Designation: D 5862 – 99a

An American National Standard

Standard Test Method for Evaluation of Engine Oils in Two-Stroke Cycle Turbo-Supercharged 6V92TA Diesel Engine[1]

This standard is issued under the fixed designation D 5862; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

This test method can be used by any properly equipped laboratory, without outside assistance. However, the ASTM Test Monitoring Center (TMC)[2] provides reference oils and an assessment of the test results obtained on those oils by the laboratory (see Annex A1). By this means, the laboratory will know whether their use of the test method gives results statistically similar to those obtained by other laboratories. Furthermore, various agencies require that a laboratory utilize the TMC services in seeking qualification of oils against specifications. For example, the U.S. Army imposes such a requirement, in connection with several Army engine lubricating oil specifications.

Accordingly, this test method is written for use by laboratories that utilize the TMC services. Laboratories that choose not to use those services may simply ignore those portions of the test method that refer to the TMC.

This test method may be modified by means of Information Letters issued by the TMC. In addition, the TMC may issue supplementary memoranda related to this test method. (See Annex A1.)

1. Scope

1.1 This test method describes a two-stroke cycle diesel engine test procedure for evaluating engine oils for certain high-temperature performance characteristics, particularly cylinder liner scuffing and piston ring face distress, but also including port plugging, slipper bushing, and piston skirt distress. Such oils include both single viscosity SAE grade and multiviscosity SAE grade oils used in diesel engines. It is commonly known as the 6V92TA test. (See Note 1.)

NOTE 1—Companion test methods used to evaluate other engine oil performance characteristics for specification requirements are discussed in Engine Oil tests—SAE J304.[3]

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Section 8, Section 10, Section 13, and Section 14.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as the standard. The values stated in each system may not be exact equivalents; therefore each system must be used independently of the other, without combining values in any way.

1.4 This test method is arranged as follows:

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.B0.02 on Heavy Duty Engine Oils.

Current edition approved Dec. 10, 1999. Published January 2000. Originally published as D 5862 – 95. Last previous edition D 5862 – 99.

[2] ASTM Test Monitoring Center, 6555 Penn Ave., Pittsburgh, PA 15206-4489. This test method is supplemented by Information Letters and memoranda issued by the TMC. Users of this test method shall contact the TMC to obtain the most recent of these. This edition incorporates revisions in all Information Letters through No. 99–2.

[3] This standard is not available separately; see Footnote 10. Other information about Test Method D 5862 can be found in the ASTM Research Report RR: D02-1319, available from ASTM Headquarters.

2. Referenced Documents

2.1 *ASTM Standards:*

D 86 Test Method for Distillation of Petroleum Products[4]

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup[4]

D 240 Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter[4]

D 287 Test Method for API Gravity of Crude Petroleum and Petroleum Products (Hydrometer Method)[4]

D 445 Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (and the Calculation of Dynamic Viscosity)[4]

D 482 Test Method for Ash from Petroleum Products[4]

D 613 Test Method for Cetane Number of Diesel Fuel Oil[5]

D 2622 Test Method for Sulfur in Petroleum Products by X-Ray Spectrometry[4]

D 2709 Test Method for Water and Sediment in Distillate Fuels by Centrifuge[4]

D 2887 Test Method for Boiling Range Distribution of Petroleum Fractions by Gas Chromatography[4]

D 4175 Terminology Relating to Petroleum, Petroleum Products, and Lubricants[6]

D 4485 Specification for Performance of Engine Oils[6]

D 4683 Test Method for Measuring Viscosity at High Temperature and High Shear Rate by Tapered Bearing Simulator[6]

D 4739 Test Method for Base Number Determination by Potentiometric Titration[6]

D 5185 Test Method for the Determination of Additive Metals, Wear Metals and Contaminants in Used Lubricating Oils by Inductively-Coupled Plasma Atomic Emission Spectrometry[6]

E 344 Terminology Relating to Thermometry and Hydrometry[7]

G 40 Terminology Relating to Wear and Erosion[8]

2.2 *SAE Standards:*[9]

SAE J183 Engine Oil Performance and Engine Service Classification

SAE J304 Engine Oil Tests

2.3 *Military Specifications:*[10]

MIL-L-2104 Lubricating Oil, Internal Combustion Engine, Combat/Tactical Service

3. Terminology

3.1 *Definitions:*

3.1.1 *additive*, *n*—a material added to another, usually in small amounts, to impart or enhance desirable properties or to suppress undesirable properties. **(D 4175)**

3.1.2 *calibrate*, *v*—to determine the indication or output of a measuring device with respect to that of a standard. **(E 344)**

3.1.3 *candidate oil*, *n*—an oil which is intended to have the performance characteristics necessary to satisfy a specification and is to be tested against that specification. **(D 5844)**

3.1.4 *corrosion*, *n*—the chemical or electrochemical reaction between a material, usually a metal surface and its environment, that can produce a deterioration of the material and its properties. **(D 5844)**

3.1.5 *debris*, *n—in internal combustion engines*, solid contaminant materials unintentionally introduced into the engine or resulting from wear.

3.1.6 *engine oil*, *n*—a liquid that reduces fricton or wear, or both, between the moving parts within an engine, removes heat, particularly from the underside of pistons; and serves as a combustion gas sealant for the piston rings.

3.1.6.1 *Discussion*—It may contain additives to enhance certain properties. Inhibition of engine rusting, deposit formation, valve train wear, oil oxidation and foaming are examples.

3.1.7 *free piston ring*, *n— in internal combustion engines*, a piston ring that will fall in its groove under its own weight when the piston, with the ring in a horizontal plane, is turned 90° (putting the ring in a vertical plane). **(Subcommittee B Glossary[11])**

3.1.8 *heavy-duty*, *adj— in internal combustion engine operation*, characterized by average speeds, power output, and internal temperatures that are close to the potential maximums. **(D 4485)**

[4] *Annual Book of ASTM Standards*, Vol 05.01.
[5] *Annual Book of ASTM Standards*, Vol 05.05.
[6] *Annual Book of ASTM Standards*, Vol 05.02.
[7] *Annual Book of ASTM Standards*, Vol 14.03.
[8] *Annual Book of ASTM Standards*, Vol 03.02.
[9] This standard is not available separately. Either order the SAE Handbook Vol 3, or the SAE Fuels and Lubricants Standards Manual HS 23 from: Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096-0001.
[10] Available from the Standardization Documents Order Desk, Building 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094.
[11] Available from the Secretary of the ASTM D02.B0 Subcommittee.

3.1.9 *heavy-duty engine*, *n— in internal combustion engines*, one that is designed to allow operation continuously at or close to its peak output. **(D 4485)**

3.1.10 *lubricant*, *n*—any material interposed between two surfaces that reduces the friction or wear, or both, between them.

3.1.11 *non-reference oil*, *n*—any oil other than a reference oil, such as a research formulation, commercial oil, or candidate oil. **(D 5844)**

3.1.12 *plugging*, *n*—the restriction of a flow path due to the accumulation of material along the flow path boundaries.

3.1.13 *reference oil*—an oil of known performance characteristics, used as a basis for comparison. **(D 5844)**

3.1.13.1 *Discussion*—Reference oils are used to calibrate testing facilities, to compare the performance of other oils, or to evaluate other materials (such as seals) that interact with oils.

3.1.14 *scoring*, *n—in tribology*, a severe form of wear characterized by the formation of extensive grooves and scratches in the direction of sliding. **(G 40)**

3.1.15 *scuffing*, *n—in lubrication*, damage caused by instantaneous localized welding between surfaces in relative motion which does not result in immobilization of the parts. **(D 4863)**

3.1.16 *soot*, *n—in internal combustion engines*, sub-micron size particles, primarily carbon, created in the combustion chamber as products of incomplete combustion.

3.1.17 *tight piston ring*, *n— in internal combustion engines*, a piston ring that will not fall in its groove under its own weight when the piston, with the ring in a horizontal plane, is turned 90° (putting the ring in a vertical plane); by subsequent application of moderate finger pressure, the ring will be displaced.

(Subcommittee B Glossary[11])

3.1.18 *used oil*, *n*—any oil that has been in a piece of equipment (for example, an engine, gearbox, transformer, or turbine), whether operated or not. **(D 4175)**

3.1.19 *wear*, *n*—the loss of material from, or relocation of material on, a surface.

3.1.19.1 *Discussion*—Wear generally occurs between two surfaces moving relative to each other, and is the result of mechanical or chemical action or by a combination of mechanical and chemical actions. **(D 5302)**

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *liner scuffing*, *n*—scuffing characterized by vertical markings in the direction of piston motion which obscure visual detection of the honing crosshatch pattern of the liner.

3.2.2 *test*, *n*—any engine run-time accumulated beyond the break-in conducted according to this test method.

4. Summary of Test Method

4.1 A 500 horsepower 6V92TA diesel engine[12] is completely disassembled, solvent-cleaned, measured, and assembled using new parts as specified.

4.2 The engine is installed on a test stand equipped with the appropriate accessories for controlling speed, load, and various other engine operating parameters.

4.3 The engine is charged with the test oil and operated for 6 h and 10 min on a break-in cycle. An airbox inspection is made after break-in to determine cylinder liner scuffing as a measure of the suitability of the engine build.

4.4 Following the break-in, the engine is operated under steady state conditions at both high load and high power for 7 cycles, totaling 100 h running time. Each cycle includes a heat soak and cool-down portion. This test stresses the lubricant thermally and mechanically to duplicate the service typical of these types of engines in use today.

4.5 Used oil samples are taken every 16 h with viscometric characteristics, metals, and base number (TBN) measured on a fixed schedule.

4.6 At the end of the test, the engine is disassembled, and the rings, liners, slipper bushings, and piston skirts are visually inspected for those signs of distress that relate to overall engine life.

5. Significance and Use

5.1 This test method was developed to evaluate diesel engine oils for protection against ring and liner distress caused by high thermal and mechanical loading.

5.2 Liner scuffing and ring distress experienced in this test method are measures of the oil's ability to protect against scuffing and scoring under high power and high load conditions typical of service experienced by engines in use today.

5.3 Piston pin slipper bushing wear, piston skirt tin removal, and liner port plugging are also examined in this test for distress which relates to overall engine life.

5.4 This test method was developed to correlate with field experience using oils of known good and poor protection against ring and liner distress.

5.5 The 6V92TA engine oil test is used in specifications and classifications of engine lubricating oils, such as the following:

5.5.1 Specification D 4485,

5.5.2 Military Specification MIL-L-2104, and

5.5.3 SAE Classification J 183.

6. Apparatus—General Description

6.1 The test engine is based on an 9 L Detroit Diesel 6V92TA, turbo-supercharged, aftercooled, two-stroke cycle diesel engine.

6.2 Use an engine test stand equipped to control engine speed and load, various temperatures, and other parameters.

6.3 Use appropriate air conditioning or heating apparatus, or both, as necessary to control the temperature of the intake air.

6.4 Use an appropriate fuel supply system.

7. Apparatus—Laboratory and Test Stand Requirements

7.1 *Laboratory*—Observe the following laboratory conditions to ensure good control of test operations and good repeatability:

7.1.1 Maintain the ambient laboratory atmosphere relatively free of dirt, dust, and other contaminants.

7.1.2 Control the temperature of the room in which parts measurements are made so that the temperature for after-test

---

[12] A Detroit Diesel 6V92TA engine shall be used; purchase it from a local Detroit Diesel Distributor. If it is necessary to locate a distributor, contact the Test Developer: Attention: Sequence 6V92TA Test Developer, Detroit Diesel Corporation, Fuels and Lubricants, 13400 West Outer Drive, Detroit, MI 48239-4001.

measurements is within a range of ±3°C (±5°F) relative to the temperature for the before-test measurements. If difficulty of parts fit during engine assembly is encountered, consider the effects of temperature coefficient of expansion.

7.2 *Engine Stand Requirements*—A typical test stand is shown in Annex A2 (Fig. A2.1).

7.2.1 *Engine Speed and Load Control*— Dynamometer shall be able to maintain engine speeds of 1200 and 2300 r/min at the torques of 1850 N-m and 1550 N-m, respectively (approximately 373 kW). Load ramping is not required.

7.2.2 *Engine Cooling System*—Use a suitable external engine cooling system to maintain the specified engine coolant temperature during both the operating and cool-down portions of the test. The system shall incorporate the following features:

7.2.2.1 Cooling capacity of 370 kW (21 000 Btu/min).

7.2.2.2 Flow capacity of 760 L/min (200 gal/min).

7.2.2.3 Temperature control with coolant out temperature maintained at 84 ± 2°C (183 ± 4°F).

7.2.3 *Air Inlet System*:

7.2.3.1 Shall have a capacity of 34 m^3/min (1200 cfm), at a temperature of 35 ± 3°C (95 ± 5°F).

7.2.3.2 Shall utilize 13-cm (5-in.) inside diameter pipe as shown in Fig. 1.

7.2.7 *Fuel System*—Use a fuel system with 11 500 L (3000 gal) capacity. It shall have a mass flow capability of 92 kg/h (202 lbm/h) minimum.

7.3 *Drawings*—Obtain the equipment drawings referenced in the Annex A1 of this test method from the ASTM Test Monitoring Center. Because the drawings may not be to scale, when using them to fabricate special parts, use the dimensions specified. Do not use a drawing as a pattern. Drawing dimensions are considered to be correct when the temperature of the equipment is 22°C (72°F), unless otherwise specified.

7.4 *Specified Equipment*—Use the equipment specified in the procedure whenever possible. Substitution of equivalent equipment is allowed, but only after equivalency has been proven to the satisfaction of the ASTM Test Monitoring Center. See Annex A2 (Fig. A2.1) for a view of the engine and attached apparatus used in this test method.

8. Apparatus—Test Engine

8.1 *The Test Engine*—Detroit Diesel 6V92TA 9 L500 horsepower (rating for evaluation of lubricants) turbo-supercharged, aftercooled, two-stroke cycle diesel engine is procured from the recommended source.[12] Rebuild the engine as specified in this test method. It is based on the Industrial Engine Model

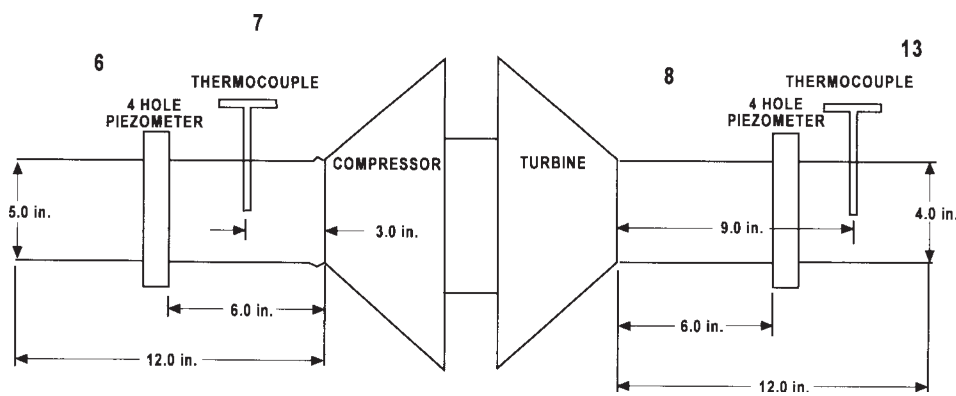


FIG. 1 Inlet and Exhaust Pressure and Temperature Sensor Locations

7.2.3.3 Shall have an air inlet restriction of 2.5 ± 0.7 kPa (10 ± 3 in. H_2O).

7.2.4 *Exhaust System*:

7.2.4.1 Shall have a flow capacity of 85 m^3/min (3000 cfm) at 510°C (950°F).

7.2.4.2 Shall utilize a 10-cm (4-in.) inside diameter pipe as shown in Fig. 1.

7.2.4.3 Shall have backpressure of 3.2± 0.8 kPa (0.95 ± 0.25 in. Hg).

7.2.5 *External Oil Cooling System*—Incorporate the external oil cooling system shown in Annex A2 (Fig. A2.2). A bracket for this system is shown in Annex A2 (Fig. A2.3). The oil gallery set-point is to be 102 ± 1°C (216 ± 2°F) during the load mode, and 111 ± 1°C (232 ± 2°F) during the power mode. The table in Annex A2 (A2.1) describes the parts required for the external cooler.

7.2.6 *Adjustable Dipstick*—Shall be used to monitor oil consumption. The construction of this dipstick is shown in Annex A2 (Fig. A2.4).

Number 8063-7408 which has the power rating of 410 kW (550 bhp) at 2300 r/min. Engine timing: 1.484 in., Lash 0.016 in.

8.2 *Engine Parts*—Engine parts which are to be used for intermittent overhauls required in conducting this test procedure are listed in Annex A3. Critical parts are discussed under 8.2.4 and 8.2.5. Subassemblies are listed by complete subassemblies only; not by parts making up the subassemblies. Such parts are not replaced routinely and can be obtained from the Detroit Diesel Distributor.

8.2.1 Use all engine parts as received from the supplier; either the special kits from the Detroit Diesel Distributor (see 8.2.4), or original equipment manufactured by Detroit Diesel, unless defects in the parts require that they be returned to the supplier.

8.2.2 Do not divert to other applications parts obtained for use in 6V92TA testing.

8.2.3 Special tools are required for over-haul and measurement of the engine. Unless otherwise specified in this standard, these tools are available from the supplier and part numbers are listed in the Service Manual.[13]

8.2.4 *Service Part Kit*—Use the service parts (see Annex A3) and special parts in 8.2.5 and build-up procedures appropriate to the 6V92TA test engine stated in the service manual. Engine build-up and overhaul cannot be easily accomplished without this manual. Special service test cylinder kits (23508936) comprise parts that shall be replaced after each test and are available by order from any Detroit Diesel Distributor. These parts have undergone 100 % inspection by the test developer and orders for these uniquely numbered parts are linked by computer to a centrally controlled supply. The parts that replaced each test are included in these special service kits. They shall be used with no substitutions. Any difficulties experienced in ordering these pre-inspected parts should be referred to the test developer.[12]

8.2.5 *Required New Engine Parts*—See Table 1.

TABLE 1 Replace Listed Parts Each Test

Part Name	Part Number
Cylinder liner	23508937
Piston dome	23508938
Seal—dome to skirt	8923729
Piston skirt	23508940
Piston pin	5101120
Piston pin retainer	5180250
Slipper bushing	23501687
Oil control ring upper groove	23509097 top ring 23509098 bottom ring
Oil control ring lower groove	23509099 2 rings required
Oil ring expander	23509101
Fire ring	23508939
Compression rings	23509100 2 rings required per kit
Connecting rod upper bearing shell[A]	5107200
Connecting rod lower bearing shell[A]	5148936
Oil filter (12 μm)[A]	23518524 2 required

[A]Parts not in 23508936 cylinder kits.

8.2.6 *Parts Replaced As Needed*—See Table 2. Not routinely replaced, these parts have normal service part numbers and shall be used.

8.2.7 *Cylinder Liners*—The following measurements and directives shall be followed for free standing cylinder liners.

8.2.7.1 Measure diametrical cylinder bore:

13 mm (0.5 in.) from the top
25 mm (1 in.) above ports
25 mm (1 in.) below ports
13 mm (0.5 in.) from bottom

Specified range is 122.911 to 122.974 mm (4.8390 to 4.8415 in.). Measure and report on two axes (eight total measurements). Use Form 11 in Annex A5 (Fig. A5.12) for reporting these measurements.

8.2.7.2 Average surface finish:[14] maintain 1.1–1.7 μm (45–65 μ-in.) R_a above the ports. Use Form 11 in Annex A5 (Fig. A5.12) for reporting these measurements.

8.2.7.3 Sort liners by flange height, identified by *L* or *H*. Use only the same flange heights on each side of the engine; however both sizes may be used in the same engine.

8.2.8 *Piston Ring Measurement*—Measure all rings as follows:

8.2.8.1 Measure radial thickness for all fire and compression rings. Measure in five locations, two at 25 mm each side of the ring gap, one opposite the gap, and two more locations mid-distance between the gap and opposite the gap. Average the measurements and record on Form 10 in Annex A5 (Fig. A5.11).

8.2.8.2 Measure end gaps using 123.0 mm (4.840 in.) gage.[15]

(*1*) *Fire and Compression Rings*—1.016 ± 0.127 mm (0.040 ± 0.005 in.).

(*2*) *Oil Control Rings*—Upper 0.4064 ± 0.025 mm (0.016 ± 0.001 in.). Lower 0.5842 ± 0.051 mm (0.023 ± 0.002 in.).

8.2.8.3 Weigh all rings in grams. Use Form 10 in Annex A5 (Fig. A5.11) for reporting these measurements.

8.2.9 *Piston Skirt Measurements and Clearances*:

8.2.9.1 Diameter of the piston shall be 122.667 to 122.733 mm (4.8294 to 4.8320 in.) measured[16] at 13 mm (0.5 in.) toward the top of the piston skirt 90° from the piston pin hole. This dimension includes tin plate.

8.2.9.2 Tin plate thickness for pistons supplied in the test kit shall be measured and verified to be in specification by the test kit supplier.

8.2.9.3 Piston skirt to liner clearance shall fall between 0.1778 and 0.3048 mm (0.007 and 0.012 in.), to be determined by subtracting diameters. Use Form 11 in Annex A5 (Fig. A5.12) for reporting these measurements.

8.2.10 *Piston Pin Slipper Bushing*—Weigh to ±0.001 g. Use Form 10 in Annex A5 (Fig. A5.11) for reporting these measurements.

8.2.11 *Main Bearings*—Inspect main bearing shells prior to each test and replace every three tests or sooner, if necessary.

8.2.12 *Rocker Arm Bushings Injector Position*—Measure[17] the inside diameter and record on Form 11 in Annex A5 (Fig. A5.12).

8.2.13 *Valves*—Leak check prior to each test. Regrind or replace valves every five tests. See 8.4.2.2.

TABLE 2 Parts To Be Replaced as Needed

Part Name	Part Number
Connecting rod	5104501
Fuel injector 145 mm^3(6 required)	5226555[A]
Turbocharger (1.23 A/F OTM MNT, 4 in. IN)	23502746
Blower	23505854
Plate oil cooler	8547237
Water pump	892236

[A]For rebuilt injectors see 8.2.15.

[13] Service Manuals, Sections 1–3 and Sections 4–15 are identified as 06SE0379 (two volumes) and can be purchased from Robot Printing Inc., Detroit Diesel Corporation, 25215 Glendale Ave., Redford, MI 48239-2675.

[14] A Taylor Hobson (Form Talysurf) has been found suitable for this purpose. It is available from Rank Precision Industries, 411 East Jarvis Ave., Des Plaines, IL 60018.

[15] A Hemco Master 4.840 Class Y Ring Standard has been found suitable for this purpose. It is available from Rex Supply Corporation, 8539 North East Loop 410, San Antonio, TX 78216.

[16] A Mitutoyo (4–5 in.) C Clamp micrometre #293-751-10 has been found suitable for this purpose. It is available from L. Dewitt McCarter, Inc., 318 East Nakoma, San Antonio, TX 78216.

[17] A Mitutoyo Inside Micrometre #568-406 has been found suitable for this purpose.

8.2.14 *Connecting Rods*—Install a new set of six connecting rods at least every tenth test. It is recommended that all six connecting rods be replaced following a cylinder kit failure.

8.2.15 *Injectors*—Check injector output every test. These data may be recorded on the form in Appendix X3, (Fig. X3.10Fig. X3.10) or a similar form. Replace with new or rebuilt injectors if injector requirements are not met. These are described in Section 2.0 of the Shop Notes.[13] A special tool, J22410 is called for.

8.2.15.1 If injector rebuilding is selected, use the following injector exchange program, ASTM Injector Exchange Program, Detroit Diesel Remanufacturing—West, Inc., 100 Lodestone Way, Tooele, UT 84074. Attention: ASTM Injector Exchange Administrator.

8.2.16 *Ordering Information*:

8.2.16.1 Refer to Part Number 5226555 ASTM.

8.2.16.2 Delivery will be ten days after ordering.

8.2.16.3 Injectors will be identified with "ASTM" conspicuously stamped on the injector body.

8.2.16.4 It is recommended that laboratories maintain 12 working and calibrated injectors per engine minimum.

8.2.17 *Additional Information*:

8.2.17.1 Injectors will be disassembled and cleaned.

8.2.17.2 A new spray tip assembly will be installed.

8.2.17.3 Plunger and bushing to be machined to new part specifications.

8.2.17.4 Output flow specification 140 to 145 cc.

8.2.17.5 All injectors to be visually inspected for visual and functional defects.

8.3 *Special Cleaning Procedures*—Before any major disassembly, drain the engine of lubrication oil, water and fuel. Before removing any subassemblies from the engine (but after removal of the electrical equipment) thoroughly clean the exterior of the engine. Then, after each subassembly is removed and disassembled, clean the individual parts as necessary. Engine build-up forms are provided in Appendix X3 and may be used to organize the cleaning, parts measurements, and engine build-up tasks.

8.3.1 *Engine Block Cleaning*—Complete disassembly of the block may not be required, provided adequate cleaning is accomplished. This modification shall be included in the test report. If disassembly is required, the following procedure should be used. Note that a new service replacement cylinder block shall be cleaned with Penetone[18] to remove the rust preventive and the oil galleries shall be blown out with compressed air. (**Warning**—In addition to other precautions, to prevent possible personal injury, wear adequate eye protection. Penetone is a solvent and should not be ingested, nor come into contact with eyes or more than casual contact with the skin; spray goggles and hand protection are recommended. Use an airgun meeting OSHA standards.)

8.3.1.1 If judged necessary, the engine block should be completely disassembled and cleaned thoroughly by solvent spraying[19] with Varsol 3139.[20] Alternatively, the block may be soaked in Penetone for about 12 h. (**Warning**—Health hazard.)

8.3.1.2 Scrape all gasket material from the cylinder block. (**Warning**—In addition to other precautions, unless it is known otherwise, treat all gasket material in the engine and subassemblies as though it contains asbestos. When stripping gaskets from parts, do not grind or file off the material or abrade it off with a wire brush or wheel. Use a putty knife to remove the gasket after it has been wetted with water or oil.)

8.3.1.3 Before each run, all oil gallery plugs and core hole plugs (except cup plugs) should be removed to allow the cleaning solution to contact the inside of the oil and water passages. This permits more efficient cleaning. As a minimum, the engine may be solvent flushed while remaining on the test stand.

8.3.1.4 Rinse the block in hot water to remove cleaning solution.

8.3.1.5 Dry the cylinder block with compressed air. (**Warning**—In addition to other precautions, to prevent possible personal injury, wear adequate eye protection. Use an airgun that conforms to OSHA requirements.)

(*1*) The above procedure may be used on all ordinary cast iron and steel parts of the engine, unless specifically mentioned.

8.3.2 *Cylinder Head Cleaning*—After the cylinder head has been disassembled and all of the plugs (except cup plugs) have been removed, thoroughly solvent clean the head and dry with compressed air. Do not soak heads in Penetone because it will deteriorate the fuel injector tube seals. Instead use an aliphatic hydrocarbon to wash the heads. (**Warning**—In addition to other precautions, aliphatic hydrocarbons and should not be ingested, nor come into contact with eyes or more than casual contact with the skin. Spray goggles and hand protection are recommended.)

8.3.3 *Piston Ring Cleaning*—Remove heavy carbon from the piston rings by using an ultrasonic bath with Oakite Rust Stripper[21] as a cleaning medium. A concentration of 150 g/L has been found effective. Agitate for 1 h and rinse with hot water. Rinse rings with EF-411 as soon as possible to prevent rusting. (**Warning**—Health hazard.) (**Warning**—In addition to other precautions, the rust stripper is caustic. Use eye and hand protection.)

8.3.4 *Air Box Cleaning*—Special attention shall be given to the airbox area to ensure that there is no residual debris that could be ingested through the liner ports in subsequent tests. A check for air flow from the air box drain tubes should be made as outlined in the service manual.

8.3.5 *Oil Heat Exchanger Cleaning*—Disassemble and flush oil side with Varsol 3139. Water side may be cleaned as necessary.

8.3.6 *Blower Cleaning*—Remove rear cover and drain all oil, then wash front and rear with Varsol or equivalent.

[18] Penetone (specifically Penmul L-460) is a product of Penetone Corp., P.O. Box 22006, Los Angeles, CA 90022.

[19] A Flex-Rite Spray Gun has been found suitable for this purpose. It is available from Snap-On, Dan Rodgers, 114 Storywood, San Antonio, TX 78217.

[20] Aliphatic hydrocarbons are available at local petroleum product suppliers.

[21] Oakite Rust Stripper, OF, has been found suitable for this purpose. It can be obtained from Wrico, 4835 Whirlwind, San Antonio, TX 78217.

8.3.7 *Turbocharger Cleaning*—Do not routinely wash or clean turbocharger; just drain oil.

8.3.8 *Crankshaft*—Blow out drilled passages in the crankshaft.

8.4 *Periodic Maintenance Inspections*—Use forms equivalent to those shown in Appendix X3. As contrasted with the inspections and test part measurements made in 8.2, make the following inspections only at periodic intervals based on the overhaul experience of the laboratory; not necessarily after each test. However they should be done after each failure where obvious overheating occurred.

8.4.1 *Cylinder Block Inspection*—Remove liners with the special tool described in the service manual. Do not attempt to push the liner out by inserting a bar in the liner ports and rotating the crankshaft, otherwise the piston may be damaged or the upper ring groove may collapse.

8.4.1.1 *Inspect Block Bores*—Because most of the engine cooling is accomplished by heat transfer through the cylinder liners to the water jacket, a good liner-to-block contact must exist when the engine is operating. After the cylinder liners are removed from the engine, the block bores shall be inspected as outlined in the service manual.

8.4.1.2 *Check for Flatness*—The cylinder head contact surfaces shall be checked for flatness with an accurate straight edge and a feeler gage. The cylinder head deck surfaces of the block shall not vary more than 0.003 in. (0.076 mm) transversely and not over 0.006 in. (0.152 mm) longitudinally.

8.4.1.3 *Check Counterbore Depth*—Make sure the cylinder liner counterbores in the block are clean and free of dirt. Then check the depth. They shall be either 0.4755 to 0.4770 in. (12.078 to 12.116 mm) or 0.4905 to 0.4920 in. (12.459 to 12.497 mm) and shall not vary more than 0.0015 in. (0.0381 mm) throughout the entire circumference. Tool J22273[22] or equivalent is recommended for this measurement.

8.4.1.4 *Check Main Bearing Bores*—Check the bore diameters[23] with the main bearing caps in their original positions. The specified main bearing bore diameter is 4.812 to 4.813 in. (122.225 to 122.250 mm). If the bores do not fall within these limits, the block shall be rejected. Main bearing bores are line-bored with the bearing caps in place and thus are in longitudinal alignment. If a main bearing bore is more than 0.001 in. (0.025 mm) maximum overall misalignment or 0.0005 in. (0.013 mm) misalignment between adjacent bores, the block shall be line-bored or scrapped.

8.4.1.5 The cylinder block main bearing bore measurements should be made with the block in an upside down position on a flat surface rather than on an engine overhaul stand.

8.4.1.6 *After Inspection*—If the cylinder block is not to be used immediately, spray the machined surfaces with EF-411.[24]

8.4.2 *Cylinder Head Inspection*:

8.4.2.1 It is good practice to inspect cylinder heads for cracks after each test. A number of methods are described in the service manual for this purpose. A service replacement cylinder head is available which includes the exhaust valve guides, valve seat inserts, water nozzles, injector tubes, pilot sleeves, bridge guides, valve spring seats and the necessary plugs. The head shall be rebuilt at least every five runs. If the plugs are replaced separately, coat the threads with Locktite Pipe Sealant with Teflon®[25], install the necessary plugs and tighten to torque specified in the service manual.

8.4.2.2 Leak test valves after each test. Commercial testers[26] are specifically manufactured for this purpose.

8.4.2.3 Check exhaust valve to head protrusion/recession after each test and log the results on forms equivalent to those shown in Fig. X3.10. If valve recession exceeds 0.711 mm (0.028 in.) replace valve seats.[27]

8.4.3 *Rocker Arm Bushing, Injector Position*—Check inside diameter of the bushing and record on Form 11 in Annex A5 (Fig. A5.12). Replace if rocker arm shaft to bushing clearance exceeds 0.102 mm (0.0040 in.).

8.4.4 *Other Part and Sub-Assembly Inspection*—Other parts and subassemblies should be inspected less frequently, based on laboratory experience. Procedures are outlined in detail in the service manual for the inspection of all parts and subassemblies. Particular attention should be paid to making visual inspections of such items as the turbocharger aftercooler and turbine wheel assembly where deposit build-up is gradual and therefore performance deterioration is difficult to detect.

8.5 *Engine Build-up Procedures*:

8.5.1 *General*—Assembly procedures and the numerous special tools required are not detailed in the following, but should be done in accordance with the instructions in the service manual.

8.5.2 *Parts Selection*—Instructions concerning the use of new or used parts are given under 8.2.

8.5.3 *Engine Measurement Records*—Record engine parts measurements on data sheets equivalent to those shown in Appendix X3. Certain critical parts measurements are also recorded in Annex A5.

8.5.4 *Build-up Lubrication*—Lubricate all engine parts with EF-411 during assembly.

