



# Test Monitoring Center

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**MEMORANDUM:** 01-037

**DATE:** April 17, 2001

**TO:** Charlie Leverett, Chairman, Sequence VIA/VIB Surveillance Panel

**FROM:** Donald Lind

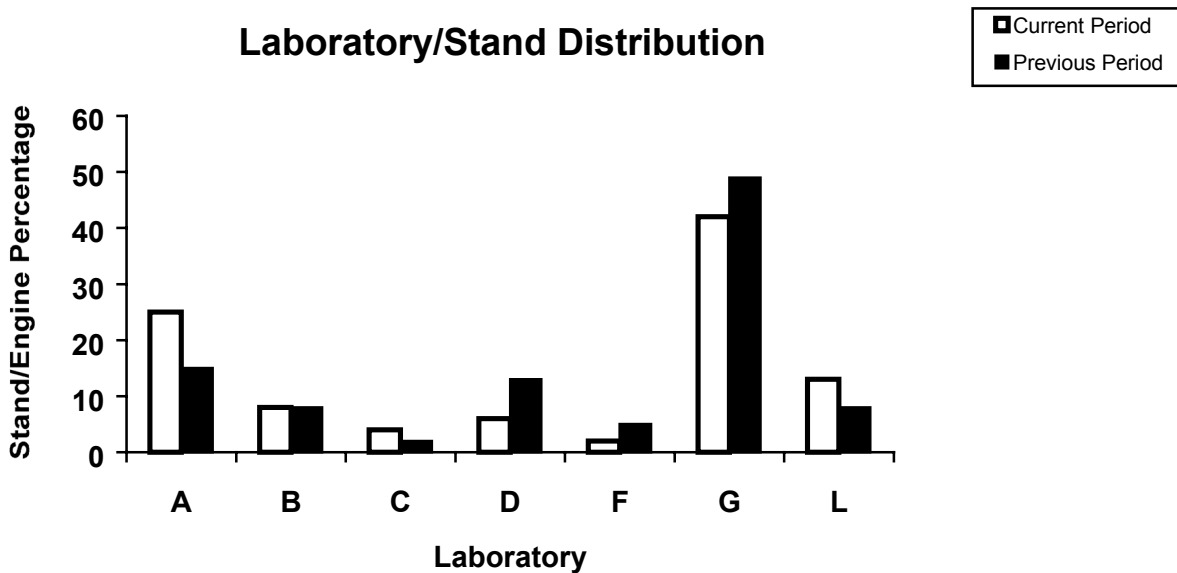
**SUBJECT:** Sequence VIB Test Results from October 1, 2000 through March 31, 2001

The following is a summary of Sequence VIB reference tests that were reported to the Test Monitoring Center during the period October 1, 2000 through March 31, 2001.

### Lab and Stand Summary

	Reported Data During Period	Calibrated as of 03/31/2001
Laboratories	7	6
Stand/Engine Combinations	48	21

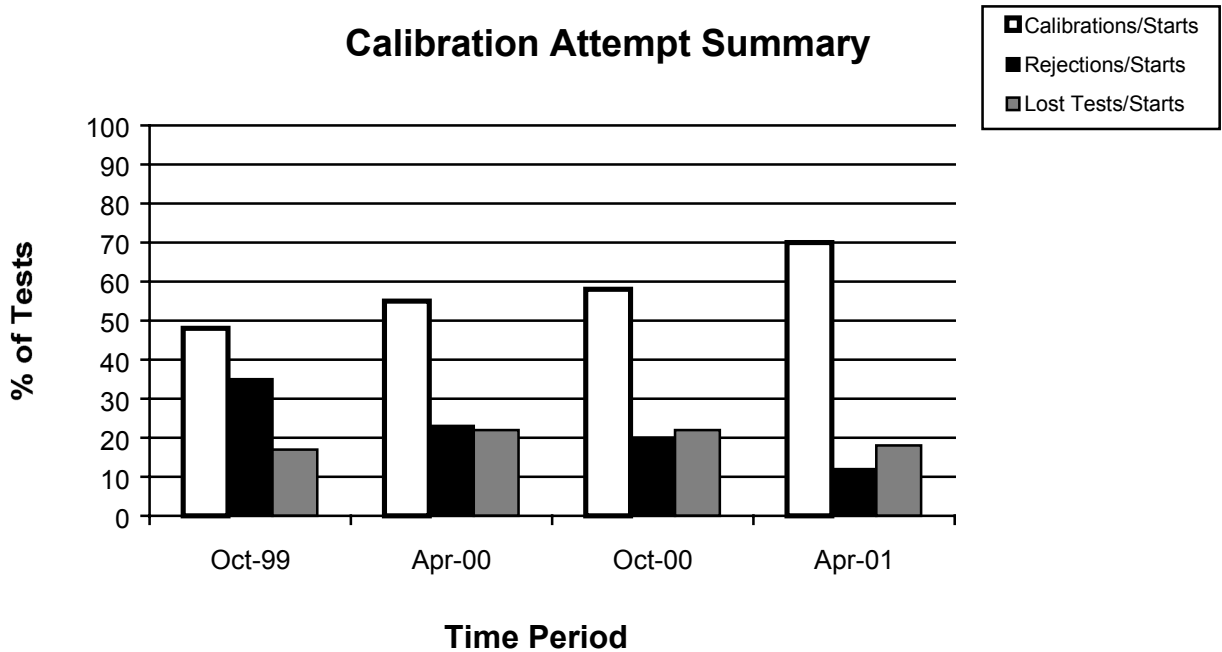
The following chart shows the laboratory stand/engine distribution for data reported during this report period:



