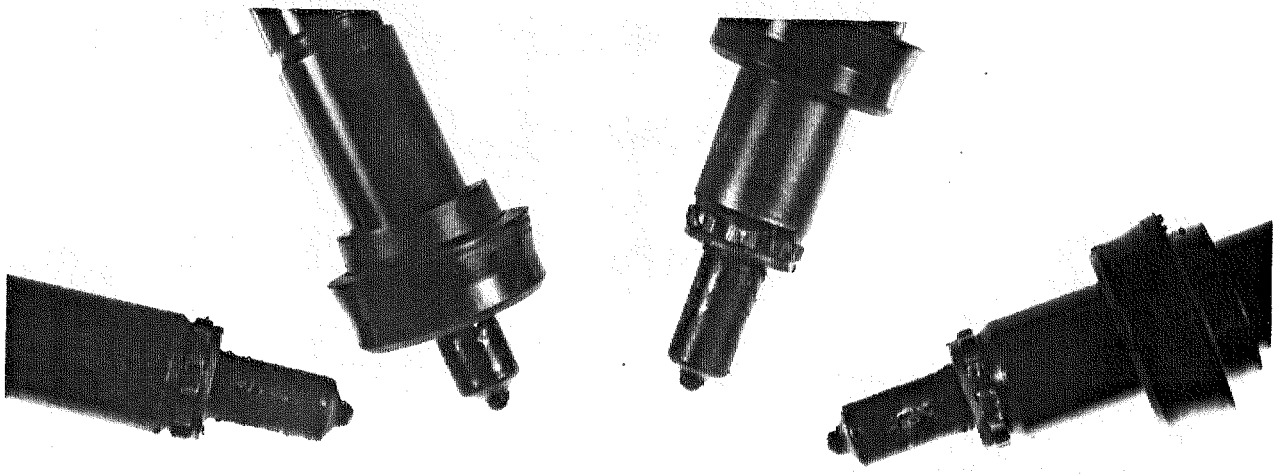
1

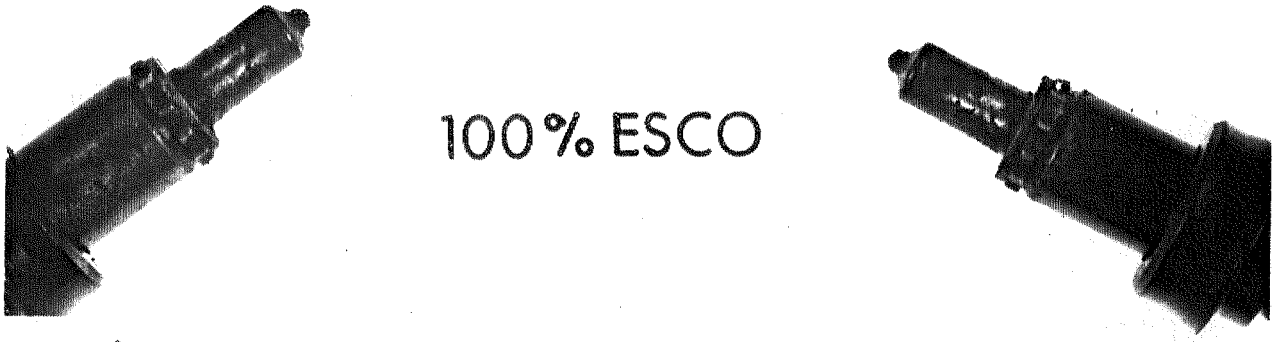


2



3

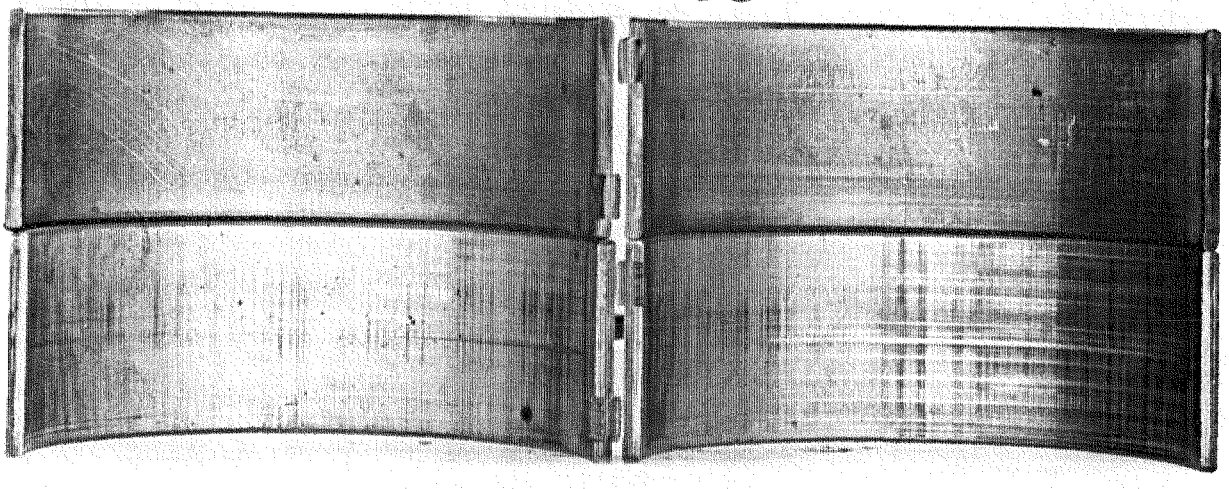




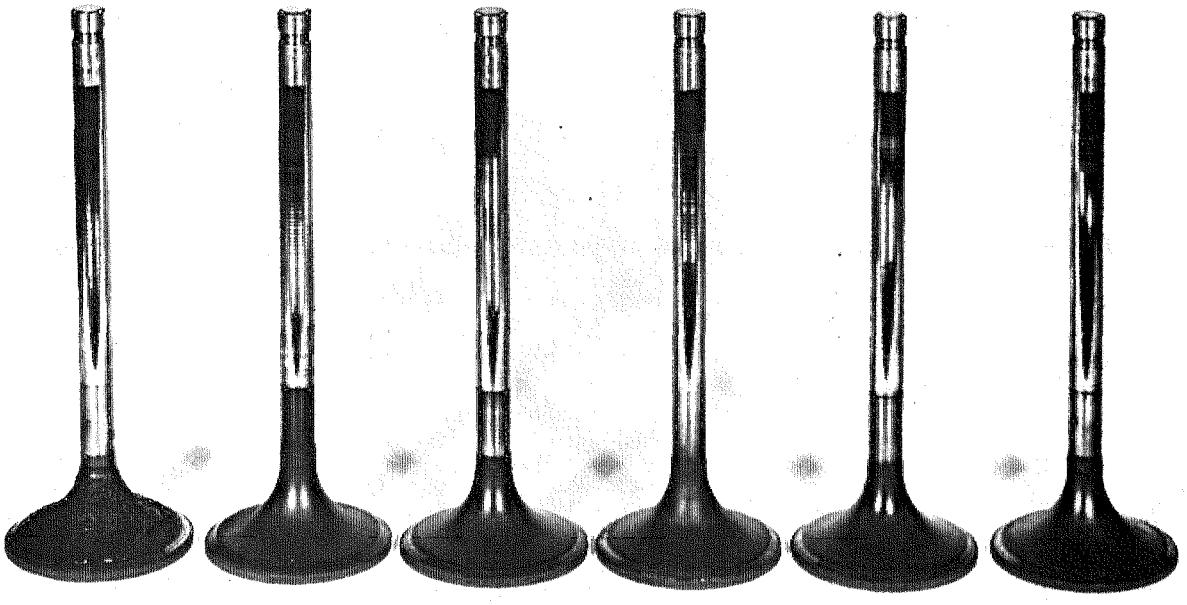
100% ESCO

4

100% ESCO

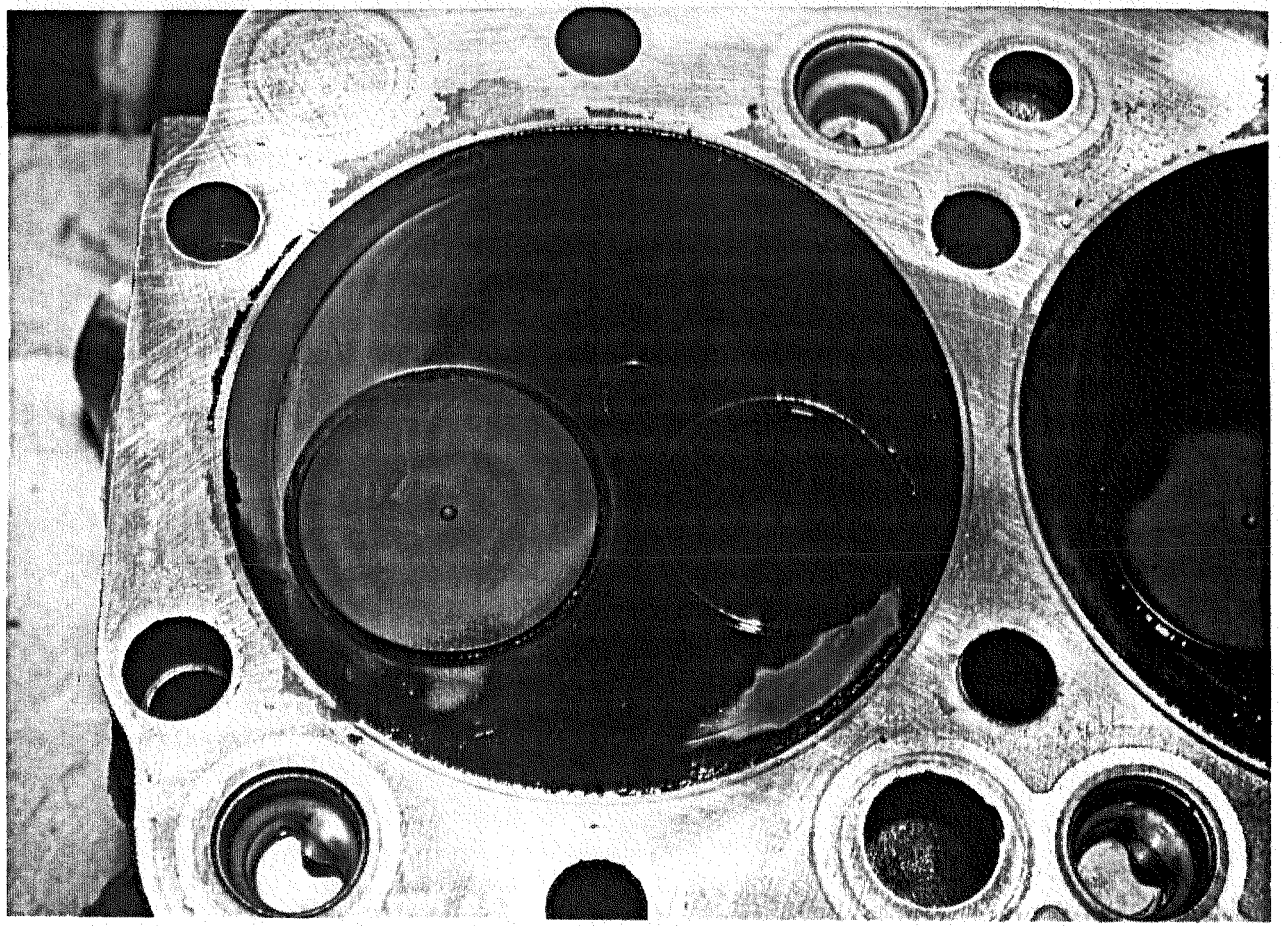


5

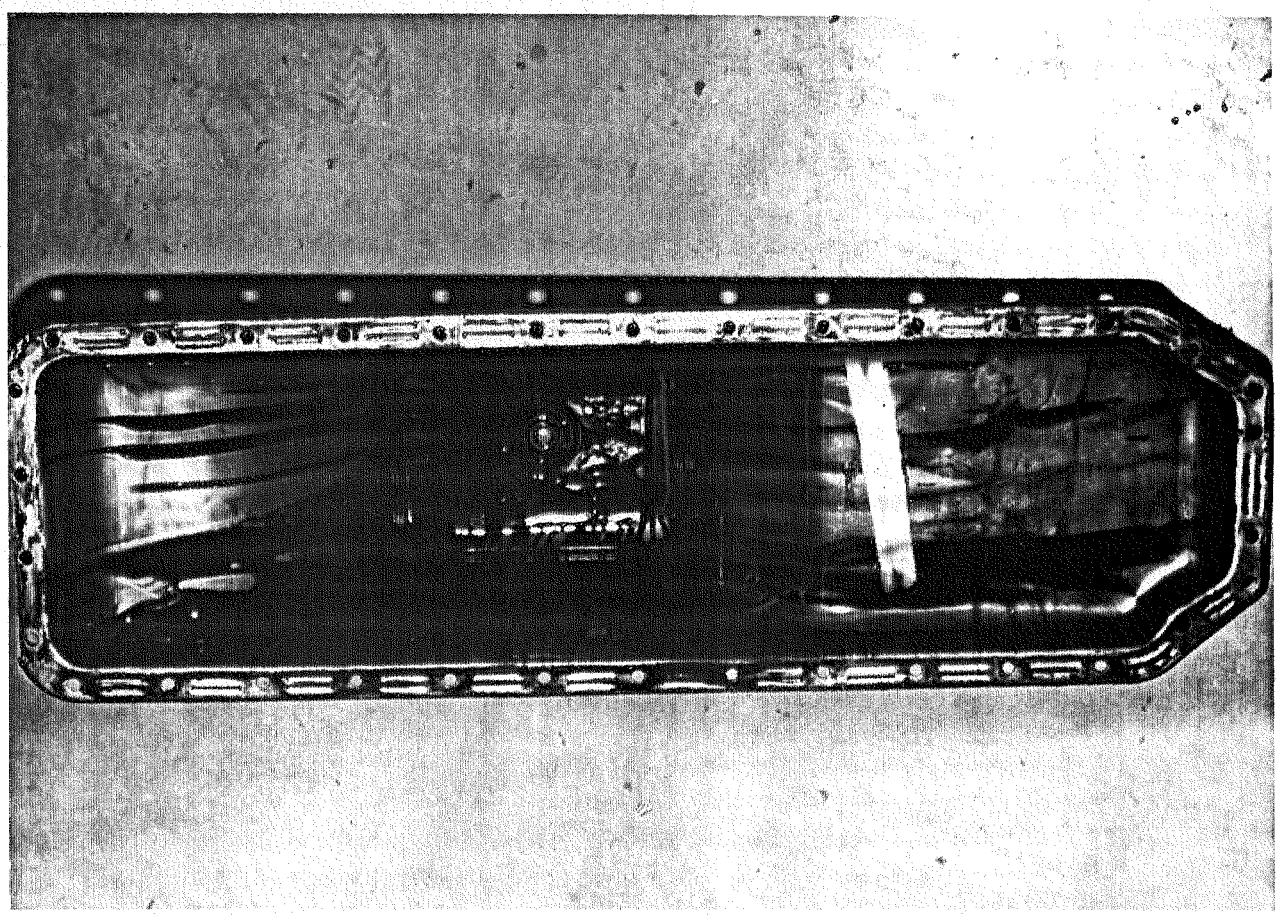


100% ESCO

6



7



8

APPENDIX D

This Appendix contains description, performance and emission data, rating sheets, and photographs relating to the 200 hour durability evaluation using 100 percent DF-2 (diesel) fuel. This test was intended as a reference, especially against the test with 100 percent ESCO which latter test was so relatively successful.

This evaluation, as was certainly expected, completed the 200 hours without difficulty. The smoke meter gave considerable difficulty with the result that smoke readings were made rather infrequently. Table D-I gives the performance data. The same speed/load cycles were used for this program as were used for the 100 percent ESCO test.

Table D-II gives a summary of the performance results for the DF-2 durability evaluation corrected to standard dry conditions. The first two readings at reduced power conditions (9/23/81) are incomplete. The fuel rate was not measured and the proper dynamometer load was not applied.

Exhaust gas emission results are given in Table D-III. The condition and time at which the measurements were made may be related to the performance data by comparing the "Engine Hours" on the emission data sheet to the "TEST HOURS" at the top of the performance data sheet.

Table D-IV presents the brake specific exhaust gas emissions based on the data in Table D-III.

Rating results are shown in Table D-V. The engine was in good condition at the end of the evaluation. The cylinder interior was noted for the uniform deposit of soft carbon (soot) over the piston top, the bottom of the head, and the injector tips. This condition was also found to exist at the end of the 100 percent ESCO test.

It is interesting to note that the crownland deposit demerits are slightly higher for this diesel fuel evaluation than for the ESCO fuel evaluation. There is somewhat more medium carbon present. The difference in the ratings is not judged significant, however.

Table D-VI shows the piston ring proudness before and after the durability evaluation. The initial proudness was about 30 percent less than it was for the previous durability evaluation but the final proudness was about the same as that obtained earlier. This is to be expected since the grooves were nearly filled and the proudness limit was established by the cylinder bore diameter.

Table D-VII gives the quantitative evaluation of the pistons. Again we see that results of the evaluation using the diesel fuel actually gives slightly worse results than did the evaluation using ESCO fuel, shown in Table C-VII. The overall piston demerits for the diesel fuel evaluation is 433.56, while the overall value for the ESCO fuel evaluation is 340.15. Interestingly enough, the demerits due to proudness are virtually equal for the two fuels.

The percent groove fill appears somewhat worse for the diesel fuel, except for piston 5 which has only a 40% fill compared to a 90 percent fill for the ESCO fuel.

Figure D-1 presents photographs of some parts of the engine after testing. The cylinder liners were not broken in half so no pictures are available. The liners were in good condition with no deterioration of the cross-hatched honing marks.

Photo 1 shows a close-up of a typical piston. The softness of the crownland deposits is attested to by the prominent finger print. Note the absence of deposits in the oil control ring groove. Photo 2 shows the top of the piston and the spray cup. The spots in the cup are fuel stains. The soot in the cup is probably a little lighter than was in the cup at the end of the ESCO test. The injector tips are in Photo 3. There is less buildup evident on these tips than for the ESCO test. Two connecting rod bearings are in Photo 4. Note considerable scratches. It is not evident in the photographs but most of the bearing liners showed copper patches at the register tang. Photo 5 is of the intake valves, No. 1 to the left. Note the build-up of carbon at the edge of several faces. The pan is shown in Photo 6 and is clean except for residual oil.

TABLE D-1

PERFORMANCE DATA FOR 200 HOUR
DURABILITY EVALUATION: 100% DF-2

INTENTIONALLY BLANK

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-23-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	1/2	1 1/2	2 1/2	3	3 1/2	4 1/2	5 1/2	6
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	725	2503	1800	2000	724	2501	1803	2000
Dyno Load (lb) Observed	3.0	205.8	252.2	5.4	2.6	205.2	251.3	61.2
BHP	0.7	171.7	151.3	3.6	0.6	171.1	151.0	41.0
1 - Coolant Out Temperature, F	131	187	188	183	179	188	186	183
2 - Coolant In Temperature, F	89	181	177	179	177	178	175	178
3 - Oil Sump Temperature, F	133	215	225	200	183	225	217	204
4 - Intake Air Temperature, F	78	84	88	88	89	92	94	95
5 - Fuel Temperature, F	83	93	92	95	91	91	92	94
6 - Intake Manifold After Turbo	82	152	268	114	97	271	229	131
7 - Ambient Air Temperature, F	78	81	86	84	86	89	90	93
8 - Exhaust Temperature Cyl. #1	204	950	966	325	213	972	977	496
9 - Exhaust Temperature Cyl. #2	208	1020	1048	343	224	1029	1056	517
10 - Exhaust Temperature Cyl. #3	193	962	1009	328	234	987	1023	514
11 - Exhaust Temperature Cyl. #4	205	988	1017	353	240	1002	1029	542
12 - Exhaust Temperature Cyl. #5	183	989	1036	345	191	1010	1039	541
13 - Exhaust Temperature Cyl. #6	205	918	937	335	210	933	945	498
Oil Gallery Pressure, psi	40.5	45.5	37.4	46.4	21.0	44.8	36.8	45.9
Pressure Before Fuel Filter, psi	30.5	54.8	47.9	54.8	30.0	57.0	48.0	54.4
Pressure After Fuel Filter, psi	30.5	57.5	48.0	55.0	30.0	56.9	47.8	54.5
Intake Manifold Pressure, In. Hg.	0	26.7	20.7	0	0	26.8	20.3	1.8
Intake Air Restriction, In. H_2O		6		3			4	3
Fuel Rate LBS/HR		64.2	55.9			66.9	56.0	
Fuel Time Sec/ ½ lb.		28.1	32.81			26.90	32.13	
Barometer Pressure, In. Hg.			29.12				29.12	
Dry Bulb Temp., F			84				85	
Wet Bulb Temp., F/R.H.%		66%	75			57%	73	
Blow-by, CFH		276				287		
Smoke RDG. % 0-20% scale						2.2	8.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-23-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	6 1/2	7 1/2	8 1/2	9	9 1/2	10 1/2	11 1/2	12
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	720	2497	1800	1999	724	2474	1799	1997
Dyno Load (lb) Observed	3.8	204.6	251.8	59.4	3.4	208.8	252.4	59.0
BHP	0.9	170.3	151.1	39.6	0.8	172.2	151.4	39.3
1 - Coolant Out Temperature, F	178	186	190	189	189	189	188	189
2 - Coolant In Temperature, F	175	176	179	184	187	179	177	184
3 - Oil Sump Temperature, F	193	224	219	208	191	225	218	209
4 - Intake Air Temperature, F	95	96	98	95	93	93	91	90
5 - Fuel Temperature, F	93	92	93	94	91	90	90	93
6 - Intake Manifold After Turbo	105	273	231	130	101	269	225	126
7 - Ambient Air Temperature, F	94	94	94	93	91	89	88	87
8 - Exhaust Temperature Cyl. #1	233	971	984	493	221	970	978	493
9 - Exhaust Temperature Cyl. #2	246	1033	1061	514	230	1034	1053	511
10 - Exhaust Temperature Cyl. #3	262	994	1030	511	240	991	1020	506
11 - Exhaust Temperature Cyl. #4	263	1009	1035	538	248	1001	1021	533
12 - Exhaust Temperature Cyl. #5	214	1014	1052	537	196	1009	1038	535
13 - Exhaust Temperature Cyl. #6	227	940	952	493	218	940	942	496
Oil Gallery Pressure, psi	19.9	44.9	36.0	45.0	19.7	44.0	36.2	44.8
Pressure Before Fuel Filter, psi	29.9	57.0	48.0	54.2	30.0	56.9	47.8	54.2
Pressure After Fuel Filter, psi	29.8	56.9	47.8	54.2	29.9	56.8	47.6	54.2
Intake Manifold Pressure, In. Hg.	0	26.1	20.8	2.9	.0	26.2	20.8	3.0
Intake Air Restriction, In. H_2O		6	4	3	1	5	4	3
Fuel Rate LBS/HR		66.6	55.0	18.4		68.0	55.4	18.1
Fuel Time Sec/ ½ lb.		27.01	32.73	97.79		26.47	32.51	99.49
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		287				298		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-23-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	12 1/2	13 1/2	14 1/2	15				
Time	9:30	10:30	11:30	12:00				
Engine RPM	719	2493	1809	2007				
Dyno Load (lb) Observed	3.4	208.8	254.6	58.6				
BHP	0.8	173.5	153.5	39.2				
1 - Coolant Out Temperature, F	190	189	190	189				
2 - Coolant In Temperature, F	188	180	179	185				
3 - Oil Sump Temperature, F	189	226	219	209				
4 - Intake Air Temperature, F	88	84	84	84				
5 - Fuel Temperature, F	90	91	92	95				
6 - Intake Manifold After Turbo	96	262	220	119				
7 - Ambient Air Temperature, F	85	82	80	81				
8 - Exhaust Temperature Cyl. #1	221	956	972	482				
9 - Exhaust Temperature Cyl. #2	228	1029	1043	502				
10 - Exhaust Temperature Cyl. #3	237	976	1012	498				
11 - Exhaust Temperature Cyl. #4	247	991	1014	519				
12 - Exhaust Temperature Cyl. #5	191	998	1026	522				
13 - Exhaust Temperature Cyl. #6	215	929	930	486				
Oil Gallery Pressure, psi	19.8	44.0	36.0	44.9				
Pressure Before Fuel Filter, psi	29.9	56.6	48.0	54.2				
Pressure After Fuel Filter, psi	29.9	56.6	47.9	54.1				
Intake Manifold Pressure, In. Hg.	.0	27.0	21.1	3.0				
Intake Air Restriction, In. H_2O	2	5	4	2				
Fuel Rate LBS/HR		68.7	56.5	18.0				
Fuel Time Sec/ ½ lb.		26.21	31.85	99.81				
Barometer Pressure, In. Hg.		29.14						
Dry Bulb Temp., F		83						
Wet Bulb Temp., F/R.H.%	66%	74						
Blow-by, CFH		303						
Smoke RDG. % 0-20% scale								

Down @ 12:00 for soak.