8.5.5 *Sealing Compounds*—During rebuilding, cylinder head bolts and main bearing bolts which are torqued to specific settings shall be first coated with International Compound No. 2.[28] Be sure that no excess is left on the bolts. However, all bolts, plugs, fittings or fasteners, (including studs) that intersect with a through hole and come in contact with oil, fuel or coolant shall have a sealer applied to the threads. It is recommended that Loctite J26558-92 Pipe Sealant with Teflon,

[22] Specialized overhaul tools can be purchased from Detroit Diesel distributors. A listing of such tools necessary for the overhaul of the engine used in this test method can be provided by referring to footnote 12.

[23] A Sunnen Model CF-1000 Bore Gage has been found suitable for this purpose. It is available from Sunnen Products, 7910 Manchester, St. Louis, MO 63143.

[24] EF-411 is supplied by Mobil Oil Corp., Att: Illinois Order Board, P.O. Box 66940, AMF-O'Hare, IL 60666. Request P/N 47503–8.

[25] Locktite J26558-92 is available from local distributors of Permatex products, or may be found by contacting Permatex Company, Inc. (Locktite Corporation), 18731 Cranwood Parkway, P.O. Box 7138, Cleveland, OH 44128-7137.

[26] A Sioux 1630K Vacuum Tester has been found suitable for this purpose. It is available from Sioux Tools Inc., 2909 Floyn Boulevard, Sioux City, IA 51102.

[27] A Kwik-Way Out-of-Round Tool P/N 049-0340-24 has been found suitable for seat out of round measurements. It is available from Kwik-Way, 500 57th Street, Marion, IA 52302.

[28] International Compound No. 2 is available from IRMCO, 2117 Greenleaf Street, Evanston, IL 60202.

or equivalent, be used. Exercise care to use International Compound No. 2 only when specified in the service manual.

8.5.6 *Gaskets and Seals*—Use new gaskets and seals as necessary at all locations during each engine assembly. Utilize gasket kit No. 23512684. The gasket between the turbocharger and blower (No. 8925778) shall be renewed each test.

8.5.7 *Engine Assembly*:

8.5.7.1 *Install Connecting Rods to Pistons*—Torque connecting rod bolts to 55–60 lbf·ft (75–81 N·m). Use International Compound No. 2 on threads when torquing.

8.5.7.2 *Install Pistons into Cylinder Liners*—With the piston assembled to the connecting rod and the piston rings in place, lubricate the piston, rings, and inside surface of the piston ring compressor J2422 as described in the service manual. Use EF-411 to lubricate the surfaces.

8.5.7.3 *Install Liners into Block*—Slide the piston, rod, and liner assembly into the block bore until the liner flange rests against the insert in the counterbore in the block. Ensure that the various matchmarks described in the service manual are in line.

8.5.7.4 *Install Lower Bearing Shell*—Tighten the connecting rod bolt nuts to 60–70 lbf·ft (81–95 N·m).

8.5.7.5 *Assemble and Install Cylinder Head*—After cleaning and inspection, assemble and install the cylinder head as described in the service manual. Note that a special lifting tool is required. Note that the bolt tightening sequence described shall be followed.

8.5.7.6 *Install Subassemblies*—Complete the engine assembly by installing all remaining accessories, fuel lines, electrical connections, controls, etc.

9. Measurement Instrumentation

9.1 *Temperature Measurement*—Use iron-constantan (Type J) thermocouples or platinum resistance thermocouples for temperature measurement.[29] Other temperature sensors that give the same results may be used, provided that they are approved by the ASTM Test Monitoring Center.

9.1.1 *Thermocouple Location*—Locate the sensing tip of all thermocouples in the center of the stream of the medium involved, unless otherwise specified.

9.1.2 *Oil Gallery*—Locate thermocouple on the right front of block in turbocharger oil feed line, flush with block face. See Fig. 2, location No. 2.

9.1.3 *Fuel In*—Locate thermocouple at the fuel filter. See Fig. 3, location No. 3.

9.1.4 *Coolant In*—Locate thermocouple at coolant inlet to coolant pump. See Fig. 3, location No. 4.

9.1.5 *Coolant Out*—Locate thermocouple after right and left thermostat housing outlets join. See Fig. 4, location No. 5.

9.1.6 *Air Inlet*—Locate thermocouple before compressor. See Fig. 1, location No. 7.

9.1.7 *Air Box*—Locate thermocouple right bank, rear air box cover. Tip of thermocouple should be 32 mm (1¼ in.) inside air box cover.

[29] Thermocouples and packing glands (Part MPG-125-A-T) have been found suitable and are available from the Sales Department of Conax Corporation, 2300 Walden Ave., Buffalo, NY 14225.

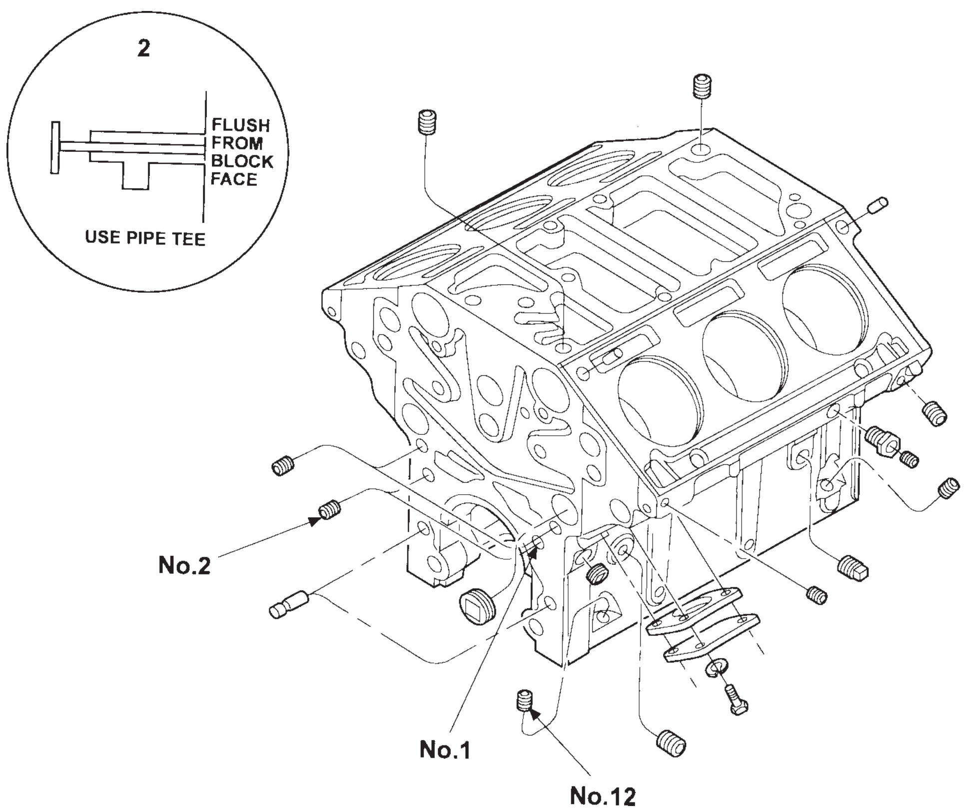


FIG. 2 Position of Pressure and Temperature Sensors

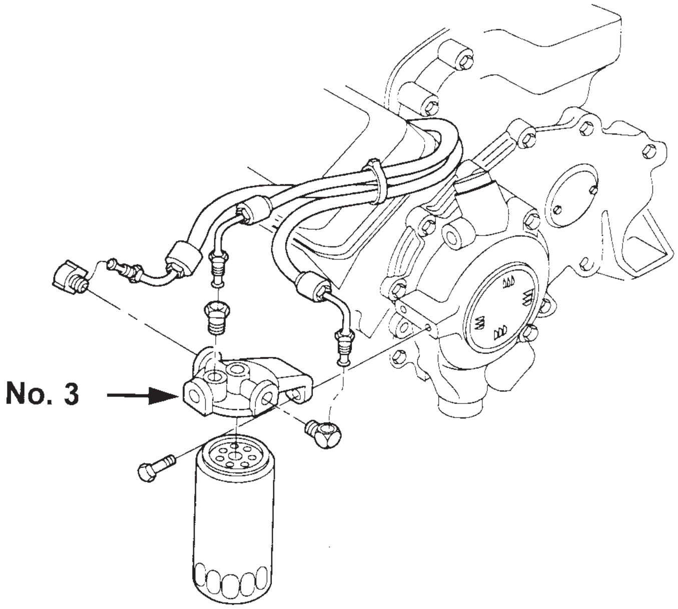


FIG. 3 Position of Pressure and Temperature Sensors

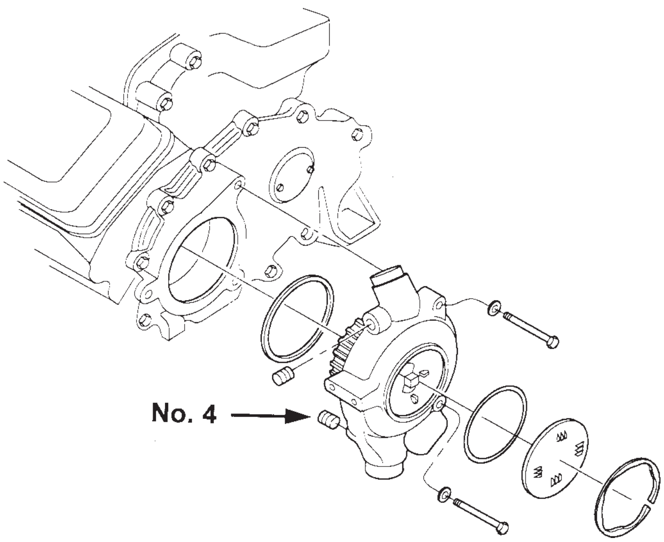


FIG. 3 *(continued)*

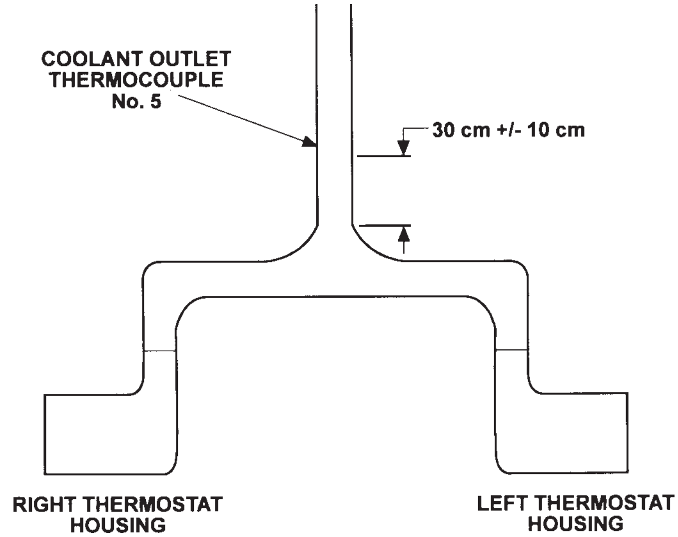


FIG. 4 Coolant Outlet Thermocouple Location

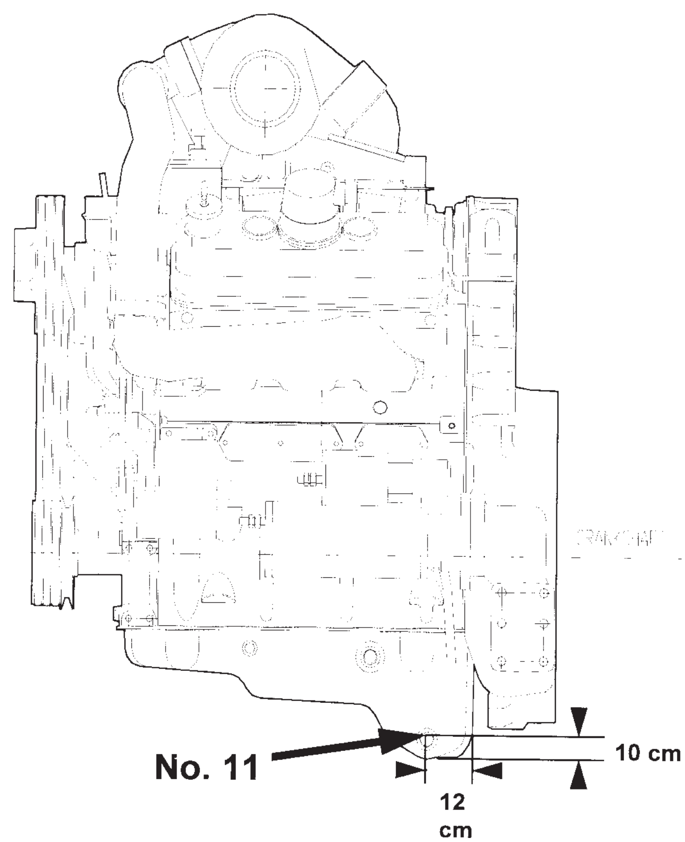


FIG. 5 Oil Sump Temperature Sensor Location

9.1.8 *Oil Sump*—Locate thermocouple in left side of oil sump, 50 to 120 mm (2 to 5 in.) from back and 50 to 100 mm (2 to 4 in.) from bottom of oil pan. See Fig. 5, location No. 11.

9.1.9 *Exhaust*—Locate thermocouple as shown in Fig. 1, location No. 13.

9.2 *Pressure Measurement*—Use pressure sensors such as pressure gages or manometers, or electronic transducers, located as indicated, and following the established guidelines.[30]

9.2.1 *Pressure Sensor Location*—Locate pressure sensors in the center of flow unless otherwise specified.

9.2.2 *Oil Gallery*—Locate pressure sensor on the left front of block. See Fig. 2, location No. 1.

9.2.3 *Air Inlet*—The air inlet restriction sensor (4-hole piezometer) is located in the air inlet, 150 ± 25 mm (6 ± 1 in.) from turbocharger as shown in Fig. 1, location No. 6.

9.2.4 *Exhaust Back Pressure*—Locate 4-hole piezometer in exhaust stream as shown in Fig. 1, location No. 8.

9.2.5 *Air Box*—Locate sensor in right bank, rear air box cover.

9.2.6 *Crankcase Pressure*—The sensor may be located in the front dipstick hole on the left side of the engine as shown in Fig. 2, location No. 12. This measurement is optional.

[30] See the 1987-04-02 Instrumentation Task Force Report to the ASTM Committee D02.B0.08 Technical Guidance Committee (RR:D02-1218).

10. Reagents and Materials

10.1 *Test Fuel*—Use ASTM 2D Fuel or equivalent. It shall have the specific properties shown in Annex A4 (Table A4.1). (**Warning**—Combustible. Health hazard.)

10.1.1 Make certain that all tanks used for transportation and storage are clean before they are filled with test fuel.

10.1.2 Verify that at least 11 300 L (3000 gal) of test fuel is available before starting the test.

10.2 *Test Oil*:

10.2.1 *Selection*—The supplier of the test oil sample shall determine that it is representative of the lubricant formulation being evaluated and that it is not contaminated.

10.2.2 *Quantity*—The supplier of the test oil shall provide approximately 100 L (25 gal) of the test oil sample.

10.2.3 *Identification*—The oil sample shall be clearly identified with the name of the test sponsor, the oil formulation, and the batch code. The code number from the container is to be entered on the test report.

10.2.4 *Storage Prior to Test*—The test laboratory shall store the test oil sample in a covered building to prevent both contamination by rainwater and excessive heat exposure.

10.3 *Coolant Composition*—A 50 % concentration of regular grade ethylene glycol type antifreeze[31] in distilled water is to be used. (**Warning**—Combustible. Health hazard.)

10.4 *Sealing and Anti-seize Compounds*—The following sealing and anti-seize compounds are required for this test method:

10.4.1 *For All Bolts Under Specified Torque*—Use International Compound No. 2 to achieve proper fastener torque. Use minimum quantities and remove all excess, as discussed in 8.5.5.

10.4.2 All bolts, plugs, fittings or fasteners, (including studs) that intersect with a through hole and come in contact with oil, fuel or coolant shall have a sealer applied to the threads. It is recommended that Loctite J26558-92 Pipe Sealant with Teflon® be used, as discussed in 8.5.5.

10.5 *Cleaning Materials*—The following cleaning materials are required in the procedure. The use of alternative materials requires approval by the ASTM TMC.

10.5.1 *For Block Cleaning*—Use Penetone (specifically Penmul L-460), as discussed in 8.3.1.

10.5.2 *For Head Cleaning*—Use an aliphatic carbon, as discussed in 8.3.2.

10.5.3 *For Piston Ring Cleaning*—Use Oakite Rust Stripper OF, as discussed in 8.3.3.

10.5.4 *For Coolant System Cleaning*—Use Nalprep 2001,[32] as discussed in 13.1.2.

11. Hazards

11.1 *General*—The environment involved with any engine test is inherently hazardous. Serious injury of personnel and damage to facilities can occur if adequate safety precautions are not taken. However, as evidenced by the fact that many thousands of engine tests are successfully conducted each year it is possible to take adequate precautions.

11.2 *Caveat*—The following paragraphs do not cover all possible safety-related problems associated with 6V92TA testing.

11.3 *Personnel*—Carefully select and train personnel who will be responsible for the design, installation, and operation of 6V92TA test stands. Make certain that the test operators are capable of handling the tools and facilities involved and in observing all safety precautions, including avoiding contact with either moving or hot test parts.

11.4 *Personnel Protection Facilities*—Provide the following personnel protection facilities:

11.4.1 Provide safety shower and eye-rinse equipment in close proximity to the facilities used for parts cleaning, engine assembly, engine test operation, and parts rating.

11.4.2 Provide, and require the use of, appropriate face masks, eye protection, chemical breathers, gloves, and so forth, in all aspects of 6V92TA testing.

11.4.3 Provide dry chemical fire extinguishers for putting out fires.

11.4.4 Advise personnel not to use water to attempt to extinguish fires involving fuel, oil, or glycol.

11.4.5 Equip test stands with automatic fire extinguishing equipment.

11.4.6 Install suitable guards around all external moving parts, or hot parts.

11.4.7 Advise personnel not to work alongside the engine and coupling shaft when the engine is operating at high speeds.

11.4.8 Provide barrier protection between the engine and coupling shaft, and operating personnel.

11.4.9 Prohibit the wearing of loose or flowing clothing by personnel working near a running engine.

11.5 *Safety Equipment and Practices*—Observe the following in order to establish and maintain safe working conditions for 6V92TA testing:

11.5.1 Provide the proper tools for conducting the 6V92TA test.

11.5.2 Require regular inspection and approval by the laboratory safety department of the facilities used for 6V92TA testing.

11.5.3 Properly install all fuel lines, oil lines, and electrical wiring. Maintain them in good condition.

11.5.4 Select and install coolant hoses and clamps with special care in order to prevent coolant leaks and possible fires.

11.5.5 Do not permit tripping hazards to exist in any of the areas involved with 6V92TA testing.

11.5.6 Keep the outer surfaces of the engine, other equipment, and the floor area free from fuel and oil.

11.5.7 Do not allow the accumulation of containers of oil or fuel in 6V92TA areas.

11.5.8 Demand that personnel be alert for leaking fuel, exhaust gas, oil, or coolant, and that they take action to stop such leaks.

11.5.9 Equip the test stand with an automatic fuel shutoff valve designed to turn off the fuel supply to the engine whenever the engine is not running.

[31] Ethylene glycol, if not available locally, is available from Dow Chemical Company, 2040 Dow Center, Midland, MI 48674.

[32] Nalprep 2001 has been found suitable for this purpose. It is available from Detroit Diesel Corporation, Part Number 23507863, or Penn Ray Companies, Inc., 1801 Estes Ave., Elkgrove Village, IL 60007.

11.5.10 Make provision for manual, remote operation of the fuel shutoff valve.

11.5.11 Install suitable interlocks to shut down the engine when any of the following develop: loss of dynamometer field current, engine overspeeding, loss of engine oil pressure, failure of the exhaust system, failure of the room ventilation, activation of the fire protection system, excessive vibration, and so forth.

11.5.12 In case of injury, seek medical attention immediately, and report the incident to the proper administrative people.

12. Laboratory and Test Stand Calibration

12.1 *Frequency of Calibration*—To maintain test precision and avoid bias, engine test stand calibration is required at regular intervals. The frequency of calibration is dependent on the laboratories' previous calibration experience or at the discretion of the ASTM Test Monitoring Center. See 12.5.1.

12.2 *Reference Oils*—The reference oils used to calibrate 6V92TA test stands have been formulated or selected to represent specific chemical types or performance levels, or both. They are available from the TMC. The Test Monitoring Center will assign reference oils for calibration tests. These oils are supplied under code numbers (blind reference oils).

12.2.1 Reference oils and subsequent reblends that have been used in this test method are:

TMC 861 (REO 217), SAE 15W-40
TMC 862, SAE 30

12.3 *Test Numbering*—Each 6V92TA test shall be numbered to identify the test stand number, the test stand run number, engine number and number of runs made on engine. See 15.1 for test numbering protocol.

12.4 *New Laboratories and New Test Stands*:

12.4.1 A new stand is defined as a test dynamometer/cell and support hardware that has never been previously calibrated under this test procedure. On both new and existing stands the test engine is not part of the stand calibration.

12.4.2 A new laboratory shall have consecutive calibration test passes to be considered calibrated.

12.4.3 A laboratory not running a 6V92TA test for twelve months from the start of the last test is considered a new laboratory. Under special circumstances (that is, extended downtime due to industry-wide parts shortage or fuel outages) the TMC may extend the lapsed time requirement. Non-reference oil tests conducted during an extended time allowance shall be annotated on Form A5.15 in Annex A5 (Fig. A5.16).

12.4.4 The TMC may schedule more frequent reference oil tests at their discretion.

12.5 *Calibrated Laboratories and Test Stands*:

12.5.1 A calibration test on a reference oil assigned by the TMC is required after no more than ten operationally valid non-reference oil tests starts or after six months from the start date of the last acceptable calibration test (whichever comes first).

12.6 *Calibration Test Acceptance Bands*:

12.6.1 Calibration test targets and acceptance bands are published every six months by the TMC. These acceptance bands, based on a 90 % confidence level, are calculated using reference oil tests completed during the previous six-month period or ten tests, whichever is greater. Calibration status of a test laboratory is based upon the calibration test acceptance bands in effect at the time of completion of the calibration test.

12.6.2 The specified test parameters for determination of the test acceptance bands are:

12.6.2.1 Cylinder liner, % area scuffing,

12.6.2.2 Fire ring face distress, demerits, and

12.6.2.3 Second and third ring average ring face distress, demerits.

12.7 *Failing Calibration Tests*:

12.7.1 Failure of a reference oil test to meet test acceptance bands can be indicative of a false alarm, testing stand, testing laboratory, or industry-related problem. When this occurs, the laboratory, in conjunction with the TMC, shall attempt to determine the problem source.

12.7.2 The TMC will decide, with input as needed from industry expertise (testing laboratories, test developer, ASTM Technical Guidance Committee, Surveillance Panel, and so forth), if the reason for any unacceptable blind reference oil test is isolated to one particular stand or related to other stands. If it is decided that the problem is isolated to an individual stand, calibrated testing on other stands can continue throughout the laboratory. Alternatively, if it is decided that more than one stand may be involved, the involved stands will not be considered calibrated until the problem is identified, corrected and an acceptable reference oil test completed in one of the involved stands.

12.7.3 If non-standard tests are conducted on the calibrated test stand, the stand may be required to be re-calibrated prior to running standard tests, at the discretion of the TMC.

12.8 *Non-reference Oil Test Result Severity Adjustment*:

12.8.1 Fixed non-reference oil test pass criteria are published in Specification D 4485. Provision is made in this test procedure to adjust non-reference oil test results to compensate for test severity deviations from the original severity levels. Non-reference test adjustment factors represent the shift in the means of average liner scuffing, fire ring distress, and 2nd and 3rd ring face distress of Reference Oil 862 (and subsequent reblends) and are based on a moving average of the five most recent operationally valid tests on that oil.

12.8.2 Adjustment factors for non-reference tests are published semiannually by the TMC. Adjustment factors are applied (added) to individual test results based on the time period in which a 6V92TA test is completed. In the case of a single test, these adjusted results are compared to the fixed pass limits for a one-test program. In two-test or three-test programs, the adjusted test results are first averaged and then compared to the appropriate two-test or three-test fixed pass limits. Test results are recorded in the appropriate spaces on the form shown in Annex A5 (Fig. A5.21).

12.9 *Reporting Reference Results*:

12.9.1 *Final Report Forms*—Final report forms are shown in Annex A5. Use these report forms when reporting data to both the TMC and to users of the test. Transmit the calibration test results by facsimile to the ASTM Test Monitoring Center (fax number 412-365-1045) immediately after completion of the test analysis using forms in Annex A5 (Fig. A5.1, Fig. A5.2, Fig. A5.5, Fig. A5.6, Fig. A5.15, Fig. A5.16, and Fig. A5.17). Electronic data transfer is discussed in 15.4. Adhere to the variable formats (significant digits) listed in Annex A6 when reporting test results regardless of transfer medium. Referee results should be reported to the TMC on form as shown in Annex A5 (Fig. A5.8) within ten working days of test completion. The TMC will review all calibration test results to determine test acceptability. If the test is judged acceptable, the reference oil code along with the industry average for the reference oil will be disclosed by the TMC. In the event the reference oil test is not acceptable, an explanation of the problem relating to the failure should be provided by the test laboratory. If the problem is not obvious, all test related equipment shall be rechecked. If no explanation of the problem is presented, it will be assumed the problem is laboratory related and another reference oil will be assigned. One copy of the standard final test report with photographs, one copy of the daily and operational log sheets, and one copy of the rating work sheets for each 6V92TA reference oil test shall be forwarded as soon as possible to the following and shall be received within 30 days of test completion: ASTM Test Monitoring Center, 6555 Penn Ave., Pittsburgh, PA 15206-4489.

12.10 *Analysis of Reference Oils*—Do not submit reference oils to physical or chemical analyses, or both, for identification purposes prior to testing. Identifying the oils by analyses prior to testing could undermine the confidentiality required to operate an effective blind reference oil system. Therefore, reference oils are supplied with the explicit understanding that they will not be subjected to analyses other than those specified within this procedure (see 13.3.1.1) unless specifically authorized by the ASTM Test Monitoring Center. In such cases where analyses beyond the test procedure are authorized, written confirmation of the circumstances involved, the data obtained, and the name of the person authorizing the analysis shall be supplied to the ASTM Test Monitoring Center.

13. Test Procedure

13.1 *Pre-Test Procedure*:

13.1.1 *Oil Charging*—Test severity can be affected by the volume of oil maintained in the engine during this test. Additionally, oil consumption is a condition of test validity.

13.1.1.1 Oil filling is accomplished with the use of an electric or air driven gear pump suitable for this purpose. Reasonable care should be exercised to ensure that the test oil, as delivered from the pump, is clean and free of contamination. Previous test oils shall be thoroughly flushed from the pump and delivery lines.

13.1.1.2 The recommended location for oil filling is at the remote oil cooler filter adapter. See Annex A2 (Fig. A2.2). This location also may be used for oil sampling.

13.1.1.3 For dry engine oil charge, pump 22.0 ± 0.3 kg (48.5 ± 0.7 lb) of test oil into the engine through the oil filter adapter.

13.1.1.4 Start the engine and idle for 10 min or until the oil gallery temperature reaches 60°C (140°F).

13.1.1.5 Stop the engine and wait 25 min.

13.1.1.6 Set the full mark on the adjustable dipstick to the oil level. The adjustable dipstick is described in Annex A2 (Fig. A2.4). Remove the dipstick and place in a location where this setting will not be altered. Cap the dipstick tube opening.

13.1.1.7 Complete the break-in as described in 13.1.2.

13.1.1.8 For wet engine oil charge, pump 18 kg (40 lb) of test oil into the engine.

13.1.1.9 Start the engine and idle for 10 min or until the oil gallery temperature reaches 60°C (140°F).

13.1.1.10 Stop the engine and wait 25 min.

13.1.1.11 Add additional test oil until the oil level reaches the full mark. This represents the initial oil charge.

13.1.1.12 Oil additions are made at the end of each test cycle after the engine has stopped for 25 min. Determine the approximate oil volume needed to return to the full mark indicated on the adjustable dipstick using the intermediate scribe lines.

13.1.1.13 Weigh the oil make-up and add to the engine. Record the weight in the test log.

13.1.1.14 At the end of the test, estimate the weight of oil needed to return to the full mark, but do not add fresh oil at this point.

13.1.1.15 The total oil consumed in the test is determined by the sum of the oil additions, included the estimated addition described in 13.1.1.14. It does not include the initial oil charge or the final quantity of oil in the engine. Record as grams per hour (g/h) on forms as shown in Annex A5 (Fig. A5.2 or Fig. A5.3) as appropriate.

13.1.2 *Coolant Flush Procedure*—Fill the engine coolant system with cleaning agent[21] just previous to start-up for engine break-in. (**Warning**—Health hazard.)

13.1.2.1 At the start of break-in, fill the coolant system as follows:

(*1*) Check that all drain cocks are closed.

(*2*) Fill the coolant system (approximately 45 L) with clean water and add 1 L of Nalprep 2001 to the surge pot as it is filling up.

(*3*) Fill the system until the coolant level is to the top of the sight glass.

(*4*) Install the red cap.

13.1.2.2 Flush the cleaning agent from the coolant system prior to start-up for a test. Proceed as follows:

(*1*) Drain the cleaning solution from the engine.

(*2*) Fill and drain the cooling system two times with clean water.

(*3*) Fill the cooling system with clean water.

(*4*) Run the engine to do oil leveling at idle until the oil sump temperature is >60°C; then shut down the engine.

(*5*) Drain the water from the engine.

(*6*) Fill the coolant system with a premixed 50/50 solution of ethylene glycol type antifreeze in distilled water.

13.1.3 *Engine Break-in*—Perform engine conditioning using the test oil, reference or non-reference. Make an oil and filter change following break-in. The specific engine operating conditions for break-in are provided in Table 3.

TABLE 3 Engine Operating Conditions for Break-in

Speed, r/min	Torque, Nm	Power, kW	Duration, min	Coolant Out Temperature, °C Nominal	Oil Pressure, kPa Nominal
1000	Nominal	15	10	Report	200
1200	320	40	10	78	220
1500	320	50	20	78	337
1500	640	100	30	78	337
1500	960	150	30	78	337
2100	960	211	90	78	404
2100	1360	299	180	78	404

13.1.4 *Power Check*—At the conclusion of break-in, but before shutting down engine, verify that engine output is adequate by performing a power check. Increase engine speed to 2300 r/min and increase torque until a nominal fuel flow rate of 90 kg/h is obtained. Observe and record engine power, which shall be at least 373 kW. If the engine fails to reach this power level, and repairs cannot remedy the power loss, the test should not be started. The duration of the power check should be only long enough to determine engine power output.

13.1.5 *Air Box Inspection*—At the conclusion of break-in and after the power check, an air box inspection shall be made. See 13.3.2.

13.2 *Engine Operating Procedure*:

13.2.1 *Test Procedure*:

13.2.1.1 At the completion of break-in and following service to the lubricant and filters, start the engine and allow it to warm up for 10 min, maintaining an idle. Increase engine speed to 1200 r/min. Apply load and adjust fuel flow until the conditions for Mode 1 (Torque), as is shown in Table 4, are set. Maintain this setting for 8 h.

13.2.1.2 At the end of Mode 1 (Torque) increase engine speed to 2300 r/min. Adjust the fuel flow to obtain the fuel flow range specified in Table 4. Maintain this condition for 8 h. Upon completion of this mode, return engine to idle for 5 min, then stop engine. Oil sampling shall be done during this 5-min period. See 13.3.1 for oil sampling procedure and schedule.

13.2.1.3 The third mode is a heat soak period and is an integral portion of the test procedure. During this period however, airbox inspections, oil sampling and oil leveling may be performed. This mode of the test may be longer, but cannot be shorter than 3 h. Heat soak after the seventh cycle is not necessary.

13.2.1.4 Table 5 summarizes the 100-h test sequence by segment.

13.3 *Periodic Measurements and Functions*:

13.3.1 *Oil Additions and Used Oil Sampling*:

13.3.1.1 Take samples of the test oil according to the schedule shown in Table 6 as a means of test quality control and possible problem diagnosis. Where applicable, ASTM test methods are recommended for this analysis and are identified in Table 6.

13.3.1.2 Take oil samples from the oil filter adapter of the remote oil cooler, Annex A2 (Fig. A2.2), while the engine is idling. This shall be done during the 5-min cool down after completion of a test mode. (**Warning**—In addition to other precautions, oil samples taken in this manner will be hot and can cause severe burns. Proper safety precautions to avoid skin contact, including the use of gloves, apron and safety glasses, are recommended.)

13.3.1.3 Take oil samples by first purging the sample line of 100 mL (approximately 3.4 fl oz) of test oil. This purge oil is immediately returned to the engine before oil leveling. Then draw the sample into the appropriate clean, engine oil compatible container as required by the analytical laboratory. All sample volumes should be within 10 % of 100 mL, except for a 500-mL sample taken at 96 h.