The following summarizes the status of the reference oil tests reported to the TMC this report period:

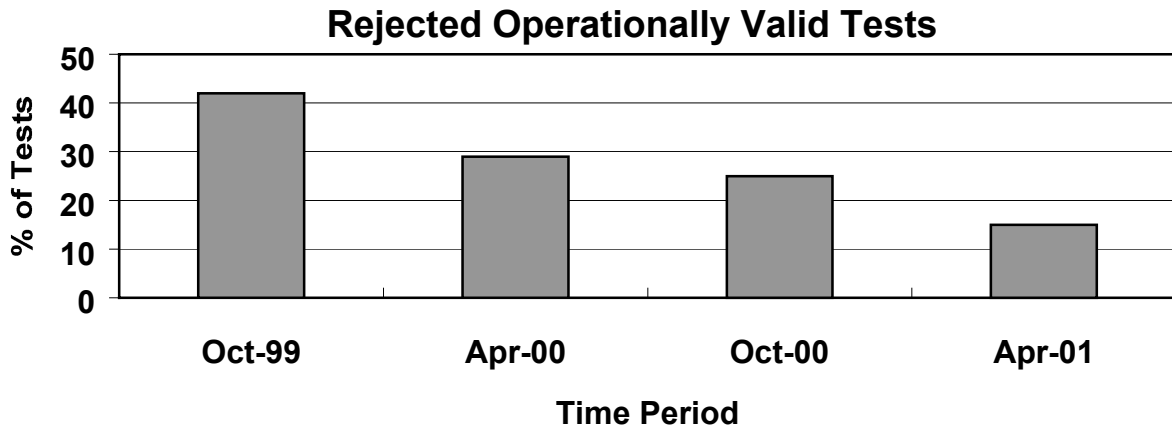
	TMC Validity Codes	No. of Tests
Operationally and Statistically Acceptable	AC	96
Failed Acceptance Criteria	OC	16
Operationally Invalid (Laboratory Judgement)	LC	8
Operationally Invalid (Laboratory & TMC Judgement)	RC	0
Aborted	XC	6
Tests Lost Due to Abandoned Engines	MC	11
<b>Total</b>		<b>137</b>

Attempted calibration tests are depicted graphically below by report period:

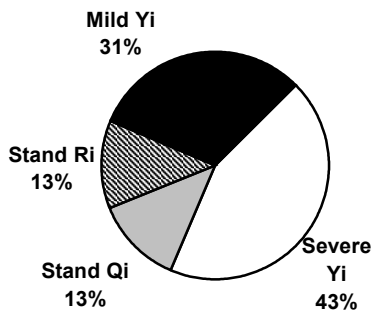


The calibration per start rate has increased this report period. The rejected per start rate and lost test per start rate has decreased this report period.

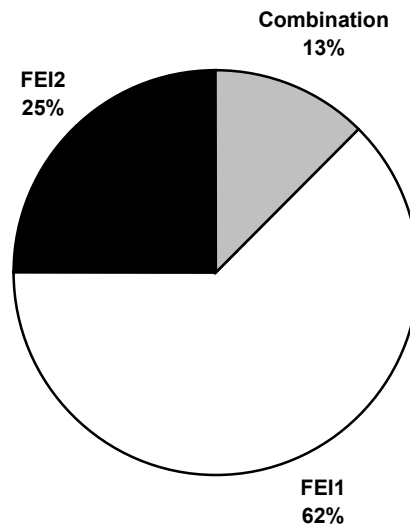
The percentage of tests failing the acceptance criteria for operationally valid tests decreased this report period. The percentages are depicted graphically below.



