



Test Monitoring Center

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Sequence IVA Information Letter 10-1
Sequence Number 19
January 4, 2010

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: Addition of an Alternative Blowby Measurement Apparatus and Updated Off Gas Routing

At the November 19, 2009 Sequence IV Surveillance panel meeting, the panel agreed to include an additional blowby measuring apparatus in the procedure. This alternate blowby measuring apparatus is similar to the apparatus used in the Sequence IIIG test method. This apparatus had been used successfully by several laboratories since the introduction of the IVA test but was never included in the method. The panel also approved an optional 3.2 mm, needle-valve to isolate the PCV when using the alternative blowby measuring apparatus. New Figures 3 and A3.18 have been added. Section 11.3.1 has been revised in its entirety, to reflect taking measurements with either blowby apparatus. Section 6.3.10 has been rewritten to improve the flow of the procedure and to reflect the optional 3.2mm needle-valve. Section 6.3.11 has been added also to reflect the optional 3.2 mm needle-valve.

The attached changes to Test Method D 6891 are effective the date of this information letter.

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Chairman
Sequence IVA Surveillance Panel

Frank M. Farber
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Attachment

c: ftp://ftp.astmtmc.cmu.edu/docs/gas/sequenceiv/procedure_and_ils/il10-1.pdf

Distribution: Email

**Revises Test Method D 6891-06a, as amended by Information Letters 08-1, 09-1 and
09-2**

6.3.10 *Crankcase Ventilation System* (Figure 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.

6.3.10.1 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 Figure 3 for a drawing of the ventilation system plumbing).

6.3.10.2 Use a mass flow meter to measure the 10.0 L/min (SLPM, Standard Litres per Minute) fresh airflow to the rocker cover. This meter, corrected to standard conditions, shall have an accuracy of ± 0.25 L/min (SLPM) 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).^{12, 20}

6.3.10.3 Prior to the meter is a three-way control valve. This valve should have a nominal size of 13 mm, with 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.^{11, 21} Use a 20 L nominal surge at the exit of the flow meter.

6.3.10.4 The plumbing from the 3-way valve to the engine front cover is 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, is a nominal diameter of 16 mm. A 3.2mm needle-valve may be installed between the intake and the PCV.

6.3.11 *Diversion for Blowby Measurement*— To facilitate the periodic measurement of engine blowby, install a 3-way valve in the hose between the engine PCV and the intake manifold vacuum source. Use a longer hose to connect the rocker cover to the air cleaner housing.

6.3.11.1 During blowby measurement, position the 3-way valve and hoses to route blowby from the rocker cover (bypassing the air cleaner), through the blowby meter, through the 3-way valve, then to the intake manifold vacuum source.

6.3.11.2 Monitor crankcase pressure at the dipstick tube. During blowby measurement, adjust the blowby measurement apparatus for zero crankcase pressure.

11.3.1 *Blowby Flow Rate Measurement*—Measure and record the blowby flow rate during the middle of Stage I of cycle 5 and cycle 100. Stabilize and operate the engine at normal Stage I operating conditions. Use a 3.175 mm diameter blowby orifice size for the normal blowby flow range of (5 to 12) L/min. An apparatus similar to those shown in schematics in Figures A3.17 or A3.18 may be used. The design of the apparatus is left up to the discretion of the laboratory. Perform steps 11.3.1.1 through 11.3.1.8 when using a device similar to the schematic in Figure A3.17 or perform steps 11.3.1.9 through 11.3.1.15 when using a device similar to the schematic in A3.18.

11.3.1.1 Open the flow valve (bleeder valve) completely.

11.3.1.2 Connect the blowby apparatus flow line to the 3-way valve located between the engine PCV and intake vacuum port.

11.3.1.3 Disconnect the hose at the air cleaner that is routed from the rocker cover. Then connect it to the inlet plumbing of the blowby apparatus orifice meter.

11.3.1.4 Position the 3-way valve to divert intake manifold vacuum from the engine PVC to the exhaust plumbing of the blowby apparatus meter.

11.3.1.5 Connect the blowby apparatus pressure sensor to the dipstick tube.

11.3.1.6 Adjust the flow valve (bleeder valve) to maintain crankcase pressure at (0 to 0.025) kPa.

11.3.1.7 Record the differential pressure across the blowby meter orifice, record the blowby gas temperature, and the barometric pressure.

11.3.1.8 After completing the measurement, return the engine to normal operating configuration. First, the dipstick tube pressure port; second, reconnect the hose from the rocker cover to the air cleaner; third, reposition the 3-way valve to ensure porting of the intake vacuum to the engine PCV; fourth, disconnect blowby apparatus hose from the closed port of the 3-way valve.

11.3.1.9 Connect the pressure gage from the blowby measurement device to the dipstick tube. Where the pressure gage is part of the measurement apparatus, plug the dipstick tube. It may also be necessary to isolate flow to the front cover.

11.3.1.10 Connect the blowby measurement device to the engine at the rocker cover.

11.3.1.11 Connect the blowby measurement device to the pressurized air source.

11.3.1.12 Slowly close the 3-way valve and the 3.2 mm needle-valve simultaneously.

11.3.1.13 Adjust the fine and coarse adjustment valves to maintain crankcase pressure at (0 to 0.025) kPa, as measured by the gage connected to the dipstick tube or on the measurement device.