13.3.1.4 Take samples prior to any oil leveling or makeup.

13.3.2 *Air Box Inspections*:

13.3.2.1 Perform airbox inspections by removing small covers on the engine block exposing the liner port area. With the use of a bore scope or similar device, a limited inspection of the ring faces and liner inside diameter are possible. Such inspections are useful as a diagnostic tool to provide interim test part conditions and identify impending engine failure. It is not intended for prediction of failing oil performance.

13.3.2.2 An airbox inspection for liner and ring distress is required after break-in. Make an estimate of cylinder liner scuffing and report on Form 16 in Annex A5 (Fig. A5.17). Exercise extreme care when removing the airbox covers and working in the liner port area so as not to disturb any soot accumulation in the liner parts, which, if accidentally spilled into the cylinder, can cause ring and liner scuffing. Use a bore

TABLE 4 Test Parameters

(Means and Ranges)

Controlled Conditions	Torque Mode	Power Mode
Engine speed, r/min	1200 ± 10	2300 ± 10
Oil gallery temperature, °C	102.0 ± 1.1	111.0 ± 1.1
Fuel temperature, °C	38.0 ± 2.8	38.0 ± 2.8
Fuel rate, kg/h	52.0 ± 1.8	90.0 ± 1.8
Coolant ΔT, °C	6.0 ± 2.7	6.0 ± 2.7
Air inlet restriction, kPa	Report only	2.5 ± 0.7
Exhaust backpressure, kPa	Report only	3.2 ± 0.8
Air inlet temperature, °C	35.0 ± 2.8	35.0 ± 2.8
Engine coolant out, °C	84.0 ± 2.2	84.0 ± 2.2
Non-Controlled Conditions	**Torque Mode**	**Power Mode**
Engine power, kW	216–238	364–379
Oil sump temperature, °C	111–119	120–131
Oil gallery pressure, kPa	207–310	345–482
Oil consumption max, g/h	340	340

TABLE 5 6V92TA 100-Hour Test Summary

Segment	Mode	Length
	Break-in	6 h 10 min
	Power check	Only long enough to determine output
	Cool down	5 min
	Oil and filter change	...
1	Start-up	10 min
	Torque mode	8 h (test begins)
	Power mode	8 h
	Cool-down	5 min
	Heat soak	3 h minimum
2–6	Repeat number 1 (5 times)	
7	Start-up	10 min
	Torque mode	2 h
	Power mode	2 h
	Cool-down	5 min
	End of test	

TABLE 6 Oil Sampling Schedule

Analytical Tests	New Oil	Break-in	Engine Test Hours 16	32	48	64	80	96
Viscosity, cSt (D 445)								
40°C	X	X	X		X		X	X
100°C	X	X	X		X		X	X
Wear metals, ppm (D 5185)								
Fe, Sn, Pb, Cu, Cr, Al, Si	X	X	X	X	X	X	X	X
Additive metals, ppm								
B, Ca, Mg, Zn, P, Mo, Na, S	X	X	X		X		X	X
Base number (D 4739)	X	X	X		X		X	X
Viscosity HTHS								
10^6 s^{-1} 150°C (D 4683)	X							
Volatility at 371°C								
(D 2887)	X							X

scope[33] for this inspection. Excessive liner scuffing after break-in could be indicative of a test problem. A test may be aborted at the discretion of the laboratory.

13.3.2.3 Due to the potential of introducing soot and combustion debris, which can initiate liner and ring scuffing, airbox inspections are not recommended during the test unless one or more of the following conditions exist:

(*1*) A sudden increase in crankcase pressure or blowby occurs.

(*2*) Used oil iron content exceeds 500 ppm.

(*3*) Power output is below 364 kW (488 bhp) during the power mode immediately preceding the inspection.

13.3.2.4 Report all airbox inspections on Form 16 in Annex A5 (Fig. A5.17). Note the cause for the inspection in the appropriate area of the form.

13.4 *Diagnostic Data Review*—This section outlines significant characteristics of specific engine operating parameters. The parameters can directly influence the test or may be used to indicate normalcy of other parameters.

13.4.1 *Exhaust Temperatures*—Deviations for individual exhaust temperatures are used to indicate incorrect combustion, a sign of injector malfunctioning.

13.4.2 *Crankcase Pressure*—Higher crankcase pressure than normal can indicate scuffed cylinders, a leak in the seal between the piston dome and skirt, or a blower seal failure.

13.4.3 *Airbox Pressure*—Low boost pressure can indicate a damaged turbocharger (either broken vanes or a bearing failure), exhaust system leaks or blower malfunction.

13.5 *End of Test Procedure*:

13.5.1 Estimate the amount of oil necessary to bring oil to full mark, and add this amount to the cumulative oil make-up for a final oil consumption figure. Do not actually add the oil to the engine.

13.5.2 After taking end-of-test oil sample, drain oil, fuel, and water from the engine.

13.5.3 Remove engine to cleaning area and clean all surfaces as necessary to remove loose dirt, etc. before removing sub-assemblies.

13.5.4 Mount engine on overhaul stand and remove all required subassemblies, cleaning each individual part after removal. Pistons, rings, and liners, and bearings shall be cleaned as outlined in 8.3. Take care to identify and maintain all locations for test parts. Cut liners as exactly in half as possible, along the crankshaft center line, taking special care not to disturb deposits. This is accomplished by use of a suitable saw and done after cleaning with Varsol 3139 and before rating.

14. Interpretation of Test Results

14.1 *Parts Rating Area—Environment*:

14.1.1 Ensure that the ambient atmosphere of the parts rating area is reasonably free of contaminants and the temperature maintained at 75 ± 5°F (24 ± 3°C).

14.1.2 Rate all engine parts under cool white fluorescent lighting with an illumination level of 350 to 500 fc (3800–5400 lx). Ensure that all background and adjacent surfaces are flat white.

14.2 *Piston Rings*:

14.2.1 Measure radial ring thickness, mm.

14.2.2 Measure end gap all rings, mm.

14.2.3 Measure percent ring collapse based on reduction of freestanding ring gap, report to nearest 25 %.

14.2.4 Measure ring weight change, g.

14.2.5 Visually rate for ring distress in demerits as follows.

14.2.5.1 *Ring Face Distress*—Rate the rings using the scale shown in Table 7. To obtain a numerical ring demerit, multiply the distress value by the percentage of the affected area in relation to the total ring face. Determine area of distress to the nearest 1 %. Broken rings are assumed to have a distressed area of 100 % and are therefore assigned 1.00. Report results on Form 6 as shown in Annex A5 (Fig. A5.7). (**Warning**—Due to extreme collapsing, rings broken near the tips may not be recognized as broken. Measurement of ring weights or outside diameter, or both, may be necessary to confirm ring breakage.)

14.3 *Cylinder Liner*:

14.3.1 Visually rate for liner distress (scuffing):

14.3.1.1 For rating purposes, cut the liner in half vertically along the crankshaft center line. Only the area below 30 mm (1³⁄₁₆ in.) from the top of the liner and above 12.7 mm (0.5 in.) from the top of ports is rated. The area removed by the cut is normally 1 % of the area on each side. The scuff rating of this missing area is estimated based on the rating of the adjacent areas. If the adjacent area is scuffed, the area removed by the cut is rated as scuffed and vice versa. If a liner is not cut exactly into 50 % halves, the percentage of scuffed area will be

TABLE 7 Ring Distress Rating Scale[A]

Demerit Factor	Distress Type	Definition
0.00	Non-distress	Non-contact area or contact area with no scratches or discoloration.
0.25	Light distress	Discoloration or light vertical scratches with no discoloration.
0.50	Medium distress	Light vertical scratches with discoloration.
0.75	Heavy distress	Deep vertical scratches with discoloration.
1.00	Extreme distress	Deep vertical scratches or scoring with discoloration. Indications of blowby, broken, or hot sticking.

[A]On the rare occasions when piston ring surface shows a color tint rather than a distinct color change, the ring will be called discolored.

[33] An Olympus Model 1LK-5 and 1FD-10 (both parts needed) has been found suitable for this purpose. It is available from Olympus Corporation, Industrial Fiberoptics, 4 Nevada Drive, Lake Success, NY 11042-1179.

normalized to the 50 % ideal by transferring the excess scuffing on the larger section to the smaller. Scuffing, which occurs anywhere within the circumference, regardless of its vertical area, is measured in circumferential percentage. A completely scuffed liner is assigned 100 %. Scuffing is defined, for the purpose of this test method, as vertical markings that overwhelm the honing crosshatch, such that no honing crosshatch pattern is visible. No differentiation is made as to scuffing severity. Report results on Form 6 in Annex A5 (see Fig. A5.7).

14.3.2 Visually rate for port plugging, percent area.

14.3.2.1 Estimate the percentage of cross-sectional area of the liner ports, which is plugged by deposits. These deposits likely will be black in color and dry to wet in consistency. Estimate each port and average for each liner. When reporting liner port plugging less than 1 %, report to one decimal place, that is, 0.X %. When plugging is equal to or greater than 1 %, report to the nearest 1 %. Report results on Form 7 in Annex A5 (see Fig. A5.7).

14.4 *Piston Pin Slipper Bushing*:

14.4.1 Measure weight to ±0.001 g, record on Form 12, Fig. A5.13.

14.5 *Piston Rating*:

14.5.1 Identify areas of tin plate removal by scratching the surface with a sharp iron object (a nail works well). Quantify those areas as a percentage of the total piston skirt surface area. Report results on Form 6 in Annex A5 (see Fig. A5.7).

14.6 *Rocker Arm Bushing Injector Position*:

14.6.1 Measure inside diameter, mm^2, record on a form similar to the one in Appendix X3 (Fig. X3.10).

14.7 *Referee Rating*:

14.7.1 Referee ratings are required for every calibration test. The official calibration test rating is the average of the lab and referee ratings. Conduct a referee rating by a calibrated rater at a facility other than the laboratory that conducted the test. Referee ratings cannot be performed by the same calibrated facility on two consecutive tests from any laboratory.

14.7.2 Referee ratings are optional on non-reference oil tests. Conduct a referee rating by a calibrated rater at a facility other than the laboratory that conducted the test. Referee rating are recommended when a test result is close to the passing limit of the test.

14.7.3 When utilized, report the referee rating. The final test result is the average of the laboratory rating and the referee rating.

14.7.4 *Calibrated Rater*—Each laboratory, on a calendar year basis, shall send a minimum of one heavy-duty diesel rater to either the task force meeting held every spring or the expanded Heavy-Duty Piston Rating Workshop held every fall. If this schedule is not suitable to a particular rater or laboratory, then make alternative arrangements as soon as possible to have the rater calibrated.

15. Preparation of Report

15.1 *Test Numbering*:

15.1.1 Use a four segment test number to provide a unique identification for each test. The format for this number is shown in Table 8.

15.2 *Operational Data*:

TABLE 8 Test Numbering

NOTE 1—Segment 1—Segment 2—Segment 3—Segment 4 (Example 58-12A-25-8) where:

Segment Number	Description	Example
Segment 1	Test stand (cell) number	Stand 58
Segment 2	Sequential test stand run number—Test stand number and sequential test stand run number remain unchanged for reruns of aborted, invalid or unacceptable calibration tests. However, the sequential stand run number shall be followed by the letter A for the first rerun, B for the second, etc.	12A = 12th run, 1st repeat.
Segment 3	*Engine Number*—Assigned by laboratory and permanently stamped or etched on block.	Engine 25
Segment 4	*Sequential Engine Run Number*—Any time a test finishes break-in and reaches test conditions it is considered a test, and as such, increases the run number on the engine regardless of the outcome.	Run No. 8

15.2.1 Provide accumulated operational data in the following format according to the forms in Annex A5 (Fig. A5.5 and Fig. A5.6):

AVERAGE STANDARD DEVIATION MAXIMUM MINIMUM

15.3 *Photographs*—Identify components from each cylinder with the test number appearing on the photograph. Identify thrust and anti-thrust sides where applicable.

15.3.1 *Cylinder Liners*—Split along crankshaft axis to show inside surface. Identify thrust and anti-thrust surfaces.

15.3.2 *Pistons*—Photograph thrust and anti-thrust of each with the pin bores parallel with the plane of the photograph. Optimize the lighting to identify areas of tin loss.

15.3.3 *Rings*—Arrange in position as they are on the piston, by cylinder. Photograph area 180° from the ring gap. One cylinder set per photo.

15.3.4 *Slipper Bushings*—It is recommended to arrange all six per photograph. Identify cylinder position.

15.3.5 *Cylinder Heads Fire Deck or Piston Domes*—All cylinders may be included in a single photograph, but shall be identified as to position. Photographs of either fire deck or piston domes may be taken for indication of any unusual lubricant ash deposits.

15.4 *Test Oil Analysis*—Record the oil analysis results of samples taken in Annex A5 (Form 9, Fig. A5.10) or similar form.

15.5 *Electronic Transmission of Test Results*—Data may be transferred electronically to the TMC. This is especially desirable for those laboratories routinely submitting data to the TMC. ASTM Data Dictionaries have been prepared by the ASTM Data Communication Task Force that are specific to the 6V92TA Procedure. The report forms shown in Annex A5 contain variable names (Mnemonics) that correspond to mnemonics shown in Annex A6, Data Dictionary. These mnemonics are used to develop a flat-file for electronic data transfer. Mnemonics shown in the left most column in Annex A6 are industry approved standards and may assist users in developing data bases. In addition, the variable formats (significant digits) listed in Annex A6 are to be adhered to when reporting test results regardless of transfer medium. For more information on the use of Annex A6 and transmitting data electronically, contact the TMC.

16. Precision and Bias

16.1 *Precision*—To aid the potential user of this test method in assessing the variability that can be expected between test results when the test method is used in one or more laboratories, the precision information in Table 9 has been developed. Test precision is established on the basis of reference oil test results (for operationally valid tests) monitored by the ASTM Test Monitoring Center. The data are reviewed semiannually by the 6V92TA Surveillance Panel and are available on request from the TMC.

TABLE 9 Test Precision—Reference Oils

Parameter	No. of Laboratories	*n*	Repeat-ability (*r*)	Reproduc-ibility (*R*)
Average fire ring distress, (demerits)	5	39	0.178	0.184
Average 2nd and 3rd ring distress (demerits)	5	39	0.092	0.093
Average liner distress (demerits)	5	39	29.0	30.1

16.1.1 Repeatability (*r*) is defined as: the difference between successive results obtained by the same laboratory under constant operating conditions on the same oil. Table 9 shows that the repeatability was obtained by pooling standard deviation of test results obtained from individual laboratories across reference oils 861, 861.1, and 862.

16.1.2 Reproducibility (*R*) is defined as: the difference between two single and independent results obtained by different operators working in different laboratories on the same oil. The values (*r* and *R*) shown in Table 9 were based on data available in December 1994. The latest information for these precision values can be obtained from the TMC.

16.2 *Bias*—No estimate of the bias for this procedure is possible, as the behavior of an oil is determined only under the specific conditions of the test and no absolute standards exist.

17. Keywords

17.1 cylinder liner distress; diesel engines; engine oil; engine wear; heavy-duty performance; ring distress; scoring; scuffing; 6V92TA test

ANNEXES

(Mandatory Information)

A1. THE ROLE OF THE ASTM TEST MONITORING CENTER AND THE CALIBRATION PROGRAM

A1.1 *Nature and Functions of the ASTM Test Monitoring Center (TMC):*

A1.1.1 The ASTM TMC[2] is a non-profit organization located in Pittsburgh, PA, and is staffed to administer engineering studies; conduct laboratory visits; perform statistical analyses of reference oil test data; blend, store, and ship reference oils; and provide the associated administrative functions to maintain the referencing calibration program for various lubricant tests as directed by Subcommittee D02.B and the Test Monitoring Board. The TMC coordinates its activities with the test sponsors, the test developers, the surveillance panels, and the testing laboratories.

A1.2 *Rules of Operation of the ASTM TMC:*

A1.2.1 The TMC operates in accordance with the ASTM Charter, the ASTM Bylaws, the Regulations Governing ASTM Technical Committees, the Bylaws Governing ASTM Committee D02, and the Rules and Regulations Governing the ASTM Test Monitoring System.

A1.3 *Management of the ASTM TMC:*

A1.3.1 The management of the Test Monitoring System is vested in the Test Monitoring Board (TMB) elected by Subcommittee D02.B. The TMB selects the TMC Administrator who is responsible for directing the activities of the TMC staff.

A1.4 *Operating Income of the ASTM TMC:*

A1.4.1 The TMC operating income is obtained from fees levied on the reference oils supplied and on the calibration tests conducted. Fee schedules are established and reviewed by Subcommittee D02.B.

A1.5 *Conducting a Reference Oil Test:*

A1.5.1 For those laboratories that choose to utilize the services of the ASTM TMC in maintaining calibration of test stands, full-scale calibration testing shall be conducted at regular intervals. These full-scale tests are conducted using coded reference oils supplied by the ASTM TMC. It is a laboratory's responsibility to maintain the calibration in accordance with the test procedure. It is also a laboratory's responsibility to keep the on-site reference oil inventory at or above the minimum level specified by the TMC test engineers.

A1.5.2 When laboratory personnel decide to run a reference calibration test, they shall request an oil code from the cognizant TMC engineer. Upon completion of the reference oil test, the data shall be sent in summary form (use TMC-acceptable forms) to the TMC by telephone facsimile transmission, or by some other method acceptable to the TMC. The TMC will review the data and contact the laboratory engineer to report the laboratory's calibration status. All reference oil tests, whether aborted, invalidated, or successfully completed, shall be reported to the TMC. Subsequent to sending the data in summary form to the TMC, the laboratory is required to submit to the TMC the written test report specified in the test procedure.

A1.6 *New Laboratories:*

A1.6.1 Laboratories wishing to become a part of the ASTM Test Monitoring System will be requested to conduct reference oil tests to ensure that the laboratory is using the proper testing techniques. Information concerning fees, laboratory inspection, reagents, testing practices, appropriate committee membership, and rater training can be obtained by contacting the TMC Administrator at: ASTM Test Monitoring Center, 6555 Penn Avenue, Pittsburgh, PA 15206-4489.

A1.7 *Introducing New 6V92TA Reference Oils:*

A1.7.1 The calibrating reference oils produce various ring and liner distress characteristics. When new reference oils are selected, member laboratories will be requested to conduct their share of tests to enable the TMC to establish the proper industry average and test acceptance limits. The ASTM D02.B02 6V92TA Surveillance Panel will require a minimum number of tests to establish the industry average and test acceptance targets for new reference oils. The TMC estimates that laboratories normally will be requested to run no more than one contributing test per year per test stand.

A1.8 *TMC Information Letters:*

A1.8.1 Occasionally it is necessary to change the procedure, and notify the test laboratories of the change, prior to consideration of the change by either Subcommittee D02.B on Automotive Lubricants, or Committee D02 on Petroleum Products and Lubricants. In such a case, the TMC will issue an Information Letter. Subsequently, prior to each semiannual Committee D02 meeting, the accumulated Information Letters are balloted by Subcommittee D02.B. By this means, the society due process procedures are applied to these Information Letters.

A1.8.2 The review of an Information Letter prior to its original issue will differ according to its nature. In the case of an Information Letter concerning a part number change which does not affect test results, the TMC is authorized to issue such a letter. Long-term studies by the Surveillance Panel to improve the test procedure through improved operation and hardware control may result in a recommendation to issue an Information Letter. If obvious procedural items affecting test results need immediate attention, the test sponsor and the TMC will issue an Information Letter and present the background and data to the Surveillance Panel for approval prior to the semiannual Subcommittee D02.B meeting.

A1.8.3 Authority for the issuance of Information Letters was given by the Committee on Technical Committee Operations in 1984, as follows: "COTCO recognizes that D-2 has a unique and complex situation. The use of Information Letters is approved providing each letter contains a disclaimer to the effect that such has not obtained ASTM consensus. These Information Letters should be moved to such consensus as rapidly as possible."

A1.9 *TMC Memoranda:*

A1.9.1 In addition to the aforementioned Information Letters, supplementary memoranda are issued. These are developed by the TMC, and distributed to the 6V92TA Surveillance Panel and to participating laboratories. They convey such information as batch approvals for test parts or materials, clarification of the test procedure, notes and suggestions of the collection and analysis of special data that the TMC may request, or for any other pertinent matters having no direct effect on the test performance, results, or precision and bias.

A2. DETAILED SPECIFICATIONS AND DRAWINGS OF APPARATUS

A2.1 See Table A2.1 and Figs. A2.1-A2.4

TABLE A2.1 Parts List—External Oil Cooler 6V92TA Engine Oil Test[A],[B]

NOTE 1—Detroit Diesel sourced parts may be purchased from any Detroit Diesel Distributor.

Quantity to Order	Part Name	Vendor	Part No.
1	Filter housing adapter	Detroit Diesel	8920506
1	Oil cooler cover	Detroit Diesel	5101742
1	Exchanger housing	Detroit Diesel	5117680
1	Core (double pass 12 plate)	Detroit Diesel	8547237
1	Oil line #1 26 in., #20	Local	...
1	Oil line #2 26 in., #20	Local	...
1	Water control valve with ½ in. orifice	Honeywell	311747
1	Water pipe—assorted ¾ in. galv. pipe	Local	...
1	Cover/sandwich plate	Detroit Diesel	5130374
1	Gasket for sandwich plate	Detroit Diesel	23501594
1	Gasket for water-in side plate	Detroit Diesel	5117317
1	Elbow	Detroit Diesel	5129834
1	Elbow gasket	Detroit Diesel	5117254
1	Oil-in and -out gasket	Detroit Diesel	8924412
4	Oil-in and -out gasket	Detroit Diesel	5117535
1	Oil-in and -out gasket	Detroit Diesel	8926782
1	Oil-in and -out gasket	Detroit Diesel	23501585
1	Oil-in and -out gasket	Detroit Diesel	23501589

[A]Honeywell P/N 311747 has been found suitable for this use. Equivalent valves of other manufacture may be used.

[B]Parts fabricated on-site: coolant to engine adapter, oil lines to engine block adapter plate, oil lines to heat exchanger adaptor plate, process water line cover plate, and water neck cover plate.

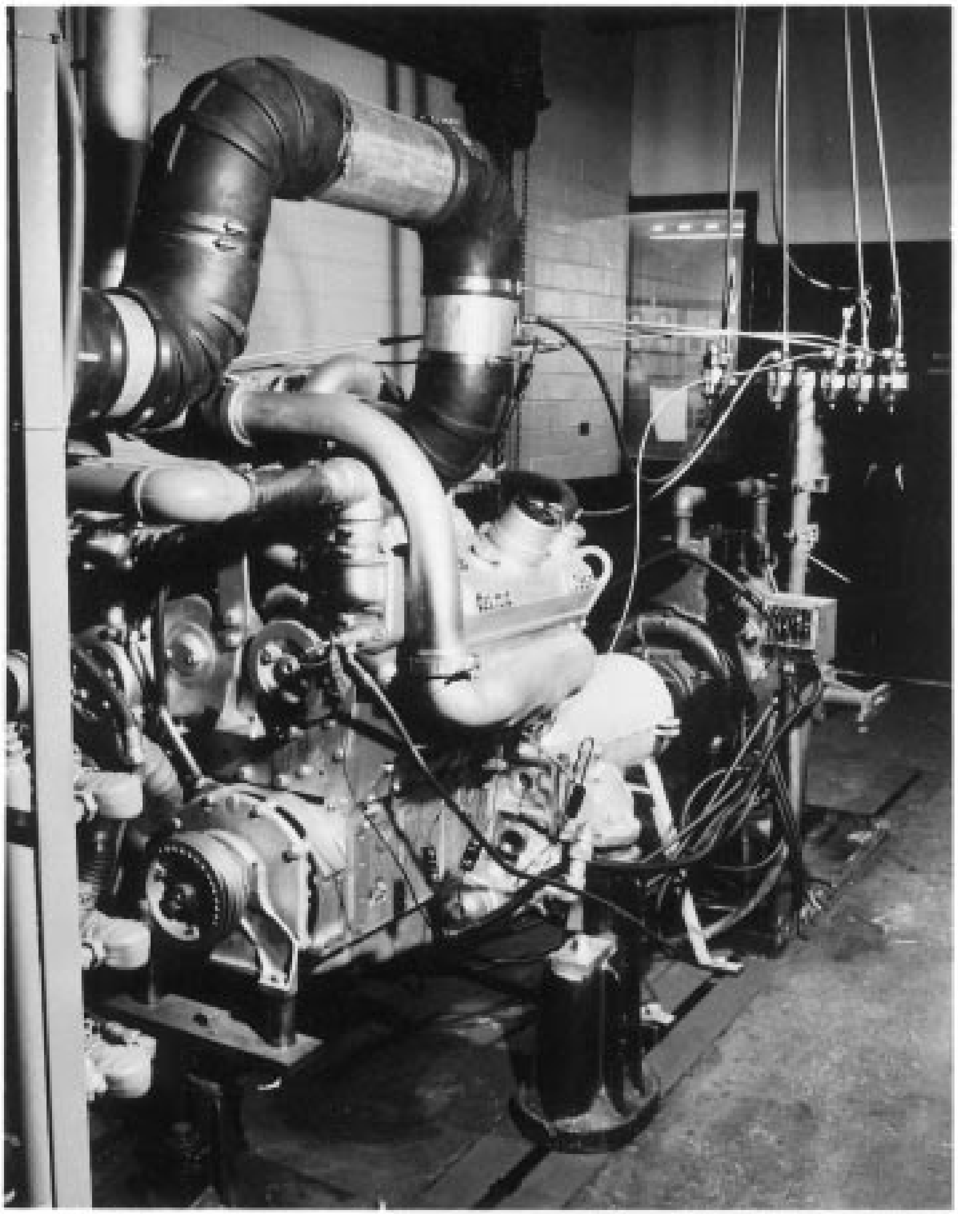


FIG. A2.1 Typical 6V92TA Engine Oil Test Stand

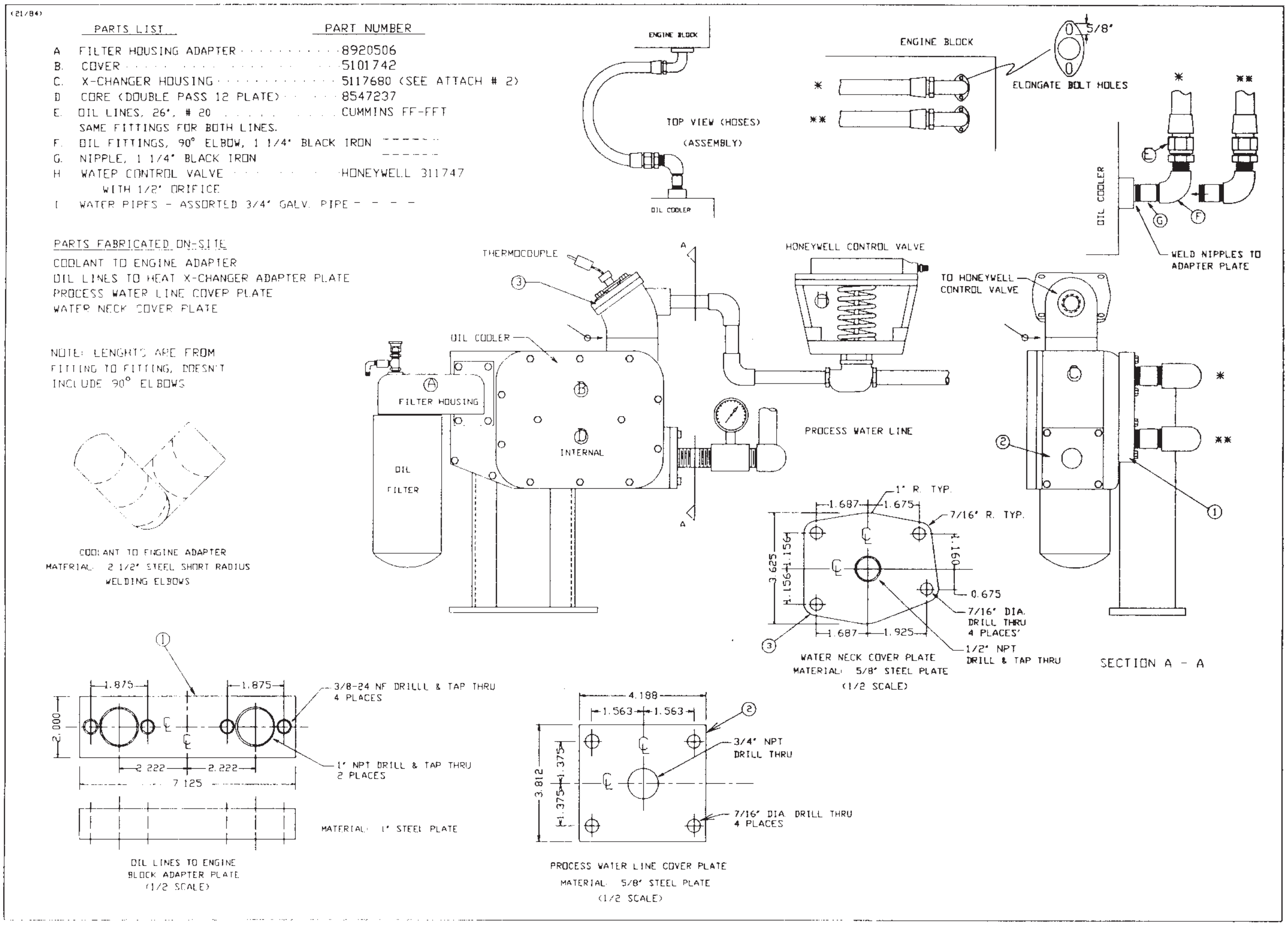


FIG. A2.2 External Oil Cooler, 6V92TA Engine Oil Test

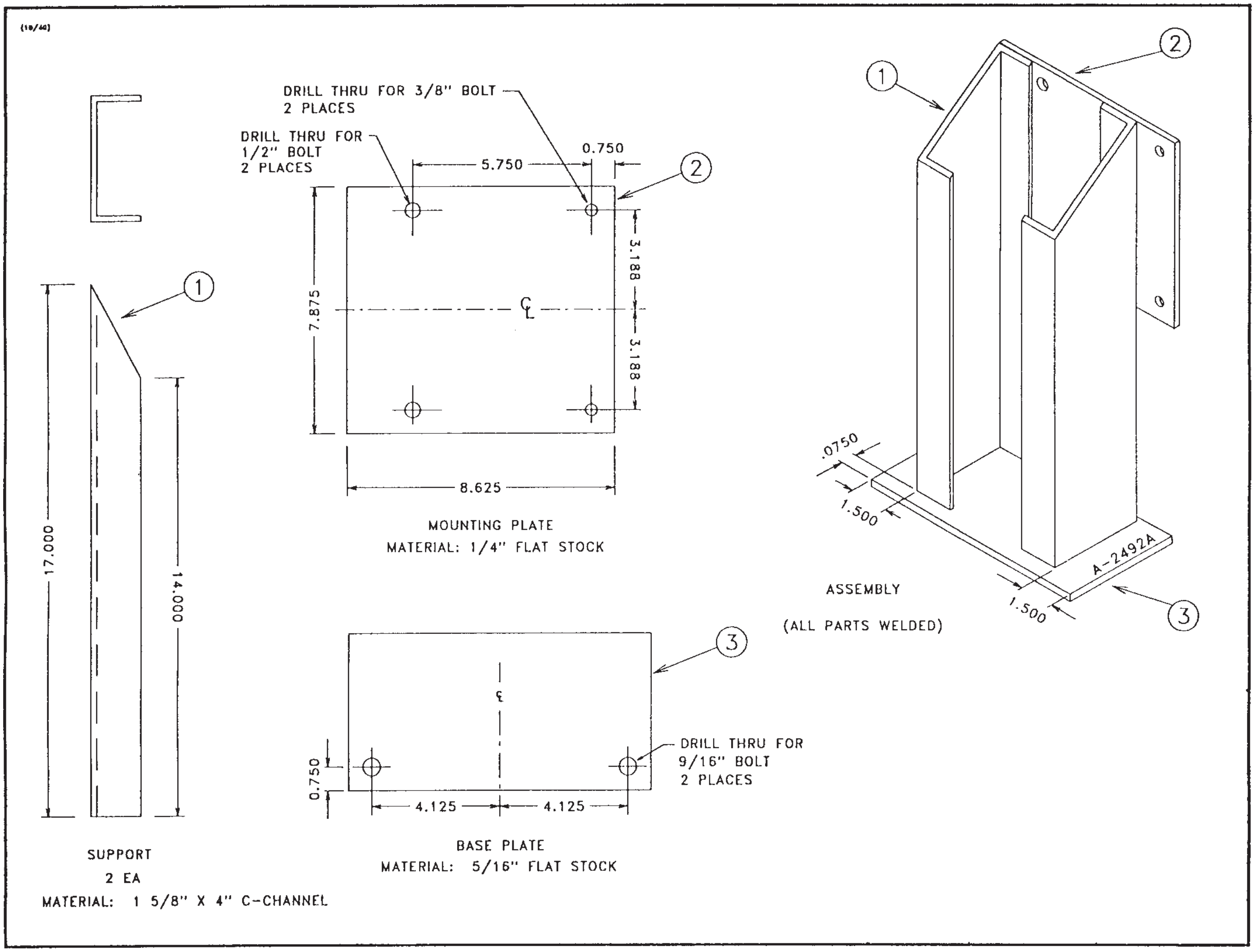
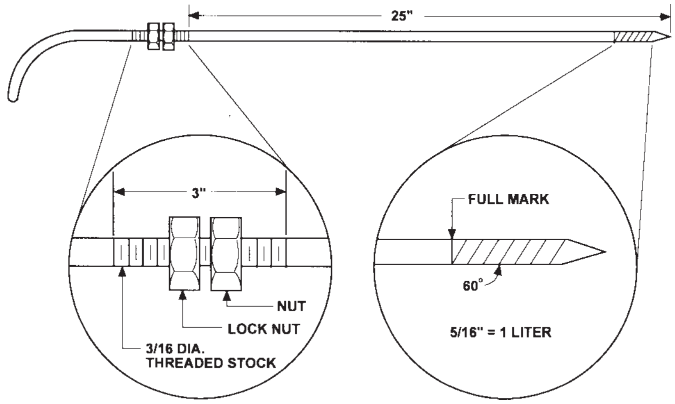


FIG. A2.3 Support—External Oil Cooler, 6V92TA Engine Oil Test



[A] For the purpose of this test procedure, an adjustable length dipstick is required to monitor oil consumption. This dipstick may be constructed to the dimensional requirements shown above or the supplied dipstick may be modified as follows:

1. Cut the supplied dipstick into two sections just below the handle, separating the ribbon section from the handle.
2. Cut 2 in. from the bottom of the ribbon section and grind a taper similar to the original ribbon end.
3. Weld a 3-in. long section of 3⁄16-in. diameter threaded stock to the handle. Thread two matching nuts onto this section and weld the ribbon section at the other end of the threaded section. The length from the handle to the tip of the dipstick should be approximately 28 in. with the factory supplied dipstick tube.
4. Scribe seven lines equally spaced at 3⁄16-in. from the bottom of the dipstick. The top line represents the full mark. These lines should be parallel to the oil level. The factory supplied dipstick tube will require scribed lines at a 60° angle from horizontal to compensate for the angle of entry of the dipstick. Each line will correspond to 1 L of oil.