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-24-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	15 1/2	16 1/2	17 1/2	18	18 1/2	19 1/2	20 1/2	21
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	715	2502	1808	2000	717	2503	1807	2002
Dyno Load (lb) Observed	2.8	205.2	254.0	55.4	3.0	204.3	250.8	55.2
BHP	0.7	171.1	153.1	36.9	0.7	170.5	151.1	36.8
1 - Coolant Out Temperature, F	120	188	185	183	183	184	182	179
2 - Coolant In Temperature, F	118	178	175	178	181	175	171	174
3 - Oil Sump Temperature, F	124	225	216	204	186	222	214	202
4 - Intake Air Temperature, F	80	86	90	90	93	92	98	97
5 - Fuel Temperature, F	82	93	95	98	97	97	97	100
6 - Intake Manifold After Turbo	83	262	225	125	100	269	231	131
7 - Ambient Air Temperature, F	79	84	85	88	90	89	95	97
8 - Exhaust Temperature Cyl. #1	210	958	974	474	221	972	988	484
9 - Exhaust Temperature Cyl. #2	208	1014	1048	496	230	1025	1058	504
10 - Exhaust Temperature Cyl. #3	189	975	1021	491	237	984	1028	498
11 - Exhaust Temperature Cyl. #4	204	992	1014	516	245	1000	1028	521
12 - Exhaust Temperature Cyl. #5	177	996	1030	517	190	1005	1039	526
13 - Exhaust Temperature Cyl. #6	208	920	940	481	214	935	943	486
Oil Gallery Pressure, psi	40.8	44.9	32.0	45.9	20.0	45.0	37.5	46.2
Pressure Before Fuel Filter, psi	30.0	52.2	43.0	54.2	29.0	57.0	47.5	54.0
Pressure After Fuel Filter, psi	30.0	52.0	43.0	54.1	29.0	56.9	47.5	54.0
Intake Manifold Pressure, In. Hg.	0	26.9	20.9	2.5	0	26.1	20.1	2.8
Intake Air Restriction, In. H_2O	1	6	4	2	1	6	4	2
Fuel Rate LBS/HR		67.1	55.8	17.6		66.4	55.3	17.4
Fuel Time Sec/ ½ lb.		26.83	32.28	102.54		27.11	32.55	103.20
Barometer Pressure, In. Hg.			29.16				29.17	
Dry Bulb Temp., F			86				87	
Wet Bulb Temp., F/R.H.%		48%	71			58%	75	
Blow-by, CFH		313				292		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-24-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	21 1/2	22 1/2	23 1/2	24	24 1/2	25 1/2	26 1/2	27
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	719	2497	1803	1999	718	2506	1809	1999
Dyno Load (lb) Observed	3.4	206.0	251.8	58.2	3.4	205.8	254.4	60.8
BHP	0.8	172.0	151.3	38.8	0.8	171.9	153.4	40.5
1 - Coolant Out Temperature, F	175	184	190	189	186	190	190	189
2 - Coolant In Temperature, F	172	174	179	184	184	180	179	184
3 - Oil Sump Temperature, F	182	222	219	209	187	226	220	209
4 - Intake Air Temperature, F	97	97	98	96	96	94	91	89
5 - Fuel Temperature, F	98	98	98	101	98	97	95	98
6 - Intake Manifold After Turbo	104	273	232	131	103	271	227	126
7 - Ambient Air Temperature, F	92	92	94	94	93	90	90	85
8 - Exhaust Temperature Cyl. #1	219	976	987	488	223	977	982	496
9 - Exhaust Temperature Cyl. #2	228	1034	1061	512	230	1029	1051	514
10 - Exhaust Temperature Cyl. #3	236	992	1033	507	237	986	1021	509
11 - Exhaust Temperature Cyl. #4	242	1004	1031	535	247	1005	1022	535
12 - Exhaust Temperature Cyl. #5	190	1012	1048	536	190	1007	1039	539
13 - Exhaust Temperature Cyl. #6	211	940	949	493	215	931	945	498
Oil Gallery Pressure, psi	21.2	45.2	36.1	44.9	20.5	44.0	36.0	45.0
Pressure Before Fuel Filter, psi	29.0	57.1	47.3	54.0	29.1	57.2	48.0	54.0
Pressure After Fuel Filter, psi	29.0	57.0	47.2	54.1	29.1	57.2	47.9	54.0
Intake Manifold Pressure, In. Hg.	0	26.0	20.2	3.0	.0	26.8	21.1	3.0
Intake Air Restriction, In. H_2O	1	5	4	4	0	6	4	3
Fuel Rate LBS/HR		66.3	55.2	18.4		67.3	56.7	18.3
Fuel Time Sec/ ½ lb.		27.14	32.64	97.75		26.73	31.77	98.59
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		292				303		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-24-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	27 1/2	28 1/2	29 1/2	30				
Time	9:30	10:30	11:30	12:00				
Engine RPM	718	2511	1809	2001				
Dyno Load (lb) Observed	3.2	205.6	256.8	60.4				
BHP	0.8	172.1	154.9	40.3				
1 - Coolant Out Temperature, F	192	188	190	189				
2 - Coolant In Temperature, F	190	180	179	184				
3 - Oil Sump Temperature, F	194	226	220	208				
4 - Intake Air Temperature, F	89	86	86	85				
5 - Fuel Temperature, F	95	94	94	97				
6 - Intake Manifold After Turbo	97	270	222	121				
7 - Ambient Air Temperature, F	84	85	81	81				
8 - Exhaust Temperature Cyl. #1	223	976	974	488				
9 - Exhaust Temperature Cyl. #2	231	1032	1044	507				
10 - Exhaust Temperature Cyl. #3	238	990	1014	504				
11 - Exhaust Temperature Cyl. #4	248	1003	1013	529				
12 - Exhaust Temperature Cyl. #5	191	1008	1026	532				
13 - Exhaust Temperature Cyl. #6	218	937	934	493				
Oil Gallery Pressure, psi	19.0	45.1	36.0	45.0				
Pressure Before Fuel Filter, psi	29.2	57.2	47.9	54.0				
Pressure After Fuel Filter, psi	29.3	57.2	47.8	54.0				
Intake Manifold Pressure, In. Hg.	.0	26.1	21.1	3.0				
Intake Air Restriction, In. H_2O	0	5	4	2				
Fuel Rate LBS/HR		66.8	57.0	18.6				
Fuel Time Sec/ ½ lb.		26.95	31.56	96.77				
Barometer Pressure, In. Hg.		29.15						
Dry Bulb Temp., F		87						
Wet Bulb Temp., F/R.H.%	55%	74						
Blow-by, CFH		298						
Smoke RDG. % 0-20% scale								

Down @ 12:00 p.m. for soak.

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-25-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	30 1/2	31 1/2	32 1/2	33	33 1/2	34 1/2	35 1/2	36
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	713	2501	1797	2003	719	2504	1800	2001
Dyno Load (lb) Observed	2.2	206.2	254.8	63.2	3.0	204.6	253.8	60.8
BHP	0.5	171.9	152.6	42.2	0.7	170.8	152.3	40.6
1 - Coolant Out Temperature, F	130	188	186	184	177	185	186	185
2 - Coolant In Temperature, F	128	178	175	179	175	175	175	180
3 - Oil Sump Temperature, F	132	225	216	206	182	223	217	206
4 - Intake Air Temperature, F	79	89	89	91	91	95	98	96
5 - Fuel Temperature, F	85	94	95	98	95	96	96	98
6 - Intake Manifold After Turbo	84	265	224	128	98	272	233	132
7 - Ambient Air Temperature, F	78	86	86	88	89	95	96	96
8 - Exhaust Temperature Cyl. #1	211	956	982	504	216	971	994	501
9 - Exhaust Temperature Cyl. #2	211	1017	1052	527	224	1029	1064	523
10 - Exhaust Temperature Cyl. #3	192	975	1022	522	233	989	1038	517
11 - Exhaust Temperature Cyl. #4	205	995	1017	550	242	1004	1033	545
12 - Exhaust Temperature Cyl. #5	175	1000	1033	549	185	1010	1050	541
13 - Exhaust Temperature Cyl. #6	204	928	935	510	213	939	956	503
Oil Gallery Pressure, psi	42.9	44.8	37.0	45.5	21.0	45.1	36.5	45.2
Pressure Before Fuel Filter, psi	29.8	58.0	47.2	54.0	29.1	58.1	47.5	53.1
Pressure After Fuel Filter, psi	29.5	58.0	47.3	54.0	29.1	58.0	47.5	53.1
Intake Manifold Pressure, In. Hg.	0	26.5	20.8	3.1	0	26.1	20.5	2.5
Intake Air Restriction, In. H_2O	0	6	3	3	0	6	3	2
Fuel Rate LBS/HR		68.2	55.7	19.2		66.3	55.5	18.7
Fuel Time Sec/ ½ lb.		26.40	32.33	93.67		27.14	32.42	96.24
Barometer Pressure, In. Hg.			29.17				29.15	
Dry Bulb Temp., F			90				89	
Wet Bulb Temp., F/R.H.%		59%	78			58%	77	
Blow-by, CFH		292				281		
Smoke RDG. % 0-20% scale						2.5	8.5	

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-25-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	36 1/2	37 1/2	38 1/2	39	39 1/2	40 1/2	41 1/2	42
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	717	2501	1799	2001	715	2509	1808	1999
Dyno Load (lb) Observed	3.6	207.6	253.8	61.0	3.2	206.8	255.4	61.2
BHP	0.9	173.1	152.2	40.7	0.8	173.0	153.9	40.8
1 - Coolant Out Temperature, F	181	187	189	189	190	189	190	190
2 - Coolant In Temperature, F	179	177	178	184	188	179	179	185
3 - Oil Sump Temperature, F	185	224	219	209	193	225	220	210
4 - Intake Air Temperature, F	97	97	100	98	95	92	92	91
5 - Fuel Temperature, F	95	95	95	98	95	94	94	98
6 - Intake Manifold After Turbo	104	275	235	134	103	270	229	128
7 - Ambient Air Temperature, F	93	96	96	95	93	89	90	90
8 - Exhaust Temperature Cyl. #1	224	977	1003	507	227	971	989	503
9 - Exhaust Temperature Cyl. #2	226	1037	1069	526	230	1025	1056	523
10 - Exhaust Temperature Cyl. #3	235	994	1044	520	242	986	1028	515
11 - Exhaust Temperature Cyl. #4	248	1011	1036	549	255	1002	1022	548
12 - Exhaust Temperature Cyl. #5	189	1015	1053	549	192	1005	1038	544
13 - Exhaust Temperature Cyl. #6	217	946	961	508	221	933	944	504
Oil Gallery Pressure, psi	20.1	44.9	36.1	44.9	19.2	44.4	36.1	45.0
Pressure Before Fuel Filter, psi	29.2	58.2	47.8	54.0	29.3	58.4	47.9	54.1
Pressure After Fuel Filter, psi	29.2	58.1	47.6	54.0	29.3	58.2	47.8	54.1
Intake Manifold Pressure, In. Hg.	0	26.5	20.8	3.0	.0	26.8	21.2	3.0
Intake Air Restriction, In. H_2O	1	5	4	3	1	6	4	3
Fuel Rate LBS/HR	1.4	66.4	55.6	19.0		66.7	56.1	18.9
Fuel Time Sec/ ½ lb.	1245.84	27.11	32.39	94.85		27.00	32.09	95.40
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		298				292		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-25-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	42 1/2	43 1/2	44 1/2	45				
Time	9:30	10:30	11:30	12:00				
Engine RPM	718	2506	1812	1999				
Dyno Load (lb) Observed	3.6	207.0	263.6	62.2				
BHP	0.9	172.9	159.2	41.4				
1 - Coolant Out Temperature, F	190	189	189	189				
2 - Coolant In Temperature, F	189	180	178	184				
3 - Oil Sump Temperature, F	193	226	220	209				
4 - Intake Air Temperature, F	89	89	85	86				
5 - Fuel Temperature, F	95	95	95	98				
6 - Intake Manifold After Turbo	97	266	228	123				
7 - Ambient Air Temperature, F	87	86	84	85				
8 - Exhaust Temperature Cyl. #1	225	966	991	499				
9 - Exhaust Temperature Cyl. #2	226	1019	1059	519				
10 - Exhaust Temperature Cyl. #3	239	977	1034	510				
11 - Exhaust Temperature Cyl. #4	251	996	1031	539				
12 - Exhaust Temperature Cyl. #5	192	999	1047	540				
13 - Exhaust Temperature Cyl. #6	221	924	965	500				
Oil Gallery Pressure, psi	19.2	44.1	36.1	44.9				
Pressure Before Fuel Filter, psi	29.2	58.9	47.6	54.0				
Pressure After Fuel Filter, psi	29.2	58.8	47.5	54.1				
Intake Manifold Pressure, In. Hg.	.0	26.8	22.2	3.0				
Intake Air Restriction, In. H_2O	0	5	4	3				
Fuel Rate LBS/HR		66.2	58.1	18.9				
Fuel Time Sec/ ½ lb.		27.20	31.00	95.09				
Barometer Pressure, In. Hg.		29.14						
Dry Bulb Temp., F		84						
Wet Bulb Temp., F/R.H.%	62%	74						
Blow-by, CFH		298						
Smoke RDG. % 0-20% scale								

Down @ 12:00 p.m. for soak.

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-26-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	45 1/2	46 1/2	47 1/2	48	48 1/2	49 1/2	50 1/2	51
Time	9:20	10:20	11:20	11:50	12:20	1:20	2:20	2:50
Engine RPM	722	2510	1807	2007	721	2510	1800	2002
Dyno Load (lb) Observed	3.4	205.8	258.2	68.4	3.4	200.6	255.3	65.0
BHP	0.81	172.2	155.5	45.8	0.8	167.8	153.2	43.4
1 - Coolant Out Temperature, F	142	200	195	193	186	195	195	190
2 - Coolant In Temperature, F	141	190	184	187	184	185	185	184
3 - Oil Sump Temperature, F	144	234	224	212	190	230	221	210
4 - Intake Air Temperature, F	81	88	96	91	91	97	96	97
5 - Fuel Temperature, F	87	95	96	98	96	97	96	98
6 - Intake Manifold After Turbo	86	265	232	130	99	273	233	135
7 - Ambient Air Temperature, F	80	84	89	87	89	93	93	95
8 - Exhaust Temperature Cyl. #1	218	965	997	521	219	978	993	518
9 - Exhaust Temperature Cyl. #2	210	1019	1071	548	226	1026	1062	539
10 - Exhaust Temperature Cyl. #3	191	977	1041	542	236	987	1036	530
11 - Exhaust Temperature Cyl. #4	210	999	1033	570	252	1009	1032	563
12 - Exhaust Temperature Cyl. #5	181	999	1057	565	193	1009	1047	553
13 - Exhaust Temperature Cyl. #6	215	917	964	525	218	932	951	519
Oil Gallery Pressure, psi	35.0	40.5	34.0	43.8	19.2	42.3	36.2	44.5
Pressure Before Fuel Filter, psi	29.9	58.0	47.5	54.0	29.2	59.0	47.2	54.0
Pressure After Fuel Filter, psi	29.5	57.5	47.5	54.0	29.2	59.0	47.2	54.0
Intake Manifold Pressure, In. Hg.	.0	27.0	21.8	3.2	0	26.2	20.5	3.2
Intake Air Restriction, In. H_2O	1	5	4	5	1	6	3	3
Fuel Rate LBS/HR		66.6	56.8	20.1		65.7	55.2	18.9
Fuel Time Sec/ ½ lb.		27.03	31.72	89.64		27.38	32.61	95.30
Barometer Pressure, In. Hg.			29.15				29.15	
Dry Bulb Temp., F			83				91	
Wet Bulb Temp., F/R.H.%		66%	74			51%	76	
Blow-by, CFH		292				292		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-26-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	51 1/2	52 1/2	53 1/2	54	54 1/2	55 1/2	56 1/2	57
Time	3:20	4:20	5:20	5:50	6:20	7:20	8:20	8:50
Engine RPM	721	2512	1809	1999	721	2516	1814	2002
Dyno Load (lb) Observed	3.6	202.8	255.8	64.4	3.8	203.2	254.2	64.6
BHP	0.9	169.8	154.2	42.9	0.9	170.4	153.7	43.1
1 - Coolant Out Temperature, F	185	194	192	189	186	190	189	190
2 - Coolant In Temperature, F	183	184	181	184	183	180	178	184
3 - Oil Sump Temperature, F	189	229	222	210	188	226	219	209
4 - Intake Air Temperature, F	96	97	99	97	97	94	92	91
5 - Fuel Temperature, F	95	96	95	98	96	96	96	98
6 - Intake Manifold After Turbo	104	273	238	134	104	270	227	128
7 - Ambient Air Temperature, F	94	98	96	94	93	91	88	88
8 - Exhaust Temperature Cyl. #1	223	976	1006	519	221	977	973	514
9 - Exhaust Temperature Cyl. #2	227	1029	1080	539	227	1024	1049	533
10 - Exhaust Temperature Cyl. #3	239	990	1053	527	240	984	1024	522
11 - Exhaust Temperature Cyl. #4	253	1011	1037	558	253	1000	1018	551
12 - Exhaust Temperature Cyl. #5	192	1011	1059	552	199	1002	1035	546
13 - Exhaust Temperature Cyl. #6	219	934	965	517	218	929	939	510
Oil Gallery Pressure, psi	19.5	42.8	30.0	44.7	19.8	43.0	36.1	44.8
Pressure Before Fuel Filter, psi	29.2	58.6	47.6	54.1	29.2	59.0	47.8	54.1
Pressure After Fuel Filter, psi	29.2	58.6	47.6	54.2	29.2	59.0	47.8	54.1
Intake Manifold Pressure, In. Hg.	0	26.1	21.0	3.1	0	26.2	21.0	3.1
Intake Air Restriction, In. H_2O	1	6	3	2	1	6	3	2
Fuel Rate LBS/HR		66.6	57.7	19.4		65.9	55.8	19.3
Fuel Time Sec/ ½ lb.		27.01	31.22	92.98		27.33	32.26	93.42
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		292				278		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-26-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	57 1/2	58 1/2	59 1/2	60				
Time	9:20	10:20	11:20	11:50				
Engine RPM	722	2512	1814	2002				
Dyno Load (lb) Observed	3.6	203.6	262.6	64.2				
BHP	0.9	170.5	158.8	42.8				
1 - Coolant Out Temperature, F	190	189	188	189				
2 - Coolant In Temperature, F	188	180	177	184				
3 - Oil Sump Temperature, F	192	225	219	209				
4 - Intake Air Temperature, F	90	88	87	85				
5 - Fuel Temperature, F	95	95	93	96				
6 - Intake Manifold After Turbo	98	264	229	723				
7 - Ambient Air Temperature, F	87	89	84	81				
8 - Exhaust Temperature Cyl. #1	219	957	990	507				
9 - Exhaust Temperature Cyl. #2	227	1010	1061	524				
10 - Exhaust Temperature Cyl. #3	238	975	1034	513				
11 - Exhaust Temperature Cyl. #4	254	992	1022	543				
12 - Exhaust Temperature Cyl. #5	193	992	1042	539				
13 - Exhaust Temperature Cyl. #6	219	917	960	505				
Oil Gallery Pressure, psi	19.0	44.4	36.4	44.8				
Pressure Before Fuel Filter, psi	29.2	59.8	47.9	54.3				
Pressure After Fuel Filter, psi	29.2	59.8	47.7	54.2				
Intake Manifold Pressure, In. Hg.	0	26.3	22.4	3.2				
Intake Air Restriction, In. H_2O	1	6	4	2				
Fuel Rate LBS/HR		65.2	58.1	19.4				
Fuel Time Sec/ ½ lb.		27.63	30.98	93.02				
Barometer Pressure, In. Hg.		29.13						
Dry Bulb Temp., F		87						
Wet Bulb Temp., F/R.H.%	55%	74						
Blow-by, CFH		276						
Smoke RDG. % 0-20% scale								

Down @ 11:50 p.m. for soak.

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-27-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	60 1/2	61 1/2	62 1/2	63	63 1/2	64 1/2	65 1/2	66
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	715	2507	1806	2002	719	2513	1803	2000
Dyno Load (lb) Observed	2.6	202.5	253.2	68.8	3.2	200.8	253.2	68.4
BHP	0.6	169.2	152.4	45.9	0.8	168.2	152.2	45.6
1 - Coolant Out Temperature, F	126	193	188	185	179	188	185	183
2 - Coolant In Temperature, F	124	183	177	180	177	178	174	178
3 - Oil Sump Temperature, F	129	228	217	208	184	223	216	204
4 - Intake Air Temperature, F	81	84	90	89	92	94	97	96
5 - Fuel Temperature, F	84	95	94	97	93	96	94	96
6 - Intake Manifold After Turbo	85	259	225	130	99	269	231	134
7 - Ambient Air Temperature, F	81	82	87	87	89	91	96	94
8 - Exhaust Temperature Cyl. #1	214	943	971	534	240	957	981	528
9 - Exhaust Temperature Cyl. #2	210	1002	1048	555	232	1015	1059	550
10 - Exhaust Temperature Cyl. #3	192	967	1021	542	208	978	1033	538
11 - Exhaust Temperature Cyl. #4	210	981	1015	568	228	995	1027	565
12 - Exhaust Temperature Cyl. #5	175	987	1035	568	202	1000	1042	562
13 - Exhaust Temperature Cyl. #6	201	912	937	532	235	925	950	527
Oil Gallery Pressure, psi	45.0	42.2	37.5	45.8	21.5	45.0	38.0	46.0
Pressure Before Fuel Filter, psi	29.9	60.0	47.8	54.0	29.2	60.0	47.5	54.5
Pressure After Fuel Filter, psi	29.5	60.0	47.8	54.0	29.2	60.0	47.5	54.5
Intake Manifold Pressure, In. Hg.	0	26.2	21.0	4.0	0	26.0	20.5	4.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR		65.3	55.6	20.8		65.6	55.2	20.9
Fuel Time Sec/ ½ lb.		27.58	32.38	86.62		27.43	32.64	85.98
Barometer Pressure, In. Hg.		29.16					29.15	
Dry Bulb Temp., F		84					85	
Wet Bulb Temp., F/R.H.%	73%	77				54%	72	
Blow-by, CFH		303				298		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-27-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	66 1/2	67 1/2	68 1/2	69	69 1/2	70 1/2	71 1/2	72
Time	3:30	4:30	5:30	6:00	6:50	7:30	8:30	9:00
Engine RPM	711	2512	1803	1999	718	2501	1802	2000
Dyno Load (lb) Observed	2.8	200.4	253.4	71.2	3.4	203.4	256.6	77.4
BHP	0.7	167.8	152.3	47.4	0.8	169.6	154.1	51.6
1 - Coolant Out Temperature, F	179	187	190	189	185	190	189	189
2 - Coolant In Temperature, F	176	177	179	184	184	182	179	182
3 - Oil Sump Temperature, F	182	223	217	209	188	228	218	208
4 - Intake Air Temperature, F	94	96	100	97	94	93	85	85
5 - Fuel Temperature, F	93	95	94	96	93	93	91	94
6 - Intake Manifold After Turbo	101	271	234	136	102	268	220	127
7 - Ambient Air Temperature, F	91	95	96	95	91	86	83	82
8 - Exhaust Temperature Cyl. #1	218	962	986	540	225	956	965	547
9 - Exhaust Temperature Cyl. #2	223	1020	1065	562	227	1014	1044	568
10 - Exhaust Temperature Cyl. #3	232	983	1037	547	238	979	1013	552
11 - Exhaust Temperature Cyl. #4	247	1003	1031	575	249	998	1011	583
12 - Exhaust Temperature Cyl. #5	188	1009	1046	573	191	1004	1028	576
13 - Exhaust Temperature Cyl. #6	215	935	951	535	218	932	936	544
Oil Gallery Pressure, psi	22.0	45.7	32.3	45.2	20.8	44.8	37.0	45.5
Pressure Before Fuel Filter, psi	29.0	60.2	48.0	54.2	29.6	60.2	48.0	54.5
Pressure After Fuel Filter, psi	29.0	60.3	47.8	54.3	29.7	60.3	48.0	54.5
Intake Manifold Pressure, In. Hg.	.0	26.0	20.7	3.5	0	26.1	21.0	4.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR		65.6	55.2	20.4		65.2	55.6	21.9
Fuel Time Sec/ ½ lb.		27.44	32.59	88.08		27.59	32.35	82.25
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		281				276		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-27-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	72 1/2	73 1/2	74 1/2	75				
Time	9:30	10:30	11:30	12:00				
Engine RPM	717	2506	1805	2001				
Dyno Load (lb) Observed	3.4	201.8	255.8	78.8				
BHP	0.8	168.6	153.9	52.5				
1 - Coolant Out Temperature, F	189	190	189	189				
2 - Coolant In Temperature, F	183	181	178	184				
3 - Oil Sump Temperature, F	186	225	218	210				
4 - Intake Air Temperature, F	89	88	88	85				
5 - Fuel Temperature, F	90	92	91	94				
6 - Intake Manifold After Turbo	96	262	222	128				
7 - Ambient Air Temperature, F	84	86	81	82				
8 - Exhaust Temperature Cyl. #1	223	949	972	554				
9 - Exhaust Temperature Cyl. #2	224	1004	1045	577				
10 - Exhaust Temperature Cyl. #3	236	970	1013	560				
11 - Exhaust Temperature Cyl. #4	244	989	1011	589				
12 - Exhaust Temperature Cyl. #5	188	996	1026	583				
13 - Exhaust Temperature Cyl. #6	216	923	932	548				
Oil Gallery Pressure, psi	20.7	45.0	37.5	45.0				
Pressure Before Fuel Filter, psi	29.8	60.3	48.0	54.5				
Pressure After Fuel Filter, psi	29.8	60.4	47.9	54.5				
Intake Manifold Pressure, In. Hg.	0	26.2	21.0	4.0				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR		64.9	55.8	22.3				
Fuel Time Sec/ ½ lb.		27.72	32.27	80.88				
Barometer Pressure, In. Hg.		29.14						
Dry Bulb Temp., F		81						
Wet Bulb Temp., F/R.H.%	58%	70						
Blow-by, CFH		298						
Smoke RDG. % 0-20% scale								

Down @ 12:00 p.m. for soak.

