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Sequence VG Information Letter 08-2
Sequence No. 30

March 5, 2008

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 VG Mailing List

SUBJECT: Closed Loop AFR Control

During the February 20, 2008 Sequence VG Surveillance Panel teleconference meeting, the panel agreed to require closed loop control of the Air-Fuel Ratio (AFR) during stage III of the test. Sections 9.6.1.1, 9.6.1.2, X2.1.22, Tables 2 and 4, and Figure A3.14 of Test Method D 6593 have been revised and Sections 8.6, 8.6.1, 8.6.1.1 and 8.6.1.2 have been added to the test method. Existing Section 8.4.3.4 has been deleted and Section 8.4.3.5 has been renumbered as 8.4.3.4.

The attached revisions to Test Method D 6593 are effective February 20, 2008.

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Attachment

c: ftp://ftp.astmtmc.cmu.edu/docs/gas/sequencev/procedure_and_ils/vgil08-2-30.pdf

Distribution: Email

(Revises Test Method D6593-07a, as amended by Information Letters 07-1 and 08-1)

Delete Section 8.4.3.4

Renumber Section 8.4.3.5 as 8.4.3.4

8.6. Stage III Closed Loop AFR Control.

8.6.1 Modify the mass airflow sensor to engine control module wiring in accordance with Figure A3.14, to supply a simulated mass air flow sensor signal to provide closed loop AFR control during stage III.

8.6.1.1 Vary the simulated mass airflow sensor signal to obtain a constant fuel flow. Periodically adjust the fuel flow set point to obtain the lambda values in Table 2.

8.6.1.2 Alternatively, use the average of lambda from both the left and right cylinder bank AFR sensors to provide the feedback for the mass air flow sensor to directly control the lambda values during stage III.

9.6.1.1 Determine the air-fuel ratio using a wide band sensor to measure Lambda. The device shall have a minimum accuracy of ±2%. Suitable devices are available from the suppliers listed in X2.1.22.

9.6.1.2 Calibrate, zero, and span the AFR sensor in accordance with the user's manual prior to conducting a stand reference oil test sequence and/or when an O_2 sensor is replaced.

TABLE 2 Sequence VG Operating Specification

Condition	Stage I	Stage II	Stage III
Duration, min	120	75	45
Engine speed, r/min	1200 ± 5	2900 ± 5	700 ± 15
Engine power, kW	record	Record	1.30 ± 0.2
Manifold abs press, kPa (abs)	69 ± 0.2	66 ± 0.2	record
Engine oil in, °C	68 ± 0.5	100 ± 0.5	45 ± 1
Engine coolant out,° C	57 ± 0.5	85 ± 0.5	45 ± 1
Engine coolant flow, L/min	48 ± 2	Record	record
Engine coolant pressure, kPa (gage)	70 ± 10	70 ± 10	70 ± 10
RAC coolant in, °C	29 ± 0.5	85 ± 0.5	29 ± 1
Rocker cover flow, L/min	15 ± 1	15 ± 1	15 ± 1
Intake, air, °C	30 ± 0.5	30 ± 0.5	30 ± 0.5
Intake air press, kPa (gage)	0.05 ± 0.02	0.05 ± 0.02	0.05 ± 0.02
Lambda	1.00±0.05	1.00±0.05	0.75±0.03
Blowby flow rate, avg, L/min	record	60-70	—
Intake air humidity, g/kg	11.4 ± 0.8	11.4 ± 0.8	11.4 ± 0.8
Exhaust back pressure, kPa abs	104 ± 2	107 ± 2	record
Fuel flow, kg/min	record	Record	record

TABLE 4 Test Ramping Requirements [A]

Stage III to I	
Engine speed	1195 r/min within 5 to 20 s
Manifold absolute pressure	68.8 kPa within 20 to 80 s
Oil inlet temperature	67.5°C within 8 ± 2 min
Coolant outlet temperature	56.5°C within 6 ± 2 min
Rocker arm cover inlet temperature	29°C within 17 min
Stage I to II	
Engine speed	2895 r/min within 30 to 90 s
Manifold absolute pressure	66 ± .2 kPa within 60 to 150 s
Oil inlet temperature	99.5°C within 7 ± 2 min
Coolant outlet temperature	84.5°C within 7 ± 2 min
Rocker arm cover inlet temperature	84.5°C within 17 ± 2 min
Stage II to III	
Engine speed	715 r/min within 5 to 20 s
Engine power	< 3kW at 5 to 20 s
Oil inlet temperature	46°C within 15 ± 2 min
Coolant outlet temperature	46°C within 9 ± 2 min
Rocker arm cover inlet temperature	30°C within 10 ± 2 min
Lambda	0.705 to 0.765 at 15 s

[A] *Test Ramping Requirements Information*—At the start of the III to I ramp, return the mass air flow to engine control module relay to its normal position, allowing the mass air flow sensor to provide the normal signal to the engine.