FIG. A2.4 Adjustable Oil Dipstick 6V92TA Engine Oil Test [A]

A3. ENGINE PART NUMBER LISTING

A3.1 See Table A3.1.

TABLE A3.1 6V92TA Engine Parts (Non-Critical) Required for Build-Up

Part Name	Part Number
Liner insert	05148501
Liner seal	08927189
Element fuel strainer, spin-on TP-915D	25013878
Element fuel strainer, spin-on TP-916D	5013794
Gasket air box cover, small	08923792
Gasket air box cover, large	08923791
Shell, main bearing upper	05148830
Shell, main bearing lower	05107201
Thrust washer	05117005
Gasket set, cylinder head	05199673
Gasket, oil pan	23503588
Gasket, pick-up tube	05117269
Gasket, pick-up tube	05117242
Piston pin, solid core	05101120

A4. TEST FUEL ANALYSIS

A4.1 See Table A4.1.

TABLE A4.1 Typical Analysis of 6V92TA Test Fuel

ASTM 2D Fuel (or equivalent) with the Following Specific Properties:
Cetane No.[A] 40 min
API gravity[B] at 15.6°C 33 Typical
Distillation[C]
IBP 160 to 204°C (320 to 400°F)
50 % 246 to 288°C (475 to 550°F)
90 % 288 to 327°C (550 to 620°F)
Total sulfur[D] 0.10 to 0.40 %
Flash point[E] 54°C (130°F) min
Viscosity[F] 1.9 to 4.0 cSt at 40°C
Ash[G] 0.01 % max
Water and solids[H] 0.05 % max
Gross heat of combustion[I] 45.2 MJ/kg min
Approximately 11 360 L (3000 gal) required

[A] In accordance with Test Method D 613.
[B] In accordance with Test Method D 287.
[C] In accordance with Test Method D 86.
[D] In accordance with Test Method D 1266.
[E] In accordance with Test Method D 92.
[F] In accordance with Test Method D 445.
[G] In accordance with Test Method D 482.
[H] In accordance with Test Method D 2709.
[I] In accordance with Test Method D 240.

A5. REPORT FORMS

A5.1 See Figs. A5.1-A5.21 and Table A5.1

A5. Report Forms

TEST METHOD D5862

(6V92TA)

VERSION *19990414*

SPONSORED BY:

TSTSPON1

TSTSPON2

LABVALID	V = VALID; THE REFERENCE OIL/NON-REFERENCE OIL WAS EVALUATED IN ACCORDANCE WITH THE TEST PROCEDURE.
	I = INVALID; THE REFERENCE OIL/NON-REFERENCE OIL WAS NOT EVALUATED IN ACCORDANCE WITH THE TEST PROCEDURE.
	N = NOT INTERPRETED; THE NON-REFERENCE OIL RESULTS CANNOT BE INTERPRETED AND SHALL NOT BE USED IN DETERMINING AN AVERAGE TEST RESULT USING MULTIPLE TEST CRITERIA.

Test Number			
Test Stand: *STAND*	Stand Run Number: *STRUN/RSTRUN*	Engine Number: *RENGINE/ENGINE*	Engine Run Number: *ENRUN/RENRUN*

Date Completed: *RDTCOMP/DTCOMP*		Time Completed: *REOTTIME/EOTTIME*	
Oil Code [A]: *OILCODE/CMIR*			
Formulation/Stand Code: *FORM*			
Additional Comments:	*ALTCODE1*	*ALTCODE2*	*ALTCODE3*

In my opinion this test *OPVALID* been conducted in a valid manner in accordance with Test Method D5862 and the appropriate amendments through the information letter system. The remarks included in this report describe the anomalies associated with this test.

[A] CMIR or Non-Reference Oil Code

SUBMITTED BY:

SUBLAB
Testing Laboratory

SUBSIGIM
Signature

SUBNAME
Typed Name

SUBTITLE
Title

FIG. A5.1 Final Report Cover Sheet

TEST METHOD D5862
(6V92TA)
FORM 1
TEST LAB AFFIDAVIT

REFERENCE OIL TEST

TEST LAB	TEST STAND NO.	TEST STAND RUN NO.	ENGINE BLOCK NO.	ENGINE BLOCK RUN NO.
LAB	*STAND*	*RSTRUN*	*RENGINE*	*RENRUN*
LAB OIL CODE	SAE VISCOSITY	TEST LENGTH	DATE STARTED	EOT TIME
RLABOCOD	*RSAEVISC*	*RTESTLEN*	*RDTSTRT*	*REOTTIME*

DATE TEST COMP.	CMIR CODE NO.	TMC OIL NO.	REF. TEST ACCEPT. LIMITS EFFECTIVE DATE
RDTCOMP	*CMIR*	*IND*	*EFFDATE*

	FIRE RING DISTRESS (DEMERITS)	2ND & 3RD AVG FACE DISTRESS (DEMERITS)	AVG LINER SCUFFING (% AREA)
LAB RATING	*RLFRD*	*RL23A*	*RLDSA6*
REFEREE RATING	*RRFRD*	*RR23A*	*RRLDSA6*
AVERAGE	*RAFRD*	*RA23A*	*RALDSA6*
ACCEPTANCE LIMITS			
MINIMUM	*IMINFRD*	*IMINA23*	*IMINALD*
MAXIMUM	*IMAXFRD*	*IMAXA23*	*IMAXALD*
MEAN	*IMENFRD*	*IMENA23*	*IMENALD*

NON-REFERENCE OIL TEST

TEST LAB	TEST STAND NO.	TEST STAND RUN NO.	ENGINE BLOCK NO.	ENGINE BLOCK RUN NO.
LAB	*STAND*	*STRUN*	*ENGINE*	*ENRUN*
LAB OIL CODE	SAE VISCOSITY	TEST LENGTH	DATE STARTED	EOT TIME
LABOCODE	*SAEVISC*	*TESTLEN*	*DTSTRT*	*EOTTIME*

DATE TEST COMP.	OIL CODE NO.
DTCOMP	*OILCODE*

FORMULATION/STAND CODE
FORM

	FIRE RING DISTRESS (DEMERITS)	2ND & 3RD AVG FACE DISTRESS (DEMERITS)	AVG LINER SCUFFING (% AREA)
LAB RATING	*LFRD*	*L23A*	*LDSA6*
REFEREE RATING	*RFRD*	*R23A*	*RDSA6*
AVERAGE	*AFRD*	*A23A*	*ALDSA6*
CORRECTION FACTORS	*LFRDCF*	*L23ACF*	*LDSA6CF*
FINAL RESULTS	*LFRDFNL*	*L23AFNL*	*LDSA6FNL*

FIG. A5.2 Form 1 Test Lab Affidavit

TEST METHOD D5862
(6V92TA)
FORM 2
CALIBRATION TEST RESULT SUMMARY

Lab *LAB*	**Stand**[A]	**Stand Run No.**[A] *RSTRUN*
Engine[A] *RENGINE*	**Engine Run No.**[A] *RENRUN*	
CMIR *CMIR*	**TMC Oil No.** *IND*	
Fuel Supplier *RFUELSUP*		
Start Date *RDTSTRT*	**End Date** *RDTCOMP*	**Report Date** *DTERPT*

PARAMETER	VALUE
Average Fire Ring Face Distress, Demerits[B]	*RAFRD*
Number of Broken Rings	*RBRKRING*
Average 2nd & 3rd Ring Face Distress, Demerits[B]	*RA23A*
Average Liner Scuffing, % Area[B]	*RALDSA6*
Maximum Liner Port Plugging, % Area	*RMPP*
Average Liner Port Plugging, % Area	*RAPP*
Maximum Piston Skirt Tin Removed, % Area	*RMAXPSTR*
Average Piston Skirt Tin Removed, % Area	*RAVGPSTR*
Oil Iron Content at 96 Test Hours, ppm	*ROILFE*
Average Oil Consumption, g/h	*ROILCON*

[A] Test Number is: Stand - Stand Run No. - Engine - Engine Run No.

[B] Average of Lab & Referee Rating

FIG. A5.3 Form 2 Calibration Test Result Summary

TEST METHOD D5862
(6V92TA)
FORM 3
NON-REFERENCE TEST RESULT SUMMARY

Lab *LAB*	Stand[A] *STAND*	Stand Run No.[A] *STRUN*
Engine[A] *ENGINE*		Engine Run No.[A] *ENRUN*
Formulation/Stand Code: *FORM*		
Oil Code *OILCODE*		Fuel Supplier *FUELSUP*
Start Date *DTSTRT*		End Date *DTCOMP*

PARAMETER	VALUE
Average Fire Ring Face Distress, Demerits[B]	*LFRD/AFRD*
Correction Factor Fire Ring Face Distress, Demerits[B]	*LFRDCF*
Final Result Fire Ring Face Distress, Demerits[B]	*LFRDFNL*
Number of Broken Rings	*BRKRING*
Average 2nd & 3rd Ring Face Distress, Demerits[B]	*A23A/L23A*
Correction Factor 2nd & 3rd Ring Face Distress, Demerits[B]	*L23ACF*
Final Result 2nd & 3rd Ring Face Distress, Demerits[B]	*L23AFNL*
Average Liner Scuffing, % Area[B]	*LDSA6/ALDSA6*
Correction Factor Liner Scuffing, % Area[B]	*LDSA6CF*
Final Result Liner Scuffing, % Area[B]	*LDSA6FNL*
Maximum Liner Port Plugging, % Area	*MPP*
Average Liner Port Plugging, % Area	*APP*
Maximum Piston Skirt Tin Removed, % Area	*MAXPSTR*
Average Piston Skirt Tin Removed, % Area	*AVGPSTR*
Oil Iron Content at 96 Test Hours, ppm	*OILFE*
Average Oil Consumption, g/h	*OILCON*

[A] Test Number is: Stand - Stand Run No. - Engine - Engine Run No.

[B] Either Test Lab Rating or Average of Lab & Referee Rating (Referee Rating is Optional)

FIG. A5.4 Form 3 Non-Reference Test Result Summary

TEST METHOD D5862
(6V92TA)
FORM 4
TORQUE MODE - OPERATIONAL SUMMARY

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	
Test Mode: Torque	

TEST PARAMETER		SPECIFICATION	AVERAGE	STD. DEV.	MINIMUM	MAXIMUM
Engine Speed	r/min	1200 ± 10	*LARPM*	*LSRPM*	*LIRPM*	*LXRPM*
Load	N-m	Report Only	*LALOAD*	*LSLOAD*	*LILOAD*	*LXLOAD*
Power	kW	216 - 238	*LAPWR*	*LSPWR*	*LIPWR*	*LXPWR*
Fuel Flow	kg/h	52 ± 1.8	*LAFFLO*	*LSFFLO*	*LIFFLO*	*LXFFLO*
BSFC	g/kW-h	Report Only	*LABSFC*	*LSBSFC*	*LIBSFC*	*LXBSFC*
TEMPERATURE °C						
Coolant Out	°C	84 ± 2.2	*LACOLOUT*	*LSCOLOUT*	*LICOLOUT*	*LXCOLOUT*
Coolant In	°C	Report Only	*LACOLIN*	*LSCOLIN*	*LICOLIN*	*LXCOLIN*
Coolant delta T	°C	6 ± 2.7	*LACOLDT*	*LSCOLDT*	*LICOLDT*	*LXCOLDT*
Oil Gallery	°C	102 ± 1.1	*LAOILTEM*	*LSOILTEM*	*LIOILTEM*	*LXOILTEM*
Oil Sump	°C	111 - 119	*LASUMPT*	*LSSUMPT*	*LISUMPT*	*LXSUMPT*
Fuel @ Filter	°C	38 ± 2.7	*LAFFILT*	*LSFFILT*	*LIFFILT*	*LXFFILT*
Air Inlet	°C	35 ± 2.7	*LAINT*	*LSINT*	*LIINT*	*LXINT*
Air Box	°C	Report Only	*LABOXT*	*LSBOXT*	*LIBOXT*	*LXBOXT*
Exhaust	°C	Report Only	*LAEXHT*	*LSEXHT*	*LIEXHT*	*LXEXHT*
PRESSURES						
Oil Gallery	kPa	207 - 310	*LAOILPRS*	*LSOILPRS*	*LIOILPRS*	*LXOILPRS*
Air In. Res.	kPa	Report Only	*LAINPRES*	*LSINPRES*	*LIINPRES*	*LXINPRES*
Fuel	kPa	Report Only	*LAFPRES*	*LSFPRES*	*LIFPRES*	*LXFPRES*
Air Box	kPa	Report Only	*LABOXPRS*	*LSBOXPRS*	*LIBOXPRS*	*LXBOXPRS*
Turbo Outlet	kPa	Report Only	*LATURPRS*	*LSTURPRS*	*LITURPRS*	*LXTURPRS*

FIG. A5.5 Form 4 Torque Mode—Operational Summary

TEST METHOD D5862
(6V92TA)
FORM 5
POWER MODE - OPERATIONAL SUMMARY

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND* - *STRUN/RSTRUN* - *ENGINE* - *ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	
Test Mode: Power	

TEST PARAMETER		SPECIFICATION	AVERAGE	STD. DEV.	MINIMUM	MAXIMUM
Engine Speed	r/min	2300 ± 10	*PARPM*	*PSRPM*	*PIRPM*	*PXRPM*
Load	N-m	Report Only	*PALOAD*	*PSLOAD*	*PILOAD*	*PXLOAD*
Power	kW	364 - 379	*PAPWR*	*PSPWR*	*PIPWR*	*PXPWR*
Fuel Flow	kg/h	90 ± 1.8	*PAFFLO*	*PSFFLO*	*PIFFLO*	*PXFFLO*
BSFC	g/kW-h	Report Only	*PABSFC*	*PSBSFC*	*PIBSFC*	*PXBSFC*
TEMPERATURE °C						
Coolant Out	°C	84 ± 2.2	*PACOLOUT*	*PSCOLOUT*	*PICOLOUT*	*PXCOLOUT*
Coolant In	°C	Report Only	*PACOLIN*	*PSCOLIN*	*PICOLIN*	*PXCOLIN*
Coolant delta T	°C	6 ± 2.7	*PACOLDT*	*PSCOLDT*	*PICOLDT*	*PXCOLDT*
Oil Gallery	°C	111 ± 1.1	*PAOILTEM*	*PSOILTEM*	*PIOILTEM*	*PXOILTEM*
Oil Sump	°C	120 - 131	*PASUMPT*	*PSSUMPT*	*PISUMPT*	*PXSUMPT*
Fuel @ Filter	°C	38 ± 2.7	*PAFFILT*	*PSFFILT*	*PIFFILT*	*PXFFILT*
Air Inlet	°C	35 ± 2.7	*PAINT*	*PSINT*	*PIINT*	*PXINT*
Air Box	°C	Report Only	*PABOXT*	*PSBOXT*	*PIBOXT*	*PXBOXT*
Exhaust	°C	Report Only	*PAEXHT*	*PSEXHT*	*PIEXHT*	*PXEXHT*
PRESSURES						
Oil Gallery	kPa	345 - 482	*PAOILPRS*	*PSOILPRS*	*PIOILPRS*	*PXOILPRS*
Air In. Res.	kPa	2.5 ± 0.7	*PAINPRES*	*PSINPRES*	*PIINPRES*	*PXINPRES*
Fuel	kPa	Report Only	*PAFPRES*	*PSFPRES*	*PIFPRES*	*PXFPRES*
Air Box	kPa	Report Only	*PABOXPRS*	*PSBOXPRS*	*PIBOXPRS*	*PXBOXPRS*
Turbo Outlet	kPa	3.2 ± 0.8	*PATURPRS*	*PSTURPRS*	*PITURPRS*	*PXTURPRS*

FIG. A5.6 Form 5 Power Mode Operational Summary

TEST METHOD D5862
(6V92TA)
FORM 6
TEST LAB ENGINE RATING RESULT

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

Cylinder Liners

Scuffing, % Area	1L	2L	3L	1R	2R	3R	Average
Thrust	*TLDS1L*	*TLDS2L*	*TLDS3L*	*TLDS1R*	*TLDS2R*	*TLDS3R*	*TLDSA6*
Anti-Thrust	*ATLDS1L*	*ATLDS2L*	*ATLDS3L*	*ATLDS1R*	*ATLDS2R*	*ATLDS3R*	*ATLDSA6*
Total	*LDS1L*	*LDS2L*	*LDS3L*	*LDS1R*	*LDS2R*	*LDS3R*	*LDSA6/ALDSA6*
% Liner Port Plugging	*LPP1L*	*LPP2L*	*LPP3L*	*LPP1R*	*LPP2R*	*LPP3R*	*RAPP/APP*

Piston Rings

Face Distress Demerits	1L	2L	3L	1R	2R	3R	Average
Fire Ring	*LF1L92*	*LF2L92*	*LF3L92*	*LF1R92*	*LF2R92*	*LF3R92*	*RLFRD/LFRD*
2nd Ring	*L21L92*	*L22L92*	*L23L92*	*L21R92*	*L22R92*	*L23R92*	*LR2D92*
3rd Ring	*L31L92*	*L32L92*	*L33L92*	*L31R92*	*L32R92*	*L33R92*	*LR3D92*
Average 2nd & 3rd	*LA1L92*	*LA2L92*	*LA3L92*	*LA1R92*	*LA2R92*	*LA3R92*	*RL23A/L23A*

Piston Skirt

% Area Plate Removal	1L	2L	3L	1R	2R	3R	Average
Value	*PSPR1L*	*PSPR2L*	*PSPR3L*	*PSPR1R*	*PSPR2R*	*PSPR3R*	*RAVGPSTR/AVGPSTR*

FIG. A5.7 Form 6 Test Lab Engine Rating Result

TEST METHOD D5862
(6V92TA)
FORM 7
REFEREE LAB ENGINE RATING RESULT
(Required for reference test; Optional for non-reference test)

Laboratory: *LAB*		**EOT Date:** *RDTCOMP/DTCOMP*	
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*		**Oil Code:** *OILCODE/CMIR*	
Formulation/Stand Code: *FORM*			
Referee Lab: *RRLAB*	Referee Initials: *RINIT*	Referee Rating Date: *RRDATE*	

Cylinder Liners

Scuffing, % Area	1L	2L	3L	1R	2R	3R	Average
Thrust	*RTLDS1L*	*RTLDS2L*	*RTLDS3L*	*RTLDS1R*	*RTLDS2R*	*RTLDS3R*	*RTLDSA6*
Anti-Thrust	*RATLDS1L*	*RATLDS2L*	*RATLDS3L*	*RATLDS1R*	*RATLDS2R*	*RATLDS3R*	*RATLDSA6*
Total	*RLDS1L*	*RLDS2L*	*RLDS3L*	*RLDS1R*	*RLDS2R*	*RLDS3R*	*RRLDSA6/RDSA6*

Piston Rings

Face Distress Demerits	1L	2L	3L	1R	2R	3R	Average
Fire Ring	*RF1L92*	*RF2L92*	*RF3L92*	*RF1R92*	*RF2R92*	*RF3R92*	*RRFRD/RFRD*
2nd Ring	*R21L92*	*R22L92*	*R23L92*	*R21R92*	*R22R92*	*R23R92*	*RR2D92*
3rd Ring	*R31L92*	*R32L92*	*R33L92*	*R31R92*	*R32R92*	*R33R92*	*RR3D92*
Average 2nd & 3rd	*RA1L92*	*RA2L92*	*RA3L92*	*RA1R92*	*RA2R92*	*RA3R92*	*RR23A/R23A*

FIG. A5.8 Form 7 Referee Lab Engine Rating Result

TEST METHOD D5862
(6V92TA)
FORM 8
PARTS MEASUREMENT SUMMARY

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

Weight Loss Summary

Piston Ring	1L	2L	3L	1R	2R	3R	Average
Fire Ring, g	*WLF1L*	*WLF2L*	*WLF3L*	*WLF1R*	*WLF2R*	*WLF3R*	*WLFA6*
2nd Ring, g	*WL21L*	*WL22L*	*WL23L*	*WL21R*	*WL22R*	*WL23R*	*WL2A6*
3rd Ring, g	*WL31L*	*WL32L*	*WL33L*	*WL31R*	*WL32R*	*WL33R*	*WL3A6*
Slipper Bushing, g	*WLSB1L*	*WLSB2L*	*WLSB3L*	*WLSB1R*	*WLSB2R*	*WLSB3R*	*WLSBA6*

Wear Summary

Piston Ring Radial Wear Thickness	1L	2L	3L	1R	2R	3R	Average
Fire Ring, mm	*RWF1L*	*RWF2L*	*RWF3L*	*RWF1R*	*RWF2R*	*RWF3R*	*RWFA6*
2nd Ring, mm	*RW21L*	*RW22L*	*RW23L*	*RW21R*	*RW22R*	*RW23R*	*RW2A6*
3rd Ring, mm	*RW31L*	*RW32L*	*RW33L*	*RW31R*	*RW32R*	*RW33R*	*RW3A6*
Injector Rocker Arm Bushing Wear ID, mm	*RABW1L*	*RABW2L*	*RABW3L*	*RABW1R*	*RABW2R*	*RABW3R*	*RABWA6*

End Gap Increase

Piston Ring	1L	2L	3L	1R	2R	3R	Average
Fire Ring, mm	*EGIF1L*	*EGIF2L*	*EGIF3L*	*EGIF1R*	*EGIF2R*	*EGIF3R*	*EGIFA6*
2nd Ring, mm	*EGI21L*	*EGI22L*	*EGI23L*	*EGI21R*	*EGI22R*	*EGI23R*	*EGI2A6*
3rd Ring, mm	*EGI31L*	*EGI32L*	*EGI33L*	*EGI31R*	*EGI32R*	*EGI33R*	*EGI3A6*
Top Ring Upper Groove, mm	*EGIUGT1L*	*EGIUGT2L*	*EGIUGT3L*	*EGIUGT1R*	*EGIUGT2R*	*EGIUGT3R*	*EGIUGTA6*
Bottom Ring Upper Groove, mm	*EGIUGB1L*	*EGIUGB2L*	*EGIUGB3L*	*EGIUGB1R*	*EGIUGB2R*	*EGIUGB3R*	*EGIUGBA6*
Top Ring Lower Groove, mm	*EGILGT1L*	*EGILGT2L*	*EGILGT3L*	*EGILGT1R*	*EGILGT2R*	*EGILGT3R*	*EGILGTA6*
Bottom Ring Lower Groove, mm	*EGILGB1L*	*EGILGB2L*	*EGILGB3L*	*EGILGB1R*	*EGILGB2R*	*EGILGB3R*	*EGILGBA6*

FIG. A5.9 Form 8 Parts Measurement Summary

TEST METHOD D5862
(6V92TA)
FORM 9
OIL ANALYSIS SUMMARY

Laboratory:	*LAB*	**EOT Date:**	*RDTCOMP/DTCOMP*
Test Number:	*STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:**	*OILCODE/CMIR*
Formulation/Stand Code:	*FORM*		

Hours	Viscosity @ 40°C (cSt)	Viscosity @ 100°C (cSt)	TBN D4739	Viscosity HT/HS @ 150°C (cP)	Volatility % @ 371°C
New	*VIS_HNEW*	*VIS1HNEW*	*TBN_HNEW*	*VHTHSNEW*	*VOLTHNEW*
Break-in	*VIS_HBRK*	*VIS1HBRK*	*TBN_HBRK*		
16	*VIS_H016*	*VIS1H016*	*TBN_H016*		
48	*VIS_H048*	*VIS1H048*	*TBN_H048*		
80	*VIS_H080*	*VIS1H080*	*TBN_H080*		
96	*VIS_H096*	*VIS1H096*	*TBN_H096*		*VOLTH096*

PPM	NEW	Break-in	Hour 16	Hour 32	Hour 48	Hour 64	Hour 80	Hour 96
Fe	*FE__HNEW*	*FE__HBRK*	*FE__H016*	*FE__H032*	*FE__H048*	*FE__H064*	*FE__H080*	*ROILFE/OILFE*
Sn	*SN__HNEW*	*SN__HBRK*	*SN__H016*	*SN__H032*	*SN__H048*	*SN__H064*	*SN__H080*	*SN__H096*
Pb	*PB__HNEW*	*PB__HBRK*	*PB__H016*	*PB__H032*	*PB__H048*	*PB__H064*	*PB__H080*	*PB__H096*
Cu	*CU__HNEW*	*CU__HBRK*	*CU__H016*	*CU__H032*	*CU__H048*	*CU__H064*	*CU__H080*	*CU__H096*
Cr	*CR__HNEW*	*CR__HBRK*	*CR__H016*	*CR__H032*	*CR__H048*	*CR__H064*	*CR__H080*	*CR__H096*
Al	*AL__HNEW*	*AL__HBRK*	*AL__H016*	*AL__H032*	*AL__H048*	*AL__H064*	*AL__H080*	*AL__H096*
Si	*SI__HNEW*	*SI__HBRK*	*SI__H016*	*SI__H032*	*SI__H048*	*SI__H064*	*SI__H080*	*SI__H096*
Ca	*CA__HNEW*	*CA__HBRK*	*CA__H016*		*CA__H048*		*CA__H080*	*CA__H096*
Mg	*MG__HNEW*	*MG__HBRK*	*MG__H016*		*MG__H048*		*MG__H080*	*MG__H096*
Zn	*ZN__HNEW*	*ZN__HBRK*	*ZN__H016*		*ZN__H048*		*ZN__H080*	*ZN__H096*
P	*P__HNEW*	*P__HBRK*	*P__H016*		*P__H048*		*P__H080*	*P__H096*
Mo	*MO__HNEW*	*MO__HBRK*	*MO__H016*		*MO__H048*		*MO__H080*	*MO__H096*
B	*B__HNEW*	*B__HBRK*	*B__H016*		*B__H048*		*B__H080*	*B__H096*
Na	*NA__HNEW*	*NA__HBRK*	*NA__H016*		*NA__H048*		*NA__H080*	*NA__H096*
S	*S__HNEW*	*S__HBRK*	*S__H016*		*S__H048*		*S__H080*	*S__H096*

FIG. A5.10 Form 9 Oil Analysis Summary

TEST METHOD D5862
(6V92TA)
FORM 10
PRE-TEST PARTS MEASUREMENT

Laboratory: *LAB*	EOT Date: *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	Oil Code: *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	
Measurement Performed: Pre Test	

Component Weight

Piston Rings	1L	2L	3L	1R	2R	3R	Average
Fire Ring, g	*W1F1L*	*W1F2L*	*W1F3L*	*W1F1R*	*W1F2R*	*W1F3R*	*W1FA6*
2nd Ring, g	*W121L*	*W122L*	*W123L*	*W121R*	*W122R*	*W123R*	*W12A6*
3rd Ring, g	*W131L*	*W132L*	*W133L*	*W131R*	*W132R*	*W133R*	*W13A6*
Slipper Bushing, g	*W1SB1L*	*W1SB2L*	*W1SB3L*	*W1SB1R*	*W1SB2R*	*W1SB3R*	*W1SBA6*

Radial Thickness

Piston Rings	1L	2L	3L	1R	2R	3R	Average
Fire Ring, mm	*RT1F1L*	*RT1F2L*	*RT1F3L*	*RT1F1R*	*RT1F2R*	*RT1F3R*	*RT1FA6*
2nd Ring, mm	*RT121L*	*RT122L*	*RT123L*	*RT121R*	*RT122R*	*RT123R*	*RT12A6*
3rd Ring, mm	*RT131L*	*RT132L*	*RT133L*	*RT131R*	*RT132R*	*RT133R*	*RT13A6*

End Gap @ 122.936 mm gage

Piston Rings	1L	2L	3L	1R	2R	3R	Average	Spec
Fire Ring, mm	*EG1F1L*	*EG1F2L*	*EG1F3L*	*EG1F1R*	*EG1F2R*	*EG1F3R*	*EG1FA6*	1.016 ± 0.127 mm
2nd Ring, mm	*EG121L*	*EG122L*	*EG123L*	*EG121R*	*EG122R*	*EG123R*	*EG12A6*	1.016 ± 0.127 mm
3rd Ring, mm	*EG131L*	*EG132L*	*EG133L*	*EG131R*	*EG132R*	*EG133R*	*EG13A6*	1.016 ± 0.127 mm
Top Ring Upper Groove, mm	*EG1UGT1L*	*EG1UGT2L*	*EG1UGT3L*	*EG1UGT1R*	*EG1UGT2R*	*EG1UGT3R*	*EG1UGTA6*	0.406 ± 0.025 mm
Bottom Ring Upper Groove, mm	*EG1UGB1L*	*EG1UGB2L*	*EG1UGB3L*	*EG1UGB1R*	*EG1UGB2R*	*EG1UGB3R*	*EG1UGBA6*	0.406 ± 0.025 mm
Top Ring Lower Groove, mm	*EG1LGT1L*	*EG1LGT2L*	*EG1LGT3L*	*EG1LGT1R*	*EG1LGT2R*	*EG1LGT3R*	*EG1LGTA6*	0.584 ± 0.051 mm
Bottom Ring Lower Groove, mm	*EG1LGB1L*	*EG1LGB2L*	*EG1LGB3L*	*EG1LGB1R*	*EG1LGB2R*	*EG1LGB3R*	*EG1LGBA6*	0.584 ± 0.051 mm

FIG. A5.11 Form 10 Pre-Test Parts Measurement

TEST METHOD D5862
(6V92TA)
FORM 11
PRE-TEST PARTS MEASUREMENT

Laboratory: *LAB*	EOT Date: *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTENGINE - ENRUN/RENRUN*	Oilcode: *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	
Measurement Performed: Pre Test	

Cylinder Liner

Parameter	1L	2L	3L	1R	2R	3R	Average	Spec
Average Diameter,[A] mm	*LDIA11L*	*LDIA12L*	*LDIA13L*	*LDIA11R*	*LDIA12R*	*LDIA13R*	*LDIA1A6*	122.911 - 122.974
Surf. Finish, R_a µm	*LFIN11L*	*LFIN12L*	*LFIN13L*	*LFIN11R*	*LFIN12R*	*LFIN13R*	*LFIN1A6*	1.1 - 1.7 µm

Piston Skirt

Parameter	1L	2L	3L	1R	2R	3R	Average	Spec
Average Diameter, mm	*PDIA11L*	*PDIA12L*	*PDIA13L*	*PDIA11R*	*PDIA12R*	*PDIA13R*	*PDIA1A6*	122.667 - 122.733

Clearance, Liner to Piston

Parameter	1L	2L	3L	1R	2R	3R	Average	Spec
Clearance, mm	*LPC11L*	*LPC12L*	*LPC13L*	*LPC11R*	*LPC12R*	*LPC13R*	*LPC1A6*	0.178 - 0.305

Injector Rocker Arm Bushing

Parameter	1L	2L	3L	1R	2R	3R	Average
Inside Diameter, mm	*RAB11L*	*RAB12L*	*RAB13L*	*RAB11R*	*RAB12R*	*RAB13R*	*RAB1A6*

[A] Average of the 8 measurements per test procedure

FIG. A5.12 Form 11 Pre-Test Parts Measurement

TEST METHOD D5862
(6V92TA)
FORM 12
POST-TEST PARTS MEASUREMENT

Laboratory: *LAB*	EOT Date: *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	Oil Code: *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	
Measurement Performed: Post Test	