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-28-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	75 1/2	76 1/2	77 1/2	78	78 1/2	79 1/2	80 1/2	81
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	2:50
Engine RPM	719	2496	1809	1989	716	2498	1804	2000
Dyno Load (lb) Observed	2.6	203.8	256.0	63.2	3.4	200.6	254.4	69.0
BHP	0.6	169.6	154.4	41.9	0.8	167.0	153.0	46.0
1 - Coolant Out Temperature, F	129	189	185	186	183	191	190	187
2 - Coolant In Temperature, F	128	180	174	181	181	182	179	181
3 - Oil Sump Temperature, F	131	225	215	207	188	226	219	207
4 - Intake Air Temperature, F	78	85	90	90	90	91	97	93
5 - Fuel Temperature, F	80	91	91	95	93	94	93	96
6 - Intake Manifold After Turbo	82	258	226	144	98	264	231	132
7 - Ambient Air Temperature, F	78	81	86	89	87	90	93	89
8 - Exhaust Temperature Cyl. #1	197	938	973	546	225	944	982	526
9 - Exhaust Temperature Cyl. #2	203	997	1054	528	227	1002	1061	555
10 - Exhaust Temperature Cyl. #3	205	962	1022	557	235	968	1031	533
11 - Exhaust Temperature Cyl. #4	222	986	1019	551	247	1000	1031	565
12 - Exhaust Temperature Cyl. #5	174	993	1021	517	190	1008	1050	558
13 - Exhaust Temperature Cyl. #6	192	921	1040	515	217	929	949	524
Oil Gallery Pressure, psi	45.1	45.0	38.8	45.0	20.0	45.0	37.0	45.8
Pressure Before Fuel Filter, psi	29.9	60.1	48.0	54.0	29.1	60.5	48.0	54.9
Pressure After Fuel Filter, psi	29.9	60.1	48.0	54.0	29.1	60.5	48.0	54.9
Intake Manifold Pressure, In. Hg.	0	26.2	21.2	4.2	0	26.0	20.8	4.2
Intake Air Restriction, In. H_2O	0	6	4	3	1	6	4	2
Fuel Rate LBS/HR		65.0	56.7	19.3		64.4	55.1	21.3
Fuel Time Sec/ ½ lb.		27.68	31.76	93.24		27.95	32.68	84.68
Barometer Pressure, In. Hg.		29.16					29.16	
Dry Bulb Temp., F		84					92	
Wet Bulb Temp., F/R.H.%	57%	72				55%	78	
Blow-by, CFH		303				308		
Smoke RDG. % 0-20% scale						2.5	8.5	1.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-28-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	81 1/2	82 1/2	83 1/2	84	84 1/2	85 1/2	86 1/2	87
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	718	2497	1798	2004	714	2494	1806	2001
Dyno Load (lb) Observed	3.6	200.0	257.6	65.2	3.2	201.2	256.2	67.8
BHP	0.9	166.5	154.4	43.6	0.8	167.3	154.2	45.2
1 - Coolant Out Temperature, F	182	191	189	189	191	190	189	189
2 - Coolant In Temperature, F	180	181	178	181	188	180	178	184
3 - Oil Sump Temperature, F	186	226	218	207	192	225	218	209
4 - Intake Air Temperature, F	93	97	97	94	93	92	91	87
5 - Fuel Temperature, F	92	94	92	96	93	93	91	95
6 - Intake Manifold After Turbo	101	269	234	132	101	265	226	127
7 - Ambient Air Temperature, F	93	90	93	93	89	88	86	83
8 - Exhaust Temperature Cyl. #1	222	949	995	518	231	939	971	523
9 - Exhaust Temperature Cyl. #2	226	1006	1073	540	229	999	1054	546
10 - Exhaust Temperature Cyl. #3	234	973	1036	526	240	965	1025	532
11 - Exhaust Temperature Cyl. #4	249	1006	1032	557	250	1002	1019	559
12 - Exhaust Temperature Cyl. #5	190	1011	1053	551	191	1008	1037	553
13 - Exhaust Temperature Cyl. #6	216	933	953	518	218	929	939	520
Oil Gallery Pressure, psi	20.8	45.0	37.0	45.8	19.5	45.0	37.3	45.3
Pressure Before Fuel Filter, psi	29.0	60.2	48.0	55.0	29.2	60.1	48.1	55.0
Pressure After Fuel Filter, psi	29.0	60.2	48.0	55.0	29.2	60.1	48.1	55.0
Intake Manifold Pressure, In. Hg.	0	25.5	20.9	3.5	0	25.5	21.0	3.5
Intake Air Restriction, In. H_2O	0	6	4	3	1	6	4	3
Fuel Rate LBS/HR		65.0	56.2	20.1		64.5	56.1	20.6
Fuel Time Sec/ ½ lb.		27.71	32.02	89.64		27.91	32.06	87.26
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		292				298		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-28-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	87 1/2	88 1/2	89 1/2	90				
Time	9:30	10:30	11:46	12:16				
Engine RPM	718	2500	1801	2000				
Dyno Load (lb) Observed	3.4	199.8	258.4	67.4				
BHP	0.8	166.5	155.1	44.9				
1 - Coolant Out Temperature, F	190	190	189	189				
2 - Coolant In Temperature, F	189	181	179	184				
3 - Oil Sump Temperature, F	192	225	218	208				
4 - Intake Air Temperature, F	88	87	86	84				
5 - Fuel Temperature, F	91	92	91	94				
6 - Intake Manifold After Turbo	97	258	221	123				
7 - Ambient Air Temperature, F	83	84	81	81				
8 - Exhaust Temperature Cyl. #1	229	931	959	516				
9 - Exhaust Temperature Cyl. #2	228	986	1047	536				
10 - Exhaust Temperature Cyl. #3	236	953	1014	525				
11 - Exhaust Temperature Cyl. #4	249	991	1013	549				
12 - Exhaust Temperature Cyl. #5	191	995	1034	543				
13 - Exhaust Temperature Cyl. #6	218	923	932	512				
Oil Gallery Pressure, psi	19.8	45.0	37.2	45.5				
Pressure Before Fuel Filter, psi	29.9	60.2	48.1	55.0				
Pressure After Fuel Filter, psi	29.9	60.2	48.0	55.0				
Intake Manifold Pressure, In. Hg.	0	25.9	21.1	3.5				
Intake Air Restriction, In. H_2O	1	5	4	3				
Fuel Rate LBS/HR		64.2	56.0	20.2				
Fuel Time Sec/ ½ lb.		28.03	32.15	89.09				
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		292						
Smoke RDG. % 0-20% scale								

Down @ 12:16 p.m. for soak.

REMARKS: Down @ 10:20 replaced fuel valve started @ 10:36.

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-29-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	90 1/2	91 1/2	92 1/2	93	93 1/2	94 1/2	95 1/2	96
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	716	2500	1809	2003	715	2493	1814	2000
Dyno Load (lb) Observed	2.4	200.0	258.8	66.0	2.6	199.8	256.2	62.6
BHP	0.6	166.7	156.1	44.1	0.6	166.0	154.9	41.7
1 - Coolant Out Temperature, F	130	189	187	184	177	189	188	186
2 - Coolant In Temperature, F	129	180	176	179	175	180	177	181
3 - Oil Sump Temperature, F	131	225	218	206	185	225	218	207
4 - Intake Air Temperature, F	79	86	89	90	90	93	95	93
5 - Fuel Temperature, F	80	93	93	97	94	95	96	98
6 - Intake Manifold After Turbo	82	258	227	128	98	264	233	130
7 - Ambient Air Temperature, F	79	85	85	87	87	90	92	88
8 - Exhaust Temperature Cyl. #1	198	933	981	523	221	934	989	515
9 - Exhaust Temperature Cyl. #2	204	988	1060	545	225	998	1065	539
10 - Exhaust Temperature Cyl. #3	205	956	1023	534	235	961	1031	524
11 - Exhaust Temperature Cyl. #4	222	994	1023	551	246	1002	1030	545
12 - Exhaust Temperature Cyl. #5	176	999	1047	550	189	1008	1046	539
13 - Exhaust Temperature Cyl. #6	194	922	948	514	213	926	953	506
Oil Gallery Pressure, psi	45.0	44.9	37.0	46.0	20.5	45.0	37.0	46.0
Pressure Before Fuel Filter, psi	29.5	60.3	47.0	55.0	29.2	60.2	47.0	55.0
Pressure After Fuel Filter, psi	29.5	60.3	47.0	55.0	29.2	60.2	47.0	55.0
Intake Manifold Pressure, In. Hg.	0	26.0	21.5	3.2	0	26.0	21.0	3.0
Intake Air Restriction, In. H_2O	0	6	3	2	0	6	4	1
Fuel Rate LBS/HR		64.9	57.1	20.1		63.5	55.8	19.1
Fuel Time Sec/ ½ lb.		27.77	31.54	89.47		28.37	32.24	94.44
Barometer Pressure, In. Hg.		29.15				29.15		
Dry Bulb Temp., F		86				92		
Wet Bulb Temp., F/R.H.%	57%	74			73%	84		
Blow-by, CFH		308				308		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-29-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	96 1/2	97 1/2	98 1/2	99	99 1/2	100 1/2	101 1/2	102
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	714	2498	1811	2006	723	2501	1815	2007
Dyno Load (lb) Observed	3.2	202.0	255.4	65.8	3.2	196.8	258.3	67.4
BHP	0.8	168.2	154.2	44.0	0.8	164.1	156.3	45.1
1 - Coolant Out Temperature, F	182	191	189	188	190	190	190	189
2 - Coolant In Temperature, F	179	181	178	183	188	180	180	184
3 - Oil Sump Temperature, F	186	226	219	209	192	226	220	210
4 - Intake Air Temperature, F	93	95	95	95	95	91	91	88
5 - Fuel Temperature, F	93	94	94	98	95	95	94	98
6 - Intake Manifold After Turbo	101	268	233	133	103	264	230	127
7 - Ambient Air Temperature, F	89	92	93	92	90	88	87	88
8 - Exhaust Temperature Cyl. #1	226	945	994	527	227	939	986	524
9 - Exhaust Temperature Cyl. #2	227	1007	1068	551	234	998	1063	548
10 - Exhaust Temperature Cyl. #3	234	971	1037	540	241	962	1024	538
11 - Exhaust Temperature Cyl. #4	247	1007	1035	558	255	1001	1028	555
12 - Exhaust Temperature Cyl. #5	187	1015	1052	553	195	1006	1046	551
13 - Exhaust Temperature Cyl. #6	217	938	957	518	218	933	954	518
Oil Gallery Pressure, psi	20.0	44.2	36.2	45.2	19.5	44.5	36.0	45.0
Pressure Before Fuel Filter, psi	29.0	60.0	48.2	55.0	29.2	60.0	48.2	55.2
Pressure After Fuel Filter, psi	29.0	60.0	48.2	55.2	29.3	60.1	48.2	55.2
Intake Manifold Pressure, In. Hg.	0	25.2	21.2	3.3	0	25.3	21.2	3.5
Intake Air Restriction, In. H_2O	0	6	4	2	1	6	4	2
Fuel Rate LBS/HR	1.8	64.7	56.4	20.2		64.7	56.2	20.2
Fuel Time Sec/ ½ lb.	978.12	27.84	31.91	89.03		27.81	32.02	89.19
Barometer Pressure, In. Hg.						29.14		
Dry Bulb Temp., F						82		
Wet Bulb Temp., F/R.H.%					69%	70		
Blow-by, CFH		298				292		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-29-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	102 1/2	103 1/2	104 1/2	105				
Time	9:30	10:30	11:30	12:00				
Engine RPM	715	2492	1814	2006				
Dyno Load (lb) Observed	3.0	200.2	260.2	70.1				
BHP	0.7	161.3	157.3	46.9				
1 - Coolant Out Temperature, F	186	190	189	188				
2 - Coolant In Temperature, F	185	181	178	183				
3 - Oil Sump Temperature, F	188	226	219	209				
4 - Intake Air Temperature, F	87	87	85	84				
5 - Fuel Temperature, F	94	96	95	98				
6 - Intake Manifold After Turbo	96	259	225	124				
7 - Ambient Air Temperature, F	84	85	81	83				
8 - Exhaust Temperature Cyl. #1	224	932	980	527				
9 - Exhaust Temperature Cyl. #2	225	992	1058	553				
10 - Exhaust Temperature Cyl. #3	233	958	1019	541				
11 - Exhaust Temperature Cyl. #4	247	992	1019	558				
12 - Exhaust Temperature Cyl. #5	188	995	1036	554				
13 - Exhaust Temperature Cyl. #6	217	924	941	516				
Oil Gallery Pressure, psi	20.0	44.5	36.8	45.2				
Pressure Before Fuel Filter, psi	29.0	60.0	48.0	55.0				
Pressure After Fuel Filter, psi	29.0	60.0	48.0	55.2				
Intake Manifold Pressure, In. Hg.	0	25.6	21.8	4.0				
Intake Air Restriction, In. H_2O	1	6	4	2				
Fuel Rate LBS/HR		64.9	57.4	20.8				
Fuel Time Sec/ ½ lb.		27.74	31.35	86.67				
Barometer Pressure, In. Hg.		29.15						
Dry Bulb Temp., F		80						
Wet Bulb Temp., F/R.H.%	56%	68						
Blow-by, CFH		287						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-30-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	105 1/2	106 1/2	107 1/2	108	108 1/2	109 1/2	110 1/2	111
Time	9:30	10:40	11:40	12:10	12:40	1:40	2:40	3:10
Engine RPM	716	2493	1810	2003	722	2492	1805	2000
Dyno Load (lb) Observed	2.2	197.6	256.4	70.0	2.8	199.8	257.6	65.4
BHP	0.5	164.2	154.7	46.7	0.7	166.0	155.0	43.6
1 - Coolant Out Temperature, F	129	190	186	184	177	185	185	185
2 - Coolant In Temperature, F	127	182	175	178	175	175	174	180
3 - Oil Sump Temperature, F	131	222	217	210	181	222	216	205
4 - Intake Air Temperature, F	79	83	89	88	90	94	93	94
5 - Fuel Temperature, F	86	97	96	99	96	97	96	100
6 - Intake Manifold After Turbo	83	254	227	133	97	265	230	133
7 - Ambient Air Temperature, F	78	80	83	84	87	91	90	94
8 - Exhaust Temperature Cyl. #1	209	918	984	549	220	945	990	523
9 - Exhaust Temperature Cyl. #2	208	983	1055	573	223	1010	1063	549
10 - Exhaust Temperature Cyl. #3	192	945	1020	567	229	969	1026	537
11 - Exhaust Temperature Cyl. #4	206	985	1021	586	243	1000	1028	558
12 - Exhaust Temperature Cyl. #5	176	989	1040	576	185	1008	1053	554
13 - Exhaust Temperature Cyl. #6	207	912	946	529	213	929	957	516
Oil Gallery Pressure, psi	44.1	45.0	37.5	45.0	22.0	45.3	37.5	46.0
Pressure Before Fuel Filter, psi	29.2	60.0	47.0	55.0	28.5	59.8	48.0	55.2
Pressure After Fuel Filter, psi	29.2	60.0	47.0	55.0	28.5	59.8	48.0	55.2
Intake Manifold Pressure, In. Hg.	0	25.8	21.5	4.0	0	25.3	21.0	3.0
Intake Air Restriction, In. H_2O	1	6	4	2	0	6	4	3
Fuel Rate LBS/HR		64.3	56.8	20.7		64.1	57.5	19.6
Fuel Time Sec/ ½ lb.		27.98	31.72	87.03		28.07	31.33	91.90
Barometer Pressure, In. Hg.		29.15				29.14		
Dry Bulb Temp., F		84				90		
Wet Bulb Temp., F/R.H.%	62%	74			51%	75		
Blow-by, CFH		292				298		
Smoke RDG. % 0-20% scale						3.0	8.5	1.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-30-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	111 1/2	112 1/2	113 1/2	114	114 1/2	115 1/2	116 1/2	117
Time	3:40	4:40	5:40	6:10	6:40	7:40	8:40	9:10
Engine RPM	718	2493	1804	2000	715	2488	1804	1997
Dyno Load (lb) Observed	3.4	198.2	258.4	60.4	3.4	200.8	258.6	67.2
BHP	0.8	164.7	155.4	40.3	0.8	163.9	155.5	44.7
1 - Coolant Out Temperature, F	133	190	170	189	186	190	188	190
2 - Coolant In Temperature, F	180	181	178	184	183	180	177	185
3 - Oil Sump Temperature, F	187	226	220	209	188	225	218	210
4 - Intake Air Temperature, F	94	97	97	94	94	91	89	89
5 - Fuel Temperature, F	95	98	97	101	95	96	95	100
6 - Intake Manifold After Turbo	101	268	237	131	102	263	229	128
7 - Ambient Air Temperature, F	90	92	93	92	92	90	87	86
8 - Exhaust Temperature Cyl. #1	220	948	1002	507	224	943	991	521
9 - Exhaust Temperature Cyl. #2	228	1014	1083	531	229	1010	1070	549
10 - Exhaust Temperature Cyl. #3	237	972	1040	517	234	966	1027	535
11 - Exhaust Temperature Cyl. #4	250	1005	1044	538	250	999	1032	554
12 - Exhaust Temperature Cyl. #5	190	1013	1060	532	190	1004	1049	549
13 - Exhaust Temperature Cyl. #6	214	932	961	497	217	924	952	513
Oil Gallery Pressure, psi	20.0	44.5	36.5	45.2	20.5	45.0	37.0	45.0
Pressure Before Fuel Filter, psi	29.2	60.0	48.0	56.0	29.5	60.0	48.2	56.0
Pressure After Fuel Filter, psi	29.2	60.0	47.9	56.1	29.2	60.0	48.1	56.0
Intake Manifold Pressure, In. Hg.	0	25.3	21.3	3.0	0	25.5	21.8	3.4
Intake Air Restriction, In. H_2O	0	5	4	2	0	5	4	3
Fuel Rate LBS/HR		63.9	56.9	18.8		64.4	57.4	19.6
Fuel Time Sec/ ½ lb.		28.17	31.66	95.74		27.97	31.37	91.69
Barometer Pressure, In. Hg.								
Dry Bulb Temp., F								
Wet Bulb Temp., F/R.H.%								
Blow-by, CFH		298				298		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 9-30-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	117 1/2	118 1/2	119 1/2	120				
Time	9:40	10:40	11:40	12:10				
Engine RPM	719	2493	1811	2002				
Dyno Load (lb) Observed	3.6	198.8	259.0	61.4				
BHP	0.9	165.2	156.3	41.0				
1 - Coolant Out Temperature, F	191	189	190	189				
2 - Coolant In Temperature, F	189	180	179	184				
3 - Oil Sump Temperature, F	193	225	220	208				
4 - Intake Air Temperature, F	90	87	87	83				
5 - Fuel Temperature, F	95	96	95	99				
6 - Intake Manifold After Turbo	98	260	226	121				
7 - Ambient Air Temperature, F	86	82	81	81				
8 - Exhaust Temperature Cyl. #1	227	937	983	502				
9 - Exhaust Temperature Cyl. #2	229	1001	1059	526				
10 - Exhaust Temperature Cyl. #3	237	959	1016	511				
11 - Exhaust Temperature Cyl. #4	250	991	1021	531				
12 - Exhaust Temperature Cyl. #5	192	994	1040	527				
13 - Exhaust Temperature Cyl. #6	220	919	944	492				
Oil Gallery Pressure, psi	19.9	45.0	36.8	45.7				
Pressure Before Fuel Filter, psi	29.5	60.1	48.2	56.2				
Pressure After Fuel Filter, psi	29.2	60.0	48.1	56.2				
Intake Manifold Pressure, In. Hg.	0	26.0	21.9	3.1				
Intake Air Restriction, In. H_2O	0	5	4	2				
Fuel Rate LBS/HR		64.5	56.8	18.9				
Fuel Time Sec/ ½ lb.		27.91	31.67	95.25				
Barometer Pressure, In. Hg.		29.03						
Dry Bulb Temp., F		84						
Wet Bulb Temp., F/R.H.%	62%	74						
Blow-by, CFH		303						
Smoke RDG. % 0-20% scale								

Down @ 12:10 for soak.

