



## Test Monitoring Center

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Sequence IVA Information Letter No. 09-1  
Sequence No. 17  
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***ASTM consensus has not been obtained on this information letter. An appropriate ASTM ballot will be issued in order to achieve such consensus.***

TO: Sequence IVA Mailing List

SUBJECT: 1. Valve Spring Measurements  
2. Number of Runs on Cylinder Head, Block, Distributor, and Oil Cooler  
3. Monitoring of RAC Coolant Inlet and Outlet Temperatures, Engine Coolant Pressure, and Front Cover Fresh Air Flow

1. At the May 6, 2009 Sequence IVA Surveillance Panel Meeting, the panel agreed to remove the requirements to measure valve spring free length and out-of-square; and to require vacuum checks of the cylinder head. Section 9.3.5 and Table 7 of Test Method D 6891 have been revised and Section 9.3.7 has been added. These changes are effective May 6, 2009.
2. At the May 6, 2009 Sequence IVA Surveillance Panel Meeting, the panel agreed to increase the number of runs allowed on a cylinder head and block. The panel also agreed to allow the oil cooler and distributor to be used as long as they remain serviceable. Sections 6.2.7, 6.4.4, 6.4.4.1 and Annex A2 have been revised. These changes are effective May 6, 2009.
3. At the May 6, 2009 Sequence IVA Meeting, the panel agreed to monitor the rocker cover inlet and outlet temperatures, the engine coolant pressure, and the front cover fresh air flow. Sections 6.3.11.9 and 6.3.12.9 have been added and Section 6.3.10 has been revised. These changes are effective August 1, 2009

The new and revised sections of Test Method D 6891 are attached.

William A. Buscher III  
Chairman  
Sequence IVA Surveillance Panel

John L. Zalar  
Administrator  
ASTM Test Monitoring Center

Attachment

c: [ftp://ftp.astmtmc.cmu.edu/documents/gas/sequenceiv/procedures\\_and\\_ils/ivail09-1-17.pdf](ftp://ftp.astmtmc.cmu.edu/documents/gas/sequenceiv/procedures_and_ils/ivail09-1-17.pdf)

Distribution: Electronic Mail

6.2.7 *Oil Cooler*—Insert a water-to-oil heat exchanger (see Annex A3) between the engine oil filter adapter block and the oil filter, using a gasket as shown in Annex A3. See Annex A3 for installation details. Plumb the water outlet to the cooler fitting and orient to the same axis as the oil filter. Orient the cooler for both water fittings to face the rear of the engine. Use flexible hoses (16 mm diameter) of approximately 500 mm length to connect process water to the oil cooler. Control the oil temperature by metering the flow of the process water outlet. A control system valve with Flow Coefficient (Cv) of 0.32 produces satisfactory control. Replace the oil cooler when it no longer remains serviceable.

6.3.10 *Crankcase Ventilation System* (Fig. 3)—Alter the Nissan production routing of the crankcase gasses to ensure that a certain mass flow rate of fresh air is supplied to the valve-train underneath the jacketed rocker cover. Take humidity-conditioned air from the bottom, left rear of the air cleaner housing and route to the rear right side of the rocker arm cover and to the engine front cover. Draw the crankcase off-gas from the engine at the production breather and oil separator. From the breather, the crankcase gas flows through the Positive Crankcase Ventilation (PCV) valve to the bottom plenum of the intake manifold. See Annex A3 for a drawing of the ventilation system plumbing. Use a mass flow meter to measure the fresh airflow to the rocker cover of 10.0 L/min (SLPM, Standard Litres per Minute). This meter, corrected to standard conditions, shall have an accuracy of  $\pm 0.25$  L/min at 10 L/min (SLPM). Full scale of the meter shall be a minimum of 20 L/min (SLPM). Time response of the measurement shall be less than or equal to 1.0 s. One model that meets these specifications is Sierra Mass Flow Meter, model 730-N2-1E0PV1V4 (air; 20 SLPM).<sup>11,20</sup> Prior to the meter, install a three-way control valve having a nominal size of 13 mm and a flow coefficient rating of 2.5 Cv. Configure the valve so that loss of control power routes all air to the rocker cover. A Badger Meter 1/2 in. research valve with Trim A meets these requirements.<sup>11,21</sup> At the exit of the flow meter, use a surge chamber having a nominal capacity of 20 L. The plumbing from the 3-way valve to the engine front cover shall have a nominal diameter of 10 mm (see Fig. 4). The plumbing from the 3-way valve, through the flow meter and surge chamber, and on to the rear of the rocker cover, shall have a nominal diameter of 16 mm. Install a similar flow meter in the fresh air flow circuit to the front cover to measure the fresh air flow to the front cover.