Component Weight

Piston Rings	1L	2L	3L	1R	2R	3R	Average
Fire Ring, g	*W2F1L*	*W2F2L*	*W2F3L*	*W2F1R*	*W2F2R*	*W2F3R*	*W2FA6*
2nd Ring, g	*W221L*	*W222L*	*W223L*	*W221R*	*W222R*	*W223R*	*W22A6*
3rd Ring, g	*W231L*	*W232L*	*W233L*	*W231R*	*W232R*	*W233R*	*W23A6*
Slipper Bushing, g	*W2SB1L*	*W2SB2L*	*W2SB3L*	*W2SB1R*	*W2SB2R*	*W2SB3R*	*W2SBA6*

Radial Thickness

Piston Rings	1L	2L	3L	1R	2R	3R	Average
Fire Ring, mm	*RT2F1L*	*RT2F2L*	*RT2F3L*	*RT2F1R*	*RT2F2R*	*RT2F3R*	*RT2FA6*
2nd Ring, mm	*RT221L*	*RT222L*	*RT223L*	*RT221R*	*RT222R*	*RT223R*	*RT22A6*
3rd Ring, mm	*RT231L*	*RT232L*	*RT233L*	*RT231R*	*RT232R*	*RT233R*	*RT23A6*

End Gap @ 122.936 mm gage

Piston Rings	1L	2L	3L	1R	2R	3R	Average
Fire Ring, mm	*EG2F1L*	*EG2F2L*	*EG2F3L*	*EG2F1R*	*EG2F2R*	*EG2F3R*	*EG2FA6*
2nd Ring, mm	*EG221L*	*EG222L*	*EG223L*	*EG221R*	*EG222R*	*EG223R*	*EG22A6*
3rd Ring, mm	*EG231L*	*EG232L*	*EG233L*	*EG231R*	*EG232R*	*EG233R*	*EG23A6*
Top Ring Upper Groove, mm	*EG2UGT1L*	*EG2UGT2L*	*EG2UGT3L*	*EG2UGT1R*	*EG2UGT2R*	*EG2UGT3R*	*EG2UGTA6*
Bottom Ring Upper Groove, mm	*EG2UGB1L*	*EG2UGB2L*	*EG2UGB3L*	*EG2UGB1R*	*EG2UGB2R*	*EG2UGB3R*	*EG2UGBA6*
Top Ring Lower Groove, mm	*EG2LGT1L*	*EG2LGT2L*	*EG2LGT3L*	*EG2LGT1R*	*EG2LGT2R*	*EG2LGT3R*	*EG2LGTA6*
Bottom Ring Lower Groove, mm	*EG2LGB1L*	*EG2LGB2L*	*EG2LGB3L*	*EG2LGB1R*	*EG2LGB2R*	*EG2LGB3R*	*EG2LGBA6*

FIG. A5.13 Form 12 Post-Test Parts Measurement

TEST METHOD D5862
(6V92TA)
FORM 13
POST-TEST PARTS MEASUREMENT

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND* - *STRUN/RSTRUN* - *ENGINE* - *ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	
Measurement Performed: Post Test	

Injector Rocker Arm Bushing

Parameter	1L	2L	3L	1R	2R	3R	Average
Inside Dia., mm	*RAB21L*	*RAB22L*	*RAB23L*	*RAB21R*	*RAB22R*	*RAB23R*	*RAB2A6*

FIG. A5.14 Form 13 Post-Test Parts Measurement

TEST METHOD D5862
(6V92TA)
FORM 14
HEAT SOAK SUMMARY

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND* - *STRUN/RSTRUN* - *ENGINE* - *ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

Number of Soak Occurrences		*NSOAK*	
TEST HOURS	DATE	SOAK TIME	DESCRIPTION
SHOUH001	*SDATH001*	*STIMH001*	*SDESH001*
		TOTLSOAK	TOTAL HEAT SOAK TIME

FIG. A5.15 Form 14 Heat Soak Summary

TEST METHOD D5862
(6V92TA)
Form 15
DOWNTIME AND COMMENTS SUMMARY

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND* - *STRUN/RSTRUN* - *ENGINE* - *ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

Number of Downtime Occurrences			*DWNOCR*	
TEST HOURS	DATE	DOWNTIME	REASONS	
DOWNH001	*DDATH001*	*DTIMH001*	*DREAH001*	
		TOTLDOWN	TOTAL DOWNTIME	

OTHER COMMENTS		
Number of Comments	*TOTCOM*	
OCOMH001		

FIG. A5.16 Form 15 Downtime and Comments Summary

TEST METHOD D5862
(6V92TA)
FORM 16
AIR BOX INSPECTION SUMMARY

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

% Area Cylinder Liner Scuffing

Number of Inspections (EXCLUDING BREAKIN INSPECTION)								*NABINS*
HOURS	**DATE**	**1L**	**2L**	**3L**	**1R**	**2R**	**3R**	**AVERAGE**
BREAKIN	*ABKDAT*	*LSCF1LBK*	*LSCF2LBK*	*LSCF3LBK*	*LSCF1RBK*	*LSCF2RBK*	*LSCF3RBK*	*LSCUFABK*
SCFHH001	*SCFDH001*	*LS1LH001*	*LS2LH001*	*LS3LH001*	*LS1RH001*	*LS2RH001*	*LS3RH001*	*LSAVH001*

TEST HOURS	**REASON FOR AIRBOX INSPECTION**
BREAKIN	*ABOXREBK*
	ABREH001

FIG. A5.17 Form 16 Air Box Inspection Summary

TEST METHOD D5862
(6V92TA)
FORM 17
TEST FUEL ANALYSIS

Laboratory:	*LAB*	EOT Date:	*RDTCOMP/DTCOMP*
Test Number:	*STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	Oil Code:	*OILCODE/CMIR*
Formulation/Stand Code:	*FORM*		

Measurement	Specs.	Analysis	Test Method
API Gravity @ 15.6°C	33 Typical	*APIGRAV*	D 287
Cetane No.	40 Minimum	*CETANENO*	D 613
Distillation, °C			
IBP	160°C-204°C	*FUELIBP*	D 86
50%	246°C-288°C	*FUEL50*	D 86
90%	288°C-327°C	*FUEL90*	D 86
Kinematic Viscosity	1.9 cSt-4.0 cSt	*KINVIS*	D 445
Total Sulfur, % Weight	0.10%-0.40%	*FUELSULF*	D 2622
Flash Point	54°C Minimum	*FLASHPT*	D 92
Ash, % Weight	0.01% Maximum	*FUELASH*	D 482
Water & Solids, % Weight	0.05% Maximum	*FUELH2O*	D 2709
Gross Heat of Combustion	45.2 MJ/kg Minimum	*FUELHEAT*	D 240

FIG. A5.18 Form 17 Test Fuel Analysis

TEST METHOD D5862
(6V92TA)
FORM 18
CHARACTERISTICS OF THE DATA ACQUISITION SYSTEM

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

PARAMETER (1)	SENSING DEVICE (2)	CALIBRATION FREQUENCY (3)	RECORD DEVICE (4)	OBSERVATION FREQUENCY (5)	RECORD FREQUENCY (6)	LOG FREQUENCY (7)	SYSTEM RESPONSE (8)
Temperatures							
Oil Gall.	*OGTSENS*	*OGTCALF*	*OGTRECD*	*OGTOBSF*	*OGTRECF*	*OGTLOGF*	*OGTSYSR*
Oil Sump	*OSTSENS*	*OSTCALF*	*OSTRECD*	*OSTOBSF*	*OSTRECF*	*OSTLOGF*	*OSTSYSR*
Fuel	*FTEMSENS*	*FTEMCALF*	*FTEMRECD*	*FTEMOBSF*	*FTEMRECF*	*FTEMLOGF*	*FTEMSYSR*
Cool In	*CITSENS*	*CITCALF*	*CITRECD*	*CITOBSF*	*CITRECF*	*CITLOGF*	*CITSYSR*
Cool Out	*COTSENS*	*COTCALF*	*COTRECD*	*COTOBSF*	*COTRECF*	*COTLOGF*	*COTSYSR*
Air Inlet	*AITSENS*	*AITCALF*	*AITRECD*	*AITOBSF*	*AITRECF*	*AITLOGF*	*AITSYSR*
Other							
Fuel Flow	*FFLOSENS*	*FFLOCALF*	*FFLORECD*	*FFLOOBSF*	*FFLORECF*	*FFLOLOGF*	*FFLOSYSR*
Engine Speed	*RPMSENS*	*RPMCALF*	*RPMRECD*	*RPMOBSF*	*RPMRECF*	*RPMLOGF*	*RPMSYSR*
Load	*LOADSENS*	*LOADCALF*	*LOADRECD*	*LOADOBSF*	*LOADRECF*	*LOADLOGF*	*LOADSYSR*
Inlet Restr	*INRESENS*	*INRECALF*	*INRERECD*	*INREOBSF*	*INRERECF*	*INRELOGF*	*INRESYSR*
Exh Press	*EXPRSENS*	*EXPRCALF*	*EXPRRECD*	*EXPROBSF*	*EXPRRECF*	*EXPRLOGF*	*EXPRSYSR*
Oil Gal Pres	*OILGSENS*	*OILGCALF*	*OILGRECD*	*OILGOBSF*	*OILGRECF*	*OILGLOGF*	*OILGSYSR*

LEGEND:

(1) OPERATING PARAMETER
(2) THE TYPE OF DEVICE USED TO MEASURE TEMPERATURE, PRESSURE OR FLOW
(3) FREQUENCY AT WHICH THE MEASUREMENT SYSTEM IS CALIBRATED
(4) THE TYPE OF DEVICE WHERE DATA IS RECORDED
LG - HANDLOG SHEET
DL - AUTOMATIC DATA LOGGER
SC - STRIP CHART RECORDER
C/M - COMPUTER, USING MANUAL DATA ENTRY
C/D - COMPUTER, USING DIRECT I/O ENTRY
(5) DATA ARE OBSERVED BUT RECORDED ONLY IF OFF SPEC.
(6) DATA ARE RECORDED BUT ARE NOT RETAINED AT EOT
(7) DATA ARE LOGGED AS PERMANENT RECORD, NOTE SPECIFY IF:
SS - SNAPSHOT TAKEN AT SPECIFIED FREQUENCY
AG/X AVERAGE OF X DATA POINTS AT SPECIFIED FREQUENCY
(8) TIME FOR THE OUTPUT TO REACH 63.2% OF FINAL VALUE FOR STEP CHANGE AT INPUT

FIG. A5.19 Form 18 Characteristics of the Data Acquisition System

TEST METHOD D5862
(6V92TA)
FORM 19
ORIGIN OF CRITICAL ENGINE PARTS

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND - STRUN/RSTRUN - ENGINE - ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

PART NAME		PART ORIGIN[A]	
Cylinder Liner		*CYLLINOR*	
Piston Dome		*PSTDOMOR*	
Piston Skirt		*PSTSKTOR*	
Slipper Bushings	#/Position	LEFT	RIGHT
	1	*SLPBUS1L*	*SLPBUS1R*
	2	*SLPBUS2L*	*SLPBUS2R*
	3	*SLPBUS3L*	*SLPBUS3R*
Oil Control Ring Upper Groove		*OCRUGOR*	
Oil Control Ring Lower Groove		*OCRLGOR*	
Oil Ring Expander		*ORNGEXOR*	
Fire Ring		*FIRRNGOR*	
Compression Rings		*CMPRNGOR*	

[A] Part Origin Value are: TESTKIT, PRODUCTION, or MIXED

FIG. A5.20 Form 19 Origin of Critical Engine Parts

TEST METHOD D5862
(6V92TA)
FORM 20
OUTLIER INFORMATION

Laboratory: *LAB*	**EOT Date:** *RDTCOMP/DTCOMP*
Test Number: *STAND* - *STRUN/RSTRUN* - *ENGINE* - *ENRUN/RENRUN*	**Oil Code:** *OILCODE/CMIR*
Formulation/Stand Code: *FORM*	

COUNTER = **NUMOUTLI**

PARAMETER	VALUE	TEST TIME
PARAH001	*VALUH001*	*TESTH001*

FIG. A5.21 Form 20 Outlier Information

TABLE A5.1 Index of Report Forms

FIGS.	A5.1 Final Report Cover Sheet
	A5.2 Form 1, Test Lab Affidavit
	A5.3 Form 2, Reference Result Summary
	A5.4 Form 3, Non-reference Oil Test Result Summary
	A5.5 Form 4, Torque Mode—Operational Summary
	A5.6 Form 5, Power Mode—Operational Summary
	A5.7 Form 6, Test Lab Engine Rating Result
	A5.8 Form 7, Referee Lab Engine Rating Result
	A5.9 Form 8, Parts Measurement Summary
	A5.10 Form 9, Oil Analysis Summary
	A5.11 Form 10, Pre-Test Parts Measurement (A)
	A5.12 Form 11, Pre-Test Parts Measurement (B)
	A5.13 Form 12, Post-Test Parts Measurement (A)
	A5.14 Form 13, Post-Test Parts Measurement (B)
	A5.15 Form 14, Heat Soak Summary
	A5.16 Form 15, Unscheduled Downtime and Maintenance Summary
	A5.17 Form 16, Air Box Inspection Summary
	A5.18 Form 17, Test Fuel Analysis
	A5.19 Form 18, Characteristics of Data Aquisition System
	A5.20 Form 19, Origin of Critical Engine Parts
	A5.21 Form 20, Outlier Information

A6. DATA DICTIONARY

A6.1 See Figs. A6.1 and Figs. A6.2.

```
##########################################################################
#                                                                        #
#          D a t a   D i c t i o n a r y   R e p e a t i n g             #
#              F i e l d   S p e c i f i c a t i o n s                   #
#                                                                        #
##########################################################################
# The following contains specifications and field groupings for fields in the
# Data Dictionary that are REPEATING Fields.  These fields can be identified
# in the Data Dictionary by the Hxxx or Rxxx in the last four positions of the
# field name.
#
# Repeating fields are used to specify repeating measurements.
#
# The format for a repeating field name is 4 descriptive characters followed
# by the letter H or R followed by 3 characters for the actual interval
# the measurement was taken. The field will always be a total of 8 characters.
#
# Example ABCDHxxx.
#
# The following is the format of this specification:
#
# Column 1 - 8:   Repeating Field Name
# Column 10 - 17: The Parent Field Name of the Group
# Column 19 - 80: Comments about the Repeating Field Group.
#
# The lines following the Repeating Field Name Record will contain the required
# measurements for the particular field.  Multiple 80 characters lines
# can be specified.  A blank line marks the end of each specification.
#
# The Field Name in Column 10-17 designates the the Group in which the field
# belongs.  The First field name in a group is the Parent of the grouping
# and can be used to determine how fields should be grouped.
# The changing of the Parent Field marks the end of a repeating group
# specification.
#
# Example:
#
# VIS_Hxxx, DVISHxxx and PVISHxxx expanded for transmission (8 and 16 hours):
#
#          VIS_H008
#          DVISH008
#          PVISH008
#          VIS_H016
#          DVISH016
#          PVISH016
#
# Note:  During electronic transmission, repeating field groups must be kept
#        together within the specified group but the order within the group
#        does not have to be maintained.
#
##########################################################################
#                Start of Field Grouping Specifications                  #
##########################################################################
#
6V92 VERSION 19990414
VIS_Hxxx VIS_Hxxx   VISCOSITY AT 40 DEG C AT XXX HOURS (cSt)
NEW BRK 080 016 048 096

VIS1Hxxx VIS_Hxxx   VISCOSITY AT 100 DEG C AT XXX HOURS (cSt)
NEW BRK 080 016 048 096
```

FIG. A6.1 Repeating Field Specifications

```
TBN_Hxxx VIS_Hxxx   TOTAL BASE NUMBER AT XXX HOURS (D4739)
NEW BRK 080 016 048 096

VOLTHxxx VOLTHxxx   VOLATILITY PERCENT AT 371 DEG C AT XXX HOURS (%)
096 NEW

FE__Hxxx FE__Hxxx   IRON HOURS [<] (ppm)
BRK 080 048 NEW 016 032 064

SN__Hxxx SN__Hxxx   TIN HOURS [<] (ppm)
096 080 048 BRK 016 032 064 NEW

PB__Hxxx PB__Hxxx   LEAD HOURS [<] (ppm)
096 080 048 BRK 016 032 064 NEW

CU__Hxxx CU__Hxxx   COPPER HOURS [<] (ppm)
096 080 048 BRK 016 032 064 NEW

CR__Hxxx CR__Hxxx   CHROMIUM HOURS [<] (ppm)
096 080 048 BRK 016 032 064 NEW

AL__Hxxx AL__Hxxx   ALUMINUM HOURS [<] (ppm)
096 080 048 BRK 016 032 064 NEW

SI__Hxxx SI__Hxxx   SILICON HOURS [<] (ppm)
096 080 048 BRK 016 032 064 NEW

CA__Hxxx CA__Hxxx   CALCIUM HOURS [<] (ppm)
NEW BRK 080 016 048 096

MG__Hxxx MG__Hxxx   MAGNESIUM HOURS [<] (ppm)
NEW BRK 080 016 048 096

ZN__Hxxx ZN__Hxxx   ZINC HOURS [<] (ppm)
NEW BRK 080 016 048 096

P___Hxxx P___Hxxx   PHOSPHORUS HOURS [<] (ppm)
NEW BRK 080 016 048 096

MO__Hxxx MO__Hxxx   MOLYBDENUM HOURS [<] (ppm)
NEW BRK 080 016 048 096

B___Hxxx B___Hxxx   BORON HOURS [<] (ppm)
NEW BRK 080 016 048 096

NA__Hxxx NA__Hxxx   SODIUM HOURS [<] (ppm)
NEW BRK 080 016 048 096

S___Hxxx S___Hxxx   SULFUR HOURS [<] (ppm)
NEW BRK 080 016 048 096

SHOUHxxx SHOUHxxx   HEAT SOAK TEST TIME (HH:MM)


SDATHxxx SHOUHxxx   HEAT SOAK DATE (YYYYMMDD)


STIMHxxx SHOUHxxx   HEAT SOAK TIME (HH:MM)
```

FIG. A6.1 Repeating Field Specifications *(continued)*

```
SDESHxxx SHOUHxxx   HEAT SOAK DESCRIPTION

DOWNHxxx DOWNHxxx   DOWNTIME TEST HOURS (HHH:MM)

DDATHxxx DOWNHxxx   DOWNTIME DATE (YYYYMMDD)

DTIMHxxx DOWNHxxx   DOWNTIME TIME (HHH:MM)

DREAHxxx DOWNHxxx   DOWNTIME REASON

OCOMHxxx OCOMHxxx   OTHER COMMENTS

SCFHHxxx SCFHHxxx   AIR BOX LINER SCUFF HOURS (HH:MM)

SCFDHxxx SCFHHxxx   AIR BOX LINER SCUFF DATE (YYYYMMDD)

LS1LHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT 1L (% AREA)

LS2LHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT 2L (% AREA)

LS3LHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT 3L (% AREA)

LS1RHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT 1R (% AREA)

LS2RHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT 2R (% AREA)

LS3RHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT 3R (% AREA)

LSAVHxxx SCFHHxxx   AIR BOX LINER SCUFF PERCENT AVG (% AREA)

ABREHxxx SCFHHxxx   REASON FOR AIR BOX INSPECTION POST BREAKIN

PARAHxxx PARAHxxx   NAME OF PARAMETER OF OUTLIER DATA POINT

VALUHxxx PARAHxxx   VALUE OF PARAMETER OF OUTLIER DATA POINT

TESTHxxx PARAHxxx   TEST TIME OF OUTLIER DATA POINT (HHH:MM)

-n
```

FIG. A6.1 Repeating Field Specifications *(continued)*

29-apr-1999

Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
10	0	6V92	VERSION	8	0	C	YYYYMMDD	6V92 VERSION 19990414
20	0	6V92	TSTSPON1	40	0	C		CONDUCTED FOR, FIRST LINE
30	0	6V92	TSTSPON2	40	0	C		CONDUCTED FOR, SECOND LINE
40	0	6V92	LABVALID	1	0	C	V, I OR N	TEST LAB VALIDATION (V, I OR N)
50	0	6V92	STAND	5	0	C		NON-REFERENCE STAND
60	0	6V92	STRUN	4	0	C		NON-REFERENCE STAND RUN
70	0	6V92	RSTRUN	4	0	C		STAND RUN
80	0	6V92	ENGINE	6	0	C		NON-REFERENCE ENGINE
90	0	6V92	RENGINE	6	0	C		ENGINE
100	0	6V92	ENRUN	4	0	C		NON-REFERENCE ENGINE RUN
110	0	6V92	RENRUN	4	0	C		ENGINE RUN
120	0	6V92	RDTCOMP	8	0	C	YYYYMMDD	COMPLETED DATE(YYYYMMDD)
130	0	6V92	DTCOMP	8	0	C	YYYYMMDD	NON-REFERENCE COMPLETED DATE (YYYYMMDD)
140	0	6V92	REOTTIME	5	0	C	HH:MM	COMPLETED TIME (HH:MM)
150	0	6V92	EOTTIME	5	0	C	HH:MM	END OF TEST TIME (HH:MM)
160	0	6V92	OILCODE	38	0	C		NON-REFERENCE OIL CODE
170	0	6V92	CMIR	6	0	C		CMIR
180	0	6V92	FORM	38	0	C		FORMULATION//STAND CODE
190	0	6V92	ALTCODE1	10	0	C		ALTERNATE OIL CODE 1
200	0	6V92	ALTCODE2	10	0	C		ALTERNATE OIL CODE 2
210	0	6V92	ALTCODE3	10	0	C		ALTERNATE OIL CODE 3
220	0	6V92	OPVALID	8	0	C		OPERATIONAL VALIDITY -- HAS/HAS NOT
230	0	6V92	SUBLAB	40	0	C		SUBMITTED BY: TESTING LABORATORY
240	0	6V92	SUBSIGIM	70	0	C		SUBMITTED BY: SIGNATURE IMAGE
250	0	6V92	SUBNAME	40	0	C		SUBMITTED BY: SIGNATURE TYPED NAME
260	0	6V92	SUBTITLE	40	0	C		SUBMITTED BY: TITLE
270	1	6V92	LAB	2	0	C		LAB CODE
280	1	6V92	RLABOCOD	12	0	C		REFERENCE LABORATORY INTERNAL OIL CODE
290	1	6V92	RSAEVISC	7	0	C		REFERENCE SAE VISCOSITY GRADE
300	1	6V92	RTESTLEN	3	0	Z	HHH	REFERENCE TEST LENGTH (HHH)
310	1	6V92	RDTSTRT	8	0	C	YYYYMMDD	REFERENCE STARTING DATE (YYYYMMDD)
320	1	6V92	LABOCODE	12	0	C		LABORATORY INTERNAL OIL CODE
330	1	6V92	SAEVISC	7	0	C		SAE VISCOSITY GRADE
340	1	6V92	TESTLEN	3	0	Z	HHH	TEST LENGTH (HHH)
350	1	6V92	DTSTRT	8	0	C	YYYYMMDD	STARTING DATE(YYYYMMDD)
360	1	6V92	IND	6	0	C		TMC OIL CODE
370	1	6V92	EFFDATE	8	0	C	YYYYMMDD	ACCEPTANCE LIMIT EFFECTIVE DATE (YYYYMMDD)
380	1	6V92	RLFRD	7	3	N	DEMERITS	AVG LAB FIRE RING DISTRESS 6V92T (DEMERITS)
390	1	6V92	RL23A	7	3	N	DEMERITS	AVG LAB 2ND & 3RD RING AVG 6V92T (DEMERITS)
400	1	6V92	RLDSA6	5	1	N	% AREA	LINER DISTRESS AVG 6 (% AREA)
410	1	6V92	RRFRD	7	3	N	DEMERITS	AVG REF FIRE RING DISTRESS 6V92T (DEMERITS)
420	1	6V92	RR23A	7	3	N	DEMERITS	AVG REF 2ND & 3RD RING AVG 6V92T (DEMERITS)
430	1	6V92	RRLDSA6	5	1	N	% AREA	REF LINER DISTRESS AVG 6 (% AREA)
440	1	6V92	RAFRD	7	3	N	DEMERITS	AVG OF REF & LAB FIRE RING DISTRESS (DEMERITS)
450	1	6V92	RA23A	7	3	N	DEMERITS	AVG OF REF & LAB 2ND & 3RD RING AVG (DEMERITS)
460	1	6V92	RALDSA6	5	1	N	% AREA	AVG OF REF & LAB LINER DISTRESS (% AREA)
470	1	6V92	IMINFRD	7	3	N	DEMERITS	INDUSTRY MIN FIRE RING DISTRESS (DEMERITS)
480	1	6V92	IMINA23	7	3	N	DEMERITS	INDUSTRY MIN 2ND & 3RD RING AVG (DEMERITS)
490	1	6V92	IMINALD	5	1	N	% AREA	INDUSTRY MIN LINER DISTRESS (% AREA)
500	1	6V92	IMAXFRD	7	3	N	DEMERITS	INDUSTRY MAX FIRE RING DISTRESS (DEMERITS)
510	1	6V92	IMAXA23	7	3	N	DEMERITS	INDUSTRY MAX 2ND & 3RD RING AVG (DEMERITS)
520	1	6V92	IMAXALD	5	1	N	% AREA	INDUSTRY MAX LINER DISTRESS (% AREA)
530	1	6V92	IMENFRD	7	3	N	DEMERITS	INDUSTRY MEAN FIRE RING DISTRESS (DEMERITS)