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-1-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	120 1/2	121 1/2	122 1/2	123	123 1/2	124 1/2	125 1/2	126
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	717	2491	1806	2000	719	2489	1801	1999
Dyno Load (lb) Observed	2.0	199.6	257.4	65.8	2.8	198.6	257.0	62.0
BHP	0.5	165.7	155.0	43.9	0.7	164.8	154.3	41.3
1 - Coolant Out Temperature, F	134	199	195	191	186	194	192	189
2 - Coolant In Temperature, F	133	190	184	186	184	184	181	184
3 - Oil Sump Temperature, F	137	232	223	211	188	228	222	209
4 - Intake Air Temperature, F	79	85	89	89	90	94	95	94
5 - Fuel Temperature, F	87	98	97	102	96	98	97	102
6 - Intake Manifold After Turbo	84	256	228	128	98	265	234	131
7 - Ambient Air Temperature, F	78	80	87	88	89	90	91	89
8 - Exhaust Temperature Cyl. #1	209	933	993	517	219	940	1001	512
9 - Exhaust Temperature Cyl. #2	210	998	1068	546	225	1008	1076	540
10 - Exhaust Temperature Cyl. #3	193	954	1027	529	238	967	1037	523
11 - Exhaust Temperature Cyl. #4	208	985	1033	551	253	1001	1036	545
12 - Exhaust Temperature Cyl. #5	178	991	1051	547	189	1009	1054	540
13 - Exhaust Temperature Cyl. #6	209	911	959	511	214	928	958	503
Oil Gallery Pressure, psi	41.9	42.0	35.3	44.9	20.2	44.0	36.0	45.0
Pressure Before Fuel Filter, psi	29.5	60.0	44.0	56.2	29.0	60.0	58.0	56.2
Pressure After Fuel Filter, psi	29.5	60.0	44.0	56.2	29.0	60.0	58.0	56.2
Intake Manifold Pressure, In. Hg.	0	26.0	21.7	3.0	0	25.2	21.2	3.0
Intake Air Restriction, In. H_2O	0	6	4	3	2	6	4	3
Fuel Rate LBS/HR	2.3	66.0	56.9	20.6	2.0	64.4	56.3	18.9
Fuel Time Sec/ ½ lb.	778.15	27.28	31.64	87.22	919.61	27.97	31.98	95.33
Barometer Pressure, In. Hg.		29.11				29.11		
Dry Bulb Temp., F		86				94		
Wet Bulb Temp., F/R.H.%	60%	75			39%	74		
Blow-by, CFH		298				313		
Smoke RDG. % 0-20% scale						3.5	9.0	2.0

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-1-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	126 1/2	127 1/2	128 1/2	129	129 1/2	130 1/2	131 1/2	132
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	715	2486	1804	2003	718	2501	1806	2000
Dyno Load (lb) Observed	3.0	198.4	256.6	60.0	3.6	200.0	259.6	64.6
BHP	0.7	164.4	154.3	40.1	0.9	166.7	156.3	43.1
1 - Coolant Out Temperature, F	185	193	189	186	182	189	187	185
2 - Coolant In Temperature, F	183	184	178	181	179	179	177	179
3 - Oil Sump Temperature, F	187	228	220	207	185	225	218	206
4 - Intake Air Temperature, F	95	99	97	98	97	94	86	86
5 - Fuel Temperature, F	96	98	98	102	95	96	96	99
6 - Intake Manifold After Turbo	102	271	236	134	104	267	226	125
7 - Ambient Air Temperature, F	93	97	94	96	94	91	83	84
8 - Exhaust Temperature Cyl. #1	223	953	1004	505	223	950	984	512
9 - Exhaust Temperature Cyl. #2	229	1019	1080	531	228	1011	1058	538
10 - Exhaust Temperature Cyl. #3	234	977	1038	515	234	971	1022	522
11 - Exhaust Temperature Cyl. #4	251	1009	1040	537	250	1001	1021	543
12 - Exhaust Temperature Cyl. #5	190	1016	1055	531	190	1006	1037	537
13 - Exhaust Temperature Cyl. #6	216	936	964	499	215	930	946	503
Oil Gallery Pressure, psi	20.2	44.0	36.2	45.8	20.5	45.0	37.2	46.0
Pressure Before Fuel Filter, psi	29.0	60.0	48.2	56.2	29.0	60.2	48.2	56.0
Pressure After Fuel Filter, psi	29.0	60.0	48.0	56.2	29.0	60.2	48.2	56.0
Intake Manifold Pressure, In. Hg.	0	25.2	21.2	3.0	0	25.4	21.5	3.2
Intake Air Restriction, In. H_2O	2	6	4	3	1	6	4	3
Fuel Rate LBS/HR		63.8	56.5	18.8		64.4	56.7	19.5
Fuel Time Sec/ ½ lb.		28.20	31.84	95.74		27.95	31.73	92.26
Barometer Pressure, In. Hg.		29.11						
Dry Bulb Temp., F		91						
Wet Bulb Temp., F/R.H.%	46%	74						
Blow-by, CFH		303				308		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-1-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	132 1/2	133 1/2	134 1/2	135				
Time	9:30	10:30	11:30	12:00				
Engine RPM	719	2496	1803	2001				
Dyno Load (lb) Observed	3.2	201.8	258.8	61.8				
BHP	0.8	167.9	155.5	41.2				
1 - Coolant Out Temperature, F	180	189	187	185				
2 - Coolant In Temperature, F	178	179	177	180				
3 - Oil Sump Temperature, F	184	224	218	205				
4 - Intake Air Temperature, F	86	84	85	84				
5 - Fuel Temperature, F	94	96	95	98				
6 - Intake Manifold After Turbo	94	257	224	122				
7 - Ambient Air Temperature, F	83	81	81	83				
8 - Exhaust Temperature Cyl. #1	214	933	981	503				
9 - Exhaust Temperature Cyl. #2	221	997	1060	528				
10 - Exhaust Temperature Cyl. #3	233	958	1019	512				
11 - Exhaust Temperature Cyl. #4	245	983	1016	532				
12 - Exhaust Temperature Cyl. #5	186	990	1036	528				
13 - Exhaust Temperature Cyl. #6	212	915	941	493				
Oil Gallery Pressure, psi	21.2	45.0	37.2	46.0				
Pressure Before Fuel Filter, psi	29.2	60.0	48.2	56.0				
Pressure After Fuel Filter, psi	29.2	60.0	48.2	56.0				
Intake Manifold Pressure, In. Hg.	0	26.2	21.8	3.2				
Intake Air Restriction, In. H_2O	1	6	3	3				
Fuel Rate LBS/HR		64.7	56.4	19.8				
Fuel Time Sec/ ½ lb.		27.81	31.91	91.11				
Barometer Pressure, In. Hg.		29.06						
Dry Bulb Temp., F		82						
Wet Bulb Temp., F/R.H.%	66%	73						
Blow-by, CFH		292						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-2-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	135 1/2	136 1/2	137 1/2	138	138 1/2	139 1/2	140 1/2	141
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	717	2496	1798	2003	714	2493	1805	2004
Dyno Load (lb) Observed	2.2	200.0	259.2	61.4	2.8	200.4	255.6	72.6
BHP	0.5	166.4	155.4	41.0	0.7	166.5	153.8	48.5
1 - Coolant Out Temperature, F	131	188	187	185	131	187	185	183
2 - Coolant In Temperature, F	129	179	176	180	129	177	174	177
3 - Oil Sump Temperature, F	133	224	218	206	133	224	216	205
4 - Intake Air Temperature, F	82	92	94	96	87	95	96	98
5 - Fuel Temperature, F	87	97	97	101	91	98	98	101
6 - Intake Manifold After Turbo	86	264	232	132	90	266	235	139
7 - Ambient Air Temperature, F	82	87	92	95	92	93	93	97
8 - Exhaust Temperature Cyl. #1	213	941	995	511	213	944	997	547
9 - Exhaust Temperature Cyl. #2	214	1008	1071	537	216	1010	1076	575
10 - Exhaust Temperature Cyl. #3	196	969	1034	522	200	972	1035	561
11 - Exhaust Temperature Cyl. #4	210	993	1031	543	216	1000	1034	585
12 - Exhaust Temperature Cyl. #5	180	998	1049	539	186	1007	1050	580
13 - Exhaust Temperature Cyl. #6	208	921	955	502	212	929	960	537
Oil Gallery Pressure, psi	43.4	45.1	37.2	45.8	20.5	45.2	37.8	46.0
Pressure Before Fuel Filter, psi	29.8	60.0	48.1	56.0	29.0	60.0	48.0	55.5
Pressure After Fuel Filter, psi	29.6	60.0	48.0	56.0	29.0	60.0	48.0	55.5
Intake Manifold Pressure, In. Hg.	0	25.9	21.0	3.1	0	25.0	21.0	3.8
Intake Air Restriction, In. H_2O	2	6	4	3	0	6	4	4
Fuel Rate LBS/HR	2.6	65.5	56.8	19.0		64.4	56.4	21.6
Fuel Time Sec/ ½ lb.	687.25	27.47	31.67	94.58		27.96	31.89	83.31
Barometer Pressure, In. Hg.			29.09				29.06	
Dry Bulb Temp., F			87				92	
Wet Bulb Temp., F/R.H.%		55%	74			44%	75	
Blow-by, CFH		308				281		
Smoke RDG. % 0-20% scale						3.5	9.0	2.0

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-2-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	141 1/2	142 1/2	143 1/2	144	144 1/2	145 1/2	146 1/2	147
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	721	2500	1800	2004	716	2501	1803	2001
Dyno Load (lb) Observed	3.4	198.6	255.5	62.0	3.4	200.8	259.3	64.6
BHP	0.8	165.5	153.3	41.4	0.8	167.4	155.8	43.1
1 - Coolant Out Temperature, F	177	187	188	187	190	190	190	188
2 - Coolant In Temperature, F	175	177	177	182	188	181	179	183
3 - Oil Sump Temperature, F	183	224	219	208	194	226	220	208
4 - Intake Air Temperature, F	96	97	100	96	97	93	92	88
5 - Fuel Temperature, F	97	98	98	102	97	97	96	101
6 - Intake Manifold After Turbo	103	270	238	133	106	267	232	127
7 - Ambient Air Temperature, F	94	97	102	93	93	92	91	85
8 - Exhaust Temperature Cyl. #1	220	953	1010	514	230	946	995	514
9 - Exhaust Temperature Cyl. #2	227	1018	1089	540	232	1012	1073	540
10 - Exhaust Temperature Cyl. #3	234	978	1049	525	242	975	1034	525
11 - Exhaust Temperature Cyl. #4	248	1004	1044	548	257	1000	1033	546
12 - Exhaust Temperature Cyl. #5	189	1012	1060	541	194	1007	1051	542
13 - Exhaust Temperature Cyl. #6	214	933	966	505	220	931	955	505
Oil Gallery Pressure, psi	22.0	45.2	36.8	45.5	19.0	44.7	36.5	45.2
Pressure Before Fuel Filter, psi	29.0	60.1	48.2	51.0	29.0	60.2	48.2	56.0
Pressure After Fuel Filter, psi	29.0	60.1	48.0	56.0	28.8	60.0	58.0	56.2
Intake Manifold Pressure, In. Hg.	0	25.2	21.0	3.2	0	25.5	21.2	3.2
Intake Air Restriction, In. H_2O	2	6	3	2	1	6	3	2
Fuel Rate LBS/HR		64.9	55.7	20.0		64.7	56.4	19.3
Fuel Time Sec/ ½ lb.		27.72	32.34	89.87		27.82	31.91	93.32
Barometer Pressure, In. Hg.			29.10				29.00	
Dry Bulb Temp., F			85				81	
Wet Bulb Temp., F/R.H.%		57%	73			58%	70	
Blow-by, CFH		313				303		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-2-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	147 1/2	148 1/2	149 1/2	150				
Time	9:30	10:30	11:30	12:00				
Engine RPM	712	2504	1805	2004				
Dyno Load (lb) Observed	3.8	199.8	258.6	63.2				
BHP	0.9	166.8	155.6	42.2				
1 - Coolant Out Temperature, F	189	189	190	189				
2 - Coolant In Temperature, F	187	179	179	182				
3 - Oil Sump Temperature, F	196	225	219	208				
4 - Intake Air Temperature, F	88	89	87	83				
5 - Fuel Temperature, F	97	97	96	100				
6 - Intake Manifold After Turbo	98	263	227	121				
7 - Ambient Air Temperature, F	85	90	82	81				
8 - Exhaust Temperature Cyl. #1	232	942	985	507				
9 - Exhaust Temperature Cyl. #2	235	1007	1063	533				
10 - Exhaust Temperature Cyl. #3	249	967	1020	516				
11 - Exhaust Temperature Cyl. #4	262	992	1020	540				
12 - Exhaust Temperature Cyl. #5	197	999	1043	535				
13 - Exhaust Temperature Cyl. #6	219	923	947	498				
Oil Gallery Pressure, psi	18.8	45.0	36.8	45.5				
Pressure Before Fuel Filter, psi	29.0	60.2	48.3	56.2				
Pressure After Fuel Filter, psi	28.8	60.2	48.2	56.0				
Intake Manifold Pressure, In. Hg.	0	26.0	22.0	3.5				
Intake Air Restriction, In. H_2O	1	6	4	2				
Fuel Rate LBS/HR		65.0	56.3	19.1				
Fuel Time Sec/ ½ lb.		27.68	31.97	94.29				
Barometer Pressure, In. Hg.			29.05					
Dry Bulb Temp., F			83					
Wet Bulb Temp., F/R.H.%		56%	71					
Blow-by, CFH		298						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-3-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	150 1/2	151 1/2	152 1/2	153	153 1/2	154 1/2	155 1/2	156
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	717	2493	1804	2007	723	2501	1800	2000
Dyno Load (lb) Observed	2.8	200.3	256.8	60.2	3.4	198.8	253	65.8
BHP	0.7	166.4	154.4	40.3	0.8	165.7	151.8	43.9
1 - Coolant Out Temperature, F	137	189	186	182	176	185	182	179
2 - Coolant In Temperature, F	136	179	175	177	174	175	171	173
3 - Oil Sump Temperature, F	139	228	217	204	182	222	214	202
4 - Intake Air Temperature, F	82	89	93	95	94	98	98	98
5 - Fuel Temperature, F	90	99	98	102	97	99	99	103
6 - Intake Manifold After Turbo	87	261	232	131	102	272	236	137
7 - Ambient Air Temperature, F	81	84	94	91	92	95	96	99
8 - Exhaust Temperature Cyl. #1	193	942	993	507	218	961	997	528
9 - Exhaust Temperature Cyl. #2	206	1006	1078	532	226	1022	1078	555
10 - Exhaust Temperature Cyl. #3	209	967	1034	516	234	985	1038	543
11 - Exhaust Temperature Cyl. #4	230	987	1033	539	247	1004	1037	562
12 - Exhaust Temperature Cyl. #5	175	995	1055	536	188	1008	1056	558
13 - Exhaust Temperature Cyl. #6	198	918	959	498	210	935	963	519
Oil Gallery Pressure, psi	39.9	45.5	38.0	46.2	22.5	46.0	39.0	46.8
Pressure Before Fuel Filter, psi	29.5	60.0	48.2	56.0	29.2	60.1	48.1	56.0
Pressure After Fuel Filter, psi	29.1	60.0	48.0	56.0	29.0	60.0	47.9	55.9
Intake Manifold Pressure, In. Hg.	0	26.0	21.3	3.0	0	25.8	20.8	3.5
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	4
Fuel Rate LBS/HR	2.9	64.7	56.7	19.2		64.8	56.1	20.1
Fuel Time Sec/ ½ lb.	621.85	27.84	31.77	93.65		27.78	32.11	89.40
Barometer Pressure, In. Hg.			29.00				29.0	
Dry Bulb Temp., F			85				88	
Wet Bulb Temp., F/R.H.%		63%	75			53%	74	
Blow-by, CFH		303				303		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-3-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	156 1/2	157 1/2	158 1/2	159	159 1/2	160 1/2	161 1/2	162
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	722	2504	1803	2005	718	2503	1804	2001
Dyno Load (lb) Observed	3.8	198.4	254.2	62.4	4.0	198.8	258.0	65.8
BHP	0.9	165.6	152.8	41.7	1.0	165.9	155.1	43.9
1 - Coolant Out Temperature, F	174	183	181	182	189	188	191	188
2 - Coolant In Temperature, F	172	173	170	176	712	173	170	173
3 - Oil Sump Temperature, F	179	221	214	205	179	221	213	201
4 - Intake Air Temperature, F	100	99	100	102	97	97	93	91
5 - Fuel Temperature, F	98	98	98	103	97	98	97	100
6 - Intake Manifold After Turbo	106	275	238	132	104	271	232	129
7 - Ambient Air Temperature, F	98	96	97	90	95	94	90	88
8 - Exhaust Temperature Cyl. #1	218	957	998	508	216	959	989	517
9 - Exhaust Temperature Cyl. #2	225	1024	1079	531	223	1021	1070	544
10 - Exhaust Temperature Cyl. #3	235	988	1040	515	231	983	1030	528
11 - Exhaust Temperature Cyl. #4	249	1008	1040	538	246	1002	1028	548
12 - Exhaust Temperature Cyl. #5	188	1015	1059	537	187	1009	1048	546
13 - Exhaust Temperature Cyl. #6	213	940	968	499	213	936	956	506
Oil Gallery Pressure, psi	21.9	46.0	39.1	46.2	23.0	46.1	39.1	46.8
Pressure Before Fuel Filter, psi	29.2	60.1	48.3	56.0	29.2	60.2	48.5	56.0
Pressure After Fuel Filter, psi	29.0	60.0	48.2	56.0	29.0	60.1	48.2	56.0
Intake Manifold Pressure, In. Hg.	0	25.0	21.0	3.0	0	25.9	21.6	3.1
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR			56.2	19.2		65.3	56.4	19.7
Fuel Time Sec/ ½ lb.			32.05	93.91		27.07	31.91	91.29
Barometer Pressure, In. Hg.			28.98					
Dry Bulb Temp., F			89					
Wet Bulb Temp., F/R.H.%		56%	76					
Blow-by, CFH		308				287		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-3-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	162 1/2	163 1/2	164 1/2	165				
Time	9:30	10:30	11:30	12:00				
Engine RPM	720	2506	1802	2006				
Dyno Load (lb) Observed	4.2	201.0	258.6	65.8				
BHP	1.0	167.9	155.3	44.0				
1 - Coolant Out Temperature, F	189	189	190	189				
2 - Coolant In Temperature, F	172	173	179	182				
3 - Oil Sump Temperature, F	180	221	220	208				
4 - Intake Air Temperature, F	90	90	90	87				
5 - Fuel Temperature, F	96	97	98	102				
6 - Intake Manifold After Turbo	98	265	229	125				
7 - Ambient Air Temperature, F	87	90	87	85				
8 - Exhaust Temperature Cyl. #1	215	944	986	515				
9 - Exhaust Temperature Cyl. #2	223	1013	1067	542				
10 - Exhaust Temperature Cyl. #3	232	975	1027	527				
11 - Exhaust Temperature Cyl. #4	246	992	1025	546				
12 - Exhaust Temperature Cyl. #5	185	1001	1048	543				
13 - Exhaust Temperature Cyl. #6	211	925	957	506				
Oil Gallery Pressure, psi	22.9	45.6	31.8	45.5				
Pressure Before Fuel Filter, psi	29.2	60.3	48.2	56.1				
Pressure After Fuel Filter, psi	29.1	60.1	48.1	56.0				
Intake Manifold Pressure, In. Hg.	0	26.1	21.8	3.5				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR		65.2	56.4	19.6				
Fuel Time Sec/ ½ lb.		27.63	31.92	91.72				
Barometer Pressure, In. Hg.		28.86						
Dry Bulb Temp., F		86						
Wet Bulb Temp., F/R.H.%	52%	72						
Blow-by, CFH		292						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-4-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	165 1/2	166 1/2	167 1/2	168	168 1/2	169 1/2	170 1/2	171
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	713	2501	1800	2004	717	2501	1807	2003
Dyno Load (lb) Observed	3.0	1994	256.0	65.4	3.8	199.8	255.3	63.2
BHP	0.7	166.2	153.6	43.7	0.4	166.6	153.8	42.2
1 - Coolant Out Temperature, F	121	187	183	180	173	186	186	188
2 - Coolant In Temperature, F	119	178	172	175	171	176	175	183
3 - Oil Sump Temperature, F	125	224	215	202	180	222	217	207
4 - Intake Air Temperature, F	81	87	93	91	93	97	99	96
5 - Fuel Temperature, F	87	97	97	102	97	99	99	103
6 - Intake Manifold After Turbo	85	260	232	129	100	270	238	134
7 - Ambient Air Temperature, F	79	83	92	88	91	95	98	95
8 - Exhaust Temperature Cyl. #1	212	941	992	517	216	952	1000	520
9 - Exhaust Temperature Cyl. #2	211	1001	1072	542	222	1018	1082	545
10 - Exhaust Temperature Cyl. #3	193	959	1031	530	232	978	1038	528
11 - Exhaust Temperature Cyl. #4	212	982	1031	548	245	1000	1035	549
12 - Exhaust Temperature Cyl. #5	177	993	1050	545	186	1007	1056	545
13 - Exhaust Temperature Cyl. #6	208	916	950	507	211	930	962	505
Oil Gallery Pressure, psi	46.0	45.5	39.0	46.5	22.5	45.9	37.8	46.0
Pressure Before Fuel Filter, psi	29.1	60.1	48.1	56.0	39.0	60.0	48.2	56.0
Pressure After Fuel Filter, psi	29.0	60.0	48.0	56.0	38.8	60.0	48.0	56.0
Intake Manifold Pressure, In. Hg.	0	25.9	21.2	3.2	0	25.6	21.0	3.1
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR		64.9	56.9	19.9		65.0	56.5	20.2
Fuel Time Sec/ ½ lb.		27.74	31.64	90.51		27.71	31.87	89.25
Barometer Pressure, In. Hg.			28.98				28.94	
Dry Bulb Temp., F			86				89	
Wet Bulb Temp., F/R.H.%		65%	76			53%	75	
Blow-by, CFH		298				303		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-4-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	171 1/2	172 1/2	173 1/2	174	174 1/2	175 1/2	176 1/2	177
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	719	2497	1804	2004	721	2502	1807	2000
Dyno Load (lb) Observed	3.6	199.4	254.8	63.8	4.4	199.8	257.4	63.6
BHP	0.9	166.0	153.2	42.6	1.1	166.6	155.0	42.4
1 - Coolant Out Temperature, F	184	192	191	188	183	192	190	188
2 - Coolant In Temperature, F	172	182	179	182	181	182	180	182
3 - Oil Sump Temperature, F	187	228	221	209	187	228	220	208
4 - Intake Air Temperature, F	98	100	99	98	97	97	94	90
5 - Fuel Temperature, F	98	99	99	104	97	98	97	101
6 - Intake Manifold After Turbo	105	274	237	136	105	271	233	129
7 - Ambient Air Temperature, F	95	97	96	96	97	91	89	87
8 - Exhaust Temperature Cyl. #1	222	959	1000	520	223	951	989	516
9 - Exhaust Temperature Cyl. #2	227	1025	1082	547	228	1017	1071	541
10 - Exhaust Temperature Cyl. #3	240	984	1038	533	239	982	1031	525
11 - Exhaust Temperature Cyl. #4	253	1007	1041	554	255	1000	1028	545
12 - Exhaust Temperature Cyl. #5	190	1015	1062	550	190	1006	1047	543
13 - Exhaust Temperature Cyl. #6	215	935	962	510	217	933	952	505
Oil Gallery Pressure, psi	21.0	44.2	36.4	45.4	20.6	44.3	36.6	45.5
Pressure Before Fuel Filter, psi	29.0	60.1	48.3	56.1	29.4	60.5	48.2	56.1
Pressure After Fuel Filter, psi	29.0	60.0	48.0	56.0	29.2	60.2	48.0	56.0
Intake Manifold Pressure, In. Hg.	0	25.5	21.0	3.2	0	25.8	21.2	3.2
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR		65.2	55.8	19.3		64.8	56.2	19.3
Fuel Time Sec/ ½ lb.		27.62	32.28	93.05		27.79	32.02	93.29
Barometer Pressure, In. Hg.			2888				2888	
Dry Bulb Temp., F			88				86	
Wet Bulb Temp., F/R.H.%		53%	74			55%	73	
Blow-by, CFH		303				292		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-4-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	177 1/2	178 1/2	179 1/2	180				
Time	9:30	10:30	11:30	12:00				
Engine RPM	717	2503	1805	2001				
Dyno Load (lb) Observed	4.0	200.2	258.2	63.8				
BHP	1.0	167.0	155.4	42.6				
1 - Coolant Out Temperature, F	183	192	190	188				
2 - Coolant In Temperature, F	181	182	180	182				
3 - Oil Sump Temperature, F	187	227	220	210				
4 - Intake Air Temperature, F	90	88	90	89				
5 - Fuel Temperature, F	96	97	97	102				
6 - Intake Manifold After Turbo	98	262	229	132				
7 - Ambient Air Temperature, F	87	89	85	87				
8 - Exhaust Temperature Cyl. #1	222	937	984	516				
9 - Exhaust Temperature Cyl. #2	223	1004	1067	542				
10 - Exhaust Temperature Cyl. #3	234	968	1024	525				
11 - Exhaust Temperature Cyl. #4	250	987	1023	545				
12 - Exhaust Temperature Cyl. #5	187	995	1044	542				
13 - Exhaust Temperature Cyl. #6	216	921	947	503				
Oil Gallery Pressure, psi	20.6	44.5	36.7	45.1				
Pressure Before Fuel Filter, psi	29.2	60.4	48.1	55.9				
Pressure After Fuel Filter, psi	29.0	60.2	48.0	55.8				
Intake Manifold Pressure, In. Hg.	0	26.0	21.4	3.9				
Intake Air Restriction, In. H_2O	1	6	4	2				
Fuel Rate LBS/HR		64.9	56.3	19.7				
Fuel Time Sec/ ½ lb.		27.74	32.00	91.37				
Barometer Pressure, In. Hg.		28.90						
Dry Bulb Temp., F		82						
Wet Bulb Temp., F/R.H.%	66%	73						
Blow-by, CFH		298						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-5-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	180 1/2	181 1/2	182 1/2	183	183 1/2	184 1/2	185 1/2	186
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	718	2497	1792	2009	719	2492	1791	2009
Dyno Load (lb) Observed	2.8	200.0	258.4	63.6	4.4	200.2	256.2	63.6
BHP	0.7	166.5	154.4	42.6	1.1	166.3	153.0	42.2
1 - Coolant Out Temperature, F	131	197	193	190	184	192	190	190
2 - Coolant In Temperature, F	130	188	183	185	181	183	180	185
3 - Oil Sump Temperature, F	134	232	222	210	190	228	220	210
4 - Intake Air Temperature, F	82	91	92	91	93	94	97	91
5 - Fuel Temperature, F	89	100	99	104	98	99	99	104
6 - Intake Manifold After Turbo	87	263	230	129	101	266	235	129
7 - Ambient Air Temperature, F	80	87	87	88	90	87	92	94
8 - Exhaust Temperature Cyl. #1	214	939	994	515	222	944	1000	515
9 - Exhaust Temperature Cyl. #2	211	1007	1072	538	229	1014	1080	538
10 - Exhaust Temperature Cyl. #3	196	964	1029	522	238	971	1039	522
11 - Exhaust Temperature Cyl. #4	213	986	1026	542	251	992	1034	542
12 - Exhaust Temperature Cyl. #5	181	998	1049	537	194	1001	1057	537
13 - Exhaust Temperature Cyl. #6	212	914	954	502	215	921	958	502
Oil Gallery Pressure, psi	43.8	43.0	35.8	45.0	20.5	44.5	36.5	45.0
Pressure Before Fuel Filter, psi	29.8	60.0	58.1	56.2	29.0	60.0	58.0	56.2
Pressure After Fuel Filter, psi	29.5	60.0	58.1	56.2	29.0	60.0	58.0	56.7
Intake Manifold Pressure, In. Hg.	0	26.0	21.5	3.0	0	25.9	21.5	3.0
Intake Air Restriction, In. H_2O	1	6	4	4	0	6	4	4
Fuel Rate LBS/HR			56.0	19.0		64.4	55.6	19.0
Fuel Time Sec/ ½ lb.			32.12	94.82		27.94	32.38	94.82
Barometer Pressure, In. Hg.						29.02		
Dry Bulb Temp., F						93		
Wet Bulb Temp., F/R.H.%					52%	78		
Blow-by, CFH		303				308		
Smoke RDG. % 0-20% scale						2.5	8.5	1.5

