9. Sequence VID LTMS Requirements

The following are the specific Sequence VID calibration test requirements.

A. Reference Oils and Critical Parameters

The critical parameters are Fuel Economy Improvement at 16 hours (FEI1) and Fuel Economy Improvement at 100 hours (FEI2). The reference oils required for test stand/engine calibration are reference oils accepted by the ASTM Sequence VI Surveillance Panel. The means and standard deviations for the current reference oils for each critical parameter are presented below.

FUEL ECONOMY IMPROVEMENT at 16 Hours
Unit of Measure: Percent

Reference Oil	Mean	Standard Deviation
540 (GF5A)	1.32	0.12
541 (GF5D)	0.87	0.12
542 (GF5X)	1.49	0.12
1010	1.34	0.12

FUEL ECONOMY IMPROVEMENT at 100 Hours
Unit of Measure: Percent

Reference Oil	Mean	Standard Deviation
540 (GF5A)	1.04	0.14
541 (GF5D)	0.71	0.14
542 (GF5X)	0.80	0.14
1010	1.10	0.18

B. Acceptance Criteria

1. New Test Stand/Engine

   a. A minimum of three (3) operationally valid calibration tests (uninterrupted by non-reference oil tests), with no Shewhart severity alarms (all parameters), are required to calibrate each stand/engine. Precision requirements and severity adjustments are only to be evaluated after the third operationally valid test that has successfully met the Shewhart severity requirement. Note that Special K limits may not be used for Shewhart severity control charts in the calibration of a new stand/engine. Special K limits may only be used for existing stand/engines.

   b. For every two (2) operationally invalid tests during the attempt to calibrate a new stand/engine after the first operationally valid test (the count does not start until after the first valid test), an additional operationally valid calibration test will be added to the stand/engine calibration requirement.

Sequence VID Reference Oil Targets							
Oil	n	Effective Dates		FEI1		FEI2	
		From[1]	To[2]	$\overline{X}$	s[3]	$\overline{X}$	s[3]
540 (GF5A)	11[4]	12-29-08	12-2-09	1.32	0.14	1.04	0.16
540 (GF5A)	11[4]	12-3-09	***	1.32	0.12[5]	1.04	0.14[5]
GF5B	3[4]	12-29-08	***	0.97	0.14	0.63	0.16
GF5C	4[4]	12-29-08	***	1.24	0.14	0.59	0.16
541 (GF5D)	11[4]	12-29-08	12-2-09	0.87	0.14	0.71	0.16
541 (GF5D)	11[4]	12-3-09	***	0.87	0.12[5]	0.71	0.14[5]
542 (GF5X)	11[4]	12-29-08	12-2-09	1.49	0.14	0.80	0.16
542 (GF5X)	11[4]	12-3-09	***	1.49	0.12[5]	0.80	0.14[5]
1010	5	12-01-10	9-27-11	1.31	0.12[5]	1.23	0.14[5]
1010	28	9-28-11	***	1.34	0.12[5]	1.10	0.18[6]

1 Effective for all tests completed on or after this date.
2 *** = currently in effect.
3 Pooled s from matrix analysis.
4 Matrix n-size.
5 November 2009 Pooled s calculation based on additional data– reference oil n-size used= 540-36, 541-24, 542-33, GF5B-3 and GF5C-4.
6 Standard deviation based on 28 operationally valid results.