**Distribution of LTMS Stand Alarms**

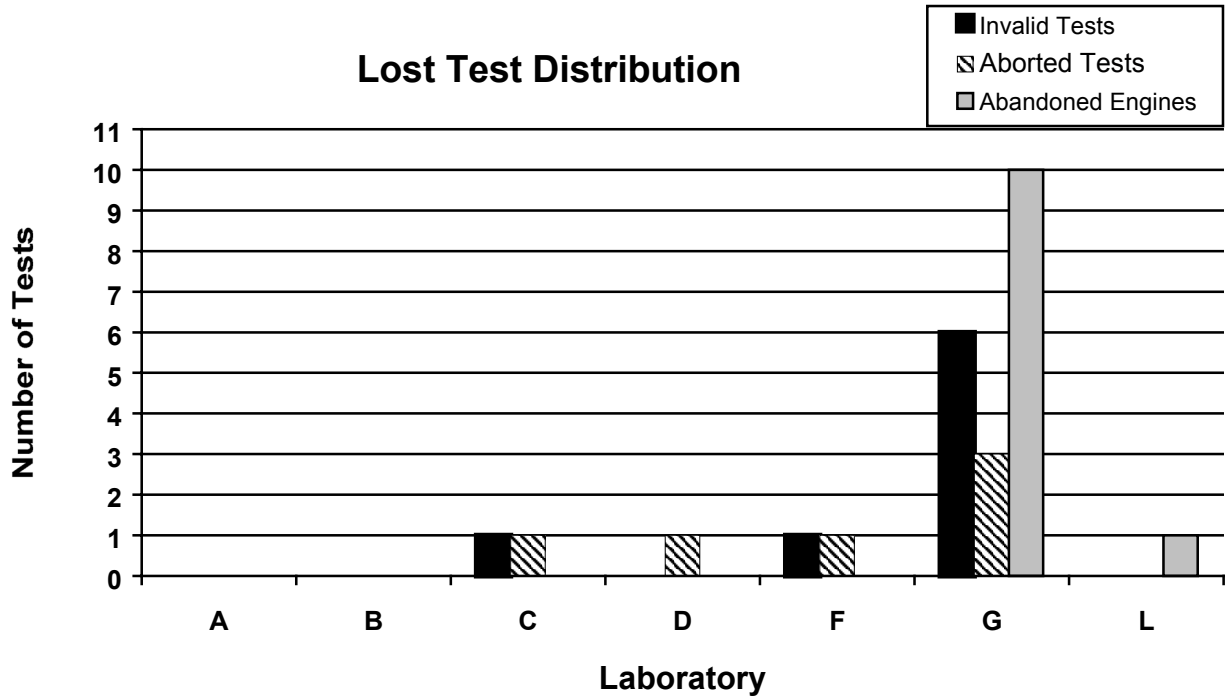


**Distribution of Stand Alarms by Parameter**

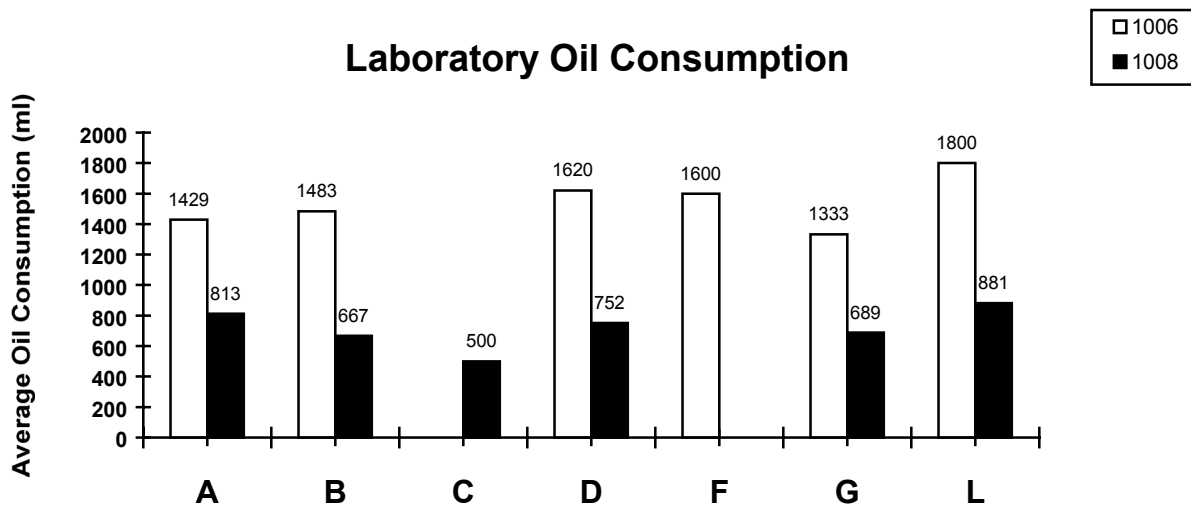


There were seven tests rejected for FEI Shewhart (Yi) severe, five tests rejected for FEI Shewhart (Yi) mild, two tests rejected for EWMA precision alarm (Qi), and two tests rejected for Shewhart precision alarm (Ri). There has never been an LTMS deviation written for Sequence VIB.

The laboratory distribution of lost tests is shown below. A detailed list of reasons for tests declared operationally invalid, aborted, or lost due to abandoned engines is shown in Table 2 (See Attachment).