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-5-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	186 1/2	187 1/2	188 1/2	189	189 1/2	190 1/2	191 1/2	192
Time	3:30	4:30	5:30	6:00	6:30	7:30	8:30	9:00
Engine RPM	714	2498	1807	2014	719	2497	1807	2009
Dyno Load (lb) Observed	4.6	200.0	256.6	56.0	4.4	200.8	257.4	56.0
BHP	1.1	166.5	154.6	37.6	1.1	167.1	155.0	37.5
1 - Coolant Out Temperature, F	182	192	190	187	182	190	188	185
2 - Coolant In Temperature, F	180	182	179	182	180	180	177	180
3 - Oil Sump Temperature, F	188	228	220	207	191	226	219	206
4 - Intake Air Temperature, F	97	99	98	97	94	90	91	87
5 - Fuel Temperature, F	99	100	100	104	100	98	98	103
6 - Intake Manifold After Turbo	104	273	236	133	103	264	230	123
7 - Ambient Air Temperature, F	94	98	96	95	90	87	87	85
8 - Exhaust Temperature Cyl. #1	225	958	995	498	229	944	984	490
9 - Exhaust Temperature Cyl. #2	227	1023	1076	523	231	1010	1062	514
10 - Exhaust Temperature Cyl. #3	237	982	1033	503	242	967	1024	495
11 - Exhaust Temperature Cyl. #4	252	1001	1037	524	254	987	1024	516
12 - Exhaust Temperature Cyl. #5	192	1012	1058	517	194	996	1041	510
13 - Exhaust Temperature Cyl. #6	218	934	960	484	219	920	943	475
Oil Gallery Pressure, psi	21.0	44.9	37.1	46.0	20.3	45.0	37.5	46.2
Pressure Before Fuel Filter, psi	29.0	60.2	48.3	56.8	29.1	60.3	48.3	56.8
Pressure After Fuel Filter, psi	29.0	60.0	48.0	56.6	29.0	60.0	48.0	56.6
Intake Manifold Pressure, In. Hg.	0	25.5	21.1	3.0	0	26.0	21.6	3.0
Intake Air Restriction, In. H_2O	1	6	4	3	1	6	4	3
Fuel Rate LBS/HR		64.7	56.4	17.6		64.5	56.2	18.1
Fuel Time Sec/ ½ lb.		27.82	31.90	102.33		27.90	32.03	99.37
Barometer Pressure, In. Hg.		28.93				29.00		
Dry Bulb Temp., F		92				88		
Wet Bulb Temp., F/R.H.%	73%	84			70%	80		
Blow-by, CFH		298				303		
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-5-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	192 1/2	193 1/2	194 1/2	195				
Time	9:30	10:30	11:30	12:00				
Engine RPM	720	2500	1808	2010				
Dyno Load (lb) Observed	3.8	200.4	259.0	57.6				
BHP	0.9	167.0	156.1	38.6				
1 - Coolant Out Temperature, F	181	190	188	186				
2 - Coolant In Temperature, F	179	180	178	181				
3 - Oil Sump Temperature, F	185	226	219	206				
4 - Intake Air Temperature, F	87	87	87	86				
5 - Fuel Temperature, F	97	99	99	103				
6 - Intake Manifold After Turbo	95	260	226	122				
7 - Ambient Air Temperature, F	86	86	85	83				
8 - Exhaust Temperature Cyl. #1	217	936	982	492				
9 - Exhaust Temperature Cyl. #2	221	1004	1058	515				
10 - Exhaust Temperature Cyl. #3	231	961	1014	495				
11 - Exhaust Temperature Cyl. #4	247	982	1017	515				
12 - Exhaust Temperature Cyl. #5	186	993	1034	510				
13 - Exhaust Temperature Cyl. #6	214	915	942	479				
Oil Gallery Pressure, psi	21.8	45.0	37.7	46.2				
Pressure Before Fuel Filter, psi	29.3	60.3	48.3	56.8				
Pressure After Fuel Filter, psi	29.0	60.0	48.0	56.5				
Intake Manifold Pressure, In. Hg.	0	26.1	21.8	3.0				
Intake Air Restriction, In. H_2O	1	6	4	3				
Fuel Rate LBS/HR		64.6	56.6	17.7				
Fuel Time Sec/ ½ lb.		27.86	31.83	101.46				
Barometer Pressure, In. Hg.		29.04						
Dry Bulb Temp., F		88						
Wet Bulb Temp., F/R.H.%	65%	78						
Blow-by, CFH		308						
Smoke RDG. % 0-20% scale								

REMARKS:

SOUTHWEST RESEARCH INSTITUTE
FUEL AND LUBRICANTS LAB

Date 10-6-81 Test No. 200 Hr. Oil Code LO-7616

Fuel Code DF2 Cell No. 14 Engine DT-436B Engine Make IH

TEST HOURS	195 1/2	196 1/2	197 1/2	198	198 1/2	199 1/2	200 1/2	201
Time	9:30	10:30	11:30	12:00	12:30	1:30	2:30	3:00
Engine RPM	715	2497	1797	2004	724	2491	1798	2001
Dyno Load (lb) Observed	3.6	199.2	258.6	57.6	4.2	197.3	256.6	57.2
BHP	0.9	165.8	154.9	38.5	1.0	163.8	153.8	38.2
1 - Coolant Out Temperature, F	126	196	192	189	182	196	190	189
2 - Coolant In Temperature, F	125	187	181	184	180	187	179	184
3 - Oil Sump Temperature, F	129	231	221	211	190	230	221	212
4 - Intake Air Temperature, F	84	88	92	88	94	91	96	89
5 - Fuel Temperature, F	90	100	99	102	97	100	99	102
6 - Intake Manifold After Turbo	88	261	230	125	101	262	239	127
7 - Ambient Air Temperature, F	84	82	85	91	90	89	92	
8 - Exhaust Temperature Cyl. #1	211	935	989	501	225	937	978	503
9 - Exhaust Temperature Cyl. #2	211	1001	1063	524	230	1004	1056	522
10 - Exhaust Temperature Cyl. #3	196	962	1025	508	238	967	1022	510
11 - Exhaust Temperature Cyl. #4	213	984	1025	525	253	986	1009	527
12 - Exhaust Temperature Cyl. #5	183	994	1045	521	193	996	1029	522
13 - Exhaust Temperature Cyl. #6	209	919	949	484	215	921	935	486
Oil Gallery Pressure, psi	45.0	43.5	36.5	45.5	20.5	43.5	39.5	45.5
Pressure Before Fuel Filter, psi	30.0	60.0	48.0	56.5	29.9	59.9	50.0	57.0
Pressure After Fuel Filter, psi	29.5	60.0	48.0	56.5	29.2	59.9	49.5	57.0
Intake Manifold Pressure, In. Hg.	0	26.0	21.5	2.5	0	26.1	22.1	2.5
Intake Air Restriction, In. H_2O	1	6	4	2	1	6	4	2
Fuel Rate LBS/HR		64.2	56.6	17.8		64.5	57.6	17.8
Fuel Time Sec/ ½ lb.		28.03	31.83	101.32		27.93	31.24	101.26
Barometer Pressure, In. Hg.						29.0		
Dry Bulb Temp., F						89		
Wet Bulb Temp., F/R.H.%					75%	82		
Blow-by, CFH		298				308		
Smoke RDG. % 0-20% scale								

REMARKS:

TABLE D-II

CORRECTED PERFORMANCE RESULTS FOR
200 HR DURABILITY EVALUATION,
100% DF-2

INTENTIONALLY BLANK

200 HR DURABILITY TEST

FUEL: DF2 HV: 18704 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 09-23-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
725	0.7	0.0	78	29.12	0.95	1.020	0.7	0.0000	1.8	0.0	0.00
724	0.6	0.0	89	29.12	0.85	1.031	0.6	0.0000	1.6	0.0	0.00
720	0.9	0.0	95	29.12	0.85	1.039	0.9	0.0000	2.4	0.0	0.00
724	0.8	0.0	93	29.12	0.85	1.036	0.8	0.0000	2.1	0.0	0.00
724	0.8	0.0	93	29.12	0.85	1.036	0.8	0.0000	2.1	0.0	0.00
719	0.8	0.0	88	29.14	0.92	1.032	0.8	0.0000	2.1	0.0	0.00
DATE: 09-24-81											
715	0.7	0.0	80	29.16	0.75	1.014	0.7	0.0000	1.8	0.0	0.00
717	0.7	0.0	93	29.17	0.92	1.037	0.7	0.0000	1.8	0.0	0.00
719	0.8	0.0	97	29.17	0.92	1.042	0.8	0.0000	2.1	0.0	0.00
718	0.8	0.0	96	29.17	0.92	1.041	0.8	0.0000	2.1	0.0	0.00
718	0.8	0.0	89	29.15	0.87	1.031	0.8	0.0000	2.1	0.0	0.00
DATE: 09-25-81											
713	0.5	0.0	79	29.17	1.02	1.022	0.5	0.0000	1.3	0.0	0.00
719	3.0	0.0	91	29.15	0.98	1.037	3.1	0.0000	7.9	0.0	0.00
717	0.9	1.4	97	29.15	0.98	1.045	0.9	1.4882	2.4	27834.8	9.14
715	0.8	0.0	95	29.15	0.98	1.043	0.8	0.0000	2.1	0.0	0.00
718	0.9	0.0	89	29.14	0.91	1.033	0.9	0.0000	2.4	0.0	0.00
DATE: 09-26-81											
722	0.8	0.0	81	29.15	0.92	1.022	0.8	0.0000	2.1	0.0	0.00
721	0.8	0.0	91	29.15	0.92	1.035	0.8	0.0000	2.1	0.0	0.00
721	0.9	0.0	96	29.15	0.92	1.042	0.9	0.0000	2.4	0.0	0.00
721	0.9	0.0	97	29.15	0.92	1.043	0.9	0.0000	2.4	0.0	0.00
722	0.9	0.0	90	29.13	0.87	1.033	0.9	0.0000	2.3	0.0	0.00
DATE: 09-27-81											
715	0.6	0.0	81	29.16	1.04	1.026	0.6	0.0000	1.6	0.0	0.00
719	0.8	0.0	92	29.15	0.81	1.032	0.8	0.0000	2.1	0.0	0.00
711	0.7	0.0	94	29.15	0.81	1.035	0.7	0.0000	1.9	0.0	0.00
718	0.8	0.0	94	29.15	0.81	1.035	0.8	0.0000	2.1	0.0	0.00
717	0.8	0.0	89	29.14	0.78	1.028	0.8	0.0000	2.1	0.0	0.00

200 HR DURABILITY TEST

FUEL: DF2 HV: 18704 BTU/LB.

LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE: 09-28-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
719	0.6	0.0	78	29.16	0.82	1.014	0.6	0.0000	1.5	0.0	0.00
716	0.8	0.0	90	29.16	1.00	1.036	0.8	0.0000	2.1	0.0	0.00
718	0.9	0.0	93	29.16	1.00	1.040	0.9	0.0000	2.4	0.0	0.00
714	0.8	0.0	93	29.16	1.00	1.040	0.8	0.0000	2.1	0.0	0.00
718	0.8	0.0	88	29.16	1.00	1.034	0.8	0.0000	2.1	0.0	0.00
DATE: 09-29-81											
716	0.6	0.0	79	29.15	0.88	1.018	0.6	0.0000	1.5	0.0	0.00
715	0.6	0.0	90	29.15	0.00	1.001	0.6	0.0000	1.5	0.0	0.00
714	0.8	1.8	93	29.14	0.77	1.033	0.8	2.1788	2.1	40751.9	6.24
723	0.8	0.0	95	29.14	0.77	1.035	0.8	0.0000	2.1	0.0	0.00
715	0.7	0.0	87	29.15	0.71	1.022	0.7	0.0000	1.8	0.0	0.00
DATE: 09-30-81											
716	0.5	0.0	79	29.15	0.91	1.019	0.5	0.0000	1.3	0.0	0.00
722	0.7	0.0	90	29.14	0.88	1.033	0.7	0.0000	1.8	0.0	0.00
718	0.8	0.0	94	29.14	0.88	1.038	0.8	0.0000	2.1	0.0	0.00
715	0.8	0.0	94	29.14	0.88	1.038	0.8	0.0000	2.1	0.0	0.00
719	0.9	0.0	90	29.03	0.91	1.038	0.9	0.0000	2.4	0.0	0.00
DATE: 10-01-81											
717	0.5	2.3	79	29.11	0.93	1.021	0.5	4.5047	1.3	84256.0	3.02
719	0.7	2.0	90	29.11	0.80	1.031	0.7	2.7714	1.8	51836.1	4.91
715	0.7	0.0	95	29.11	0.84	1.039	0.7	0.0000	1.8	0.0	0.00
718	0.9	0.0	97	29.11	0.84	1.041	0.9	0.0000	2.4	0.0	0.00
719	0.8	0.0	86	29.06	0.88	1.030	0.8	0.0000	2.1	0.0	0.00
DATE: 10-02-81											
717	0.5	2.6	82	29.09	0.87	1.024	0.5	5.0797	1.3	95011.2	2.68
714	0.7	0.0	87	29.06	0.86	1.031	0.7	0.0000	1.8	0.0	0.00
721	0.8	0.0	96	29.10	0.85	1.041	0.8	0.0000	2.1	0.0	0.00
716	0.8	0.0	97	29.00	0.78	1.043	0.8	0.0000	2.1	0.0	0.00
712	0.9	0.0	88	29.05	0.79	1.030	0.9	0.0000	2.4	0.0	0.00

200 HR DURABILITY TEST

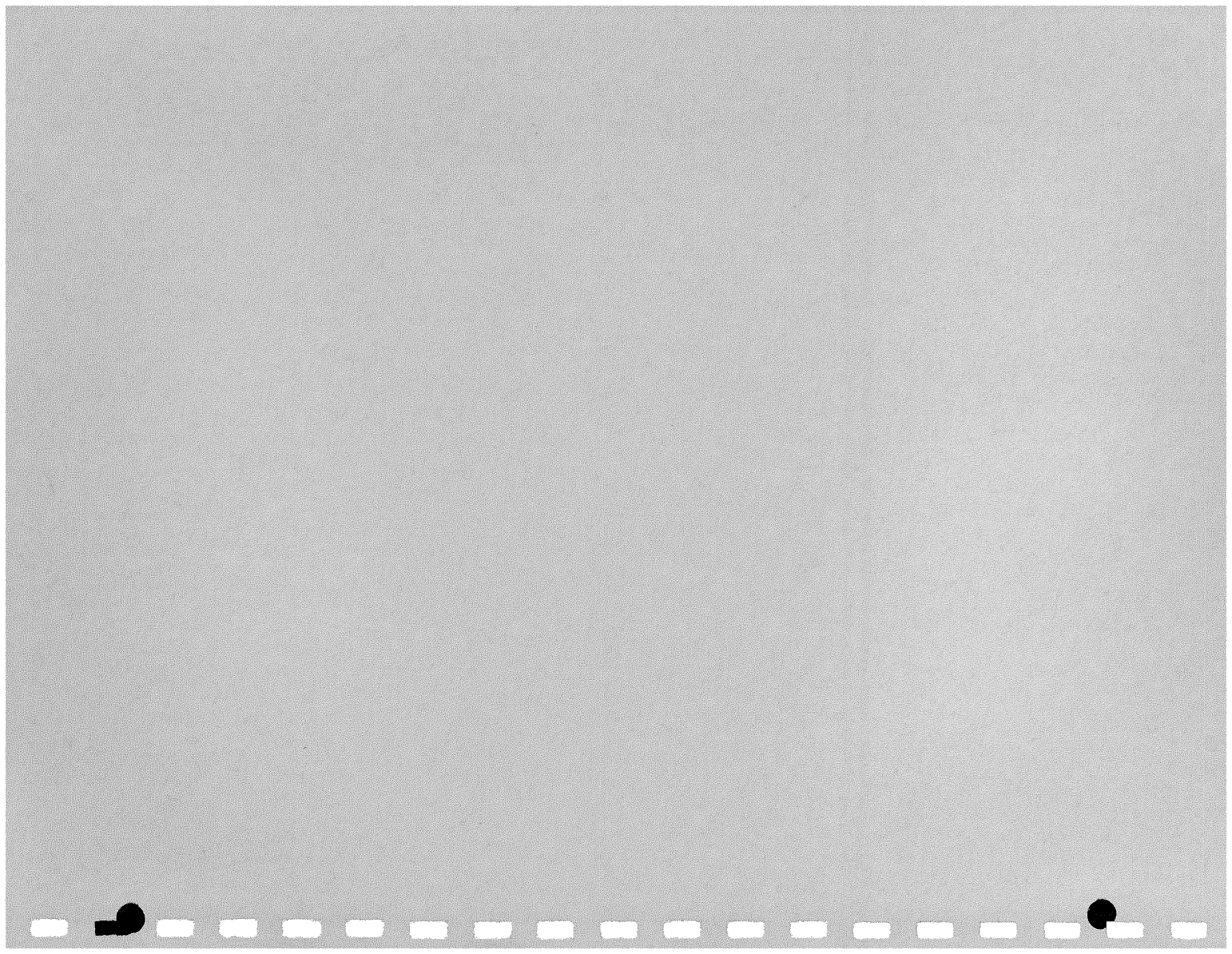
FUEL; DF2 HV; 18704 BTU/LB.

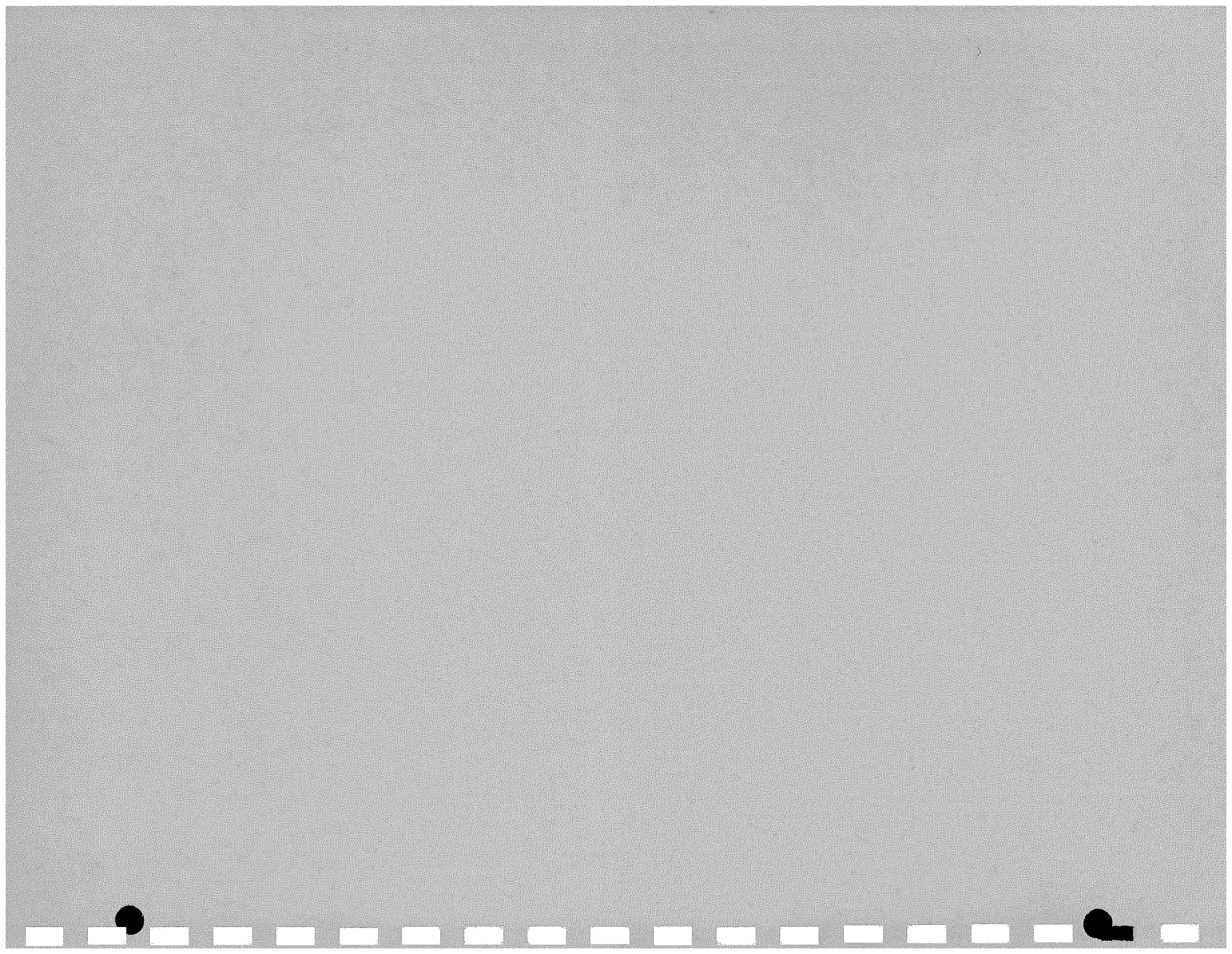
LOW IDLE STATE CONDITIONS AND CORRECTIONS.

DATE; 10-03-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
717	0.7	2.9	82	29.00	0.94	1.030	0.7	4.0241	1.8	75266.6	3.38
723	0.8	0.0	94	29.00	0.86	1.042	0.8	0.0000	2.1	0.0	0.00
722	0.9	0.0	100	28.98	0.94	1.054	0.9	0.0000	2.4	0.0	0.00
718	1.0	0.0	97	28.98	0.94	1.050	1.1	0.0000	2.7	0.0	0.00
720	1.0	0.0	90	28.86	0.80	1.040	1.0	0.0000	2.6	0.0	0.00
DATE; 10-04-81											
713	0.7	0.0	81	28.98	0.97	1.030	0.7	0.0000	1.8	0.0	0.00
717	0.4	0.0	93	28.94	0.89	1.044	0.4	0.0000	1.1	0.0	0.00
719	0.9	0.0	98	28.88	0.86	1.052	0.9	0.0000	2.4	0.0	0.00
721	1.1	0.0	97	28.88	0.84	1.050	1.2	0.0000	2.9	0.0	0.00
717	1.0	0.0	90	28.90	0.88	1.042	1.0	0.0000	2.6	0.0	0.00
DATE; 10-05-81											
718	0.7	0.0	82	29.02	0.99	1.031	0.7	0.0000	1.8	0.0	0.00
719	1.1	0.0	93	29.02	0.99	1.045	1.1	0.0000	2.9	0.0	0.00
714	1.1	0.0	97	28.93	0.00	1.018	1.1	0.0000	2.8	0.0	0.00
719	1.1	0.0	94	29.00	0.25	1.020	1.1	0.0000	2.8	0.0	0.00
720	0.9	0.0	87	29.04	1.04	1.038	0.9	0.0000	2.4	0.0	0.00
DATE; 10-06-81											
715	0.9	0.0	84	29.00	0.31	1.010	0.9	0.0000	2.3	0.0	0.00

INTENTIONALLY BLANK





200 HR DURABILITY TEST

FUEL; DF2 HV; 18704 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 09-28-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2496	169.6	65.0	85	29.16	0.82	1.023	173.5	0.3745	126.3	7005.3	36.32
2498	167.0	64.4	91	29.16	1.00	1.038	173.3	0.3716	126.0	6950.4	36.60
2497	166.5	65.0	97	29.16	1.00	1.046	174.1	0.3733	126.7	6983.1	36.43
2494	167.3	64.5	92	29.16	1.00	1.039	173.8	0.3710	126.6	6939.9	36.66
2500	166.5	64.2	87	29.16	1.00	1.032	171.9	0.3735	124.9	6985.2	36.42
DATE; 09-29-81											
2500	166.7	64.9	86	29.15	0.88	1.027	171.2	0.3790	124.4	7089.5	35.89
2493	166.0	63.5	93	29.15	0.00	1.005	166.8	0.3806	121.6	7118.9	35.74
2498	168.2	64.7	95	29.14	0.77	1.035	174.1	0.3715	126.6	6949.4	36.61
2501	164.1	64.7	91	29.14	0.77	1.030	169.0	0.3828	122.8	7159.2	35.54
2492	161.3	64.9	87	29.15	0.71	1.022	164.9	0.3936	120.2	7361.4	34.56
DATE; 09-30-81											
2493	164.2	64.3	83	29.15	0.91	1.024	168.2	0.3823	122.5	7150.8	35.58
2492	166.0	64.1	94	29.14	0.88	1.038	172.3	0.3720	125.6	6957.9	36.56
2493	164.7	63.9	97	29.14	0.88	1.042	171.6	0.3724	125.0	6964.6	36.53
2488	163.9	64.4	91	29.14	0.88	1.034	169.5	0.3800	123.7	7107.0	35.80
2493	165.2	64.5	87	29.03	0.91	1.034	170.8	0.3776	124.5	7063.0	36.02
DATE; 10-01-81											
2491	165.7	66.0	85	29.11	0.93	1.029	170.5	0.3870	124.3	7239.3	35.14
2489	164.8	64.4	94	29.11	0.80	1.036	170.8	0.3771	124.6	7053.8	36.07
2486	164.4	63.8	99	29.11	0.84	1.044	171.6	0.3717	125.4	6952.6	36.59
2501	166.7	64.4	94	29.11	0.84	1.037	172.9	0.3724	125.6	6964.8	36.53
2496	167.9	64.7	84	29.06	0.88	1.028	172.6	0.3749	125.6	7012.8	36.28
DATE; 10-02-81											
2496	166.4	64.5	92	29.09	0.87	1.037	172.5	0.3738	125.6	6992.3	36.38
2493	166.5	64.4	95	29.06	0.86	1.042	173.4	0.3714	126.4	6945.9	36.63
2500	165.5	64.9	97	29.10	0.85	1.042	172.5	0.3762	125.3	7036.9	36.15
2501	167.4	64.7	93	29.00	0.78	1.038	173.8	0.3723	126.2	6963.3	36.54
2504	166.8	65.0	89	29.05	0.79	1.031	172.0	0.3778	124.8	7066.5	36.00