11.3.1.14 Record the differential pressure across the blowby meter orifice, record the blowby gas temperature, and the barometric pressure. If the pressure drop across the orifice goes below the levels on the manometer, use a 4.763 mm orifice and repeat the measurement.

11.3.1.15 After completing the measurement, return the engine to normal operating configuration. First, the dipstick tube pressure port; second, disconnect the blowby apparatus from the rocker cover; third, reposition the 3-way valve; fourth, disconnect return the 3.2 mm needle-valve to the fully open position.

11.3.1.16 Calculate the blowby flow rate and correct the value to standard conditions (38 °C, 100.3 kPa) using the calibration data for that orifice.

SEQUENCE IVA CRANKCASE VENTILATION SYSTEM

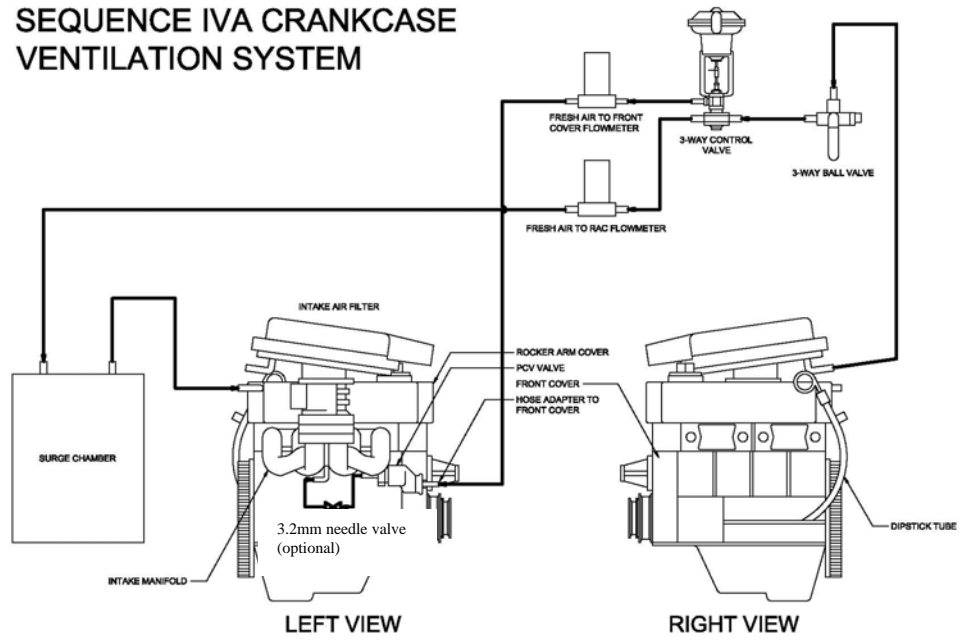


Figure 3 Typical Crankcase Ventilation

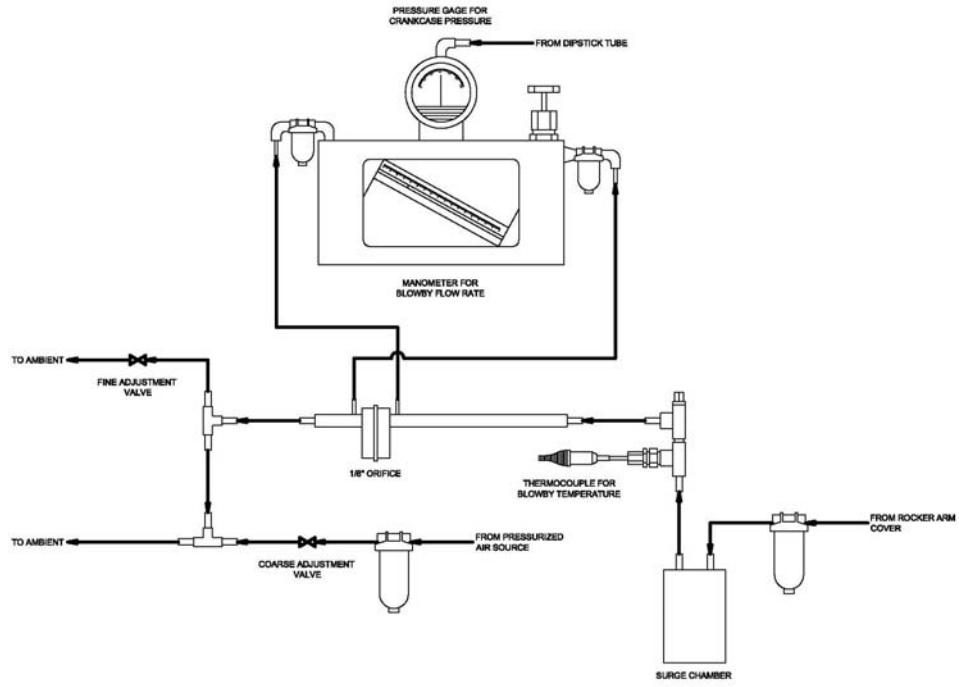


Figure A3.18 Typical Alternate Measurement Device