6.3.11.9 *Rocker Cover Inlet and Outlet Temperature*—Measure the rocker cover inlet and outlet temperature within 150 mm of the inlet and outlet connections. Install the sensor tip in the center of flow.

6.3.12.9 *Coolant Pressure*—Attach the coolant pressure sensing line to a fitting welded to the coolant reservoir.

6.4.4 *Reusable Engine Parts*—Replace the engine short block and the cylinder head as specified in Annex A2. If the engine demonstrates deterioration (excessive blowby or oil consumption or fuel dilution, poor compression, low oil pressure, clearances beyond service limits, or stripped fasteners) prior to this expected life (see Annex A2), replace the engine and follow the break-in procedure prior to resuming non-reference oil testing. Do not exceed the number of tests on the short-block or cylinder heads listed in Annex A2.

6.4.4.1 Replace the PCV valve, fuel filters, rocker cover gaskets, and air filter whenever the cylinder head, or engine, or both are replaced. The ignition distributor can be used as long as it remains serviceable. Distributor cap (Nissan Part Number 22162-40F00) and rotor (Nissan Part Number 22157-21E01) can be replaced as needed.

9.3.5 *Initial Valve Spring Screening*—Measure the force on the unassembled valve spring calibration device. The valve spring parameters shall be within the specifications shown in Table 7. Determine the final valve spring assembled force with the valve springs installed in the cylinder head (see 9.3.6). Springs slightly outside the unassembled force specification may be within the assembled force specification when installed in the cylinder head using shims under the springs.

9.3.7 *Vacuum check*—Prior to installing the cylinder head on the engine, conduct a vacuum check to ensure no leakage past the valves, and so forth. The method of checking is left up to the laboratory.

**TABLE 7 Valve Spring Specifications**

Parameters	Intake	Exhaust
Force		
outer	604.1 N at 37.6 mm	640.4 N at 34.1 mm
inner	284.4 N at 32.6 mm	328.5 N at 29.1 mm

## A.2 Parts List

A2.1 This annex illustrates the parts needed for the Sequence IVA test (Table A2.1).

Section	Description	Part Number	Contents	Supplier
6.1	Bare Engine Assembly	A0102-76P01	Engine Block/Head/Valvetrain Assembly <sup>A</sup>	Nissan North America, Inc.
6.4.1.3	Test Kit	13000-40F85	Camshaft Assembly (1) Rocker Shaft (2) Rocker Arms (12) Oil Filter Assembly (3) Spark Plug (4)	Nissan North America, Inc.
6.4.1.4	Head Assembly <sup>B</sup>	A1040-40F80	with Valves and Springs without Camshaft, Rocker Arms	Nissan North America, Inc.
6.2.7	Oil Cooler	21305-03E00	Engine Oil Cooler	Nissan North America, Inc
6.4.1.4	Engine Valve Regrind Kit	A1042-10C2E	Head Gasket and Seals	Nissan North America, Inc
6.4.1.2	Test Stand Kit No. 1	A0001-76P25		Nissan North America, Inc
6.4.1.2	Test Stand Kit No. 2	A0001-40F25		Nissan North America, Inc
6.4.1.2	Test Stand Kit No. 3	B4010-40F26		Nissan North America, Inc
6.4.1.2	Test Stand Kit No. 4	14004-F4003		Nissan North America, Inc
6.3.9	Jacketed Rocker Cover	TEI- NIVAWCR-020	Aluminum Jacketed Rocker Cover	Test Engineering, Inc.
6.2.9	Modified Wiring Harness	OHTKA24-002- 1	Modified Wiring Harness for ECM	OH Technologies, Inc.
6.3.4.2	Air Filter Assembly	16500-86G50KT	Air Filter Housing and Element	Nissan North America, Inc.
6.5.1	Cam Angle Encoder Cylinder Head Calibration Apparatus	NIVACWM010		Test Engineering, Inc. OH Technologies, Inc.
7.4.2	Silicone Gasket Maker	999MP-A7007	RTV Sealant	Nissan Dealer
7.2	Test Fuel	KA24E	KA24E (dyed green)	Dow Chemical
7.3.1	Break-in Oil	TMC 926-2	TMC 926-2	ASTM Test Monitoring Center

<sup>A</sup> Can be used for thirty-two tests, cylinder head included with assembly can be used for sixteen tests

<sup>B</sup> Can be used for sixteen tests