200 HR DURABILITY TEST

FUEL; DF2 HV; 18704 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 09-23-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2503	171.7	64.2	84	29.12	0.95	1.028	176.5	0.3637	128.1	6802.2	37.40
2501	171.1	66.9	92	29.12	0.85	1.035	177.1	0.3778	128.6	7065.8	36.01
2497	170.3	66.6	96	29.12	0.85	1.040	177.2	0.3759	128.9	7031.5	36.18
2474	172.2	68.0	93	29.12	0.85	1.036	178.5	0.3810	131.0	7127.0	35.70
2493	173.5	68.7	84	29.14	0.92	1.026	178.1	0.3858	129.7	7216.2	35.26
DATE; 09-24-81											
2502	171.1	67.1	86	29.16	0.75	1.022	174.9	0.3837	127.0	7175.9	35.45
2503	170.5	66.4	92	29.17	0.92	1.036	176.6	0.3760	128.2	7032.6	36.18
2497	172.0	66.3	97	29.17	0.92	1.042	179.3	0.3698	130.4	6917.0	36.78
2506	171.9	67.3	94	29.17	0.92	1.038	178.5	0.3770	129.4	7052.0	36.08
2511	172.1	66.8	86	29.15	0.87	1.027	176.7	0.3780	127.8	7070.6	35.98
DATE; 09-25-81											
2501	171.9	68.2	89	29.17	1.02	1.035	178.0	0.3831	129.3	7166.4	35.50
2504	170.8	66.3	95	29.15	0.98	1.043	178.1	0.3723	129.2	6963.4	36.54
2501	173.1	66.4	97	29.15	0.98	1.045	180.9	0.3670	131.4	6863.9	37.07
2509	173.0	66.7	92	29.15	0.98	1.039	179.7	0.3712	130.1	6942.6	36.64
2506	172.9	66.2	89	29.14	0.91	1.033	178.5	0.3708	129.4	6935.7	36.68
DATE; 09-26-81											
2510	172.2	66.6	88	29.15	0.92	1.031	177.6	0.3750	128.5	7014.9	36.27
2510	167.8	65.7	97	29.15	0.92	1.043	175.0	0.3754	126.7	7021.0	36.24
2512	169.8	66.6	97	29.15	0.92	1.043	177.1	0.3760	128.1	7033.4	36.17
2516	170.4	65.9	94	29.15	0.92	1.039	177.1	0.3722	127.8	6961.2	36.55
2512	170.5	65.2	88	29.13	0.87	1.030	175.6	0.3712	127.0	6943.3	36.64
DATE; 09-27-81											
2507	169.2	65.3	84	29.16	1.04	1.030	174.3	0.3747	126.3	7008.5	36.30
2513	168.2	65.6	94	29.15	0.81	1.035	174.1	0.3768	125.8	7047.5	36.10
2512	167.8	65.6	96	29.15	0.81	1.038	174.1	0.3767	125.9	7046.5	36.10
2501	169.6	65.2	93	29.15	0.81	1.034	175.3	0.3719	127.3	6955.5	36.58
2506	168.6	64.9	88	29.14	0.78	1.027	173.1	0.3750	125.5	7013.9	36.27

200 HR DURABILITY TEST

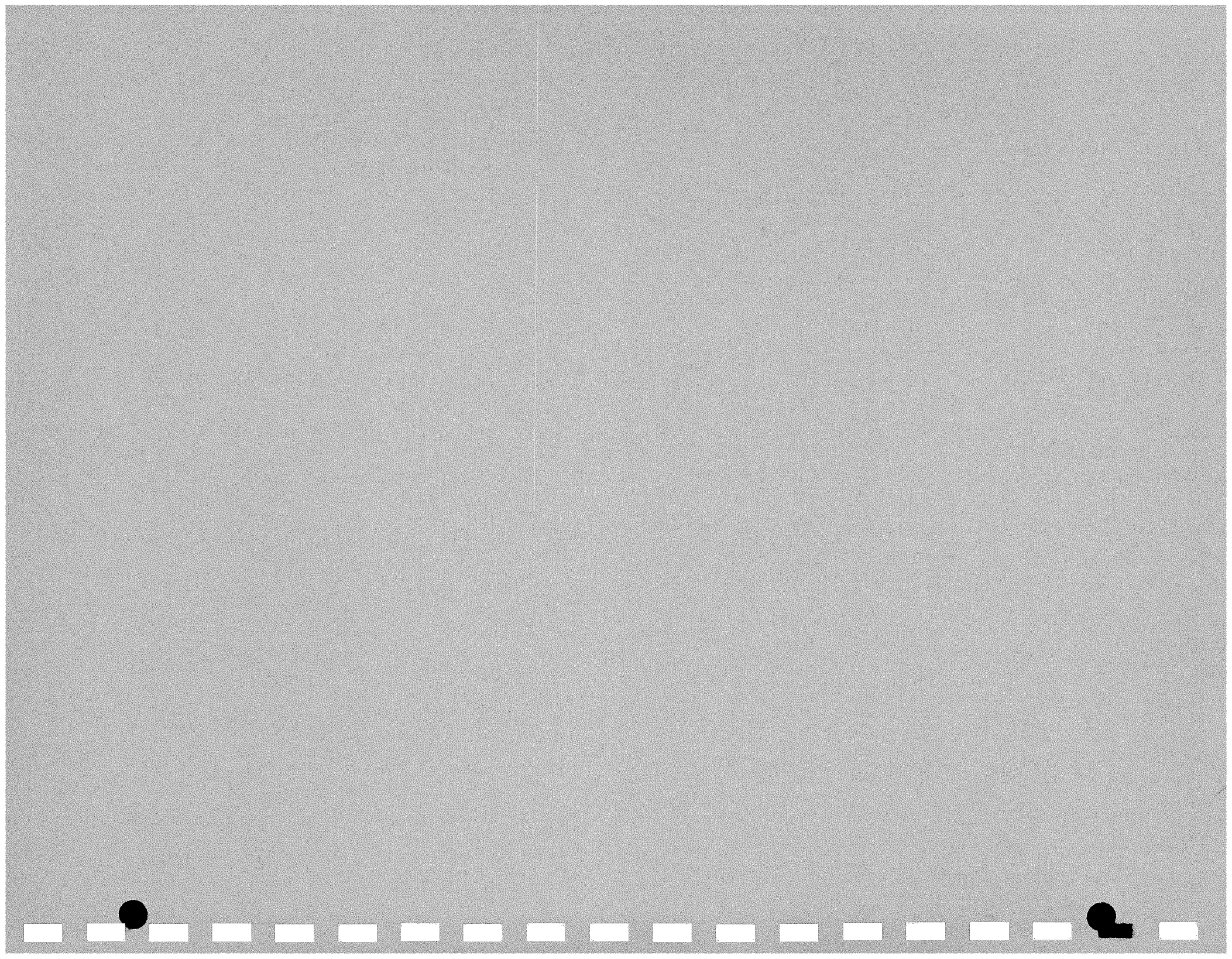
FUEL; DF2 HV; 18704 BTU/LB.

MAXIMUM POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 10-03-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2493	166.4	64.7	89	29.00	0.94	1.039	172.9	0.3743	126.0	7000.9	36.34
2501	165.7	64.8	98	29.00	0.86	1.048	173.6	0.3733	126.1	6981.5	36.44
2504	165.6	0.0	99	28.98	0.94	1.053	174.3	0.0000	126.5	0.0	0.00
2503	165.9	65.3	97	28.98	0.94	1.050	174.2	0.3748	126.4	7010.7	36.29
2506	167.9	65.2	90	28.86	0.80	1.040	174.6	0.3733	126.6	6983.0	36.43
DATE; 10-04-81											
2501	166.2	64.9	87	28.98	0.97	1.038	172.5	0.3762	125.3	7036.4	36.16
2501	166.6	65.0	97	28.94	0.89	1.050	174.9	0.3717	127.0	6951.6	36.60
2497	166.0	65.2	100	28.88	0.86	1.055	175.1	0.3724	127.4	6964.5	36.53
2502	166.6	64.8	97	28.88	0.84	1.050	175.0	0.3704	127.0	6927.8	36.72
2503	167.0	64.9	88	28.90	0.88	1.039	173.5	0.3740	125.9	6996.2	36.36
DATE; 10-05-81											
2497	166.5	0.0	91	29.02	0.99	1.043	173.6	0.0000	126.3	0.0	0.00
2492	166.3	64.4	94	29.02	0.99	1.047	174.0	0.3700	126.9	6921.1	36.76
2498	166.5	64.7	99	28.93	0.00	1.020	169.9	0.3808	123.5	7123.0	35.72
2497	167.1	64.5	90	29.00	0.25	1.015	169.6	0.3802	123.4	7111.8	35.77
2500	167.0	64.6	87	29.04	1.04	1.038	173.4	0.3725	126.0	6967.8	36.51
DATE; 10-06-81											
2497	165.8	64.2	88	29.00	0.31	1.015	168.2	0.3816	122.4	7137.5	35.64
2491	163.8	64.5	91	29.00	0.31	1.019	166.8	0.3866	121.7	7230.8	35.18

INTENTIONALLY BLANK



200 HR DURABILITY TEST

FUEL: DF2 HV: 18704 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE: 09-23-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1800	151.3	55.9	88	29.12	0.95	1.033	156.4	0.3575	157.8	6686.9	38.05
1803	151.0	56.0	94	29.12	0.85	1.038	156.7	0.3574	157.9	6684.9	38.06
1800	151.1	55.0	98	29.12	0.85	1.043	157.6	0.3490	159.0	6528.2	38.97
1799	151.4	55.4	91	29.12	0.85	1.034	156.5	0.3540	158.0	6620.9	38.43
1809	153.5	56.5	84	29.14	0.92	1.026	157.5	0.3586	158.2	6708.0	37.93
DATE: 09-24-81											
1808	153.1	55.8	90	29.16	0.75	1.027	157.3	0.3547	158.0	6635.1	38.34
1807	151.1	55.3	98	29.17	0.92	1.044	157.7	0.3507	158.5	6559.2	38.79
1803	151.3	55.2	98	29.17	0.92	1.044	157.9	0.3496	159.1	6538.7	38.91
1809	153.4	56.7	91	29.17	0.92	1.034	158.7	0.3573	159.3	6683.2	38.07
1809	154.9	57.0	86	29.15	0.87	1.027	159.0	0.3584	159.7	6703.2	37.95
DATE: 09-25-81											
1797	152.6	55.7	89	29.17	1.02	1.035	158.0	0.3525	159.7	6593.1	38.59
1800	152.3	55.5	98	29.15	0.98	1.047	159.4	0.3482	160.9	6512.5	39.06
1799	152.2	55.6	100	29.15	0.98	1.049	159.7	0.3482	161.2	6512.2	39.07
1808	153.9	56.1	92	29.15	0.98	1.039	159.9	0.3509	160.6	6564.0	38.76
1812	159.2	58.1	85	29.14	0.91	1.027	163.5	0.3553	163.9	6644.8	38.29
DATE: 09-26-81											
1807	155.5	56.8	96	29.15	0.92	1.042	162.0	0.3506	162.8	6558.3	38.79
1800	153.2	55.2	96	29.15	0.92	1.042	159.6	0.3459	161.1	6469.2	39.33
1809	154.2	57.7	99	29.15	0.92	1.046	161.2	0.3578	161.9	6693.1	38.01
1814	153.7	55.8	92	29.15	0.92	1.036	159.3	0.3503	159.5	6551.3	38.83
1814	158.8	58.1	87	29.13	0.87	1.029	163.4	0.3556	163.6	6651.5	38.25
DATE: 09-27-81											
1806	152.4	55.6	90	29.16	1.04	1.038	158.2	0.3515	159.1	6574.5	38.70
1803	152.2	55.2	97	29.15	0.81	1.039	158.1	0.3491	159.3	6528.9	38.97
1803	152.3	55.2	100	29.15	0.81	1.043	158.8	0.3475	160.0	6500.1	39.14
1802	154.1	55.6	85	29.15	0.81	1.023	157.7	0.3526	159.0	6594.9	38.58
1805	153.9	55.8	88	29.14	0.78	1.027	158.0	0.3532	159.0	6606.5	38.51

200 HR DURABILITY TEST

FUEL: DF2 HV: 18704 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE: 09-28-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1809	154.4	56.7	90	29.16	0.82	1.030	159.0	0.3566	159.7	6669.5	38.15
1804	153.0	55.1	97	29.16	1.00	1.046	160.0	0.3444	161.1	6441.8	39.49
1798	154.4	56.2	97	29.16	1.00	1.046	161.4	0.3481	163.1	6510.8	39.08
1806	154.2	56.1	91	29.16	1.00	1.038	160.0	0.3506	161.0	6557.2	38.80
1801	155.1	56.0	86	29.16	1.00	1.031	159.9	0.3501	161.3	6549.2	38.85
DATE: 09-29-81											
1809	156.1	57.1	89	29.15	0.88	1.031	161.0	0.3548	161.6	6635.5	38.34
1814	154.9	55.8	95	29.15	0.00	1.008	156.1	0.3575	156.3	6687.0	38.05
1811	154.2	56.4	95	29.14	0.77	1.035	159.6	0.3533	160.1	6607.9	38.50
1815	156.3	56.2	91	29.14	0.77	1.030	161.0	0.3491	161.1	6529.0	38.97
1814	157.3	57.4	85	29.15	0.71	1.020	160.4	0.3579	160.6	6693.4	38.01
DATE: 09-30-81											
1810	154.7	56.8	89	29.15	0.91	1.032	159.7	0.3557	160.3	6653.3	38.24
1805	155.0	57.5	93	29.14	0.88	1.037	160.7	0.3578	161.7	6692.9	38.01
1804	155.4	56.9	97	29.14	0.88	1.042	161.9	0.3514	163.0	6572.8	38.71
1804	155.5	57.4	89	29.14	0.88	1.031	160.4	0.3579	161.5	6693.7	38.01
1811	156.3	56.8	87	29.03	0.91	1.034	161.6	0.3515	162.1	6574.0	38.70
DATE: 10-01-81											
1806	155.0	56.9	89	29.11	0.93	1.034	160.3	0.3549	161.3	6638.0	38.33
1801	154.3	56.3	95	29.11	0.80	1.037	160.1	0.3517	161.5	6578.0	38.68
1804	154.3	56.5	97	29.11	0.84	1.041	160.7	0.3516	161.8	6576.6	38.68
1806	156.3	56.7	86	29.11	0.84	1.027	160.5	0.3532	161.4	6607.0	38.51
1803	155.5	56.4	85	29.06	0.88	1.029	160.0	0.3524	161.2	6592.1	38.59
DATE: 10-02-81											
1798	155.4	56.8	94	29.09	0.87	1.039	161.5	0.3516	163.2	6576.8	38.68
1805	153.8	56.4	96	29.06	0.86	1.043	160.4	0.3516	161.4	6577.1	38.68
1800	153.3	55.7	100	29.10	0.85	1.046	160.4	0.3473	161.9	6495.5	39.17
1803	155.8	56.4	92	29.00	0.78	1.037	161.5	0.3491	162.8	6530.2	38.96
1805	155.6	56.3	87	29.05	0.79	1.029	160.1	0.3517	161.1	6578.0	38.68

200 HR DURABILITY TEST

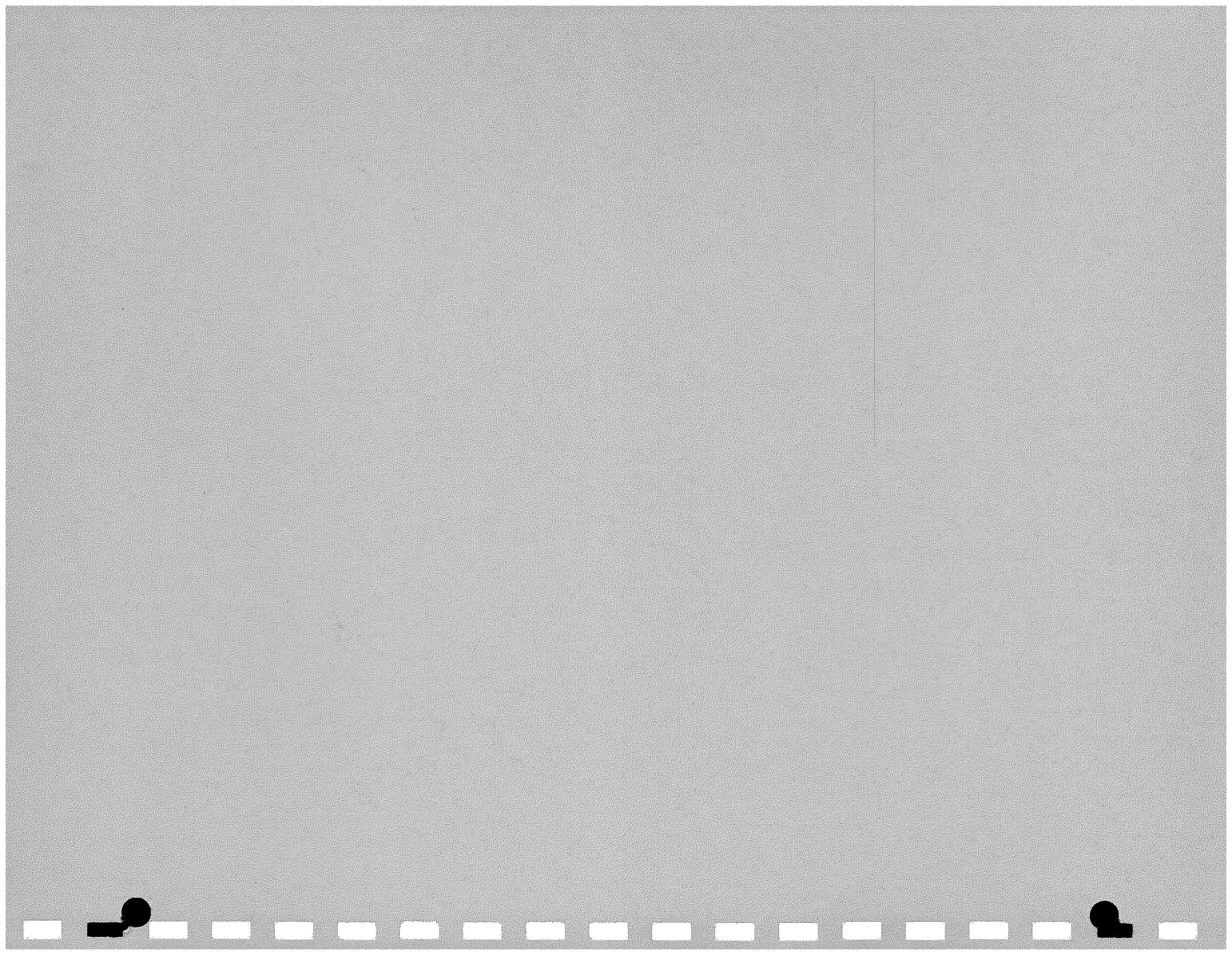
FUEL; DF2 HV; 18704 BTU/LB.

MAXIMUM TORQUE STATE CONDITIONS AND CORRECTIONS.

DATE; 10-03-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1804	154.4	56.7	93	29.00	0.94	1.044	161.2	0.3517	162.3	6578.5	38.67
1800	151.8	56.1	98	29.00	0.86	1.048	159.0	0.3527	160.5	6597.6	38.56
1803	152.8	56.2	100	28.98	0.94	1.054	161.1	0.3489	162.3	6526.4	38.98
1804	155.1	56.4	93	28.98	0.94	1.045	162.1	0.3480	163.2	6509.6	39.08
1802	155.3	56.4	90	28.86	0.80	1.040	161.5	0.3492	162.8	6530.6	38.96
DATE; 10-04-81											
1800	153.6	56.9	93	28.98	0.97	1.046	160.7	0.3542	162.1	6624.3	38.41
1807	153.8	56.5	99	28.94	0.89	1.052	161.9	0.3491	162.7	6529.1	38.97
1804	153.2	55.8	99	28.88	0.86	1.054	161.4	0.3457	162.5	6466.5	39.34
1807	155.0	56.2	94	28.88	0.84	1.046	162.2	0.3466	163.0	6482.5	39.25
1805	155.4	56.3	90	28.90	0.88	1.042	161.9	0.3478	162.9	6505.6	39.11
DATE; 10-05-81											
1792	154.4	56.0	92	29.02	0.99	1.044	161.2	0.3474	163.4	6498.6	39.15
1791	153.0	55.6	97	29.02	0.99	1.050	160.7	0.3459	163.0	6470.3	39.32
1807	154.6	56.4	98	28.93	0.00	1.019	157.6	0.3580	158.4	6695.6	38.00
1807	155.0	56.2	91	29.00	0.25	1.016	157.6	0.3567	158.4	6671.9	38.13
1808	156.1	56.6	87	29.04	1.04	1.038	162.1	0.3492	162.9	6531.2	38.95
DATE; 10-06-81											
1797	154.9	56.6	92	29.00	0.31	1.020	158.0	0.3583	159.7	6701.2	37.97
1798	153.8	57.6	96	29.00	0.31	1.025	157.7	0.3654	159.3	6833.7	37.23

INTENTIONALLY BLANK



200 HR DURABILITY TEST

FUEL; DF2 HV; 18704 BTU/LB.

REDUCED POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 09-23-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2000	3.6	0.0	88	29.12	0.95	1.033	3.7	0.0000	3.4	0.0	0.00
2000	41.0	0.0	95	29.12	0.85	1.039	42.6	0.0000	38.7	0.0	0.00
1999	39.6	18.4	95	29.12	0.85	1.039	41.1	0.4472	37.4	8364.8	30.41
1997	39.3	18.1	90	29.12	0.85	1.032	40.6	0.4461	36.9	8344.0	30.49
2007	39.2	18.0	84	29.14	0.92	1.026	40.2	0.4474	36.4	8368.3	30.40
DATE; 09-24-81											
2000	36.9	17.6	90	29.16	0.75	1.027	37.9	0.4642	34.4	8683.0	29.30
2002	36.8	17.4	97	29.17	0.92	1.042	38.4	0.4536	34.8	8484.7	29.98
1999	38.8	18.4	96	29.17	0.92	1.041	40.4	0.4555	36.7	8520.5	29.86
1999	40.5	18.3	89	29.17	0.92	1.032	41.8	0.4379	38.0	8190.8	31.06
2001	40.3	18.6	85	29.15	0.87	1.025	41.3	0.4501	37.5	8418.3	30.22
DATE; 09-25-81											
2003	42.2	19.2	91	29.17	1.02	1.038	43.8	0.4383	39.7	8197.4	31.04
2001	40.6	18.7	96	29.15	0.98	1.044	42.4	0.4412	38.5	8252.1	30.83
2001	40.7	19.0	98	29.15	0.98	1.047	42.6	0.4460	38.7	8342.9	30.49
1999	40.8	18.9	91	29.15	0.98	1.037	42.3	0.4465	38.5	8352.1	30.46
1999	41.4	18.9	86	29.14	0.91	1.029	42.6	0.4438	38.7	8301.4	30.65
DATE; 09-26-81											
2007	45.8	20.1	91	29.15	0.92	1.035	47.4	0.4240	42.9	7929.6	32.08
2002	43.4	18.3	97	29.15	0.92	1.043	45.3	0.4043	41.1	7561.1	33.65
1999	42.9	19.4	97	29.15	0.92	1.043	44.7	0.4335	40.7	8109.1	31.37
2002	43.1	19.3	91	29.15	0.92	1.035	44.6	0.4327	40.5	8093.9	31.43
2002	42.8	19.4	85	29.13	0.87	1.026	43.9	0.4417	39.9	8261.6	30.79
DATE; 09-27-81											
2002	45.9	20.8	89	29.16	1.04	1.037	47.6	0.4372	43.2	8176.7	31.11
2000	45.6	20.9	96	29.15	0.81	1.038	47.3	0.4417	43.0	8261.2	30.80
1999	47.4	20.4	97	29.15	0.81	1.039	49.2	0.4142	44.8	7747.6	32.84
2000	51.6	21.9	85	29.15	0.81	1.023	52.8	0.4148	48.0	7757.7	32.79
2001	52.5	22.3	85	29.14	0.78	1.023	53.7	0.4154	48.7	7769.4	32.75

200 HR DURABILITY TEST

FUEL; DF2 HV; 18704 BTU/LB.