FIG. A6.2 Data Dictionary

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
540	1	6V92	IMENA23	7	3	N	DEMERITS	INDUSTRY MEAN 2ND & 3RD RING AVG (DEMERITS)
550	1	6V92	IMENALD	5	1	N	% AREA	INDUSTRY MEAN LINER DISTRESS (% AREA)
560	1	6V92	LFRD	7	3	N	DEMERITS	NON-REFERENCE AVG LAB FIRE RING DISTRESS (DEMERITS)
570	1	6V92	L23A	7	3	N	DEMERITS	NON-REFERENCE AVG LAB 2ND & 3RD RING AVG (DEMERITS)
580	1	6V92	LDSA6	5	1	N	% AREA	NON-REFERENCE LAB LINER DISTRESS AVG 6 (% AREA)
590	1	6V92	RFRD	7	3	N	DEMERITS	NON-REFERENCE AVG REF FIRE RING DISTRESS (DEMERITS)
600	1	6V92	R23A	7	3	N	DEMERITS	NON-REFERENCE AVG REF 2ND & 3RD RING AVG (DEMERITS)
610	1	6V92	RDSA6	5	1	N	% AREA	NON-REFERENCE REF LINER DISTRESS AVG 6 (% AREA)
620	1	6V92	AFRD	7	3	N	DEMERITS	NON-REFERENCE AVG OF REF & LAB FIRE RING DISTRESS (DEMERITS)
630	1	6V92	A23A	7	3	N	DEMERITS	NON-REFERENCE AVG OF REF & LAB 2ND & 3RD RING AVG (DEMERITS)
640	1	6V92	ALDSA6	5	1	N	% AREA	NON-REFERENCE AVG OF REF & LAB LINER DISTRESS (% AREA)
650	1	6V92	LFRDCF	7	3	N	DEMERITS	NON-REF. CORRECTION FACTOR LAB FIRE RING DISTRESS (DEMERITS)
660	1	6V92	L23ACF	7	3	N	DEMERITS	NON-REF. COR. FACTOR AVG LAB 2ND & 3RD RING AVG (DEMERITS)
670	1	6V92	LDSA6CF	5	1	N	% AREA	NON-REF. CORRECTION FACTOR LAB LINER DISTRESS AVG 6 (% AREA)
680	1	6V92	LFRDFNL	7	3	N	DEMERITS	NON-REF. FINAL RESULT LAB FIRE RING DISTRESS (DEMERITS)
690	1	6V92	L23AFNL	7	3	N	DEMERITS	NON-REF. FINAL RESULT AVG LAB 2ND & 3RD RING AVG (DEMERITS)
700	1	6V92	LDSA6FNL	5	1	N	% AREA	NON-REF. FINAL RESULT LAB LINER DISTRESS AVG 6 (% AREA)
710	2	6V92	RFUELSUP	16	0	C		FUEL SUPPLIER
720	2	6V92	RBRKRING	4	0	N	#	NUMBER OF BROKEN RINGS (#)
730	2	6V92	RMPP	5	1	N	% AREA	MAX PORT PLUGGING (% AREA)
740	2	6V92	RAPP	5	1	N	% AREA	AVG PORT PLUGGING (% AREA)
750	2	6V92	RMAXPSTR	5	1	N	% AREA	MAX PISTON SKIRT TIN REMOVAL (% AREA)
760	2	6V92	RAVGPSTR	5	1	N	% AREA	AVG PISTON SKIRT TIN REMOVAL (% AREA)
770	2	6V92	ROILFE	6	0	A	ppm	IRON AT 96 HOURS [<] (ppm)
780	2	6V92	ROILCON	4	0	N	g/h	AVERAGE OIL CONSUMPTION (g/h)
790	3	6V92	FUELSUP	16	0	C		NON-REFERENCE FUEL SUPPLIER
800	3	6V92	BRKRING	4	0	N	#	NON-REFERENCE NUMBER OF BROKEN RINGS (#)
810	3	6V92	MPP	5	1	N	% AREA	NON-REFERENCE MAX PORT PLUGGING (% AREA)
820	3	6V92	APP	5	1	N	% AREA	NON-REFERENCE AVG PORT PLUGGING (% AREA)
830	3	6V92	MAXPSTR	5	1	N	% AREA	NON-REFERENCE MAX PISTON SKIRT TIN REMOVAL (% AREA)
840	3	6V92	AVGPSTR	5	1	N	% AREA	NON-REFERENCE AVG PISTON SKIRT TIN REMOVAL (% AREA)
850	3	6V92	OILFE	6	0	A	ppm	NON-REFERENCE OIL IRON CONTENT AT 96 HOURS [<] (ppm)
860	3	6V92	OILCON	4	0	N	g/h	NON-REFERENCE AVERAGE OIL CONSUMPTION (g/h)
870	4	6V92	LARPM	6	0	N	r/min	AVG ENGINE SPEED - LOAD (r/min)
880	4	6V92	LSRPM	6	0	N	STD DEV	ENGINE SPEED STANDARD DEVIATION - LOAD (STD DEV)
890	4	6V92	LIRPM	6	0	N	r/min	MIN ENGINE SPEED - LOAD (r/min)
900	4	6V92	LXRPM	6	0	N	r/min	MAX ENGINE SPEED - LOAD (r/min)
910	4	6V92	LALOAD	5	0	N	Nm	AVG LOAD - LOAD (Nm)
920	4	6V92	LSLOAD	5	0	N	STD DEV	LOAD STANDARD DEVIATION - LOAD (STD DEV)
930	4	6V92	LILOAD	5	0	N	Nm	MIN LOAD - LOAD (Nm)
940	4	6V92	LXLOAD	5	0	N	Nm	MAX LOAD - LOAD (Nm)
950	4	6V92	LAPWR	5	0	N	kW	AVG POWER - LOAD (kW)
960	4	6V92	LSPWR	5	0	N	STD DEV	POWER STANDARD DEVIATION - LOAD (STD DEV)
970	4	6V92	LIPWR	5	0	N	kW	MIN POWER - LOAD (kW)
980	4	6V92	LXPWR	5	0	N	kW	MAX POWER - LOAD (kW)
990	4	6V92	LAFFLO	5	1	N	kg/h	AVG FUEL FLOW - LOAD (kg/h)
1000	4	6V92	LSFFLO	5	1	N	STD DEV	FUEL FLOW STANDARD DEVIATION - LOAD (STD DEV)
1010	4	6V92	LIFFLO	5	1	N	kg/h	MIN FUEL FLOW - LOAD (kg/h)
1020	4	6V92	LXFFLO	5	1	N	kg/h	MAX FUEL FLOW - LOAD (kg/h)
1030	4	6V92	LABSFC	5	1	N	g/kWh	AVG BSFC - LOAD (g/kWh)
1040	4	6V92	LSBSFC	5	1	N	STD DEV	BSFC STANDARD DEVIATION - LOAD (STD DEV)
1050	4	6V92	LIBSFC	5	1	N	g/kWh	MIN BSFC - LOAD (g/kWh)
1060	4	6V92	LXBSFC	5	1	N	g/kWh	MAX BSFC - LOAD (g/kWh)
1070	4	6V92	LACOLOUT	6	1	N	°C	AVG COOLANT OUT TEMP - LOAD (°C)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
1080	4	6V92	LSCOLOUT	6	1	N	STD DEV	COOLANT OUT TEMP STANDARD DEVIATION - LOAD (STD DEV)
1090	4	6V92	LICOLOUT	6	1	N	°C	MIN COOLANT OUT TEMP - LOAD (°C)
1100	4	6V92	LXCOLOUT	6	1	N	°C	MAX COOLANT OUT TEMP - LOAD (°C)
1110	4	6V92	LACOLIN	6	1	N	°C	AVG COOLANT IN TEMP - LOAD (°C)
1120	4	6V92	LSCOLIN	6	1	N	STD DEV	COOLANT IN TEMP STANDARD DEVIATION - LOAD (STD DEV)
1130	4	6V92	LICOLIN	6	1	N	°C	MIN COOLANT IN TEMP - LOAD (°C)
1140	4	6V92	LXCOLIN	6	1	N	°C	MAX COOLANT IN TEMP - LOAD (°C)
1150	4	6V92	LACOLDT	5	1	N	°C	AVG COOLANT DELTA T - LOAD (°C)
1160	4	6V92	LSCOLDT	5	1	N	STD DEV	COOLANT DELTA T STANDARD DEVIATION - LOAD (STD DEV)
1170	4	6V92	LICOLDT	5	1	N	°C	MIN COOLANT DELTA T - LOAD (°C)
1180	4	6V92	LXCOLDT	5	1	N	°C	MAX COOLANT DELTA T - LOAD (°C)
1190	4	6V92	LAOILTEM	6	1	N	°C	AVG OIL GALLERY TEMP - LOAD (°C)
1200	4	6V92	LSOILTEM	6	1	N	STD DEV	OIL GALLERY TEMP STANDARD DEVIATION - LOAD (STD DEV)
1210	4	6V92	LIOILTEM	6	1	N	°C	MIN OIL GALLERY TEMP - LOAD (°C)
1220	4	6V92	LXOILTEM	6	1	N	°C	MAX OIL GALLERY TEMP - LOAD (°C)
1230	4	6V92	LASUMPT	6	1	N	°C	AVG OIL SUMP TEMP - LOAD (°C)
1240	4	6V92	LSSUMPT	6	1	N	STD DEV	OIL SUMP TEMP STANDARD DEVIATION - LOAD (STD DEV)
1250	4	6V92	LISUMPT	6	1	N	°C	MIN OIL SUMP TEMP - LOAD (°C)
1260	4	6V92	LXSUMPT	6	1	N	°C	MAX OIL SUMP TEMP - LOAD (°C)
1270	4	6V92	LAFFILT	5	1	N	°C	AVG FUEL TEMP - LOAD (°C)
1280	4	6V92	LSFFILT	5	1	N	STD DEV	FUEL TEMP STANDARD DEVIATION - LOAD (STD DEV)
1290	4	6V92	LIFFILT	5	1	N	°C	MIN FUEL TEMP - LOAD (°C)
1300	4	6V92	LXFFILT	5	1	N	°C	MAX FUEL TEMP - LOAD (°C)
1310	4	6V92	LAINT	5	1	N	°C	AVG AIR INLET TEMP - LOAD (°C)
1320	4	6V92	LSINT	5	1	N	STD DEV	AIR INLET TEMP STANDARD DEVIATION - LOAD (STD DEV)
1330	4	6V92	LIINT	5	1	N	°C	MIN AIR INLET TEMP - LOAD (°C)
1340	4	6V92	LXINT	5	1	N	°C	MAX AIR INLET TEMP - LOAD (°C)
1350	4	6V92	LABOXT	5	1	N	°C	AVG AIR BOX TEMP - LOAD (°C)
1360	4	6V92	LSBOXT	5	1	N	STD DEV	AIR BOX TEMP STANDARD DEVIATION - LOAD (STD DEV)
1370	4	6V92	LIBOXT	5	1	N	°C	MIN AIR BOX TEMP - LOAD (°C)
1380	4	6V92	LXBOXT	5	1	N	°C	MAX AIR BOX TEMP - LOAD (°C)
1390	4	6V92	LAEXHT	6	1	N	°C	AVG EXHAUST TEMP - LOAD (°C)
1400	4	6V92	LSEXHT	6	1	N	STD DEV	EXHAUST TEMP STANDARD DEVIATION - LOAD (STD DEV)
1410	4	6V92	LIEXHT	6	1	N	°C	MIN EXHAUST TEMP - LOAD (°C)
1420	4	6V92	LXEXHT	6	1	N	°C	MAX EXHAUST TEMP - LOAD (°C)
1430	4	6V92	LAOILPRS	6	1	N	kPa	AVG OIL GALLERY PRESSURE - LOAD (kPa)
1440	4	6V92	LSOILPRS	6	1	N	STD DEV	OIL GALLERY PRESSURE STANDARD DEVIATION - LOAD (STD DEV)
1450	4	6V92	LIOILPRS	6	1	N	kPa	MIN OIL GALLERY PRESSURE - LOAD (kPa)
1460	4	6V92	LXOILPRS	6	1	N	kPa	MAX OIL GALLERY PRESSURE - LOAD (kPa)
1470	4	6V92	LAINPRES	5	1	N	kPa	AVG AIR INLET PRESSURE - LOAD (kPa)
1480	4	6V92	LSINPRES	5	1	N	STD DEV	AIR INLET PRESSURE STANDARD DEVIATION - LOAD (STD DEV)
1490	4	6V92	LIINPRES	5	1	N	kPa	MIN AIR INLET PRESSURE - LOAD (kPa)
1500	4	6V92	LXINPRES	5	1	N	kPa	MAX AIR INLET PRESSURE - LOAD (kPa)
1510	4	6V92	LAFPRES	5	1	N	kPa	AVG FUEL PRESSURE - LOAD (kPa)
1520	4	6V92	LSFPRES	5	1	N	STD DEV	FUEL PRESSURE STANDARD DEVIATION - LOAD (STD DEV)
1530	4	6V92	LIFPRES	5	1	N	kPa	MIN FUEL PRESSURE - LOAD (kPa)
1540	4	6V92	LXFPRES	5	1	N	kPa	MAX FUEL PRESSURE - LOAD (kPa)
1550	4	6V92	LABOXPRS	5	1	N	kPa	AVG AIR BOX PRESSURE - LOAD (kPa)
1560	4	6V92	LSBOXPRS	5	1	N	STD DEV	AIR BOX PRESSURE STANDARD DEVIATION - LOAD (STD DEV)
1570	4	6V92	LIBOXPRS	5	1	N	kPa	MIN AIR BOX PRESSURE - LOAD (kPa)
1580	4	6V92	LXBOXPRS	5	1	N	kPa	MAX AIR BOX PRESSURE - LOAD (kPa)
1590	4	6V92	LATURPRS	5	1	N	kPa	AVG TURBO OUTLET PRESSURE - LOAD (kPa)
1600	4	6V92	LSTURPRS	5	1	N	STD DEV	TURBO OUTLET PRESSURE STANDARD DEVIATION - LOAD (STD DEV)
1610	4	6V92	LITURPRS	5	1	N	kPa	MIN TURBO OUTLET PRESSURE - LOAD (kPa)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
1620	4	6V92	LXTURPRS	5	1	N	kPa	MAX TURBO OUTLET PRESSURE - LOAD (kPa)
1630	5	6V92	PARPM	6	0	N	r/min	AVG ENGINE SPEED - POWER (r/min)
1640	5	6V92	PSRPM	6	0	N	STD DEV	ENGINE SPEED STANDARD DEVIATION - POWER (STD DEV)
1650	5	6V92	PIRPM	6	0	N	r/min	MIN ENGINE SPEED - POWER (r/min)
1660	5	6V92	PXRPM	6	0	N	r/min	MAX ENGINE SPEED - POWER (r/min)
1670	5	6V92	PALOAD	5	0	N	Nm	AVG LOAD - POWER (Nm)
1680	5	6V92	PSLOAD	5	0	N	STD DEV	LOAD STANDARD DEVIATION - POWER (STD DEV)
1690	5	6V92	PILOAD	5	0	N	Nm	MIN LOAD - POWER (Nm)
1700	5	6V92	PXLOAD	5	0	N	Nm	MAX LOAD - POWER (Nm)
1710	5	6V92	PAPWR	5	0	N	kW	AVG POWER - POWER (kW)
1720	5	6V92	PSPWR	5	0	N	STD DEV	POWER STANDARD DEVIATION - POWER (STD DEV)
1730	5	6V92	PIPWR	5	0	N	kW	MIN POWER - POWER (kW)
1740	5	6V92	PXPWR	5	0	N	kW	MAX POWER - POWER (kW)
1750	5	6V92	PAFFLO	5	1	N	kg/h	AVG FUEL FLOW - POWER (kg/h)
1760	5	6V92	PSFFLO	5	1	N	STD DEV	FUEL FLOW STANDARD DEVIATION - POWER (STD DEV)
1770	5	6V92	PIFFLO	5	1	N	kg/h	MIN FUEL FLOW - POWER (kg/h)
1780	5	6V92	PXFFLO	5	1	N	STD DEV	MAX FUEL FLOW - POWER (KG/H)
1790	5	6V92	PABSFC	5	1	N	g/kWh	AVG BSFC - POWER (g/kWh)
1800	5	6V92	PSBSFC	5	1	N	STD DEV	BSFC STANDARD DEVIATION - POWER (STD DEV)
1810	5	6V92	PIBSFC	5	1	N	g/kWh	MIN BSFC - POWER (g/kWh)
1820	5	6V92	PXBSFC	5	1	N	g/kWh	MAX BSFC - POWER (g/kWh)
1830	5	6V92	PACOLOUT	6	1	N	°C	AVG COOLANT OUT TEMP - POWER (°C)
1840	5	6V92	PSCOLOUT	6	1	N	STD DEV	COOLANT OUT TEMP STANDARD DEVIATION - POWER (STD DEV)
1850	5	6V92	PICOLOUT	6	1	N	°C	MIN COOLANT OUT TEMP - POWER (°C)
1860	5	6V92	PXCOLOUT	6	1	N	°C	MAX COOLANT OUT TEMP - POWER (°C)
1870	5	6V92	PACOLIN	6	1	N	°C	AVG COOLANT IN TEMP - POWER (°C)
1880	5	6V92	PSCOLIN	6	1	N	STD DEV	COOLANT IN TEMP STANDARD DEVIATION - POWER (STD DEV)
1890	5	6V92	PICOLIN	6	1	N	°C	MIN COOLANT IN TEMP - POWER (°C)
1900	5	6V92	PXCOLIN	6	1	N	°C	MAX COOLANT IN TEMP - POWER (°C)
1910	5	6V92	PACOLDT	5	1	N	°C	AVG COOLANT DELTA T - POWER (°C)
1920	5	6V92	PSCOLDT	5	1	N	STD DEV	COOLANT DELTA T STANDARD DEVIATION - POWER (STD DEV)
1930	5	6V92	PICOLDT	5	1	N	°C	MIN COOLANT DELTA T - POWER (°C)
1940	5	6V92	PXCOLDT	5	1	N	°C	MAX COOLANT DELTA T - POWER (°C)
1950	5	6V92	PAOILTEM	6	1	N	°C	AVG OIL GALLERY TEMP - POWER (°C)
1960	5	6V92	PSOILTEM	6	1	N	STD DEV	OIL GALLERY TEMP STANDARD DEVIATION - POWER (STD DEV)
1970	5	6V92	PIOILTEM	6	1	N	°C	MIN OIL GALLERY TEMP - POWER (°C)
1980	5	6V92	PXOILTEM	6	1	N	°C	MAX OIL GALLERY TEMP - POWER (°C)
1990	5	6V92	PASUMPT	6	1	N	°C	AVG OIL SUMP TEMP - POWER (°C)
2000	5	6V92	PSSUMPT	6	1	N	STD DEV	OIL SUMP TEMP STANDARD DEVIATION - POWER (STD DEV)
2010	5	6V92	PISUMPT	6	1	N	°C	MIN OIL SUMP TEMP - POWER (°C)
2020	5	6V92	PXSUMPT	6	1	N	°C	MAX OIL SUMP TEMP - POWER (°C)
2030	5	6V92	PAFFILT	5	1	N	°C	AVG FUEL TEMP - POWER (°C)
2040	5	6V92	PSFFILT	5	1	N	STD DEV	FUEL TEMP STANDARD DEVIATION - POWER (STD DEV)
2050	5	6V92	PIFFILT	5	1	N	°C	MIN FUEL TEMP - POWER (°C)
2060	5	6V92	PXFFILT	5	1	N	°C	MAX FUEL TEMP - POWER (°C)
2070	5	6V92	PAINT	5	1	N	°C	AVG AIR INLET TEMP - POWER (°C)
2080	5	6V92	PSINT	5	1	N	STD DEV	AIR INLET TEMP STANDARD DEVIATION - POWER (STD DEV)
2090	5	6V92	PIINT	5	1	N	°C	MIN AIR INLET TEMP - POWER (°C)
2100	5	6V92	PXINT	5	1	N	°C	MAX AIR INLET TEMP - POWER (°C)
2110	5	6V92	PABOXT	5	1	N	°C	AVG AIR BOX TEMP - POWER (°C)
2120	5	6V92	PSBOXT	5	1	N	STD DEV	AIR BOX TEMP STANDARD DEVIATION - POWER (STD DEV)
2130	5	6V92	PIBOXT	5	1	N	°C	MIN AIR BOX TEMP - POWER (°C)
2140	5	6V92	PXBOXT	5	1	N	°C	MAX AIR BOX TEMP - POWER (°C)
2150	5	6V92	PAEXHT	6	1	N	°C	AVG EXHAUST TEMP - POWER (°C)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
2160	5	6V92	PSEXHT	6	1	N	STD DEV	EXHAUST TEMP STANDARD DEVIATION - POWER (STD DEV)
2170	5	6V92	PIEXHT	6	1	N	°C	MIN EXHAUST TEMP - POWER (°C)
2180	5	6V92	PXEXHT	6	1	N	°C	MAX EXHAUST TEMP - POWER (°C)
2190	5	6V92	PAOILPRS	6	1	N	kPa	AVG OIL GALLERY PRESSURE - POWER (kPa)
2200	5	6V92	PSOILPRS	6	1	N	STD DEV	OIL GALLERY PRESSURE STANDARD DEVIATION - POWER (STD DEV)
2210	5	6V92	PIOILPRS	6	1	N	kPa	MIN OIL GALLERY PRESSURE - POWER (kPa)
2220	5	6V92	PXOILPRS	6	1	N	kPa	MAX OIL GALLERY PRESSURE - POWER (kPa)
2230	5	6V92	PAINPRES	5	1	N	kPa	AVG AIR INLET PRESSURE - POWER (kPa)
2240	5	6V92	PSINPRES	5	1	N	STD DEV	AIR INLET PRESSURE STANDARD DEVIATION - POWER (STD DEV)
2250	5	6V92	PIINPRES	5	1	N	kPa	MIN AIR INLET PRESSURE - POWER (kPa)
2260	5	6V92	PXINPRES	5	1	N	kPa	MAX AIR INLET PRESSURE - POWER (kPa)
2270	5	6V92	PAFPRES	5	1	N	kPa	AVG FUEL PRESSURE - POWER (kPa)
2280	5	6V92	PSFPRES	5	1	N	STD DEV	FUEL PRESSURE STANDARD DEVIATION - POWER (STD DEV)
2290	5	6V92	PIFPRES	5	1	N	kPa	MIN FUEL PRESSURE - POWER (kPa)
2300	5	6V92	PXFPRES	5	1	N	kPa	MAX FUEL PRESSURE - POWER (kPa)
2310	5	6V92	PABOXPRS	5	1	N	kPa	AVG AIR BOX PRESSURE - POWER (kPa)
2320	5	6V92	PSBOXPRS	5	1	N	STD DEV	AIR BOX PRESSURE STANDARD DEVIATION - POWER (STD DEV)
2330	5	6V92	PIBOXPRS	5	1	N	kPa	MIN AIR BOX PRESSURE - POWER (kPa)
2340	5	6V92	PXBOXPRS	5	1	N	kPa	MAX AIR BOX PRESSURE - POWER (kPa)
2350	5	6V92	PATURPRS	5	1	N	kPa	AVG TURBO OUTLET PRESSURE - POWER (kPa)
2360	5	6V92	PSTURPRS	5	1	N	STD DEV	TURBO OUTLET PRESSURE STANDARD DEVIATION - POWER (STD DEV)
2370	5	6V92	PITURPRS	5	1	N	kPa	MIN TURBO OUTLET PRESSURE - POWER (kPa)
2380	5	6V92	PXTURPRS	5	1	N	kPa	MAX TURBO OUTLET PRESSURE - POWER (kPa)
2390	6	6V92	TLDS1L	5	0	N	% AREA	LINER DISTRESS 1L THRUST (% AREA)
2400	6	6V92	TLDS2L	5	0	N	% AREA	LINER DISTRESS 2L THRUST (% AREA)
2410	6	6V92	TLDS3L	5	0	N	% AREA	LINER DISTRESS 3L THRUST (% AREA)
2420	6	6V92	TLDS1R	5	0	N	% AREA	LINER DISTRESS 1R THRUST (% AREA)
2430	6	6V92	TLDS2R	5	0	N	% AREA	LINER DISTRESS 2R THRUST (% AREA)
2440	6	6V92	TLDS3R	5	0	N	% AREA	LINER DISTRESS 3R THRUST (% AREA)
2450	6	6V92	TLDSA6	6	1	N	% AREA	LINER DISTRESS AVG 6 THRUST (% AREA)
2460	6	6V92	ATLDS1L	5	0	N	% AREA	LINER DISTRESS 1L ANTI-THRUST (% AREA)
2470	6	6V92	ATLDS2L	5	0	N	% AREA	LINER DISTRESS 2L ANTI-THRUST (% AREA)
2480	6	6V92	ATLDS3L	5	0	N	% AREA	LINER DISTRESS 3L ANTI-THRUST (% AREA)
2490	6	6V92	ATLDS1R	5	0	N	% AREA	LINER DISTRESS 1R ANTI-THRUST (% AREA)
2500	6	6V92	ATLDS2R	5	0	N	% AREA	LINER DISTRESS 2R ANTI-THRUST (% AREA)
2510	6	6V92	ATLDS3R	5	0	N	% AREA	LINER DISTRESS 3R ANTI-THRUST (% AREA)
2520	6	6V92	ATLDSA6	6	1	N	% AREA	LINER DISTRESS AVG 6 ANTI-THRUST (% AREA)
2530	6	6V92	LDS1L	5	0	N	% AREA	LINER DISTRESS 1L TOTAL (% AREA)
2540	6	6V92	LDS2L	5	0	N	% AREA	LINER DISTRESS 2L TOTAL (% AREA)
2550	6	6V92	LDS3L	5	0	N	% AREA	LINER DISTRESS 3L TOTAL (% AREA)
2560	6	6V92	LDS1R	5	0	N	% AREA	LINER DISTRESS 1R TOTAL (% AREA)
2570	6	6V92	LDS2R	5	0	N	% AREA	LINER DISTRESS 2R TOTAL (% AREA)
2580	6	6V92	LDS3R	5	0	N	% AREA	LINER DISTRESS 3R TOTAL (% AREA)
2590	6	6V92	LPP1L	5	1	N	% AREA	LINER PORT PLUGGING 1L (% AREA)
2600	6	6V92	LPP2L	5	1	N	% AREA	LINER PORT PLUGGING 2L (% AREA)
2610	6	6V92	LPP3L	5	1	N	% AREA	LINER PORT PLUGGING 3L (% AREA)
2620	6	6V92	LPP1R	5	1	N	% AREA	LINER PORT PLUGGING 1R (% AREA)
2630	6	6V92	LPP2R	5	1	N	% AREA	LINER PORT PLUGGING 2R (% AREA)
2640	6	6V92	LPP3R	5	1	N	% AREA	LINER PORT PLUGGING 3R (% AREA)
2650	6	6V92	LF1L92	6	3	N	DEMERITS	LAB FIRE RING 1L RATING 6V92T (DEMERITS)
2660	6	6V92	LF2L92	6	3	N	DEMERITS	LAB FIRE RING 2L RATING 6V92T (DEMERITS)
2670	6	6V92	LF3L92	6	3	N	DEMERITS	LAB FIRE RING 3L RATING 6V92T (DEMERITS)
2680	6	6V92	LF1R92	6	3	N	DEMERITS	LAB FIRE RING 1R RATING 6V92T (DEMERITS)
2690	6	6V92	LF2R92	6	3	N	DEMERITS	LAB FIRE RING 2R RATING 6V92T (DEMERITS)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
2700	6	6V92	LF3R92	6	3	N	DEMERITS	LAB FIRE RING 3R RATING 6V92T (DEMERITS)
2710	6	6V92	L21L92	6	3	N	DEMERITS	LAB 2ND RING 1L RATING 6V92T (DEMERITS)
2720	6	6V92	L22L92	6	3	N	DEMERITS	LAB 2ND RING 2L RATING 6V92T (DEMERITS)
2730	6	6V92	L23L92	6	3	N	DEMERITS	LAB 2ND RING 3L RATING 6V92T (DEMERITS)
2740	6	6V92	L21R92	6	3	N	DEMERITS	LAB 2ND RING 1R RATING 6V92T (DEMERITS)
2750	6	6V92	L22R92	6	3	N	DEMERITS	LAB 2ND RING 2R RATING 6V92T (DEMERITS)
2760	6	6V92	L23R92	6	3	N	DEMERITS	LAB 2ND RING 3R RATING 6V92T (DEMERITS)
2770	6	6V92	LR2D92	6	3	N	DEMERITS	AVG LAB 2ND RING DISTRESS 6V92T (DEMERITS)
2780	6	6V92	L31L92	6	3	N	DEMERITS	LAB 3RD RING 1L RATING 6V92T (DEMERITS)
2790	6	6V92	L32L92	6	3	N	DEMERITS	LAB 3RD RING 2L RATING 6V92T (DEMERITS)
2800	6	6V92	L33L92	6	3	N	DEMERITS	LAB 3RD RING 3L RATING 6V92T (DEMERITS)
2810	6	6V92	L31R92	6	3	N	DEMERITS	LAB 3RD RING 1R RATING 6V92T (DEMERITS)
2820	6	6V92	L32R92	6	3	N	DEMERITS	LAB 3RD RING 2R RATING 6V92T (DEMERITS)
2830	6	6V92	L33R92	6	3	N	DEMERITS	LAB 3RD RING 3R RATING 6V92T (DEMERITS)
2840	6	6V92	LR3D92	6	3	N	DEMERITS	AVG LAB 3RD RING DISTRESS 6V92T (DEMERITS)
2850	6	6V92	LA1L92	6	3	N	DEMERITS	LAB AVG 2ND & 3RD RING 1L RATING 6V92T (DEMERITS)
2860	6	6V92	LA2L92	6	3	N	DEMERITS	LAB AVG 2ND & 3RD RING 2L RATING 6V92T (DEMERITS)
2870	6	6V92	LA3L92	6	3	N	DEMERITS	LAB AVG 2ND & 3RD RING 3L RATING 6V92T (DEMERITS)
2880	6	6V92	LA1R92	6	3	N	DEMERITS	LAB AVG 2ND & 3RD RING 1R RATING 6V92T (DEMERITS)
2890	6	6V92	LA2R92	6	3	N	DEMERITS	LAB AVG 2ND & 3RD RING 2R RATING 6V92T (DEMERITS)
2900	6	6V92	LA3R92	6	3	N	DEMERITS	LAB AVG 2ND & 3RD RING 3R RATING 6V92T (DEMERITS)
2910	6	6V92	PSPR1L	5	0	N	% AREA	PISTON SKIRT PLATE REMOVAL 1L (% AREA)
2920	6	6V92	PSPR2L	5	0	N	% AREA	PISTON SKIRT PLATE REMOVAL 2L (% AREA)
2930	6	6V92	PSPR3L	5	0	N	% AREA	PISTON SKIRT PLATE REMOVAL 3L (% AREA)
2940	6	6V92	PSPR1R	5	0	N	% AREA	PISTON SKIRT PLATE REMOVAL 1R (% AREA)
2950	6	6V92	PSPR2R	5	0	N	% AREA	PISTON SKIRT PLATE REMOVAL 2R (% AREA)
2960	6	6V92	PSPR3R	5	0	N	% AREA	PISTON SKIRT PLATE REMOVAL 3R (% AREA)
2970	7	6V92	RRLAB	2	0	C		REFEREE LAB CODE
2980	7	6V92	RINIT	3	0	C		RATERS INITIALS
2990	7	6V92	RRDATE	8	0	C	YYYYMMDD	REFEREE RATING DATE (YYYYMMDD)
3000	7	6V92	RTLDS1L	5	0	N	% AREA	REF LINER DISTRESS 1L THRUST (% AREA)
3010	7	6V92	RTLDS2L	5	0	N	% AREA	REF LINER DISTRESS 2L THRUST (% AREA)
3020	7	6V92	RTLDS3L	5	0	N	% AREA	REF LINER DISTRESS 3L THRUST (% AREA)
3030	7	6V92	RTLDS1R	5	0	N	% AREA	REF LINER DISTRESS 1R THRUST (% AREA)
3040	7	6V92	RTLDS2R	5	0	N	% AREA	REF LINER DISTRESS 2R THRUST (% AREA)
3050	7	6V92	RTLDS3R	5	0	N	% AREA	REF LINER DISTRESS 3R THRUST (% AREA)
3060	7	6V92	RTLDSA6	6	1	N	% AREA	REF LINER DISTRESS AVG THRUST (% AREA)
3070	7	6V92	RATLDS1L	5	0	N	% AREA	REF LINER DISTRESS 1L ANTI-THRUST (% AREA)
3080	7	6V92	RATLDS2L	5	0	N	% AREA	REF LINER DISTRESS 2L ANTI-THRUST (% AREA)
3090	7	6V92	RATLDS3L	5	0	N	% AREA	REF LINER DISTRESS 3L ANTI-THRUST (% AREA)
3100	7	6V92	RATLDS1R	5	0	N	% AREA	REF LINER DISTRESS 1R ANTI-THRUST (% AREA)
3110	7	6V92	RATLDS2R	5	0	N	% AREA	REF LINER DISTRESS 2R ANTI-THRUST (% AREA)
3120	7	6V92	RATLDS3R	5	0	N	% AREA	REF LINER DISTRESS 3R ANTI-THRUST (% AREA)
3130	7	6V92	RATLDSA6	6	1	N	% AREA	REF LINER DISTRESS AVG ANTI-THRUST (% AREA)
3140	7	6V92	RLDS1L	5	0	N	% AREA	REF LINER DISTRESS 1L TOTAL (% AREA)
3150	7	6V92	RLDS2L	5	0	N	% AREA	REF LINER DISTRESS 2L TOTAL (% AREA)
3160	7	6V92	RLDS3L	5	0	N	% AREA	REF LINER DISTRESS 3L TOTAL (% AREA)
3170	7	6V92	RLDS1R	5	0	N	% AREA	REF LINER DISTRESS 1R TOTAL (% AREA)
3180	7	6V92	RLDS2R	5	0	N	% AREA	REF LINER DISTRESS 2R TOTAL (% AREA)
3190	7	6V92	RLDS3R	5	0	N	% AREA	REF LINER DISTRESS 3R TOTAL (% AREA)
3200	7	6V92	RF1L92	6	3	N	DEMERITS	REF FIRE RING 1L RATING 6V92T (DEMERITS)
3210	7	6V92	RF2L92	6	3	N	DEMERITS	REF FIRE RING 2L RATING 6V92T (DEMERITS)
3220	7	6V92	RF3L92	6	3	N	DEMERITS	REF FIRE RING 3L RATING 6V92T (DEMERITS)
3230	7	6V92	RF1R92	6	3	N	DEMERITS	REF FIRE RING 1R RATING 6V92T (DEMERITS)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
3240	7	6V92	RF2R92	6	3	N	DEMERITS	REF FIRE RING 2R RATING 6V92T (DEMERITS)
3250	7	6V92	RF3R92	6	3	N	DEMERITS	REF FIRE RING 3R RATING 6V92T (DEMERITS)
3260	7	6V92	R21L92	6	3	N	DEMERITS	REF 2ND RING 1L RATING 6V92T (DEMERITS)
3270	7	6V92	R22L92	6	3	N	DEMERITS	REF 2ND RING 2L RATING 6V92T (DEMERITS)
3280	7	6V92	R23L92	6	3	N	DEMERITS	REF 2ND RING 3L RATING 6V92T (DEMERITS)
3290	7	6V92	R21R92	6	3	N	DEMERITS	REF 2ND RING 1R RATING 6V92T (DEMERITS)
3300	7	6V92	R22R92	6	3	N	DEMERITS	REF 2ND RING 2R RATING 6V92T (DEMERITS)
3310	7	6V92	R23R92	6	3	N	DEMERITS	REF 2ND RING 3R RATING 6V92T (DEMERITS)
3320	7	6V92	RR2D92	6	3	N	DEMERITS	AVG REF 2ND RING DISTRESS 6V92T (DEMERITS)
3330	7	6V92	R31L92	6	3	N	DEMERITS	REF 3RD RING 1L RATING 6V92T (DEMERITS)
3340	7	6V92	R32L92	6	3	N	DEMERITS	REF 3RD RING 2L RATING 6V92T (DEMERITS)
3350	7	6V92	R33L92	6	3	N	DEMERITS	REF 3RD RING 3L RATING 6V92T (DEMERITS)
3360	7	6V92	R31R92	6	3	N	DEMERITS	REF 3RD RING 1R RATING 6V92T (DEMERITS)
3370	7	6V92	R32R92	6	3	N	DEMERITS	REF 3RD RING 2R RATING 6V92T (DEMERITS)
3380	7	6V92	R33R92	6	3	N	DEMERITS	REF 3RD RING 3R RATING 6V92T (DEMERITS)
3390	7	6V92	RR3D92	6	3	N	DEMERITS	AVG REF 3RD RING DISTRESS 6V92T (DEMERITS)
3400	7	6V92	RA1L92	6	3	N	DEMERITS	REF AVG 2ND & 3RD RING 1L RATING (DEMERITS)
3410	7	6V92	RA2L92	6	3	N	DEMERITS	REF AVG 2ND & 3RD RING 2L RATING (DEMERITS)
3420	7	6V92	RA3L92	6	3	N	DEMERITS	REF AVG 2ND & 3RD RING 3L RATING (DEMERITS)
3430	7	6V92	RA1R92	6	3	N	DEMERITS	REF AVG 2ND & 3RD RING 1R RATING (DEMERITS)
3440	7	6V92	RA2R92	6	3	N	DEMERITS	REF AVG 2ND & 3RD RING 2R RATING (DEMERITS)
3450	7	6V92	RA3R92	6	3	N	DEMERITS	REF AVG 2ND & 3RD RING 3R RATING (DEMERITS)
3460	8	6V92	WLF1L	8	4	A	g	WEIGHT LOSS FIRE RING 1L [N/A] (g)
3470	8	6V92	WLF2L	8	4	A	g	WEIGHT LOSS FIRE RING 2L [N/A] (g)
3480	8	6V92	WLF3L	8	4	A	g	WEIGHT LOSS FIRE RING 3L [N/A] (g)
3490	8	6V92	WLF1R	8	4	A	g	WEIGHT LOSS FIRE RING 1R [N/A] (g)
3500	8	6V92	WLF2R	8	4	A	g	WEIGHT LOSS FIRE RING 2R [N/A] (g)
3510	8	6V92	WLF3R	8	4	A	g	WEIGHT LOSS FIRE RING 3R [N/A] (g)
3520	8	6V92	WLFA6	8	4	A	g	WEIGHT LOSS FIRE RING AVG [N/A] (g)
3530	8	6V92	WL21L	8	4	N	g	WEIGHT LOSS 2ND RING 1L (g)
3540	8	6V92	WL22L	8	4	N	g	WEIGHT LOSS 2ND RING 2L (g)
3550	8	6V92	WL23L	8	4	N	g	WEIGHT LOSS 2ND RING 3L (g)
3560	8	6V92	WL21R	8	4	N	g	WEIGHT LOSS 2ND RING 1R (g)
3570	8	6V92	WL22R	8	4	N	g	WEIGHT LOSS 2ND RING 2R (g)
3580	8	6V92	WL23R	8	4	N	g	WEIGHT LOSS 2ND RING 3R (g)
3590	8	6V92	WL2A6	8	4	N	g	WEIGHT LOSS 2ND RING AVG (g)
3600	8	6V92	WL31L	8	4	N	g	WEIGHT LOSS 3RD RING 1L (g)
3610	8	6V92	WL32L	8	4	N	g	WEIGHT LOSS 3RD RING 2L (g)
3620	8	6V92	WL33L	8	4	N	g	WEIGHT LOSS 3RD RING 3L (g)
3630	8	6V92	WL31R	8	4	N	g	WEIGHT LOSS 3RD RING 1R (g)
3640	8	6V92	WL32R	8	4	N	g	WEIGHT LOSS 3RD RING 2R (g)
3650	8	6V92	WL33R	8	4	N	g	WEIGHT LOSS 3RD RING 3R (g)
3660	8	6V92	WL3A6	8	4	N	g	WEIGHT LOSS 3RD RING AVG (g)
3670	8	6V92	WLSB1L	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING 1L (g)
3680	8	6V92	WLSB2L	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING 2L (g)
3690	8	6V92	WLSB3L	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING 3L (g)
3700	8	6V92	WLSB1R	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING 1R (g)
3710	8	6V92	WLSB2R	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING 2R (g)
3720	8	6V92	WLSB3R	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING 3R (g)
3730	8	6V92	WLSBA6	8	4	N	g	WEIGHT LOSS SLIPPER BUSHING AVG (g)
3740	8	6V92	RWF1L	6	3	A	mm	RADIAL WEAR FIRE RING 1L [N/A] (mm)
3750	8	6V92	RWF2L	6	3	A	mm	RADIAL WEAR FIRE RING 2L [N/A] (mm)
3760	8	6V92	RWF3L	6	3	A	mm	RADIAL WEAR FIRE RING 3L [N/A] (mm)
3770	8	6V92	RWF1R	6	3	A	mm	RADIAL WEAR FIRE RING 1R [N/A] (mm)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
3780	8	6V92	RWF2R	6	3	A	mm	RADIAL WEAR FIRE RING 2R [N/A] (mm)
3790	8	6V92	RWF3R	6	3	A	mm	RADIAL WEAR FIRE RING 3R [N/A] (mm)
3800	8	6V92	RWFA6	6	3	A	mm	RADIAL WEAR FIRE RING AVG [N/A] (mm)
3810	8	6V92	RW21L	6	3	N	mm	RADIAL WEAR 2ND RING 1L (mm)
3820	8	6V92	RW22L	6	3	N	mm	RADIAL WEAR 2ND RING 2L (mm)
3830	8	6V92	RW23L	6	3	N	mm	RADIAL WEAR 2ND RING 3L (mm)
3840	8	6V92	RW21R	6	3	N	mm	RADIAL WEAR 2ND RING 1R (mm)
3850	8	6V92	RW22R	6	3	N	mm	RADIAL WEAR 2ND RING 2R (mm)
3860	8	6V92	RW23R	6	3	N	mm	RADIAL WEAR 2ND RING 3R (mm)
3870	8	6V92	RW2A6	6	3	N	mm	RADIAL WEAR 2ND RING AVG (mm)
3880	8	6V92	RW31L	6	3	N	mm	RADIAL WEAR 3RD RING 1L (mm)
3890	8	6V92	RW32L	6	3	N	mm	RADIAL WEAR 3RD RING 2L (mm)
3900	8	6V92	RW33L	6	3	N	mm	RADIAL WEAR 3RD RING 3L (mm)
3910	8	6V92	RW31R	6	3	N	mm	RADIAL WEAR 3RD RING 1R (mm)
3920	8	6V92	RW32R	6	3	N	mm	RADIAL WEAR 3RD RING 2R (mm)
3930	8	6V92	RW33R	6	3	N	mm	RADIAL WEAR 3RD RING 3R (mm)
3940	8	6V92	RW3A6	6	3	N	mm	RADIAL WEAR 3RD RING AVG (mm)
3950	8	6V92	RABW1L	6	3	N	mm	ROCKER ARM BUSHING WEAR 1L (mm)
3960	8	6V92	RABW2L	6	3	N	mm	ROCKER ARM BUSHING WEAR 2L (mm)
3970	8	6V92	RABW3L	6	3	N	mm	ROCKER ARM BUSHING WEAR 3L (mm)
3980	8	6V92	RABW1R	6	3	N	mm	ROCKER ARM BUSHING WEAR 1R (mm)
3990	8	6V92	RABW2R	6	3	N	mm	ROCKER ARM BUSHING WEAR 2R (mm)
4000	8	6V92	RABW3R	6	3	N	mm	ROCKER ARM BUSHING WEAR 3R (mm)
4010	8	6V92	RABWA6	6	3	N	mm	ROCKER ARM BUSHING WEAR AVG (mm)
4020	8	6V92	EGIF1L	6	3	A	mm	END GAP INCREASE FIRE RING 1L [N/A] (mm)
4030	8	6V92	EGIF2L	6	3	A	mm	END GAP INCREASE FIRE RING 2L [N/A] (mm)
4040	8	6V92	EGIF3L	6	3	A	mm	END GAP INCREASE FIRE RING 3L [N/A] (mm)
4050	8	6V92	EGIF1R	6	3	A	mm	END GAP INCREASE FIRE RING 1R [N/A] (mm)
4060	8	6V92	EGIF2R	6	3	A	mm	END GAP INCREASE FIRE RING 2R [N/A] (mm)
4070	8	6V92	EGIF3R	6	3	A	mm	END GAP INCREASE FIRE RING 3R [N/A] (mm)
4080	8	6V92	EGIFA6	6	3	A	mm	END GAP INCREASE FIRE RING AVG [N/A] (mm)
4090	8	6V92	EGI21L	6	3	N	mm	END GAP INCREASE 2ND RING 1L (mm)
4100	8	6V92	EGI22L	6	3	N	mm	END GAP INCREASE 2ND RING 2L (mm)
4110	8	6V92	EGI23L	6	3	N	mm	END GAP INCREASE 2ND RING 3L (mm)
4120	8	6V92	EGI21R	6	3	N	mm	END GAP INCREASE 2ND RING 1R (mm)
4130	8	6V92	EGI22R	6	3	N	mm	END GAP INCREASE 2ND RING 2R (mm)
4140	8	6V92	EGI23R	6	3	N	mm	END GAP INCREASE 2ND RING 3R (mm)
4150	8	6V92	EGI2A6	6	3	N	mm	END GAP INCREASE 2ND RING AVG (mm)
4160	8	6V92	EGI31L	6	3	N	mm	END GAP INCREASE 3RD RING 1L (mm)
4170	8	6V92	EGI32L	6	3	N	mm	END GAP INCREASE 3RD RING 2L (mm)
4180	8	6V92	EGI33L	6	3	N	mm	END GAP INCREASE 3RD RING 3L (mm)
4190	8	6V92	EGI31R	6	3	N	mm	END GAP INCREASE 3RD RING 1R (mm)
4200	8	6V92	EGI32R	6	3	N	mm	END GAP INCREASE 3RD RING 2R (mm)
4210	8	6V92	EGI33R	6	3	N	mm	END GAP INCREASE 3RD RING 3R (mm)
4220	8	6V92	EGI3A6	6	3	N	mm	END GAP INCREASE 3RD RING AVG (mm)
4230	8	6V92	EGIUGT1L	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING 1L (mm)
4240	8	6V92	EGIUGT2L	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING 2L (mm)
4250	8	6V92	EGIUGT3L	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING 3L (mm)
4260	8	6V92	EGIUGT1R	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING 1R (mm)
4270	8	6V92	EGIUGT2R	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING 2R (mm)
4280	8	6V92	EGIUGT3R	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING 3R (mm)
4290	8	6V92	EGIUGTA6	6	3	N	mm	END GAP INCREASE UPPER GROOVE TOP RING AVG (mm)
4300	8	6V92	EGIUGB1L	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING 1L (mm)
4310	8	6V92	EGIUGB2L	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING 2L (mm)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
4320	8	6V92	EGIUGB3L	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING 3L (mm)
4330	8	6V92	EGIUGB1R	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING 1R (mm)
4340	8	6V92	EGIUGB2R	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING 2R (mm)
4350	8	6V92	EGIUGB3R	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING 3R (mm)
4360	8	6V92	EGIUGBA6	6	3	N	mm	END GAP INCREASE UPPER GROOVE BOTTOM RING AVG (mm)
4370	8	6V92	EGILGT1L	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING 1L (mm)
4380	8	6V92	EGILGT2L	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING 2L (mm)
4390	8	6V92	EGILGT3L	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING 3L (mm)
4400	8	6V92	EGILGT1R	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING 1R (mm)
4410	8	6V92	EGILGT2R	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING 2R (mm)
4420	8	6V92	EGILGT3R	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING 3R (mm)
4430	8	6V92	EGILGTA6	6	3	N	mm	END GAP INCREASE LOWER GROOVE TOP RING AVG (mm)
4440	8	6V92	EGILGB1L	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING 1L (mm)
4450	8	6V92	EGILGB2L	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING 2L (mm)
4460	8	6V92	EGILGB3L	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING 3L (mm)
4470	8	6V92	EGILGB1R	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING 1R (mm)
4480	8	6V92	EGILGB2R	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING 2R (mm)
4490	8	6V92	EGILGB3R	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING 3R (mm)
4500	8	6V92	EGILGBA6	6	3	N	mm	END GAP INCREASE LOWER GROOVE BOTTOM RING AVG (mm)
4510	9	6V92	VIS_Hxxx	7	2	N	cSt	VISCOSITY AT 40 °C AT XXX HOURS (cSt)
4520	9	6V92	VIS1Hxxx	7	2	N	cSt	VISCOSITY AT 100 °C AT XXX HOURS (cSt)
4530	9	6V92	TBN_Hxxx	6	2	N	D4739	TOTAL BASE NUMBER AT XXX HOURS (D4739)
4540	9	6V92	VHTHSNEW	5	2	N	cP	VISCOSITY HT/HS AT 150 °C NEW (cP)
4550	9	6V92	VOLTHxxx	6	1	N	%	VOLATILITY PERCENT AT 371 °C AT XXX HOURS (%)
4560	9	6V92	FE__Hxxx	6	0	A	ppm	IRON HOURS [<] (ppm)
4570	9	6V92	SN__Hxxx	6	0	A	ppm	TIN HOURS [<] (ppm)
4580	9	6V92	PB__Hxxx	6	0	A	ppm	LEAD HOURS [<] (ppm)
4590	9	6V92	CU__Hxxx	6	0	A	ppm	COPPER HOURS [<] (ppm)
4600	9	6V92	CR__Hxxx	6	0	A	ppm	CHROMIUM HOURS [<] (ppm)
4610	9	6V92	AL__Hxxx	6	0	A	ppm	ALUMINUM HOURS [<] (ppm)
4620	9	6V92	SI__Hxxx	6	0	A	ppm	SILICON HOURS [<] (ppm)
4630	9	6V92	CA__Hxxx	6	0	A	ppm	CALCIUM HOURS [<] (ppm)
4640	9	6V92	MG__Hxxx	6	0	A	ppm	MAGNESIUM HOURS [<] (ppm)
4650	9	6V92	ZN__Hxxx	6	0	A	ppm	ZINC HOURS [<] (ppm)
4660	9	6V92	P___Hxxx	6	0	A	ppm	PHOSPHORUS HOURS [<] (ppm)
4670	9	6V92	MO__Hxxx	6	0	A	ppm	MOLYBDENUM HOURS [<] (ppm)
4680	9	6V92	B___Hxxx	6	0	A	ppm	BORON HOURS [<] (ppm)
4690	9	6V92	NA__Hxxx	6	0	A	ppm	SODIUM HOURS [<] (ppm)
4700	9	6V92	S___Hxxx	6	0	A	ppm	SULFUR HOURS [<] (ppm)
4710	10	6V92	W1F1L	8	4	N	g	START WEIGHT FIRE RING 1L (g)
4720	10	6V92	W1F2L	8	4	N	g	START WEIGHT FIRE RING 2L (g)
4730	10	6V92	W1F3L	8	4	N	g	START WEIGHT FIRE RING 3L (g)
4740	10	6V92	W1F1R	8	4	N	g	START WEIGHT FIRE RING 1R (g)
4750	10	6V92	W1F2R	8	4	N	g	START WEIGHT FIRE RING 2R (g)
4760	10	6V92	W1F3R	8	4	N	g	START WEIGHT FIRE RING 3R (g)
4770	10	6V92	W1FA6	8	4	N	g	START WEIGHT FIRE RING AVG (g)
4780	10	6V92	W121L	8	4	N	g	START WEIGHT 2ND RING 1L (g)
4790	10	6V92	W122L	8	4	N	g	START WEIGHT 2ND RING 2L (g)
4800	10	6V92	W123L	8	4	N	g	START WEIGHT 2ND RING 3L (g)
4810	10	6V92	W121R	8	4	N	g	START WEIGHT 2ND RING 1R (g)
4820	10	6V92	W122R	8	4	N	g	START WEIGHT 2ND RING 2R (g)
4830	10	6V92	W123R	8	4	N	g	START WEIGHT 2ND RING 3R (g)
4840	10	6V92	W12A6	8	4	N	g	START WEIGHT 2ND RING AVG (g)
4850	10	6V92	W131L	8	4	N	g	START WEIGHT 3RD RING 1L (g)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
4860	10	6V92	W132L	8	4	N	g	START WEIGHT 3RD RING 2L (g)
4870	10	6V92	W133L	8	4	N	g	START WEIGHT 3RD RING 3L (g)
4880	10	6V92	W131R	8	4	N	g	START WEIGHT 3RD RING 1R (g)
4890	10	6V92	W132R	8	4	N	g	START WEIGHT 3RD RING 2R (g)
4900	10	6V92	W133R	8	4	N	g	START WEIGHT 3RD RING 3R (g)
4910	10	6V92	W13A6	8	4	N	g	START WEIGHT 3RD RING AVG (g)
4920	10	6V92	W1SB1L	8	4	N	g	START WEIGHT SLIPPER BUSHING 1L (g)
4930	10	6V92	W1SB2L	8	4	N	g	START WEIGHT SLIPPER BUSHING 2L (g)
4940	10	6V92	W1SB3L	8	4	N	g	START WEIGHT SLIPPER BUSHING 3L (g)
4950	10	6V92	W1SB1R	8	4	N	g	START WEIGHT SLIPPER BUSHING 1R (g)
4960	10	6V92	W1SB2R	8	4	N	g	START WEIGHT SLIPPER BUSHING 2R (g)
4970	10	6V92	W1SB3R	8	4	N	g	START WEIGHT SLIPPER BUSHING 3R (g)
4980	10	6V92	W1SBA6	8	4	N	g	START WEIGHT SLIPPER BUSHING AVG (g)
4990	10	6V92	RT1F1L	6	3	N	mm	START THICKNESS FIRE RING 1L (mm)
5000	10	6V92	RT1F2L	6	3	N	mm	START THICKNESS FIRE RING 2L (mm)
5010	10	6V92	RT1F3L	6	3	N	mm	START THICKNESS FIRE RING 3L (mm)
5020	10	6V92	RT1F1R	6	3	N	mm	START THICKNESS FIRE RING 1R (mm)
5030	10	6V92	RT1F2R	6	3	N	mm	START THICKNESS FIRE RING 2R (mm)
5040	10	6V92	RT1F3R	6	3	N	mm	START THICKNESS FIRE RING 3R (mm)
5050	10	6V92	RT1FA6	6	3	N	mm	START THICKNESS FIRE RING AVG (mm)
5060	10	6V92	RT121L	6	3	N	mm	START THICKNESS 2ND RING 1L (mm)
5070	10	6V92	RT122L	6	3	N	mm	START THICKNESS 2ND RING 2L (mm)
5080	10	6V92	RT123L	6	3	N	mm	START THICKNESS 2ND RING 3L (mm)
5090	10	6V92	RT121R	6	3	N	mm	START THICKNESS 2ND RING 1R (mm)
5100	10	6V92	RT122R	6	3	N	mm	START THICKNESS 2ND RING 2R (mm)
5110	10	6V92	RT123R	6	3	N	mm	START THICKNESS 2ND RING 3R (mm)
5120	10	6V92	RT12A6	6	3	N	mm	START THICKNESS 2ND RING AVG (mm)
5130	10	6V92	RT131L	6	3	N	mm	START THICKNESS 3RD RING 1L (mm)
5140	10	6V92	RT132L	6	3	N	mm	START THICKNESS 3RD RING 2L (mm)
5150	10	6V92	RT133L	6	3	N	mm	START THICKNESS 3RD RING 3L (mm)
5160	10	6V92	RT131R	6	3	N	mm	START THICKNESS 3RD RING 1R (mm)
5170	10	6V92	RT132R	6	3	N	mm	START THICKNESS 3RD RING 2R (mm)
5180	10	6V92	RT133R	6	3	N	mm	START THICKNESS 3RD RING 3R (mm)
5190	10	6V92	RT13A6	6	3	N	mm	START THICKNESS 3RD RING AVG (mm)
5200	10	6V92	EG1F1L	6	3	N	mm	START GAP FIRE RING 1L (mm)
5210	10	6V92	EG1F2L	6	3	N	mm	START GAP FIRE RING 2L (mm)
5220	10	6V92	EG1F3L	6	3	N	mm	START GAP FIRE RING 3L (mm)
5230	10	6V92	EG1F1R	6	3	N	mm	START GAP FIRE RING 1R (mm)
5240	10	6V92	EG1F2R	6	3	N	mm	START GAP FIRE RING 2R (mm)
5250	10	6V92	EG1F3R	6	3	N	mm	START GAP FIRE RING 3R (mm)
5260	10	6V92	EG1FA6	6	3	N	mm	START GAP FIRE RING AVG (mm)
5270	10	6V92	EG121L	6	3	N	mm	START GAP 2ND RING 1L (mm)
5280	10	6V92	EG122L	6	3	N	mm	START GAP 2ND RING 2L (mm)
5290	10	6V92	EG123L	6	3	N	mm	START GAP 2ND RING 3L (mm)
5300	10	6V92	EG121R	6	3	N	mm	START GAP 2ND RING 1R (mm)
5310	10	6V92	EG122R	6	3	N	mm	START GAP 2ND RING 2R (mm)
5320	10	6V92	EG123R	6	3	N	mm	START GAP 2ND RING 3R (mm)
5330	10	6V92	EG12A6	6	3	N	mm	START GAP 2ND RING AVG (mm)
5340	10	6V92	EG131L	6	3	N	mm	START GAP 3RD RING 1L (mm)
5350	10	6V92	EG132L	6	3	N	mm	START GAP 3RD RING 2L (mm)
5360	10	6V92	EG133L	6	3	N	mm	START GAP 3RD RING 3L (mm)
5370	10	6V92	EG131R	6	3	N	mm	START GAP 3RD RING 1R (mm)
5380	10	6V92	EG132R	6	3	N	mm	START GAP 3RD RING 2R (mm)
5390	10	6V92	EG133R	6	3	N	mm	START GAP 3RD RING 3R (mm)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
5400	10	6V92	EG13A6	6	3	N	mm	START GAP 3RD RING AVG (mm)
5410	10	6V92	EG1UGT1L	6	3	N	mm	START GAP UPPER GROVE TOP RING 1L (mm)
5420	10	6V92	EG1UGT2L	6	3	N	mm	START GAP UPPER GROVE TOP RING 2L (mm)
5430	10	6V92	EG1UGT3L	6	3	N	mm	START GAP UPPER GROVE TOP RING 3L (mm)
5440	10	6V92	EG1UGT1R	6	3	N	mm	START GAP UPPER GROVE TOP RING 1R (mm)
5450	10	6V92	EG1UGT2R	6	3	N	mm	START GAP UPPER GROVE TOP RING 2R (mm)
5460	10	6V92	EG1UGT3R	6	3	N	mm	START GAP UPPER GROVE TOP RING 3R (mm)
5470	10	6V92	EG1UGTA6	6	3	N	mm	START GAP UPPER GROVE TOP RING AVG (mm)
5480	10	6V92	EG1UGB1L	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING 1L (mm)
5490	10	6V92	EG1UGB2L	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING 2L (mm)
5500	10	6V92	EG1UGB3L	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING 3L (mm)
5510	10	6V92	EG1UGB1R	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING 1R (mm)
5520	10	6V92	EG1UGB2R	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING 2R (mm)
5530	10	6V92	EG1UGB3R	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING 3R (mm)
5540	10	6V92	EG1UGBA6	6	3	N	mm	START GAP UPPER GROVE BOTTOM RING AVG (mm)
5550	10	6V92	EG1LGT1L	6	3	N	mm	START GAP LOWER GROVE TOP RING 1L (mm)
5560	10	6V92	EG1LGT2L	6	3	N	mm	START GAP LOWER GROVE TOP RING 2L (mm)
5570	10	6V92	EG1LGT3L	6	3	N	mm	START GAP LOWER GROVE TOP RING 3L (mm)
5580	10	6V92	EG1LGT1R	6	3	N	mm	START GAP LOWER GROVE TOP RING 1R (mm)
5590	10	6V92	EG1LGT2R	6	3	N	mm	START GAP LOWER GROVE TOP RING 2R (mm)
5600	10	6V92	EG1LGT3R	6	3	N	mm	START GAP LOWER GROVE TOP RING 3R (mm)
5610	10	6V92	EG1LGTA6	6	3	N	mm	START GAP LOWER GROVE TOP RING AVG (mm)
5620	10	6V92	EG1LGB1L	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING 1L (mm)
5630	10	6V92	EG1LGB2L	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING 2L (mm)
5640	10	6V92	EG1LGB3L	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING 3L (mm)
5650	10	6V92	EG1LGB1R	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING 1R (mm)
5660	10	6V92	EG1LGB2R	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING 2R (mm)
5670	10	6V92	EG1LGB3R	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING 3R (mm)
5680	10	6V92	EG1LGBA6	6	3	N	mm	START GAP LOWER GROVE BOTTOM RING AVG (mm)
5690	11	6V92	LDIA11L	8	3	N	mm	START LINER DIA 1L (mm)
5700	11	6V92	LDIA12L	8	3	N	mm	START LINER DIA 2L (mm)
5710	11	6V92	LDIA13L	8	3	N	mm	START LINER DIA 3L (mm)
5720	11	6V92	LDIA11R	8	3	N	mm	START LINER DIA 1R (mm)
5730	11	6V92	LDIA12R	8	3	N	mm	START LINER DIA 2R (mm)
5740	11	6V92	LDIA13R	8	3	N	mm	START LINER DIA 3R (mm)
5750	11	6V92	LDIA1A6	8	3	N	mm	START LINER DIA AVG (mm)
5760	11	6V92	LFIN11L	5	2	N	micrometre	START LINER SURFACE FINISH 1L (micrometre)
5770	11	6V92	LFIN12L	5	2	N	micrometre	START LINER SURFACE FINISH 2L (micrometre)
5780	11	6V92	LFIN13L	5	2	N	micrometre	START LINER SURFACE FINISH 3L (micrometre)
5790	11	6V92	LFIN11R	5	2	N	micrometre	START LINER SURFACE FINISH 1R (micrometre)
5800	11	6V92	LFIN12R	5	2	N	micrometre	START LINER SURFACE FINISH 2R (micrometre)
5810	11	6V92	LFIN13R	5	2	N	micrometre	START LINER SURFACE FINISH 3R (micrometre)
5820	11	6V92	LFIN1A6	5	2	N	micrometre	START LINER SURFACE FINISH AVG (micrometre)
5830	11	6V92	PDIA11L	8	3	N	mm	START PISTON DIA 1L (mm)
5840	11	6V92	PDIA12L	8	3	N	mm	START PISTON DIA 2L (mm)
5850	11	6V92	PDIA13L	8	3	N	mm	START PISTON DIA 3L (mm)
5860	11	6V92	PDIA11R	8	3	N	mm	START PISTON DIA 1R (mm)
5870	11	6V92	PDIA12R	8	3	N	mm	START PISTON DIA 2R (mm)
5880	11	6V92	PDIA13R	8	3	N	mm	START PISTON DIA 3R (mm)
5890	11	6V92	PDIA1A6	8	3	N	mm	START PISTON DIA AVG (mm)
5900	11	6V92	LPC11L	6	3	N	mm	START LINER PISTON CLEARANCE 1L (mm)
5910	11	6V92	LPC12L	6	3	N	mm	START LINER PISTON CLEARANCE 2L (mm)
5920	11	6V92	LPC13L	6	3	N	mm	START LINER PISTON CLEARANCE 3L (mm)
5930	11	6V92	LPC11R	6	3	N	mm	START LINER PISTON CLEARANCE 1R (mm)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
5940	11	6V92	LPC12R	6	3	N	mm	START LINER PISTON CLEARANCE 2R (mm)
5950	11	6V92	LPC13R	6	3	N	mm	START LINER PISTON CLEARANCE 3R (mm)
5960	11	6V92	LPC1A6	6	3	N	mm	START LINER PISTON CLEARANCE AVG (mm)
5970	11	6V92	RAB11L	7	3	N	mm	START ROCKER ARM BUSHING DIA 1L (mm)
5980	11	6V92	RAB12L	7	3	N	mm	START ROCKER ARM BUSHING DIA 2L (mm)
5990	11	6V92	RAB13L	7	3	N	mm	START ROCKER ARM BUSHING DIA 3L (mm)
6000	11	6V92	RAB11R	7	3	N	mm	START ROCKER ARM BUSHING DIA 1R (mm)
6010	11	6V92	RAB12R	7	3	N	mm	START ROCKER ARM BUSHING DIA 2R (mm)
6020	11	6V92	RAB13R	7	3	N	mm	START ROCKER ARM BUSHING DIA 3R (mm)
6030	11	6V92	RAB1A6	7	3	N	mm	START ROCKER ARM BUSHING DIA AVG (mm)
6040	12	6V92	W2F1L	8	4	A	g	END WEIGHT FIRE RING 1L [N/A] (g)
6050	12	6V92	W2F2L	8	4	A	g	END WEIGHT FIRE RING 2L [N/A] (g)
6060	12	6V92	W2F3L	8	4	A	g	END WEIGHT FIRE RING 3L [N/A] (g)
6070	12	6V92	W2F1R	8	4	A	g	END WEIGHT FIRE RING 1R [N/A] (g)
6080	12	6V92	W2F2R	8	4	A	g	END WEIGHT FIRE RING 2R [N/A] (g)
6090	12	6V92	W2F3R	8	4	A	g	END WEIGHT FIRE RING 3R [N/A] (g)
6100	12	6V92	W2FA6	8	4	A	g	END WEIGHT FIRE RING AVG [N/A] (g)
6110	12	6V92	W221L	8	4	N	g	END WEIGHT 2ND RING 1L (g)
6120	12	6V92	W222L	8	4	N	g	END WEIGHT 2ND RING 2L (g)
6130	12	6V92	W223L	8	4	N	g	END WEIGHT 2ND RING 3L (g)
6140	12	6V92	W221R	8	4	N	g	END WEIGHT 2ND RING 1R (g)
6150	12	6V92	W222R	8	4	N	g	END WEIGHT 2ND RING 2R (g)
6160	12	6V92	W223R	8	4	N	g	END WEIGHT 2ND RING 3R (g)
6170	12	6V92	W22A6	8	4	N	g	END WEIGHT 2ND RING AVG (g)
6180	12	6V92	W231L	8	4	N	g	END WEIGHT 3RD RING 1L (g)
6190	12	6V92	W232L	8	4	N	g	END WEIGHT 3RD RING 2L (g)
6200	12	6V92	W233L	8	4	N	g	END WEIGHT 3RD RING 3L (g)
6210	12	6V92	W231R	8	4	N	g	END WEIGHT 3RD RING 1R (g)
6220	12	6V92	W232R	8	4	N	g	END WEIGHT 3RD RING 2R (g)
6230	12	6V92	W233R	8	4	N	g	END WEIGHT 3RD RING 3R (g)
6240	12	6V92	W23A6	8	4	N	g	END WEIGHT 3RD RING AVG (g)
6250	12	6V92	W2SB1L	8	4	N	g	END WEIGHT SLIPPER BUSHING 1L (g)
6260	12	6V92	W2SB2L	8	4	N	g	END WEIGHT SLIPPER BUSHING 2L (g)
6270	12	6V92	W2SB3L	8	4	N	g	END WEIGHT SLIPPER BUSHING 3L (g)
6280	12	6V92	W2SB1R	8	4	N	g	END WEIGHT SLIPPER BUSHING 1R (g)
6290	12	6V92	W2SB2R	8	4	N	g	END WEIGHT SLIPPER BUSHING 2R (g)
6300	12	6V92	W2SB3R	8	4	N	g	END WEIGHT SLIPPER BUSHING 3R (g)
6310	12	6V92	W2SBA6	8	4	N	g	END WEIGHT SLIPPER BUSHING AVG (g)
6320	12	6V92	RT2F1L	6	3	A	mm	END THICKNESS FIRE RING 1L [N/A] (mm)
6330	12	6V92	RT2F2L	6	3	A	mm	END THICKNESS FIRE RING 2L [N/A] (mm)
6340	12	6V92	RT2F3L	6	3	A	mm	END THICKNESS FIRE RING 3L [N/A] (mm)
6350	12	6V92	RT2F1R	6	3	A	mm	END THICKNESS FIRE RING 1R [N/A] (mm)
6360	12	6V92	RT2F2R	6	3	A	mm	END THICKNESS FIRE RING 2R [N/A] (mm)
6370	12	6V92	RT2F3R	6	3	A	mm	END THICKNESS FIRE RING 3R [N/A] (mm)
6380	12	6V92	RT2FA6	6	3	A	mm	END THICKNESS FIRE RING AVG [N/A] (mm)
6390	12	6V92	RT221L	6	3	N	mm	END THICKNESS 2ND RING 1L (mm)
6400	12	6V92	RT222L	6	3	N	mm	END THICKNESS 2ND RING 2L (mm)
6410	12	6V92	RT223L	6	3	N	mm	END THICKNESS 2ND RING 3L (mm)
6420	12	6V92	RT221R	6	3	N	mm	END THICKNESS 2ND RING 1R (mm)
6430	12	6V92	RT222R	6	3	N	mm	END THICKNESS 2ND RING 2R (mm)
6440	12	6V92	RT223R	6	3	N	mm	END THICKNESS 2ND RING 3R (mm)
6450	12	6V92	RT22A6	6	3	N	mm	END THICKNESS 2ND RING AVG (mm)
6460	12	6V92	RT231L	6	3	N	mm	END THICKNESS 3RD RING 1L (mm)
6470	12	6V92	RT232L	6	3	N	mm	END THICKNESS 3RD RING 2L (mm)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
6480	12	6V92	RT233L	6	3	N	mm	END THICKNESS 3RD RING 3L (mm)
6490	12	6V92	RT231R	6	3	N	mm	END THICKNESS 3RD RING 1R (mm)
6500	12	6V92	RT232R	6	3	N	mm	END THICKNESS 3RD RING 2R (mm)
6510	12	6V92	RT233R	6	3	N	mm	END THICKNESS 3RD RING 3R (mm)
6520	12	6V92	RT23A6	6	3	N	mm	END THICKNESS 3RD RING AVG (mm)
6530	12	6V92	EG2F1L	6	3	A	mm	END GAP FIRE RING 1L [N/A] (mm)
6540	12	6V92	EG2F2L	6	3	A	mm	END GAP FIRE RING 2L [N/A] (mm)
6550	12	6V92	EG2F3L	6	3	A	mm	END GAP FIRE RING 3L [N/A] (mm)
6560	12	6V92	EG2F1R	6	3	A	mm	END GAP FIRE RING 1R [N/A] (mm)
6570	12	6V92	EG2F2R	6	3	A	mm	END GAP FIRE RING 2R [N/A] (mm)
6580	12	6V92	EG2F3R	6	3	A	mm	END GAP FIRE RING 3R [N/A] (mm)
6590	12	6V92	EG2FA6	6	3	A	mm	END GAP FIRE RING AVG [N/A] (mm)
6600	12	6V92	EG221L	6	3	N	mm	END GAP 2ND RING 1L (mm)
6610	12	6V92	EG222L	6	3	N	mm	END GAP 2ND RING 2L (mm)
6620	12	6V92	EG223L	6	3	N	mm	END GAP 2ND RING 3L (mm)
6630	12	6V92	EG221R	6	3	N	mm	END GAP 2ND RING 1R (mm)
6640	12	6V92	EG222R	6	3	N	mm	END GAP 2ND RING 2R (mm)
6650	12	6V92	EG223R	6	3	N	mm	END GAP 2ND RING 3R (mm)
6660	12	6V92	EG22A6	6	3	N	mm	END GAP 2ND RING AVG (mm)
6670	12	6V92	EG231L	6	3	N	mm	END GAP 3RD RING 1L (mm)
6680	12	6V92	EG232L	6	3	N	mm	END GAP 3RD RING 2L (mm)
6690	12	6V92	EG233L	6	3	N	mm	END GAP 3RD RING 3L (mm)
6700	12	6V92	EG231R	6	3	N	mm	END GAP 3RD RING 1R (mm)
6710	12	6V92	EG232R	6	3	N	mm	END GAP 3RD RING 2R (mm)
6720	12	6V92	EG233R	6	3	N	mm	END GAP 3RD RING 3R (mm)
6730	12	6V92	EG23A6	6	3	N	mm	END GAP 3RD RING AVG (mm)
6740	12	6V92	EG2UGT1L	6	3	N	mm	END GAP UPPER GROOVE TOP RING 1L (mm)
6750	12	6V92	EG2UGT2L	6	3	N	mm	END GAP UPPER GROOVE TOP RING 2L (mm)
6760	12	6V92	EG2UGT3L	6	3	N	mm	END GAP UPPER GROOVE TOP RING 3L (mm)
6770	12	6V92	EG2UGT1R	6	3	N	mm	END GAP UPPER GROOVE TOP RING 1R (mm)
6780	12	6V92	EG2UGT2R	6	3	N	mm	END GAP UPPER GROOVE TOP RING 2R (mm)
6790	12	6V92	EG2UGT3R	6	3	N	mm	END GAP UPPER GROOVE TOP RING 3R (mm)
6800	12	6V92	EG2UGTA6	6	3	N	mm	END GAP UPPER GROOVE TOP RING AVG (mm)
6810	12	6V92	EG2UGB1L	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING 1L (mm)
6820	12	6V92	EG2UGB2L	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING 2L (mm)
6830	12	6V92	EG2UGB3L	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING 3L (mm)
6840	12	6V92	EG2UGB1R	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING 1R (mm)
6850	12	6V92	EG2UGB2R	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING 2R (mm)
6860	12	6V92	EG2UGB3R	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING 3R (mm)
6870	12	6V92	EG2UGBA6	6	3	N	mm	END GAP UPPER GROOVE BOTTOM RING AVG (mm)
6880	12	6V92	EG2LGT1L	6	3	N	mm	END GAP LOWER GROOVE TOP RING 1L (mm)
6890	12	6V92	EG2LGT2L	6	3	N	mm	END GAP LOWER GROOVE TOP RING 2L (mm)
6900	12	6V92	EG2LGT3L	6	3	N	mm	END GAP LOWER GROOVE TOP RING 3L (mm)
6910	12	6V92	EG2LGT1R	6	3	N	mm	END GAP LOWER GROOVE TOP RING 1R (mm)
6920	12	6V92	EG2LGT2R	6	3	N	mm	END GAP LOWER GROOVE TOP RING 2R (mm)
6930	12	6V92	EG2LGT3R	6	3	N	mm	END GAP LOWER GROOVE TOP RING 3R (mm)
6940	12	6V92	EG2LGTA6	6	3	N	mm	END GAP LOWER GROOVE TOP RING AVG (mm)
6950	12	6V92	EG2LGB1L	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING 1L (mm)
6960	12	6V92	EG2LGB2L	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING 2L (mm)
6970	12	6V92	EG2LGB3L	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING 3L (mm)
6980	12	6V92	EG2LGB1R	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING 1R (mm)
6990	12	6V92	EG2LGB2R	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING 2R (mm)
7000	12	6V92	EG2LGB3R	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING 3R (mm)
7010	12	6V92	EG2LGBA6	6	3	N	mm	END GAP LOWER GROOVE BOTTOM RING AVG (mm)