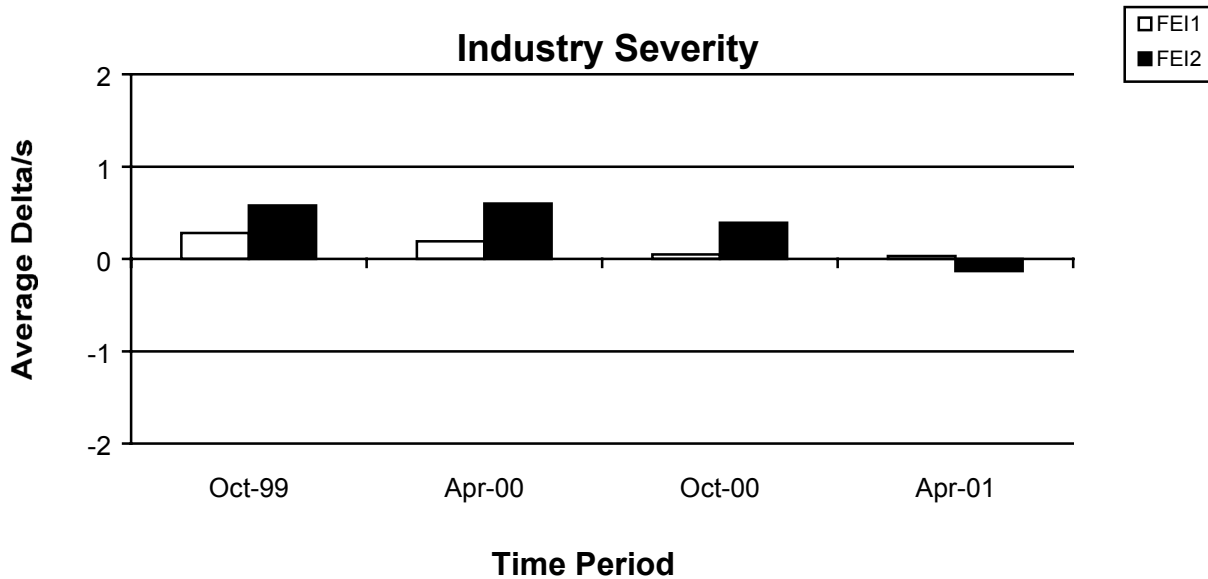


The average oil consumption by oil and laboratory are depicted graphically below. Shown below is a summary of the average oil consumption for all laboratories reporting data this report period.

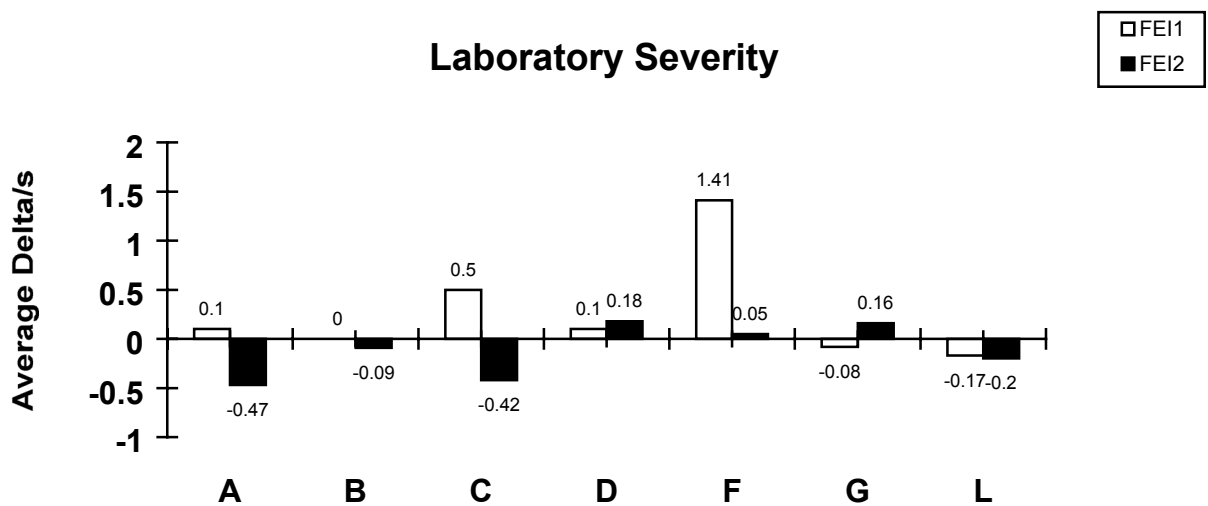


TEST SEVERITY AND PRECISION

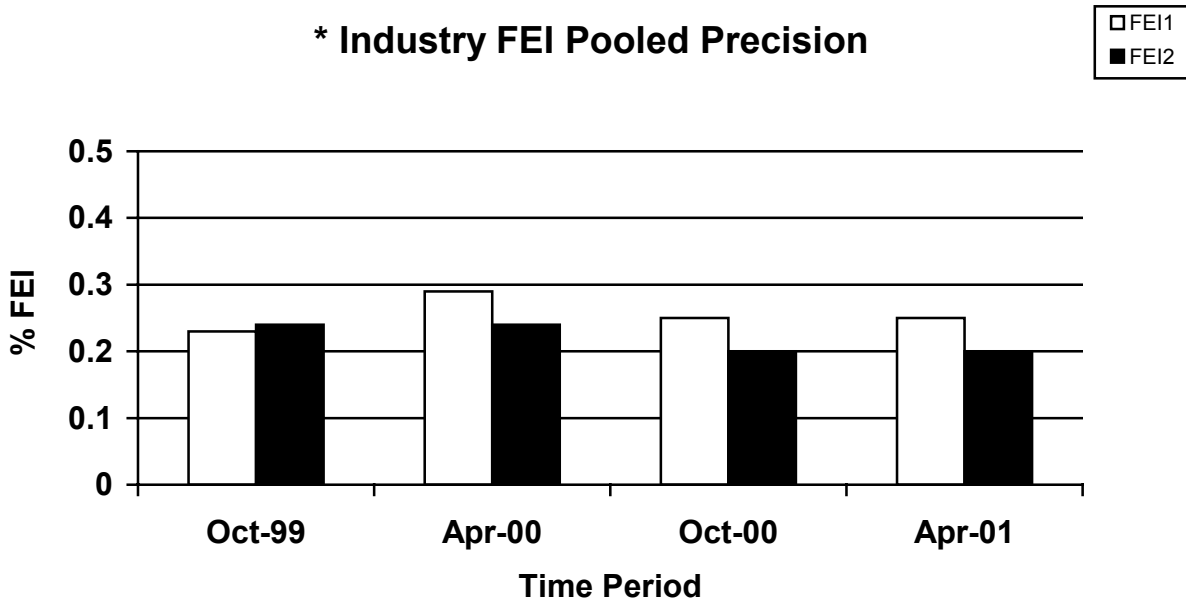
The industry mean  $\Delta/s$  for FEI1 and FEI2, for this report period, are 0.03 mild and -0.13 severe, respectively. FEI1 and FEI2 severity are very close to on target for this report period.