X2.1.22 *Lambda Measurement Devices* —Recommended devices for measuring exhaust gas Lambda are available from the following suppliers:

Innovative LM-1.
Innovative Technology, Inc.
5 Jenner, Suite 100
Irvine, CA 92618

AFM1000 single channel AFR module
Engine Control and Monitoring
Sunnyvale, CA
http://www.ecm-co.com

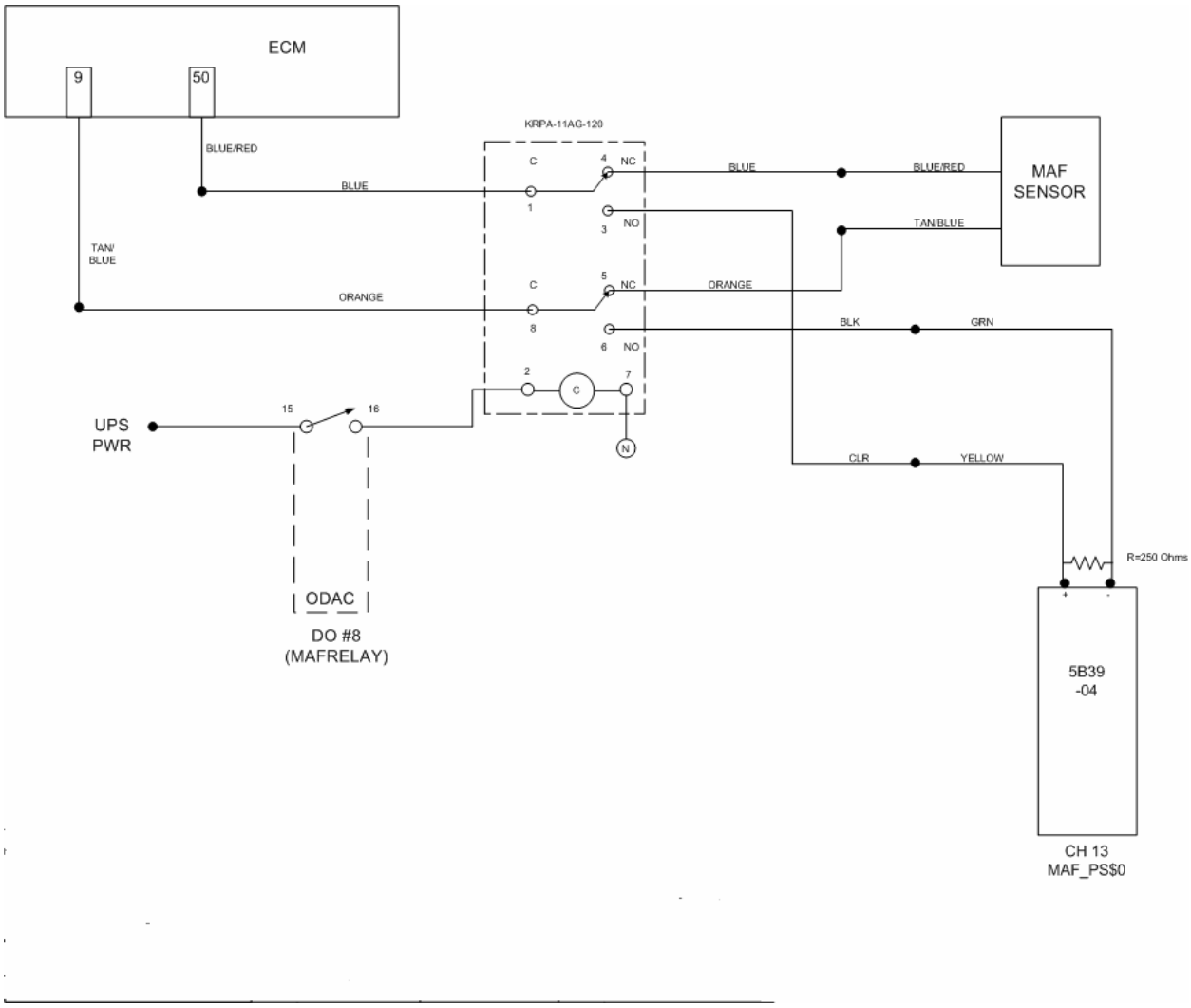

FIG. A3.14 Mass Air Flow Sensor Modifications