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
7020	13	6V92	RAB21L	7	3	N	mm	END ROCKER ARM BUSHING DIA 1L (mm)
7030	13	6V92	RAB22L	7	3	N	mm	END ROCKER ARM BUSHING DIA 2L (mm)
7040	13	6V92	RAB23L	7	3	N	mm	END ROCKER ARM BUSHING DIA 3L (mm)
7050	13	6V92	RAB21R	7	3	N	mm	END ROCKER ARM BUSHING DIA 1R (mm)
7060	13	6V92	RAB22R	7	3	N	mm	END ROCKER ARM BUSHING DIA 2R (mm)
7070	13	6V92	RAB23R	7	3	N	mm	END ROCKER ARM BUSHING DIA 3R (mm)
7080	13	6V92	RAB2A6	7	3	N	mm	END ROCKER ARM BUSHING DIA AVG (mm)
7090	14	6V92	NSOAK	2	0	N		NUMBER OF SOAK OCCURENCES
7100	14	6V92	SHOUHxxx	5	0	C	HH:MM	HEAT SOAK TEST TIME (HH:MM)
7110	14	6V92	SDATHxxx	8	0	C	YYYYMMDD	HEAT SOAK DATE (YYYYMMDD)
7120	14	6V92	STIMHxxx	5	0	C	HH:MM	HEAT SOAK TIME (HH:MM)
7130	14	6V92	SDESHxxx	50	0	C		HEAT SOAK DESCRIPTION
7140	14	6V92	TOTLSOAK	6	0	C	HHH:MM	HEAT SOAK TIME TOTAL (HHH:MM)
7150	15	6V92	DWNOCR	2	0	Z		NUMBER OF DOWNTIME OCCURRENCES
7160	15	6V92	DOWNHxxx	6	0	C	HHH:MM	DOWNTIME TEST HOURS (HHH:MM)
7170	15	6V92	DDATHxxx	8	0	C	YYYYMMDD	DOWNTIME DATE (YYYYMMDD)
7180	15	6V92	DTIMHxxx	6	0	C	HHH:MM	DOWNTIME TIME (HHH:MM)
7190	15	6V92	DREAHxxx	60	0	C		DOWNTIME REASON
7200	15	6V92	TOTLDOWN	6	0	C	HHH:MM	DOWNTIME TIME TOTAL (HHH:MM)
7210	15	6V92	TOTCOM	2	0	Z		TOTAL LINES OF COMMENTS & OUTLIERS
7220	15	6V92	OCOMHxxx	70	0	C		OTHER COMMENTS
7230	16	6V92	NABINS	2	0	N		NUMBER OF AIRBOX INSPECTIONS
7240	16	6V92	ABKDAT	8	0	C	YYYYMMDD	BREAKIN AIRBOX INSPECTION DATE (YYYYMMDD)
7250	16	6V92	LSCF1LBK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 1L BREAKIN (% AREA)
7260	16	6V92	LSCF2LBK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 2L BREAKIN (% AREA)
7270	16	6V92	LSCF3LBK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 3L BREAKIN (% AREA)
7280	16	6V92	LSCF1RBK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 1R BREAKIN (% AREA)
7290	16	6V92	LSCF2RBK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 2R BREAKIN (% AREA)
7300	16	6V92	LSCF3RBK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 3R BREAKIN (% AREA)
7310	16	6V92	LSCUFABK	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT AVG BREAKIN (% AREA)
7320	16	6V92	SCFHHxxx	5	0	C	HH:MM	AIR BOX LINER SCUFF HOURS (HH:MM)
7330	16	6V92	SCFDHxxx	8	0	C	YYYYMMDD	AIR BOX LINER SCUFF DATE (YYYYMMDD)
7340	16	6V92	LS1LHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 1L (% AREA)
7350	16	6V92	LS2LHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 2L (% AREA)
7360	16	6V92	LS3LHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 3L (% AREA)
7370	16	6V92	LS1RHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 1R (% AREA)
7380	16	6V92	LS2RHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 2R (% AREA)
7390	16	6V92	LS3RHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT 3R (% AREA)
7400	16	6V92	LSAVHxxx	5	0	N	% AREA	AIR BOX LINER SCUFF PERCENT AVG (% AREA)
7410	16	6V92	ABOXREBK	60	0	C		REASON FOR AIR BOX INSPECTION BREAKIN
7420	16	6V92	ABREHxxx	60	0	C		REASON FOR AIR BOX INSPECTION POST BREAKIN
7430	17	6V92	APIGRAV	4	0	N		TEST FUEL API GRAVITY
7440	17	6V92	CETANENO	4	0	N	#	TEST FUEL CETANE NUMBER (#)
7450	17	6V92	FUELIBP	5	0	N	°C	TEST FUEL DISTILLATION IBP (°C)
7460	17	6V92	FUEL50	5	0	N	°C	TEST FUEL DISTILLATION 50% (°C)
7470	17	6V92	FUEL90	5	0	N	°C	TEST FUEL DISTILLATION 90% (°C)
7480	17	6V92	KINVIS	4	1	N	cSt	TEST FUEL KINEMATIC VISCOSITY (cSt)
7490	17	6V92	FUELSULF	5	2	N	%	TEST FUEL PERCENT WEIGHT SULFUR (%)
7500	17	6V92	FLASHPT	5	0	N	°C	TEST FUEL FLASH POINT (°C)
7510	17	6V92	FUELASH	6	3	N	%	TEST FUEL PERCENT WEIGHT ASH (%)
7520	17	6V92	FUELH2O	7	2	A	%	TEST FUEL PERCENT WEIGHT WATER & SOLIDS [<] (%)
7530	17	6V92	FUELHEAT	6	1	N	MJ/kg	TEST FUEL HEAT CONTENT (MJ/kg)
7540	18	6V92	OGTSENS	10	0	C		OIL GALLERY TEMPERATURE SENSING DEVICE
7550	18	6V92	OGTCALF	10	0	C		OIL GALLERY TEMPERATURE CALIBRATION FREQUENCY