REDUCED POWER STATE CONDITIONS AND CORRECTIONS.

DATE; 09-28-81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG. IN. AIR TEMP F	BARO. PRESS IN. HG	VAP. PRESS IN. HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
1989	41.9	19.3	90	29.16	0.82	1.030	43.2	0.4473	39.4	8365.7	30.41
2000	46.0	21.3	93	29.16	1.00	1.040	47.9	0.4451	43.5	8324.6	30.56
2004	43.6	20.1	94	29.16	1.00	1.042	45.4	0.4426	41.2	8277.5	30.74
2001	45.2	20.6	87	29.16	1.00	1.032	46.7	0.4414	42.4	8256.3	30.81
2000	44.9	20.2	84	29.16	1.00	1.029	46.2	0.4374	41.9	8181.5	31.10
DATE; 09-29-81											
2003	44.1	20.1	90	29.15	0.88	1.032	45.5	0.4415	41.3	8257.4	30.81
2000	41.7	19.1	93	29.15	0.00	1.005	41.9	0.4557	38.1	8524.0	29.85
2006	44.0	20.2	95	29.15	0.00	1.008	44.3	0.4556	40.1	8522.1	29.85
2007	45.1	20.2	88	29.14	0.77	1.026	46.3	0.4365	41.9	8164.0	31.16
2006	46.9	20.8	84	29.15	0.71	1.018	47.8	0.4355	43.3	8145.4	31.23
DATE; 09-30-81											
2003	46.7	20.7	88	29.15	0.91	1.031	48.1	0.4300	43.7	8042.4	31.63
2000	43.6	19.6	94	29.14	0.88	1.038	45.3	0.4331	41.1	8100.3	31.41
2000	40.3	18.8	94	29.14	0.88	1.038	41.8	0.4494	38.0	8405.9	30.27
1997	44.7	19.6	89	29.14	0.88	1.031	46.1	0.4251	41.9	7951.2	32.00
2002	41.0	18.9	83	29.03	0.91	1.029	42.2	0.4481	38.3	8382.0	30.35
DATE; 10-01-81											
2000	43.9	20.6	89	29.11	0.93	1.034	45.4	0.4537	41.2	8485.1	29.98
1999	41.3	18.9	94	29.11	0.80	1.036	42.8	0.4416	38.9	8260.6	30.80
2003	40.1	18.8	98	29.11	0.84	1.043	41.8	0.4496	37.9	8409.8	30.25
2000	43.1	19.5	86	29.11	0.84	1.027	44.3	0.4406	40.2	8240.2	30.87
2001	41.2	19.8	84	29.06	0.88	1.028	42.3	0.4676	38.4	8745.9	29.09
DATE; 10-02-81											
2003	41.0	19.0	96	29.09	0.87	1.042	42.7	0.4447	38.7	8317.4	30.59
2004	48.5	21.6	98	29.06	0.86	1.045	50.7	0.4260	46.0	7967.7	31.93
2004	41.4	20.0	96	29.10	0.85	1.041	43.1	0.4641	39.1	8679.8	29.31
2001	43.1	19.3	88	29.00	0.78	1.032	44.5	0.4341	40.4	8119.0	31.34
2004	42.2	19.1	83	29.05	0.79	1.024	43.2	0.4422	39.2	8270.8	30.76

200 HR DURABILITY TEST

FUEL: DF2 HV: 19704 BTU/LB.

REDUCED POWER STATE CONDITIONS AND CORRECTIONS.

DATE: 10/03/81

AVG. RPM	AVG. BHP	AVG. FUEL RATE LB/HR	AVG.IN. AIR TEMP F	BARO. PRESS IN.HG	VAP. PRESS IN.HG	CORR. FACT.	CORR. BHP	CORR. BSFC LB/HP-H	CORR. BMEP PSI.	BTU/HP-H	THER. EFF.
2007	40.3	19.2	95	29.00	0.94	1.047	42.2	0.4552	38.2	8513.2	29.88
2000	43.9	20.1	98	29.00	0.86	1.048	46.0	0.4370	41.8	8173.8	31.13
2005	41.7	19.2	102	28.98	0.94	1.057	44.1	0.4357	39.9	8149.7	31.22
2001	43.9	19.7	91	28.98	0.94	1.042	45.8	0.4306	41.5	8053.6	31.59
2006	44.0	19.6	87	28.86	0.80	1.036	45.6	0.4299	41.3	8041.1	31.64

DATE: 10/04/81

2004	43.7	19.9	91	28.98	0.97	1.043	45.6	0.4365	41.3	8163.8	31.16
2003	42.2	20.2	96	28.94	0.89	1.048	44.2	0.4566	40.1	8539.5	29.79
2004	42.6	19.3	98	28.88	0.86	1.052	44.8	0.4306	40.6	8053.5	31.59
2000	42.4	19.3	90	28.88	0.84	1.041	44.1	0.4373	40.1	8179.6	31.10
2001	42.6	19.7	89	28.90	0.88	1.040	44.3	0.4445	40.2	8314.5	30.60

DATE: 10/05/81

2009	42.6	19.0	91	28.90	0.88	1.043	44.4	0.4276	40.2	7998.7	31.81
2009	42.2	19.0	91	29.02	0.99	1.043	44.0	0.4319	39.8	8077.4	31.50
2014	37.6	17.6	97	28.93	0.00	1.018	38.3	0.4599	34.5	8601.8	29.58
2009	37.5	18.1	87	29.00	0.25	1.011	37.9	0.4773	34.3	8927.1	28.50
2010	38.6	17.7	86	29.04	1.04	1.037	40.0	0.4422	36.2	8270.3	30.76

DATE: 10/06/81

2004	38.5	17.8	88	29.04	1.04	1.040	40.0	0.4447	36.3	8317.4	30.59
2001	38.2	17.8	89	29.00	0.31	1.016	38.8	0.4586	35.2	8578.3	29.66

INTENTIONALLY BLANK

TABLE D-III

EXHAUST GAS EMISSION DATA FOR 200
HOUR DURABILITY EVALUATION: 100% DF-2

INTENTIONALLY BLANK

EMISSION DATA

Date 9-23-81 Test No. _____

Engine DT-436B

Engine Hours 8.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 250.2

Rpm 1804

Gas	Rdg	Scale	Amount	
LCO	53.5	R1	0.178	%
CO_2	67.1	R1	8.66	%
O_2	29.2	R25	7.30	%
HC	50.5	R50	252	ppm
NO	62.2	R2500	1555	ppm
NOx	79.5	R2500	1988	ppm

Time of Completion 5:17 p.m.

Remarks:

EMISSION DATA

Date 9-23-81 Test No. _____

Engine DT 436B

Engine Hours 9

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 63.7

Rpm 2004

Gas	Rdg	Scale	Amount	
LCO	30.5	R3	0.0265	%
CO_2	76.0	R3	3.42	%
O_2	60.0	R25	15.0	%
HC	38.7	R50	194	ppm
NO	58.1	R1000	581	ppm
NOx	72.7	R1000	727	ppm

Time of Completion 5:40 p.m.

Remarks:

EMISSION DATA

Date 9-23-81 Test No. _____

Engine DT-436B

Engine Hours 10.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 204.6

Rpm 2508

Gas	Rdg	Scale	Amount	
LCO	24.0	R3	0.020	%
CO_2	60.6	R1	7.86	%
O_2	39.6	R25	9.90	%
HC	38.5	R50	193	ppm
NO	45.4	R2500	1135	ppm
NOx	57.1	R2500	1428	ppm

Time of Completion 7:08 PM

Remarks:

EMISSION DATA

Date 9-25-81 Test No. _____

Engine DT-436B

Engine Hours 34.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 207.8

Rpm 2498

Gas	Rdg	Scale	Amount	
LCO	24.0	R3	0.020	%
CO_2	72.0	R1	9.57	%
O_2	39.5	R25	9.88	%
HC	34.5	R50	172	ppm
NO	42.8	R2500	1170	ppm
NOx	52.0	R2500	1300	ppm

Time of Completion 12:50

Remarks:

EMISSION DATA

Date 9-25-81 Test No. _____

Engine DT-436B

Engine Hours 35.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 252.6

Rpm 1801

Gas	Rdg	Scale	Amount	
LCO	51.0	R1	0.165	%
CO_2	81.0	R1	12.8	%
O_2	29.5	R25	7.38	%
HC	23.5	R50	117	ppm
NO	57.5	R2500	1437	ppm
NOx	72.0	R2500	1800	ppm

Time of Completion 1:47 p.m.

Remarks:

EMISSION DATA

Date 9-25-81 Test No. _____

Engine DT-436B

Engine Hours 36

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 62.0

Rpm 2001

Gas	Rdg	Scale	Amount	
LCO	31.0	R3	0.027	%
CO_2	48.9	R1	5.64	%
O_2	59.0	R25	14.75	%
HC	37.5	R50	187	ppm
NO	56.9	R1000	569	ppm
NOx	71.6	R1000	716	ppm

Time of Completion 2:51 p.M.

Remarks:

EMISSION DATA

Date 9-28-81 Test No. _____

Engine DT-436B

Engine Hours 79.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 201.4

Rpm 2504

Gas	Rdg	Scale	Amount	
LCO	21.3	R3	0.0183	%
CO_2	58.3	R1	7.37	%
O_2	40.5	R25	10.13	%
HC	38.5	R50	193	ppm
NO	41.5	R2500	1038	ppm
NOx	51.5	R2500	1288	ppm

Time of Completion 12:53 p.m.

Remarks:

EMISSION DATA

Date 9-28-81 Test No. _____

Engine DT-436B

Engine Hours 80.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 255.4

Rpm 1806

Gas	Rdg	Scale	Amount	
LCO	48.1	R1	0.15	%
CO_2	68.5	R1	8.83	%
O_2	30.5	R25	7.63	%
HC	24.9	R50	125	ppm
NO	58.5	R2500	1463	ppm
NOx	72.8	R2500	1820	ppm

Time of Completion 1.49 p.m.

Remarks:

EMISSION DATA

Date 9-28-81 Test No. _____

Engine DT-436B

Engine Hours 81

Fuel Code DF-2(BATCH 2)

Oil Code LO 7616

Engine load, lb 69.4

Rpm 2002

Gas	Rdg	Scale	Amount	
LCO	22.8	R1	0.062	%
CO_2	81.9	R1	13.2	%
O_2	48.5	R25	12.13	%
HC	33.4	R50	167	ppm
NO	64.3	R2500	1608	ppm
NOx	80.3	R2500	2008	ppm

Time of Completion 2:45 p.m.

Remarks:

EMISSION DATA

Date 10-1-81 Test No. _____

Engine DT-436B

Engine Hours 124.5

Fuel Code DF-2 (BATCH-2)

Oil Code LO-7616

Engine load, lb 199.6

Rpm 2486

Gas	Rdg	Scale	Amount	
LCO	20.3	R3	0.0173	%
CO_2	59.0	R1	7.50	%
O_2	41.3	R25	10.3	%
HC	35.5	R50	178	ppm
NO	38.2	R2500	955	ppm
NOx	47.4	R-2500	1185	ppm

Time of Completion 12:59

Remarks:

EMISSION DATA

Date 10-1-81 Test No. _____

Engine DT-436B

Engine Hours 125.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 258.2

Rpm 1805

Gas	Rdg	Scale	Amount	
LCO	51.2	R-1	0.166	%
CO_2	69.5	R-1	8.95	%
O_2	29.7	R25	7.43	%
HC	25.6	R50	128	ppm
NO	60.9	R2500	1523	ppm
NOx	73.7	R2500	1843	ppm

Time of Completion 1:46

Remarks:

EMISSION DATA

Date 10-1-81 Test No. _____

Engine DT-436B

Engine Hours 126

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 62.4

Rpm 1999

Gas	Rdg	Scale	Amount	
LCO	28.6	R1	0.077	%
CO_2	81.5	R-3	3.75	%
O_2	59.9	R25	14.98	%
HC	33.3	R50	167	ppm
NO	56.0	R1000	560	ppm
NOx	70.3	R1000	703	ppm

Time of Completion 2:47

Remarks:

EMISSION DATA

Date 10-5-81 Test No. _____

Engine DT-436B

Engine Hours 184.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 200.2

Rpm 2492

Gas	Rdg	Scale	Amount	
LCO	27.0	R3	0.023	%
CO_2	60.5	R1	7.83	%
O_2	40.7	R 25	10.2	%
HC	35.0	R 50	175	ppm
NO	43.0	R2500	1075	ppm
NOx	52.0	R2500	1300	ppm

Time of Completion 1:25 p.m.

Remarks:

EMISSION DATA

Date 10-5-81 Test No. _____

Engine DT-436B

Engine Hours 185.5

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 255.6

Rpm 1797

Gas	Rdg	Scale	Amount	
LCO	57.0	R1	0.195	%
CO_2	68.0	R1	8.77	%
O_2	29.0	R25	7.25	%
HC	25.4	R50	127	ppm
NO	59.7	R2500	1493	ppm
NOx	72.5	R2500	1813	ppm

Time of Completion 1:53

Remarks:

EMISSION DATA

Date 10-5-81 Test No. _____

Engine DT-436B

Engine Hours 186

Fuel Code DF-2 (BATCH 2)

Oil Code LO-7616

Engine load, lb 67.2

Rpm 2006

Gas	Rdg	Scale	Amount	
LCO	27.5	R3	0.0235	%
CO_2	81.5	R3	3.75	%
O_2	58.6	R25	14.7	%
HC	37.4	R50	187	ppm
NO	61.0	R1000	610	ppm
NOx	75.4	R1000	754	ppm

Time of Completion _____

Remarks:

TABLE D-IV

BRAKE SPECIFIC EMISSIONS, 200 HOURS
DURABILITY EVALUATION: DF-2 FUEL

Test Condition	Test Hrs.	RPM	HP	A/F Ratio	BSHC %	BSCO %	BSNOx %
Max. Power	10.5	2508	178.5	27.07	.45	.88	10.35
MP	34.5	2498	178.1	24.88	.33	.71	7.57
MP	79.5	2504	173.3	28.19	.47	.84	9.71
MP	124.5	2486	170.8	28.19	.43	.79	8.91
MP	184.5	2492	174.0	27.49	.40	.99	9.19
Max. Torque	8.5	1804	157.6	22.76	.49	6.41	11.77
MT	35.5	1801	159.4	20.31	.16	4.05	7.26
MT	80.5	1806	160.0	23.03	.24	5.26	10.48
MT	125.5	1805	160.1	22.68	.24	5.85	10.67
MT	185.5	1797	160.7	22.59	.24	6.88	10.50
Quarter Power	9	2004	41.1	57.15	1.17	3.13	14.11
QP	36	2001	42.4	40.20	.69	1.92	8.35
QP	81	2002	47.9	23.74	.28	1.90	10.11
QP	126	1999	42.8	52.87	.90	8.10	12.14
QP	186	2006	44.0	52.74	1.00	2.45	12.91

TABLE D-V

ENGINE RATING RESULTS, 200 HOUR
DURABILITY EVALUATION: 100% DF-2

Test: 200 hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 100% DF-2
Oil: I.H. No. 1 SAE 30, L.O. 7616

LINERS

Condition of Cylinder Liners (% Heavy Polish)

Cyl. No.	Thrust	Antithrust
1	Good condition with trace polishing.	
2	Good condition with trace polishing.	
3	Good condition with trace polishing.	
4	Good condition with trace polishing.	
5	Good condition with trace polishing.	
6	Good condition with trace polishing.	

BEARINGS

Condition of Connecting Rod Bearings

Cyl No.	Upper	
**1	Good condition with light wear.	
*2	Good condition with light wear.	Moderate dark gray.
**3	Good condition with light wear.	
**4	Good condition with light wear.	Light dark gray.
*5	Good condition with light wear.	
**6	Good condition with light wear.	

Cyl. No.	Lower	
1	Good condition with light wear.	Trace debris scratches.
2	Good condition with light wear.	Trace dark gray.
*3	Good condition with light wear.	
*4	Good condition with light wear.	
**5	Good condition with light wear.	
*6	Good condition with light wear.	

---

* Light debris scratches
** Medium debris scratches

TABLE D-V (Con't)

ENGINE RATING RESULTS, 200 HOUR
DURABILITY EVALUATION: 100% DF-2

VALVE TRAIN

Condition of Push Tubes: Good condition, no apparent distress.

Condition of Rocker Arm Levers: Good condition, no apparent distress.

Condition of Valves:

Valve Seats: Good condition, no apparent distress.
Valve Faces: Good condition, no apparent distress. Light carbon embedment.
Valve Tulips: Intakes - 1.0 demerits all
Exhaust - 1.0 demerits all
Valve Tips: Good condition.
Valve Heads: Light carbon

Cylinder Head Combustion Deposits:

Cyl. No.	Deck % Area Covered	Intake Port Plugging, %
1	100% light carbon	
2	100% light carbon	
3	100% light carbon	
4	100% light carbon	
5	100% light carbon	
6	100% light carbon	

ENGINE SLUDGE DEPOSITS

Oil Pan: 100% 1/2 A to clean = .41 demerits
Valve Covers: 100% 1/2 A to clean = .41 demerits
Valve Deck: 100% 1/2 A to clean = .41 demerits
Oil Screen: not inspected

PISTON CROWNLAND DEPOSITS

Piston No.	% Heavy Carbon	% Medium Carbon	% Light Carbon	Demerits
1	5	10	85	31.25
2	5	5	95	28.75
3	0	5	95	26.25
4	0	10	90	27.50
5	0	5	95	26.25
6	0	10	90	27.50
			Average	27.92

TABLE D-VI

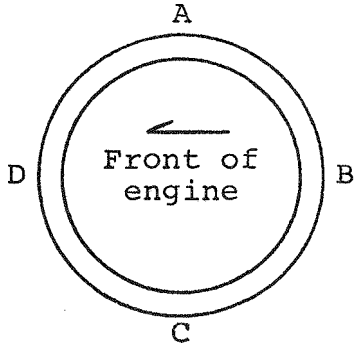
PISTON RING PROUDNESS

Test: 200 hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 100% DF-2
Oil: I.H. No. 1 SAE, L.O. 7616
Hours: 0

\+ Ring extends above piston surface
\- Ring lies below piston surface

		POSITION			
Piston No.	Ring No.	A	B	C	D
1	1 2 3	+10 (1) +80	+15 +65	+15 +75	+25 +75
2	1 2 3	+30 +80	+35 +80	+25 +75	+20 +75
3	1 2 3	+20 +75	+30 +75	+20 +70	+20 +70
4	1 2 3	+20 +75	+15 +65	+35 +75	+25 +70
5	1 2 3	+25 +75	+20 +70	+25 +75	+25 +70
6	1 2 3	+10 +80	+10 +65	+10 +65	+10 +50

Average: 20.6
72.1



(1) XX = 0.00XX
XXX = 0.0XXX

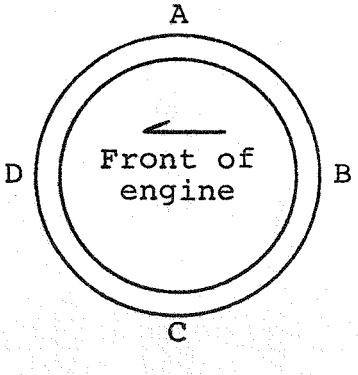
TABLE D-VI (Con't)

PISTON RING PROUDNESS

Test: 200 hour durability
Engine: I.H. 6 cyl. in-line, 436 CID, Model DT 436B
Fuel: 100% DF-2
Oil: I.H. No. 1 SAE, L.O. 7616
Hours: 201

\+ Ring extends above piston surface
\- Ring lies below piston surface

		POSITION			
Piston No.	Ring No.	A	B	C	D
1	1	165(1)	170	170	130
	2	155	140	150	90
	3				
2	1	160	145	185	160
	2	130	100	175	100
	3				
3	1	155	160	180	165
	2	160	145	150	115
	3				
4	1	160	140	165	165
	2	140	100	185	125
	3				
5	1	155	170	170	120
	2	180	170	180	150
	3				
6	1	165	100	75	130
	2	175	105	165	115
	3				
Average:		152.5	141.7		



(1) XX = 0.00XX
XXX = 0.0XXX

TABLE D-VII

CHART FOR PISTON DEMERITS

SPONSOR CODE DF-2 SWRI CODE LO-7616 HOURS 201 DATE 10-14-81

PISTON NO.		CARBON H %	CARBON H D	CARBON M %	CARBON M D	CARBON T %	CARBON T D	LACQUER VT %	LACQUER VT D	LACQUER BL %	LACQUER BL D	LACQUER BR %	LACQUER BR D	LACQUER A %	LACQUER A D	LACQUER LA %	LACQUER LA D	LACQUER TR %	LACQUER TR D	CLEAN %	CLEAN D
	1G	100	22.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	5	3.38	0	0.00	75	27.00	0	0.00	0	0.00	5	.57	0	0.00	15	.68	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.90	40	1.20	50	0.00
1	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	5	1.13	5	.88	60	7.20	30	2.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	1.80	80	2.40	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	90	1.35	10	.05	0	0.00
	1G	65	14.63	5	.88	30	3.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	80	28.80	0	0.00	0	0.00	5	.57	5	.38	10	.45	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	10	.30	85	0.00
2	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	15	3.38	10	1.75	65	7.80	10	.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	25	2.25	75	2.25	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	90	1.35	10	.05	0	0.00
	1G	90	20.25	5	.88	5	.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	0	0.00	0	0.00	85	30.60	0	0.00	0	0.00	10	1.14	5	.38	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	.45	85	0.00
3	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	0	0.00	10	1.75	70	8.40	20	1.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	.90	90	2.70	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	85	1.28	15	.08	0	0.00
	1G	100	22.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	5	3.38	0	0.00	55	19.80	0	0.00	0	0.00	0	0.00	5	.38	35	1.58	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	.45	10	.30	85	0.00
4	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	5	1.13	5	.88	20	2.40	40	3.00	0	0.00	5	.19	5	.13	20	.30	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	5	1.50	0	0.00	0	0.00	10	.90	85	2.55	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	85	1.28	15	.08	0	0.00
	1G	25	5.63	20	3.50	55	6.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	5	3.38	10	5.25	85	30.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	.45	85	0.00
5	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	0	0.00	60	10.50	35	4.20	5	.38	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	10	4.50	5	1.50	0	0.00	0	0.00	10	.90	75	2.25	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	80	1.20	20	.10	0	0.00
	1G	65	14.63	15	2.63	20	2.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2G	5	3.38	0	0.00	95	34.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	3G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	.60	80	0.00
6	4G	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	1L	5	1.13	15	2.63	70	8.40	10	.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	2L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	1.35	85	2.55	0	0.00
	3L	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
	UC	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	90	1.35	10	.05	0	0.00

TABLE D-VII (Con't)

PISTON DEMERIT SUMMARY

SPONSOR CODE DF-2 SWRI CODE LO-7616 HOURS 201 DATE 10-14-81

	PISTON NO. 1	PISTON NO. 2	PISTON NO. 3	PISTON NO. 4	PISTON NO. 5	PISTON NO. 6
CARBON (GROOVES)	52.88	47.91	52.33	45.68	54.96	57.24
CARBON (LANDS)	11.46	13.68	11.65	7.41	19.58	12.91
CARBON (UNDERCROWN)	0.00	0.00	0.00	0.00	0.00	0.00
LACQUER (GROOVES)	3.35	2.15	1.97	2.71	.45	.60
LACQUER (LANDS)	4.20	4.50	3.60	5.57	4.65	3.90
LACQUER (UNDERCROWN)	1.40	1.40	1.36	1.36	1.30	1.40
TOTAL DEMERIT	73.29	69.64	70.91	62.73	80.94	76.05