Shown below is a summary of the average FEI  $\Delta/s$  for all laboratories reporting data this report period.



The industry precision estimates for FEI1 and FEI2, for this report period, are 0.25 and 0.20 (pooled s), respectively. FEI1 and FEI2 precision remains unchanged for this report period.



\* Precision estimates are calculated by pooling lab and stand/engine combination

INDUSTRY CONTROL CHARTS

**FEI1**

There were two severity warning alarms and seventeen precision alarms (eight action and nine warning) triggered this report period as illustrated in Figure 1. The precision alarms appear to be related to a mix of new engines that have a tendency to produce severe results and older engines that are near the end of the calibration life that give mild results. An LTMS control chart for FEI1 with stand severity adjusted data is shown in Figure 3.

**FEI2**

There were two severity warning alarms and five precision alarms (one action and four warning) triggered this report period as illustrated in Figure 2. The alarms appear to be related to a mix of new engines that have a tendency to produce severe results and older engines that are near the end of their calibration life that give mild results. An LTMS control chart for FEI2 with stand severity adjusted data is shown in Figure 4.

REFERENCE OILS

The following table quantifies reference oils by the number of tests remaining at the TMC and each laboratory. Sequence VIB reference oils are shipped in quantities of 5 gallons per test.

LAB	1006	1007	1008
A	10	7	12
B	6	2	10
C	8	2	6
D	7	5	7
F	9	3	8
G	12	3	12
L	7	5	6
TMC	*	**	***

\* 1,130 Gallons (Multiple test area usage)

\*\* 657 Gallons (Multiple test area usage)

\*\*\* 493 Gallons (Multiple test area usage)

The following table addresses the potential for reblending the current Sequence VIB reference oils.

	1006	1007	1008
Viscosity Grade	5W30	5W30	5W30
Additional Reblends	Yes <sup>1</sup>	No	Yes <sup>2</sup>

<sup>1</sup> Currently two reblends of reference oil 1006 are in the TMC inventory (1006-1 & 1006-2).

<sup>2</sup> Currently this oil can be reblended however, the status a year from now is uncertain.

LAB VISITS

No lab visits were conducted during this report period.

INFORMATION LETTERS

There were two information letters issued this report period. Information Letter 00-4, Sequence Number 7, was issued on October 31, 2000 and Information Letter 01-1, Sequence Number 8, was issued on January 19 2001. Items changed with these information letters are documented in the Sequence VIB timeline (Table 3).

SUMMARY

Severity for FEI1 and FEI2 are close to being on target for this report period and compares well to historic data.

FEI1 and FEI2 precision remains unchanged compared to the last report period.

The percentage of calibrations per starts has increased this report period.

The percentage of lost tests per starts has decreased this report period.

The percentage of statistically rejected tests per starts has decreased this report period.

The percentage of operationally valid tests rejected statistically has decreased this report period.

DML/dml

Attachments

c: Sequence VIA/VIB Surveillance Panel  
Sequence VIA/VIB Test Engineers  
<ftp://www.tmc.astm.cmri.cmu.edu/docs/gas/sequencevi/semiannualreports/vib-04-2001.pdf>



Sequence VIB Semiannual Report  
List of Attachments

- Table 1 is a historic statistical summary for reference oils through March 31, 2001.
- Table 1A is a statistical summary for reference oils for the current report period.
- Table 2 is a summary of lost tests due to operationally invalid, aborted, abandoned engines or lost due to BC shift exceeding the test limits.
- Table 3 is the Sequence VIB Timeline.
- Figure 1 graphically present the Industry control charts for FEI1.
- Figure 2 graphically present the Industry control charts for FEI2.
- Figure 3 graphically present the Industry control charts for FEI1 with stand severity adjustments applied.
- Figure 4 graphically present the Industry control charts for FEI2 with stand severity adjustments applied.

SEQUENCE VIB  
 OPERATIONALLY VALID DATA SET  
 DATA PRIOR TO 04/01/01

OIL CODE 1006				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
143	FEI1	1.42	0.30	0.61 - 2.50
143	FEI2	0.55	0.26	-.14 - 1.23
OIL CODE 1007				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
92	FEI1	0.75	0.30	0.24 - 2.11
92	FEI2	0.45	0.27	-.55 - 1.25
OIL CODE 1008				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
147	FEI1	1.84	0.24	1.19 - 2.41
147	FEI2	1.24	0.21	0.58 - 1.68
382 TOTAL				

SEQUENCE VIB  
 OPERATIONALLY VALID DATA SET  
 DATA FROM 10/01/00 THRU 03/31/01

OIL CODE 1006				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
56	FEI1	1.46	0.23	0.90 - 2.08
56	FEI2	0.50	0.20	-.06 - 0.92