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
7560	18	6V92	OGTRECD	3	0	C		OIL GALLERY TEMPERATURE RECORD DEVICE
7570	18	6V92	OGTOBSF	10	0	C		OIL GALLERY TEMPERATURE OBSERVATION FREQUENCY
7580	18	6V92	OGTRECF	10	0	C		OIL GALLERY TEMPERATURE RECORD FREQUENCY
7590	18	6V92	OGTLOGF	9	0	C		OIL GALLERY TEMPERATURE LOG FREQUENCY
7600	18	6V92	OGTSYSR	8	0	C		OIL GALLERY TEMPERATURE SYSTEM RESPONSE
7610	18	6V92	OSTSENS	10	0	C		OIL SUMP TEMPERATURE SENSING DEVICE
7620	18	6V92	OSTCALF	10	0	C		OIL SUMP TEMPERATURE CALIBRATION FREQUENCY
7630	18	6V92	OSTRECD	3	0	C		OIL SUMP TEMPERATURE RECORD DEVICE
7640	18	6V92	OSTOBSF	10	0	C		OIL SUMP TEMPERATURE OBSERVATION FREQUENCY
7650	18	6V92	OSTRECF	10	0	C		OIL SUMP TEMPERATURE RECORD FREQUENCY
7660	18	6V92	OSTLOGF	9	0	C		OIL SUMP TEMPERATURE LOG FREQUENCY
7670	18	6V92	OSTSYSR	8	0	C		OIL SUMP TEMPERATURE SYSTEM RESPONSE
7680	18	6V92	FTEMSENS	10	0	C		FUEL TEMPERATURE SENSING DEVICE
7690	18	6V92	FTEMCALF	10	0	C		FUEL TEMPERATURE CALIBRATION FREQUENCY
7700	18	6V92	FTEMRECD	3	0	C		FUEL TEMPERATURE RECORD DEVICE
7710	18	6V92	FTEMOBSF	10	0	C		FUEL TEMPERATURE OBSERVATION FREQUENCY
7720	18	6V92	FTEMRECF	10	0	C		FUEL TEMPERATURE RECORD FREQUENCY
7730	18	6V92	FTEMLOGF	9	0	C		FUEL TEMPERATURE LOG FREQUENCY
7740	18	6V92	FTEMSYSR	8	0	C		FUEL TEMPERATURE SYSTEM RESPONSE
7750	18	6V92	CITSENS	10	0	C		COOLANT IN TEMPERATURE SENSING DEVICE
7760	18	6V92	CITCALF	10	0	C		COOLANT IN TEMPERATURE CALIBRATION FREQUENCY
7770	18	6V92	CITRECD	3	0	C		COOLANT IN TEMPERATURE RECORD DEVICE
7780	18	6V92	CITOBSF	10	0	C		COOLANT IN TEMPERATURE OBSERVATION FREQUENCY
7790	18	6V92	CITRECF	10	0	C		COOLANT IN TEMPERATURE RECORD FREQUENCY
7800	18	6V92	CITLOGF	9	0	C		COOLANT IN TEMPERATURE LOG FREQUENCY
7810	18	6V92	CITSYSR	8	0	C		COOLANT IN TEMPERATURE SYSTEM RESPONSE
7820	18	6V92	COTSENS	10	0	C		COOLANT OUT TEMPERATURE SENSING DEVICE
7830	18	6V92	COTCALF	10	0	C		COOLANT OUT TEMPERATURE CALIBRATION FREQUENCY
7840	18	6V92	COTRECD	3	0	C		COOLANT OUT TEMPERATURE RECORD DEVICE
7850	18	6V92	COTOBSF	10	0	C		COOLANT OUT TEMPERATURE OBSERVATION FREQUENCY
7860	18	6V92	COTRECF	10	0	C		COOLANT OUT TEMPERATURE RECORD FREQUENCY
7870	18	6V92	COTLOGF	9	0	C		COOLANT OUT TEMPERATURE LOG FREQUENCY
7880	18	6V92	COTSYSR	8	0	C		COOLANT OUT TEMPERATURE SYSTEM RESPONSE
7890	18	6V92	AITSENS	10	0	C		AIR IN TEMPERATURE SENSING DEVICE
7900	18	6V92	AITCALF	10	0	C		AIR IN TEMPERATURE CALIBRATION FREQUENCY
7910	18	6V92	AITRECD	3	0	C		AIR IN TEMPERATURE RECORD DEVICE
7920	18	6V92	AITOBSF	10	0	C		AIR IN TEMPERATURE OBSERVATION FREQUENCY
7930	18	6V92	AITRECF	10	0	C		AIR IN TEMPERATURE RECORD FREQUENCY
7940	18	6V92	AITLOGF	9	0	C		AIR IN TEMPERATURE LOG FREQUENCY
7950	18	6V92	AITSYSR	8	0	C		AIR IN TEMPERATURE SYSTEM RESPONSE
7960	18	6V92	FFLOSENS	10	0	C		FUEL FLOW SENSING DEVICE
7970	18	6V92	FFLOCALF	10	0	C		FUEL FLOW CALIBRATION FREQUENCY
7980	18	6V92	FFLORECD	3	0	C		FUEL FLOW RECORD DEVICE
7990	18	6V92	FFLOOBSF	10	0	C		FUEL FLOW OBSERVATION FREQUENCY
8000	18	6V92	FFLORECF	10	0	C		FUEL FLOW RECORD FREQUENCY
8010	18	6V92	FFLOLOGF	9	0	C		FUEL FLOW LOG FREQUENCY
8020	18	6V92	FFLOSYSR	8	0	C		FUEL FLOW SYSTEM RESPONSE
8030	18	6V92	RPMSENS	10	0	C		ENGINE SPEED SENSING DEVICE
8040	18	6V92	RPMCALF	10	0	C		ENGINE SPEED CALIBRATION FREQUENCY
8050	18	6V92	RPMRECD	3	0	C		ENGINE SPEED RECORD DEVICE
8060	18	6V92	RPMOBSF	10	0	C		ENGINE SPEED OBSERVATION FREQ
8070	18	6V92	RPMRECF	10	0	C		ENGINE SPEED RECORD FREQ
8080	18	6V92	RPMLOGF	9	0	C		ENGINE SPEED LOG FREQ
8090	18	6V92	RPMSYSR	8	0	C		ENGINE SPEED SYSTEM RESPONSE

FIG. A6.2 Data Dictionary *(continued)*

29-apr-1999 Report: ASTM Data Dictionary

Sequence	Form	Test Area	Field Name	Field Length	Decimal Size	Data Type	Units/Format	Description
8100	18	6V92	LOADSENS	10	0	C		LOAD SENSING DEVICE
8110	18	6V92	LOADCALF	10	0	C		LOAD CALIBRATION FREQUENCY
8120	18	6V92	LOADRECD	3	0	C		LOAD RECORD DEVICE
8130	18	6V92	LOADOBSF	10	0	C		LOAD OBSERVATION FREQUENCY
8140	18	6V92	LOADRECF	10	0	C		LOAD RECORD FREQUENCY
8150	18	6V92	LOADLOGF	9	0	C		LOAD LOG FREQUENCY
8160	18	6V92	LOADSYSR	8	0	C		LOAD SYSTEM RESPONSE
8170	18	6V92	INRESENS	10	0	C		INLET RESTRICTION SENSING DEVICE
8180	18	6V92	INRECALF	10	0	C		INLET RESTRICTION CALIBRATION FREQUENCY
8190	18	6V92	INRERECD	3	0	C		INLET RESTRICTION RECORD DEVICE
8200	18	6V92	INREOBSF	10	0	C		INLET RESTRICTION OBSERVATION FREQUENCY
8210	18	6V92	INRERECF	10	0	C		INLET RESTRICTION RECORD FREQUENCY
8220	18	6V92	INRELOGF	9	0	C		INLET RESTRICTION LOG FREQUENCY
8230	18	6V92	INRESYSR	8	0	C		INLET RESTRICTION SYSTEM RESPONSE
8240	18	6V92	EXPRSENS	10	0	C		EXHAUST PRESSURE SENSING DEVICE
8250	18	6V92	EXPRCALF	10	0	C		EXHAUST PRESSURE CALIBRATION FREQUENCY
8260	18	6V92	EXPRRECD	3	0	C		EXHAUST PRESSURE RECORD DEVICE
8270	18	6V92	EXPROBSF	10	0	C		EXHAUST PRESSURE OBSERVATION FREQUENCY
8280	18	6V92	EXPRRECF	10	0	C		EXHAUST PRESSURE RECORD FREQUENCY
8290	18	6V92	EXPRLOGF	9	0	C		EXHAUST PRESSURE LOG FREQUENCY
8300	18	6V92	EXPRSYSR	8	0	C		EXHAUST PRESSURE SYSTEM RESPONSE
8310	18	6V92	OILGSENS	10	0	C		OIL GALLERY PRESSURE SENSING DEVICE
8320	18	6V92	OILGCALF	10	0	C		OIL GALLERY PRESSURE CALIBRATION FREQUENCY
8330	18	6V92	OILGRECD	3	0	C		OIL GALLERY PRESSURE RECORD DEVICE
8340	18	6V92	OILGOBSF	10	0	C		OIL GALLERY PRESSURE OBSERVATION FREQUENCY
8350	18	6V92	OILGRECF	10	0	C		OIL GALLERY PRESSURE RECORD FREQUENCY
8360	18	6V92	OILGLOGF	9	0	C		OIL GALLERY PRESSURE LOG FREQUENCY
8370	18	6V92	OILGSYSR	8	0	C		OIL GALLERY PRESSURE SYSTEM RESPONSE
8380	19	6V92	CYLLINOR	10	0	C		CYLINDER LINER ORIGIN
8390	19	6V92	PSTDOMOR	10	0	C		PISTON DOME ORIGIN
8400	19	6V92	PSTSKTOR	10	0	C		PISTON SKIRT ORIGIN
8410	19	6V92	SLPBUS1L	10	0	C		1L SLIPPER BUSHING ORIGIN
8420	19	6V92	SLPBUS2L	10	0	C		2L SLIPPER BUSHING ORIGIN
8430	19	6V92	SLPBUS3L	10	0	C		3L SLIPPER BUSHING ORIGIN
8440	19	6V92	SLPBUS1R	10	0	C		1R SLIPPER BUSHING ORIGIN
8450	19	6V92	SLPBUS2R	10	0	C		2R SLIPPER BUSHING ORIGIN
8460	19	6V92	SLPBUS3R	10	0	C		3R SLIPPER BUSHING ORIGIN
8470	19	6V92	OCRUGOR	10	0	C		OIL CONTROL RING UPPER GROVE ORIGIN
8480	19	6V92	OCRLGOR	10	0	C		OIL CONTROL RING LOWER GROVE ORIGIN
8490	19	6V92	ORNGEXOR	10	0	C		OIL RING EXPANDER ORIGIN
8500	19	6V92	FIRRNGOR	10	0	C		FIRE RING ORIGIN
8510	19	6V92	CMPRNGOR	10	0	C		COMPRESSION RINGS ORIGIN
8520	20	6V92	NUMOUTLI	3	0	Z	#	NUMBER OF OUTLIER DATA POINTS (#)
8530	20	6V92	PARAHxxx	20	0	C		NAME OF PARAMETER OF OUTLIER DATA POINT
8540	20	6V92	VALUHxxx	7	1	N		VALUE OF PARAMETER OF OUTLIER DATA POINT
8550	20	6V92	TESTHxxx	6	0	C	HHH:MM	TEST TIME OF OUTLIER DATA POINT (HHH:MM)

FIG. A6.2 Data Dictionary *(continued)*

APPENDIXES

(Nonmandatory Information)

X1. OIL PRODUCER'S AFFIDAVIT

X1.1 See Fig. X1.1.

OIL PRODUCER'S AFFIDAVIT

THE NON-REFERENCE OIL (CODE NO.____________________________) EVALUATED IN THE 6V92TA TEST WAS BLENDED AND STATISTICALLY TESTED IN COMPLIANCE TO THE 6V92TA TEST METHOD AND ASTM D 4485.

____________________________ ____________________________

OIL PRODUCER'S COMPANY NAME REPRESENTATIVE'S SIGNATURE

Formulation/Stand Code FORM

TEST NO.	DATE TEST COMP	OIL CODE NO.	TEST LAB	TEST STAND NO.	TEST STAND RUN NO.	ENGINE RUN NO.	ENGINE BLOCK RUN NO.	FIRE RING DISTRESS, DEMERITS	2ND & 3RD RING AVG. FACE DIST., DEMERITS	% AREA, AVERAGE LINER SCUFFING
TEST DATA										
1ST										
2 ND										
3 RD										
4 TH										
TEST AVG.										
1 ST TEST RESULT										
2 - TEST AVERAGE										
3 - TEST AVERAGE										
OUTLIER MINIMUM LEVEL										
THREE TEST AVERAGE RESULT WITH OUTLIER REMOVED										

ACCEPTANCE LIMITS*			
	MAXIMUM	MAXIMUM	MAXIMUM
1ST TEST PASSING LIMIT			
2 - TEST PASSING LIMIT			
3 - TEST PASSING LIMIT			

* TMC Acceptance Limits (Effective Date: ________________________)

FIG. X1.1 Oil Producer's Affidavit

X2. ENGLISH TO METRIC CONVERSIONS FOR 6V92TA TEST

X2.1 See Fig. X2.1.

Parameter	English in (x)	Conversion	Metric Out	No. Decimals to Report
BSFC	lb / hp · h	608 · x	g / kWh	1
Fuel Flow	lb / h	0.45 · x	kg / h	1
Gas Volume	ft^3	0.0283 · x	m^3	
Heat Transfer Rate	Btu / min	0.0176 · x	kW	
Length	in.	25.4 · x	mm	
Liquid Volume	gal	3.785 · x	L	
Power	hp	0.746 · x	kW	1
Pressure	in. H2O	0.249 · x	kPa	1
Pressure	in. Hg	3.38 · x	kPa	1
Pressure	psi	6.895 · x	kPa	1
Temperature	°F	0.556 · (x - 32)	°C	1
Torque	lbf · ft	1.3558 · x	N · m	1

FIG. X2.1 English to Metric Conversions for 6V92TA

X3. ENGINE BUILD-UP FORMS

X3.1 See Figs. X3.1-X3.10.

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: __________________

LUBRICANT: ___________________ TECHNICIAN ____________________

Engine Parts Identification

Engine Number			
Left Head Number		Right Head Number	
Left Camshaft Number		Right Camshaft Number	
Turbocharger Number		Blower Number	
Injector Number			
1L		1R	
2L		2R	
3L		3R	

Parts Replacement Schedule

Enter the Number of Tests Prior to This Test

	Number of Tests		Number of Tests
Main Bearings (3 Tests Max.)		Valves Regrind (5 Max.)	
Connecting Rods (10 Max.)		Cylinder Head (5 Max.)	

Parts Cleaning Checksheet

Initial When Completed

Cylinder Block		Air Box	
Turbocharger		Cylinder Head	
Oil Cooler		Blower	
Crankshaft			

Parts Inspection Check Sheet

Initial when Completed

Cylinder Block Bore Measurement		Liner Counter Bore Measurement	
Main Bearing Bore Measurement		Rod Bearing Clearance	
Main Bearing Clearance		Cylinder Liner Height	
Injector Rock Arm Bushing Diameter		Cylinder Liner ID Finish Measurement	
Valve Protrusion		Valves Leak Test	
Cylinder Head Warp Measurement		Injector Output Test	

FIG. X3.1 Engine Rebuild Worksheet

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: ___________________

LUBRICANT: ___________________ TECHNICIAN _____________________

Cylinder Liner Inside Diameter Measurements

All measurements made on free standing liner

Specification: 122.911 to 122.974 mm (4.8390 to 4.8415 in.)

Roundness 0.0762 mm (0.003 in.) max.

Cyl. No.		Top	Above Port	Below Port	Bottom	Average	Roundness
1L	Transverse						
	Longitudinal						
2L	Transverse						
	Longitudinal						
3L	Transverse						
	Longitudinal						
1R	Transverse						
	Longitudinal						
2R	Transverse						
	Longitudinal						
3R	Transverse						
	Longitudinal						

Inside Diameter Measurements are to be made on two axis relative to the engine centerline and the installed position of the liner. Transverse (Thrust / Anti-thrust) and Longitudinal (Front / Back). Measurements are made in four locations:

1. Top is 12.7 mm (0.5 in.) from top
2. Above Port is 25.4 mm (1 in.) above ports
3. Below Port is 25.4 mm (1 in.) below ports
4. Bottom is 12.7 mm (0.5 in.) from bottom

Roundness is the difference of the average inside diameter measurements from each axis

Liner Bore Surface Finish

Specification 1.1 to 1.7 µm (45 - 65 micro-inches) above ports

1L	2L	3L	1R	2R	3R	Average

FIG. X3.2 Cylinder Liner Measurements Worksheet

6V92TA ENGINE OIL TEST

DATE: ___________ TEST NO: ________________

LUBRICANT: _________________ TECHNICIAN ___________________

Piston Skirt Outside Diameter and Liner Clearance

Specification: 122.667 to 122.733 mm (4.8294 to 4.8320 in.)

Piston / Liner Clearance Specification 0.1778 to 0.3048 mm (0.007 to 0.012 in.)

Cyl No.	1	2	Average	Average Liner ID from Fig X3.1	Piston / Liner Clearance
1L					
2L					
3L					
1R					
2R					
3R					

Piston Skirt Outside Diameter Measurements are to be taken on two axis, 90° apart at 12.7 mm (0.5 in.) from the pin bore toward the top of the piston skirt. The specification includes tin plating.

Piston to Liner clearance is calculated from the difference between the average liner inside diameter and the average piston skirt outside diameter.

FIG. X3.3 Worksheet for Piston Skirt and Skirt/Liner Clearance Measurement

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: __________________

LUBRICANT: __________________ TECHNICIAN ____________________

Cylinder No.		Fire Ring	2nd Comp.	3rd Comp.	No. 1 Oil Ring Upper	No. 1 Oil Ring Lower	No. 2 Oil Ring Upper	No. 2 Oil Ring Lower
Ring Gap Spec., mm(in.)		1.016 ± 0.127 (0.040 ± 0.005)	1.016 ± 0.127 (0.040 ± 0.005)	1.016 ± 0.127 (0.040 ± 0.005)	0.4064 ± 0.025 (0.016 ± 0.001)	0.5842 ± 0.051 (0.023 ± 0.002)	0.4064 ± 0.025 (0.016 ± 0.001)	0.5842 ± 0.051 (0.023 ± 0.002)
1L	Pre-Test							
	Post-Test							
	Change							
2L	Pre-Test							
	Post-Test							
	Change							
3L	Pre-Test							
	Post-Test							
	Change							
1R	Pre-Test							
	Post-Test							
	Change							
2R	Pre-Test							
	Post-Test							
	Change							
3R	Pre-Test							
	Post-Test							
	Change							

FIG. X3.4 Worksheet for Measurement of Piston Ring End Gaps

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: ___________________

LUBRICANT: ___________________ TECHNICIAN ____________________

Measurements are to be recorded in millimeters
Measurement Locations:

Locations 1 and 2 are taken 25 mm from the gap,
Location 3 is directly opposite, 180°, from the gap
Locations 4 and 5 are taken approximately mid-distance between
Locations 1 and 3, and 2 and 3 (45° from gap) respectively

Cylinder No.	**Location**	**1**	**2**	**3**	**4**	**5**	**Average**
1L	Fire Ring						
	2nd Comp.						
	3rd Comp.						
2L	Fire Ring						
	2nd Comp.						
	3rd Comp.						
3L	Fire Ring						
	2nd Comp.						
	3rd Comp.						
1R	Fire Ring						
	2nd Comp.						
	3rd Comp.						
2R	Fire Ring						
	2nd Comp.						
	3rd Comp.						
3R	Fire Ring						
	2nd Comp.						
	3rd Comp.						

FIG. X3.5 Worksheet for Pre-Test Measurement of Piston Ring Radial Thickness

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: ___________________

LUBRICANT: ___________________ TECHNICIAN _____________________

Measurements are to be recorded in millimeters
Measurement Locations:
Locations 1 and 2 are taken 25 mm from the gap,
Location 3 is directly opposite, 180°, from the gap
Locations 4 and 5 are taken approximately mid-distance between
Locations 1 and 3, and 2 and 3 (45° from gap) respectively
Enter Change as difference between Pre-Test Average and Post-Test Average Measurements

Cylinder No.		1	2	3	4	5	Average	Change
1L	Fire Ring							
	2nd Comp.							
	3rd Comp.							
2L	Fire Ring							
	2nd Comp.							
	3rd Comp.							
3L	Fire Ring							
	2nd Comp.							
	3rd Comp.							
1R	Fire Ring							
	2nd Comp.							
	3rd Comp.							
2R	Fire Ring							
	2nd Comp.							
	3rd Comp.							
3R	Fire Ring							
	2nd Comp.							
	3rd Comp.							

FIG. X3.6 Worksheet for Post-Test Measurement of Piston Ring Radial Thickness

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: ________________

LUBRICANT: ________________ TECHNICIAN ________________

Record Parts Weights in Grams

Cylinder No.		Fire Ring	2nd Comp.	3rd Comp.	Slipper Bushing	Slip Bshg Date Code
1L	Pre-Test					
	Post-Test					
	Wt. Loss					
2L	Pre-Test					
	Post-Test					
	Wt. Loss					
3L	Pre-Test					
	Post-Test					
	Wt. Loss					
1R	Pre-Test					
	Post-Test					
	Wt Loss					
2R	Pre-Test					
	Post-Test					
	Wt. Loss					
3R	Pre-Test					
	Post-Test					
	Wt. Loss					

FIG. X3.7 Worksheet for Test Part Weights

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: __________________

LUBRICANT: ____________________ TECHNICIAN ____________________

Engine Block Bore Measurements

Measurements are to be made with the block resting flat on the ground with bearing caps in place and torqued to specification

Location	1L	2L	3L	1R	2R	3R	Min.	Max.
Upper Pilot Dia.,A, mm (in.)							13.6131 (5.3595)	13.6233 (5.3635)
Lower Two Seal Ring Lands, B,mm (in.)							13.5547 (5.3365)	13.5623 (5.3395)
Water Jacket Dia. Upper, C, mm (in.)							13.2486 (5.2160)	13.2550 (5.2185)
Water Jacket Dia. Lower, D, mm (in.)							13.2486 (5.2160)'	13.2550 (5.2185)

See Service Manual Section 1.1, Figure 5 for locations.

Cylinder Head Flatness Inspection, 0.076 mm (0.003 in.) - Enter "OK" if inspected and verified ______

Cylinder Liner Counter Bore Measurements

Measurements are average of four readings minimum

	1L	2L	3L	1R	2R	3R	Specification
Diameter mm (in.)							14.1097 - 14.1224 (5.5550 - 5.5600)
Depth, mm (in.)							1.2078 - 1.2116 (0.4755 - 0.4770) or 1.2459 - 1.2497 (0.4905 - 0.4920)
Liner Height, mm (in.)							1.0617 - 1.2243 (0.0418 - 0.0482)

Depth measurements shall not vary more than 0.1381 mm (0.0015 in.) throughout the entire circumference.

Liner Height is the distance between the top of the cylinder liner installed in the block and the top of the block, see Section 1.6.3, Figure 7 of the Service Manual.

FIG. X3.8 Worksheet for Cylinder Block Dimension Measurements

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: __________________

LUBRICANT: ___________________ TECHNICIAN _____________________

Main Bearing Bore Inside Diameter Measurement
Measurements to be made with engine block upside down on flat surface
with bearing caps in place and torqued to specification

	1	2	3	4	Specification
Inside Diameter, mm (in.)					122.225 - 122.250 (4.8120 - 4.8130)
Alignment, mm (in.)					0.025 (0.001) Max.
Crankshaft Journal Diameter, mm (in.)					114.2619 - 114.3051 (4.4985 - 4.5002)
Clearance, mm (in.)					0.03556 - 0.1397 (0.0014 - 0.0055)

Bore Misalignment between adjacent bores 0.013 mm (0.005 in.) maximum

Connecting Rod Bearing Inside Diameter Measurement
Measurements are to be made in the vertical direction
with the bearing caps in placed and torqued to specification

	1L	2L	3L	1R	2R	3R	Specification
Rod Bearing Diameter, mm (in.)							76.2127 -76.2889 (3.0005 - 3.0035)
Crankshaft Journal Diameter, mm (in.)							76.1619 -76.2051 (2.9985 - 3.0002)
Clearance, mm (in.)							0.02032 - 0.1143 (0.0008 - 0.0045)

FIG. X3.9 Worksheet for Bearing and Journal Measurement

6V92TA ENGINE OIL TEST

DATE: ____________ TEST NO: ________________

LUBRICANT: ________________ TECHNICIAN ________________

Injector Rocker Arm Bushing and Shaft Clearance Measurement

Refer to Section 1.2.1 of the Service Manual

Cyl.	Pre Test	Post Test	Change	Shaft Diameter Pre Test	Clearance
1L					
2L					
3L					
1R					
2R					
3R					
Specification	22.2250 - 22.2504 (0.8750 - 0.8760)			22.1869 - 22.1996 (0.8735 - 0.8740)	.0254 - 0.1016 (0.0010 - 0.0040)

Exhaust Valve Protrusion / Recession Measurement

Refer to Section 1.2.2 of the Service Manual

	1L	2L	3L	1R	2R	3R	Specification
Protrusion							0.1524 mm (0.006 in.)
Recession							0.5842 mm (0.023 in.)

Fuel Injector Flow Measurement

Refer to Section 2.0 for Test Procedure

1L	2L	3L	1R	2R	3R	Specification
						140 -145 mm^3

FIG. X3.10 Worksheet for Cylinder Head Component Build-up Measurements