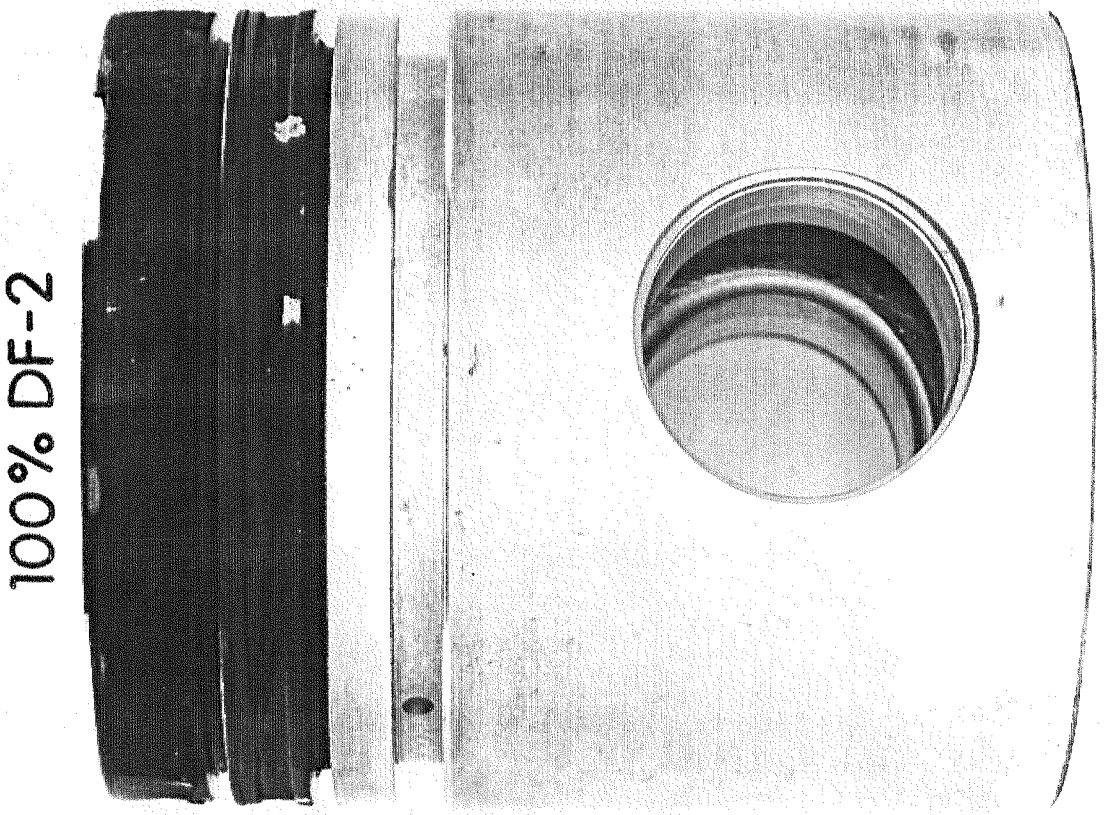
TOTAL DEMERITS	433.56
DEMERITS DUE TO PROUDNESS	113.66
DEMERITS DUE TO CARBON	387.69
DEMERITS DUE TO LACQUER	45.87

GROOVE FILL, %

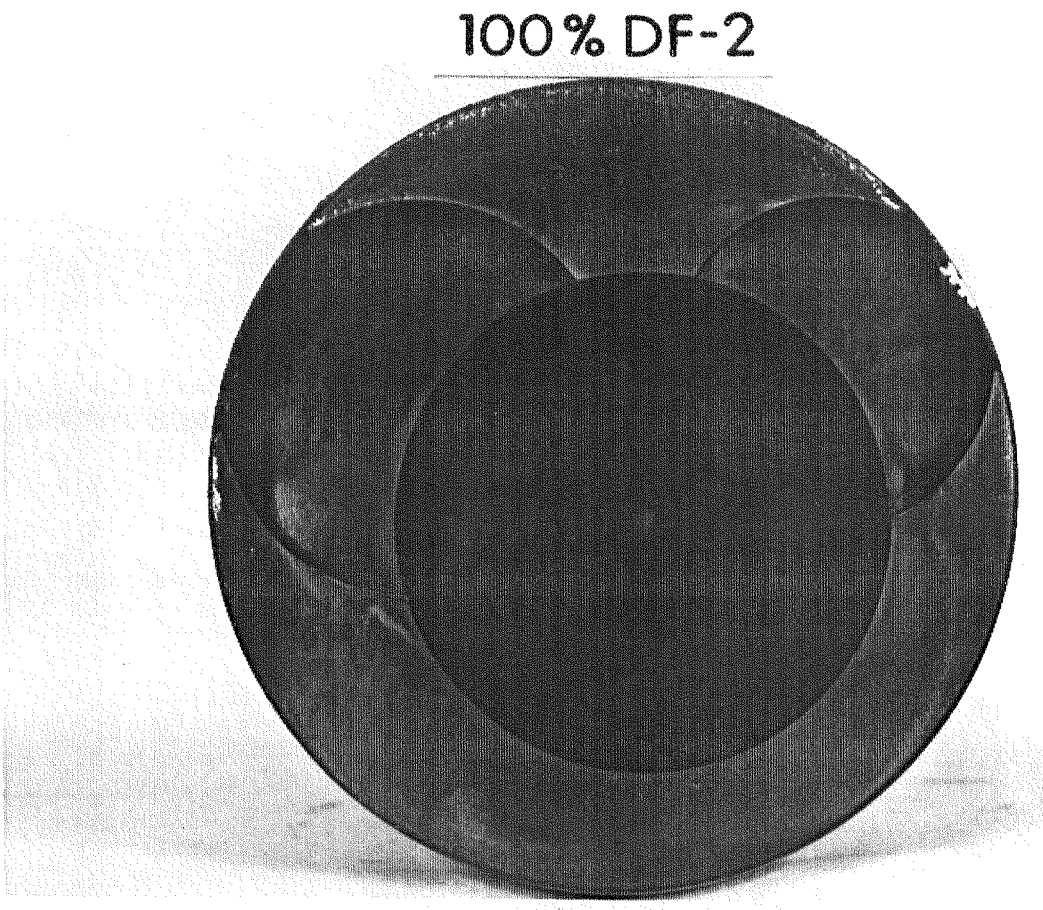
	PISTON NO. 1	PISTON NO. 2	PISTON NO. 3	PISTON NO. 4	PISTON NO. 5	PISTON NO. 6
(TOP GROOVE)	99	70	90	99	40	70

FIGURE D-1: PHOTOGRAPHS OF ENGINE AT END OF DURABILITY EVALUATION USING 100% DF-2

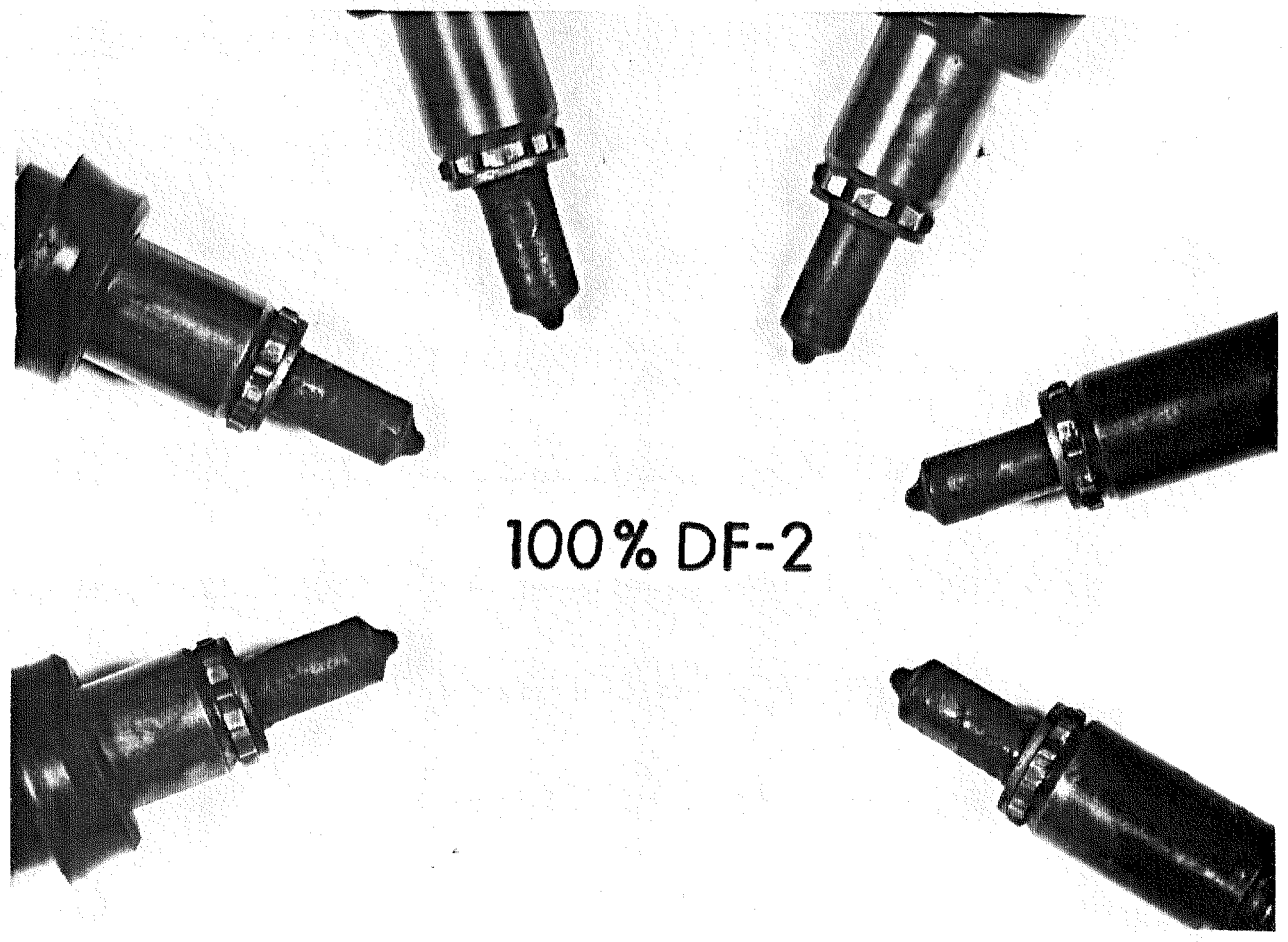
Photo 1 Piston
2 Spray Cup
3 Injectors
4 Extremes in Connecting Rod Bearing Wear
5 Intake Valves
6 Pan



1

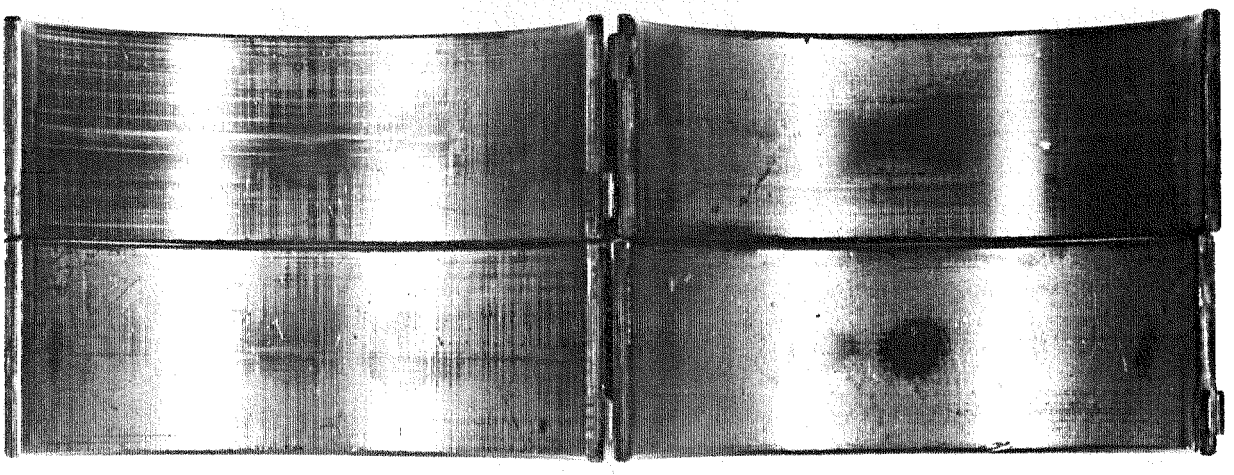


2

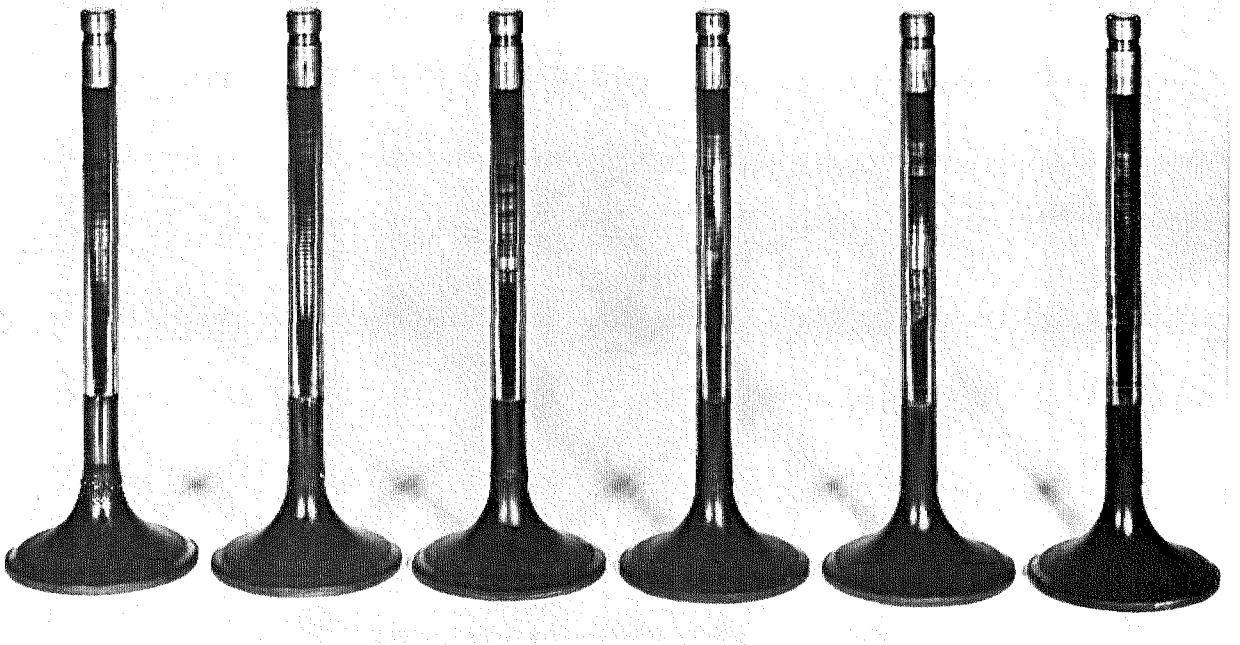


3

100% DF-2

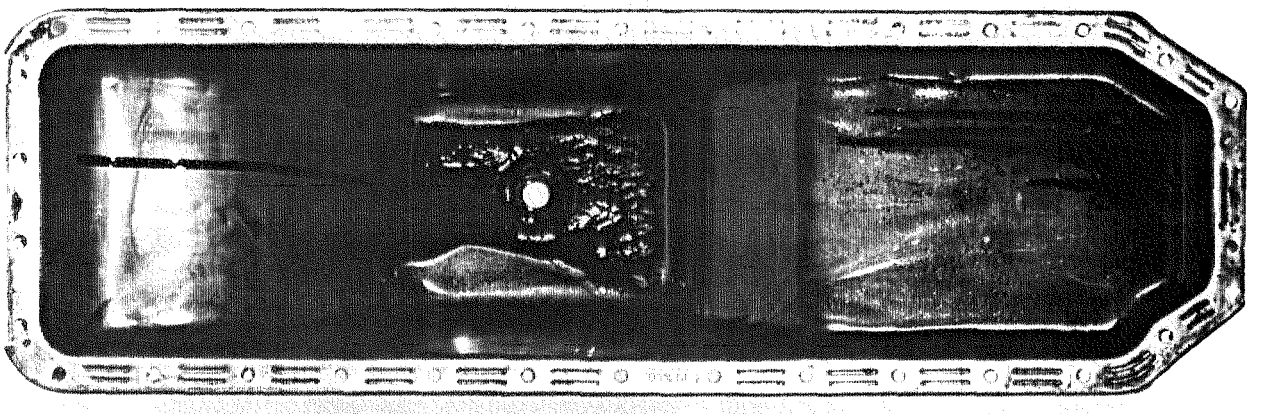


4



100% DF-2

5



6

APPENDIX E

This Appendix describes the methods used in calculating the performance characteristics of the test engine and the brake specific emissions.

A. ENGINE PERFORMANCE

The engine data are corrected to standard dry ambient conditions in order to compare data obtained over a long period of time. The corrections are described in the "SAE Standard, Engine Test Code - Spark Ignition and Diesel - SAE J816".

The standard ambient conditions used are:

Barometric Pressure B* 29,38 in. Hg. (99 kPa)
Temperature t* 85F (29.4C)
Vapor Pressure e* 0.38 in. Hg. (1.3 kPa)
Dry Barometric Pressure B_d* 29.00 in. Hg. (97.9 kPa)
Dry Air density d_d* 0.0705 lb/ft^3 (1.124 kg/m^3)

Brake horsepower is calculated from

$$BHP = \frac{N_t L_t}{K}$$

where:
BHP = brake horsepower
N_t = observed engine speed, rpm
L_t = observed dyno load, lb
K = dyno factor = 3000

The fuel rate is calculated from

$$F = \frac{3600 \text{ or } 1800}{T}$$

where:
F = fuel rate, lb/hr
T = time to use a specified amount of fuel, sec.

The 3600 figure is used if fuel time is in seconds to use 1 lb. of fuel. If the fuel time is in seconds to use 1/2 lb. of fuel, the 1800 figure is used. For the majority of instances, the 1800 figure applies.

The correction factor takes into account variations in barometric pressure, air temperature, and humidity, correcting the observed data to dry air conditions at 85F.

The correction factor is obtained from

$$CF = \frac{B_d^*}{B-e} \times \frac{(t + 460)}{(t^* + 460)}$$

where: CF = correction factor
B = observed barometric pressure, in. Hg.
t = average observed air intake temp. F
e = atmospheric water vapor pressure, in. Hg.
Bd*, t* as previously defined

The brake mean effective pressure is obtained from

$$BMEP = \frac{792,000}{D \times N} (BHP)$$

where: BMEP = brake mean effective pressure, psi
D = engine displacement, in.
N_t & BHP as previously defined

The brake specific fuel consumption is calculated from:

$$BSFC = F/BHP$$

The corrected brake horsepower, corrected brake specific fuel consumption, and the corrected brake mean effective pressure are obtained by multiplying the particular parameter by the correction factor.

The thermal efficiency is the proportion of the heat available that is used by the engine. This is determined from

$$E = \frac{2544 \times BHP \times CF \times 100}{F \times HV}$$

where: E = thermal efficiency, %
HV = net heating value, Btu/lb

The gross heating value is determined by ASTM D-240 using a bomb calorimeter. The hydrogen content is obtained from a Perkin - Elmer Elemental Analyzer Model 240. From these data the net heating value (HV) in btu/lb is calculated from

$$HV = GHV - 91.23H$$

where: GHV = gross heat value, btu/lb
H = percent hydrogen

B. BRAKE SPECIFIC EMISSIONS

The exhaust gas emissions are discussed on the basis of brake specific emissions, or the mass of the exhaust specie in g/hour per horsepower. It has therefore, been necessary to convert the exhaust emissions, which have been reported as percents of the total gas volume, to a mass basis. As reported, all emissions except the hydrocarbons were on a dry basis.

Air mass into the engine was not measured, but because the air/fuel ratio is necessary to the conversion of the HC to a dry basis, the air/fuel ratio was obtained using a method proposed by Spindt[1], based on fuel properties and the percent of exhaust gas emissions. The air/fuel ratio, together with the hydrogen/carbon ratio of the fuel, was then used to determine the dry weight of the hydrocarbons using a method from the SAE.[2]

Finally, the masses of dry exhaust emissions produced per unit of time were calculated using a procedure proposed by I.H.

The three basic fuels used in the program were analyzed, using the Perkin Elmer Elemental Analyzer Model 240, for their carbon, hydrogen and nitrogen, contents. The oxygen content was obtained by difference from 100 percent. This determination by difference lumps all other constituents in the fuel into the oxygen percent. The error for these fuels was considered negligible. From these data, the fraction of carbon in the fuel was obtained, together with the oxygen, carbon ratio, the hydrogen/carbon ratio, and the molecular weight of the fuel per carbon molecule. Table E-I shows the results of the elemental analysis and the results of computations made with these results.

The procedure used for obtaining the specific exhaust gas emissions may be illustrated by using the fuel data and exhaust gas analysis results obtained during testing from the power curve test Number 10 using 100 percent ESCO as fuel.

From the elemental fuel analysis in Table E-I:

$$O/C = \frac{\%O}{\%C} \times \frac{\text{mol wt C}}{\text{mol wt O}}$$

$$= \frac{11.21}{75.20} \times \frac{12.01}{16.00}$$

$$= .11$$

The hydrogen/carbon ratio is

$$H/C = \frac{\%H}{\%C} \times \frac{\text{mol wt C}}{\text{mol wt H}}$$

$$\frac{12.12}{75.70} \times \frac{12.01}{1}$$

$$= 1.94$$

---

1 Spindt, R.S., "Air-Fuel Ratios from Exhaust Gas Analysis", SAE Paper 650507.

2 "Measurement of Carbon Dioxide, Carbon Monoxide, and Oxides of Nitrogen in Diesel Exhaust", SAE J177a.

The molecular weight of the fuel per carbon atom is:

$$\begin{aligned} \text{Mol wt} &= \text{mol wt C} + \text{mol wt H} \times \text{H/C} + \text{mol wt O} \times \text{O/C} \\ &= 12.01 + 1.007 \times 1.94 + 16 \times .11 \\ &= 15.72 \end{aligned}$$

This particular computation ignores the nitrogen, which is less than 2 percent.

The following exhaust emissions taken from Table C-III in Appendix C were measured during Test Number 10 under condtiions of maximum power at 2500 rpm:

$$\begin{aligned} CO &= .0105\% \\ CO_2 &= 7.82\% \\ O_2 &= 10.375\% \\ HC &= 192 \text{ ppm} = .0192\% \\ NO_x &= 1168 \text{ ppm} = .1168\% \end{aligned}$$

Other data needed are from Test Number 10 in Table VII in the main part of the report. These are:

$$\begin{aligned} FR &= \text{fuel rate} = 71.4 \text{ lb/hr} \\ HP_c &= \text{corrected HP} = 164.1 \end{aligned}$$

From these,

$$\begin{aligned} R &= \%CO/\%CO_2 = .00134 \\ Q &= \%O_2/\%CO_2 = 1.327 \\ F_b &= (\%CO + \%CO_2)/(\%CO + \%CO_2 + \%HC) = .998 \end{aligned}$$

The air/fuel ratio is:

$$\begin{aligned} A/F &= F \left\{ 11.492\ F_c \left(\frac{1 + R_2 + Q}{1 + R} \right) + \frac{120\ (1 - Fe)}{3.5 + R} \right\} \\ &= 28.52 \end{aligned}$$

In this equation F is the fraction of carbon in the fuel from Table E-I.

The HC emisions are converted from the wet, as measured, basis to a dry basis by:

$$\begin{aligned} ppm_d &= ppm_\omega / \left\{ 1 - \frac{(H/C)}{(A/F)} \right\} \\ &= 192 / \left\{ 1 - \frac{1.94}{28.52} \right\} \\ &= 206 \text{ ppm} \end{aligned}$$

The percent of total carbon in the exhaust is obtained from:

$$\begin{aligned} TC &= \%CO_2 + \%CO + (ppm_d \times 10^{-4}) \\ &= 7.82 + .0105 + (206 \times 10^{-4}) \\ &= 7.851\% \end{aligned}$$

The mass of the exhaust specie are obtained from the following equations:

$$\text{HC mass} = \frac{\%HC}{TC} \times FR\ (453.6)\ \text{g/hr}$$

$$\text{CO mass} = \frac{\%CO}{TC} \times FR\ (453.6) \times \frac{\text{mol wt CO}}{\text{mol wt/c}}\ \text{g/hr}$$

$$\text{NOx mass} = \frac{\%No}{TC} \times FR\ (453.6) \times \frac{\text{mol wt NO}}{\text{mol wt/C}}\ \text{g/hr}$$

In these equations, the %HC is the dry fraction of the hydrocarbon expressed in percent instead of ppm . The mol wt NOx is assumed to be the same as NO . The mol wt/C is the molecular weight of the fuel per carbon atom from Table E-I.

Substituting the proper values into these equations gives:

$$\text{HC mass} = \frac{.0206}{7.851} \times 71.4\ (453.6) = 84.98\ \text{g/hr}$$

$$\text{CO mass} = \frac{.0105}{7.851} \times 71.4\ (453.6) \times \frac{28.01}{15.72} = 77.18\ \text{g/hr}$$

$$NO_x\ \text{mass} = \frac{.1168}{7.851} \times 71.4\ (45.36) \times \frac{46.01}{15.72} = 1410.2\ \text{g/hr}$$

Finally, the specie mass is divided by the corrected brake horsepower to give the brake specific emissions:

$$BSHC = \text{HC mass}/HP_C = 84.98/1641 = .52\ \text{g/hp-hr}$$
$$BSCO = \text{CO mass}/HP_C = 77.18/164.1 = .47\ \text{g/hp-hr}$$
$$BSNO_x = NO_x\ \text{mass}/HP_C = 1410.2/164/1 = 8.59\ \text{g/hp-hr}$$

TABLE E-I

ELEMENTAL FUEL ANALYSIS

Fuel	Element, %	O/C	H/C	Fc, %	mol wt/C
DF-2	N 1.71				
	C 85.355			.8536	13.88
	H 13.26		1.87		
	O .66	---			
ESCO	N 1.47				
	C 75.20			.7520	15.72
	H 12.12		1.94		
	O 11.21	.11			
CSO	N 1.38				
	C 75.90			.7590	15.64
	H 11.79		1.86		
	O 10.93	.11			