OIL CODE 1008				
N	TEST PARAMETER	MEAN	s	REPORTED RANGE
56	FEI1	1.84	0.27	1.19 - 2.37
56	FEI2	1.21	0.23	0.58 - 1.68

112 TOTAL

### Lost Tests Summary

Tests declared operationally invalid, aborted, or lost due to abandoned engines are summarized below by laboratory, reason, number of lost tests, and percent of lost tests:

LAB	REASON	Tests Lost	% of Tests Lost
C	Oil Consumption	1	29%
	Coolant and Oil Temperature Control Problem	1	
D	Coolant Temperature Control Problem	1	8%
G	Exceeded Allowable Downtime Hours	5	37%
	Coolant Temperature Out of Specification	1	
	Exceeded Allowable Number of Shutdowns	2	
	Abandon Engine	10	
	Load Cell Calibration Shift	1	
F	Coolant Temperature Out of Specification	1	67%
	Abandon Engine	1	
L	Abandon Engine	1	6%

### Sequence VIB Timeline

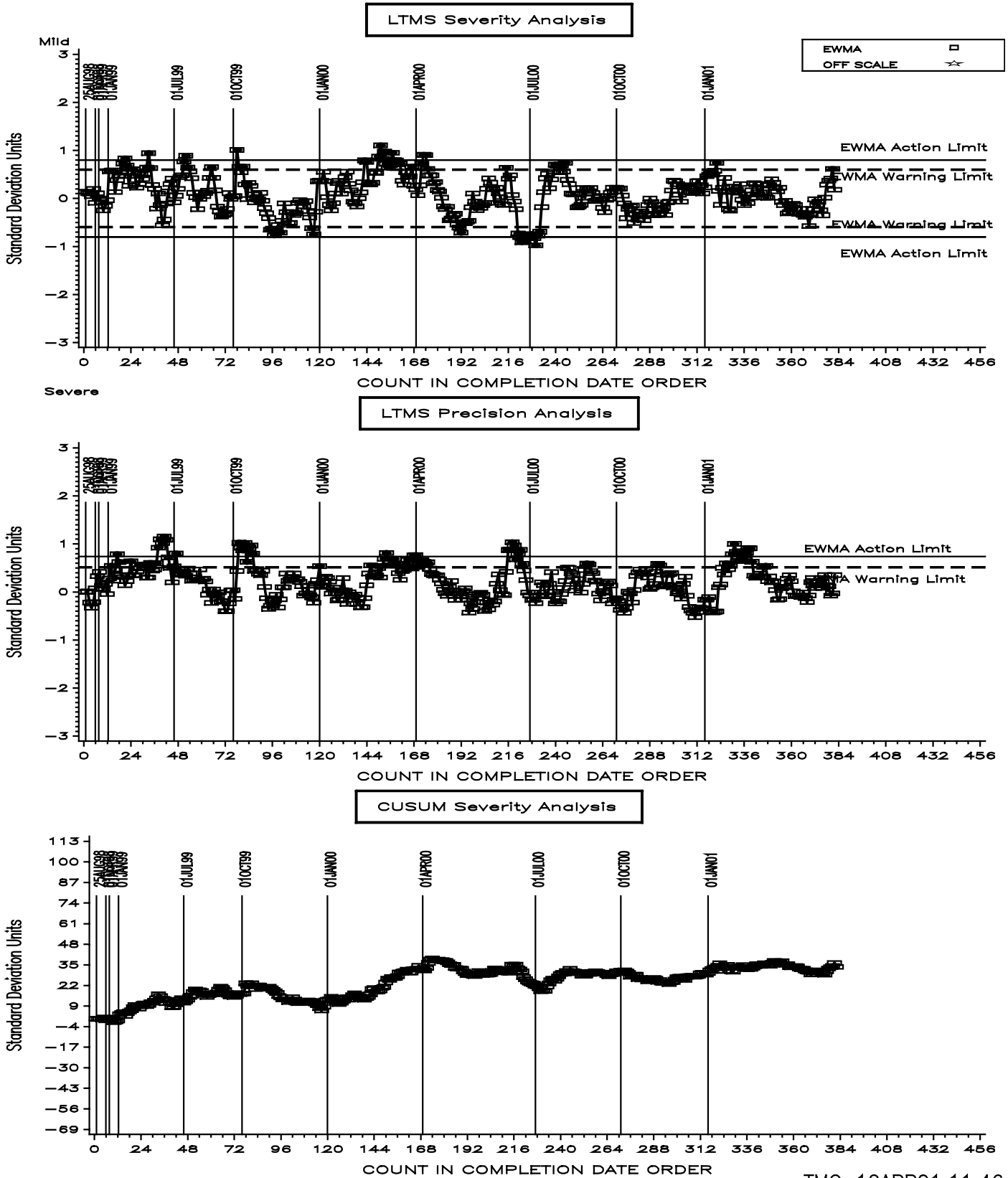
Date	Item Changed	Information Letter
19990809	Reference oil 1006 targets updated	
19990809	Reference oil 1007 targets updated	
19990809	Reference oil 1008 targets updated	
19990924	Calibration requirements	99-1
19990924	Alternative Cooling system	99-1
19990924	Fuel injection flow procedure	99-1
19990924	Requirement for of Use Maintenance log	99-1
19990924	Coolant flow measurement device calibration revision	99-1
19990924	Preparation procedure for oil charge	99-1
19990924	Recording compression pressures	99-1
19990924	Ignition timing checks	99-1
19990924	Valve stem seal replacements	99-1
19990924	Alternative Racor oil filter (LFS-62) use approved	99-1
19990924	Engine serial number added to report	99-1
19991015	Invalid test BC shift limits of -0.5 to 0.8% added	99-2
19991015	Tests terminated due to an FEI result are not permitted	99-2
19991015	Section 11.5.17.3 deleted – Manual data logging no longer required	99-2
19991015	Exhaust back pressure calibration prior to calibration test added	99-2
19991015	Instrumentation calibration requirements	99-2
19991015	Use of Eaton 37KW (50hp) dry gap dynamometer approved	99-2
19991015	New flush oil (BCFHD) and flush oil procedure	99-2
19991015	Micro motion model CMF010 mass flow meter approved	99-2
19991015	Kinematic viscosity measurements on new reference oils permitted	99-2
19991015	Report form editorial change for LABVALID made	99-2
19990924	Valve stem seal revised part number	99-3
20000207	Oil sight glass calibration	00-1
20000207	Revised Figure A2.22 – Oil Level Marker Ruler	00-1
20000207	Revised flush effectiveness procedure	00-1
20000207	Coolant flush procedure	00-1
20000207	Oil consumption validity interpretation	00-1
20000207	Load cell temperature specification	00-1
20000410	Valve Spring Replacement	00-2
20000524	Eliminate Baseline Shift Criteria	00-3
20000601	Maximum Allowable Oil Consumption Test Limit	00-3
20000601	Oil Sample Location Defined	00-3
20000601	Revised Blow-by and Crankcase Ventilation System	00-3
20000807	Fuel Injector Calibration Flow Rate Specification Added	00-3
20000807	Dynamometer Replacement During a test is not permitted	00-3
20000807	Engine Break-in Stand Requirements	00-3
20000807	Removal of Ford Wiring Harness Diagram	00-3
20000807	Addition of Alternative Injector Wiring Harness Part Numbers	00-3
20000807	Addition of Alternative HEGO Sensor Part Numbers	00-3
20000807	Addition of Alternative Throttle Body Adapter Part Number	00-3
20000807	Visteon EEC Control Module	00-3
20000901	Barometric Pressure added to report packet as record only	00-3



SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE I (%)

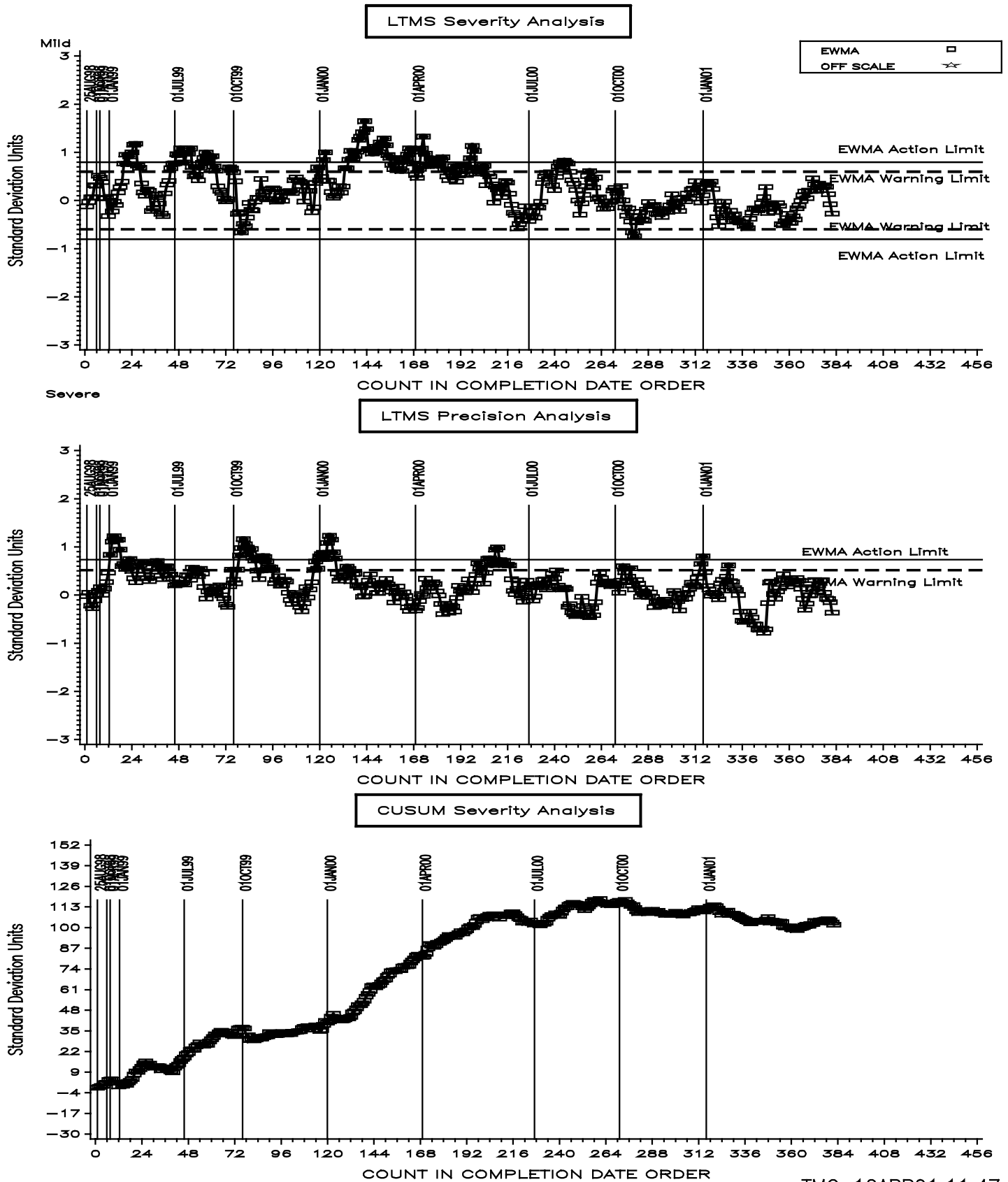
FIGURE 1



# SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

FEI FINAL RESULT PHASE II (%)

FIGURE 2

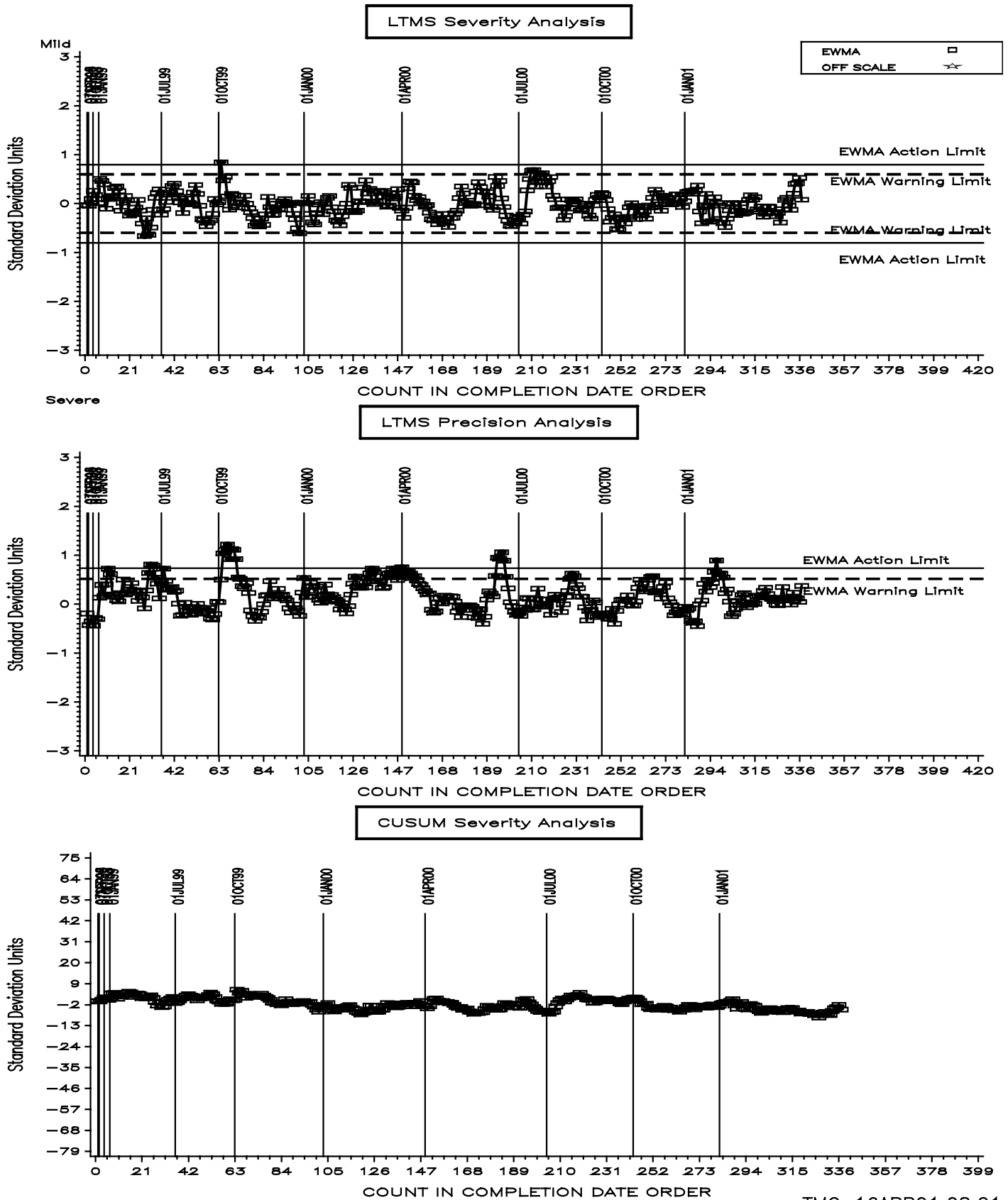




# SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

Stand Severity Adjusted Data  
FEI FINAL RESULT PHASE I (%)

FIGURE 3



# SEQUENCE VIB INDUSTRY OPERATIONALLY VALID DATA

Stand Severity Adjusted Data  
FEI FINAL RESULT PHASE II (%)

FIGURE 4

