A Program of ASTM International

Test Monitoring Center

@ Carnegie Mellon University
6555 Penn Avenue, Pittsburgh, PA 15206, USA

http://astmtmc.cmu.edu
412-365-1000

MEMORANDUM: 14-024

DATE: October 22, 2014

TO: Chris Prengaman, Chairman, L-37 Surveillance Panel

FROM: Scott Parke

SUBJECT: L-37 Testing from April 1, 2014 through September 30, 2014

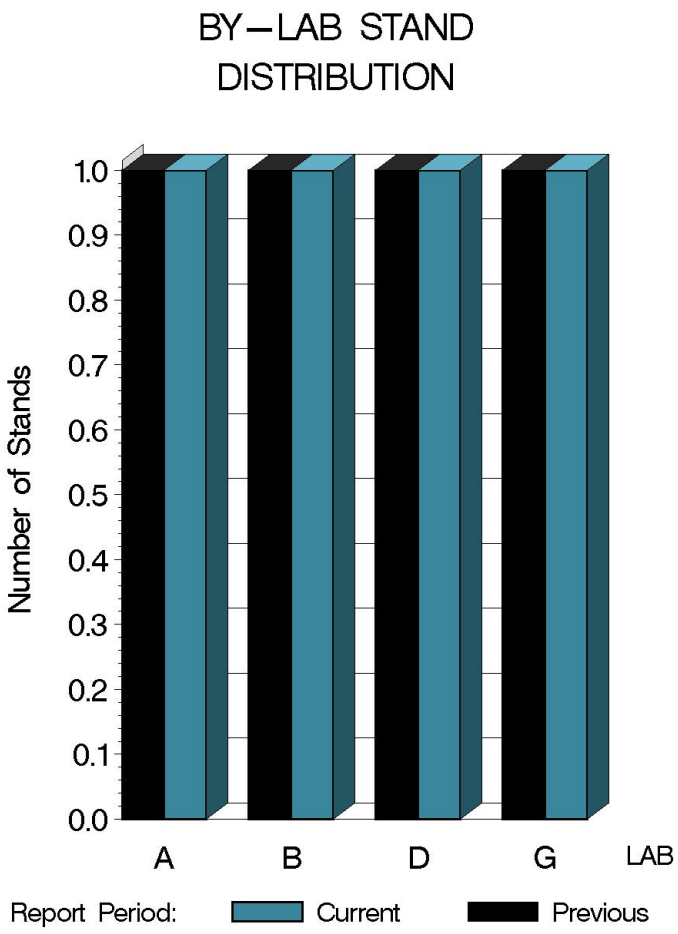
Please find attached a summary of reference oil testing activity this period.

SDP/sdp/mem14-024.sdp.doc
cc: Frank Farber
Jeff Clark
L-37 Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gear/l37/semiannualreports/l37-10-2014.pdf

Distribution: email

L-37 (D6121)

	Reporting Data	Calibrated on 9-30-14
Number of Labs	4	4
Number of Stands	4	4



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L-37 (D6121)

Test Distribution by Oil and Validity

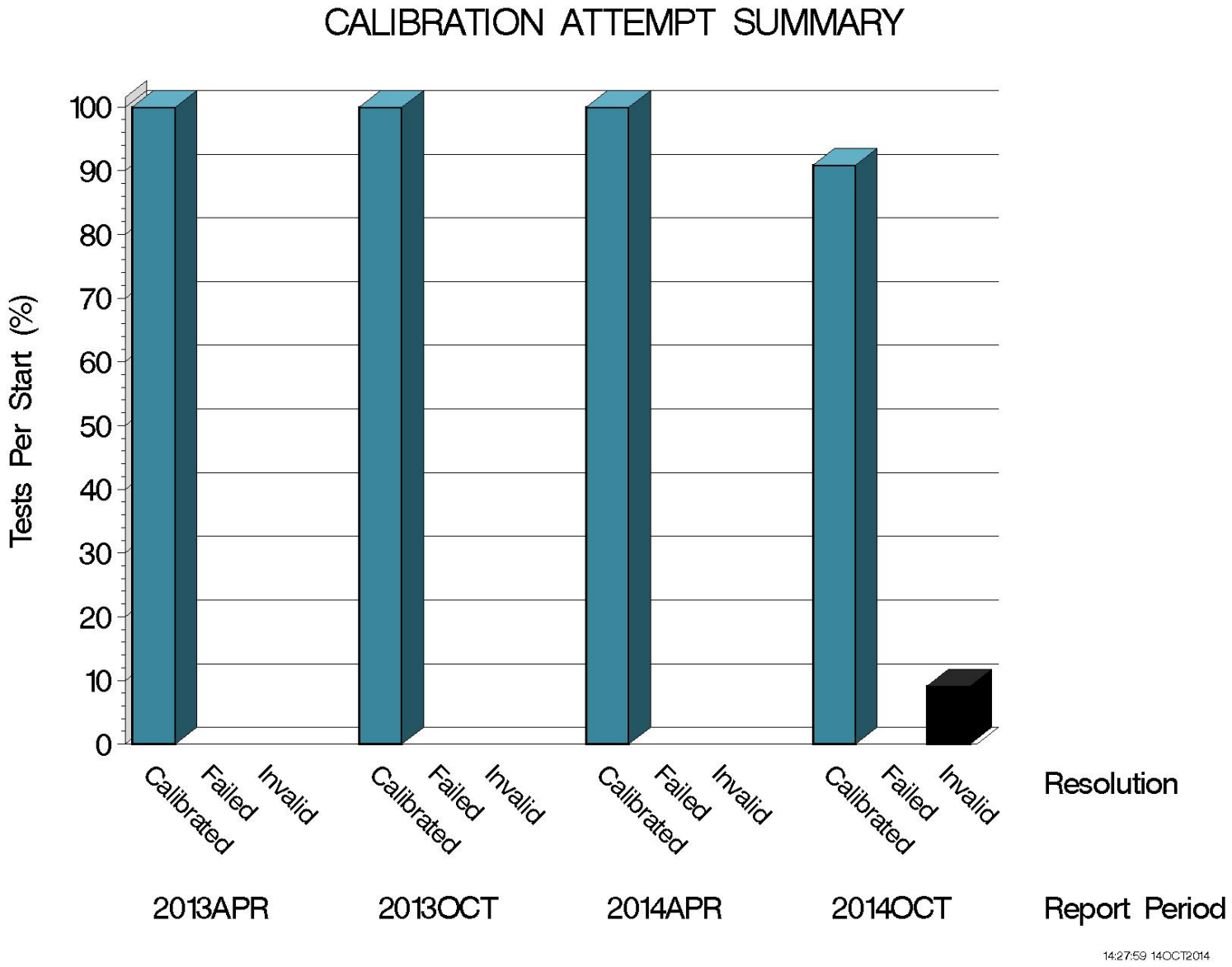
		134	152-1	152-2	155	155-1	Totals Last Period	Totals This Period
Accepted for calibration	AC	4	0	2	0	4	5	10
Rejected (Mild)	OC	0	0	0	0	0	0	0
Rejected (Severe)	OC	0	0	0	0	0	0	0
Rejected (Precision)	OC	0	0	0	0	0	0	0
Invalidated calibration	RC	0	0	0	0	1	0	1
Acceptable info run	NI	8	0	3	0	0	1	11
Unacceptable info run	MI	0	0	0	0	0	0	0
Aborted info run	XI	1	0	0	0	0	0	1
Total		13	0	5	0	5	6	23

L-37 (D6121)

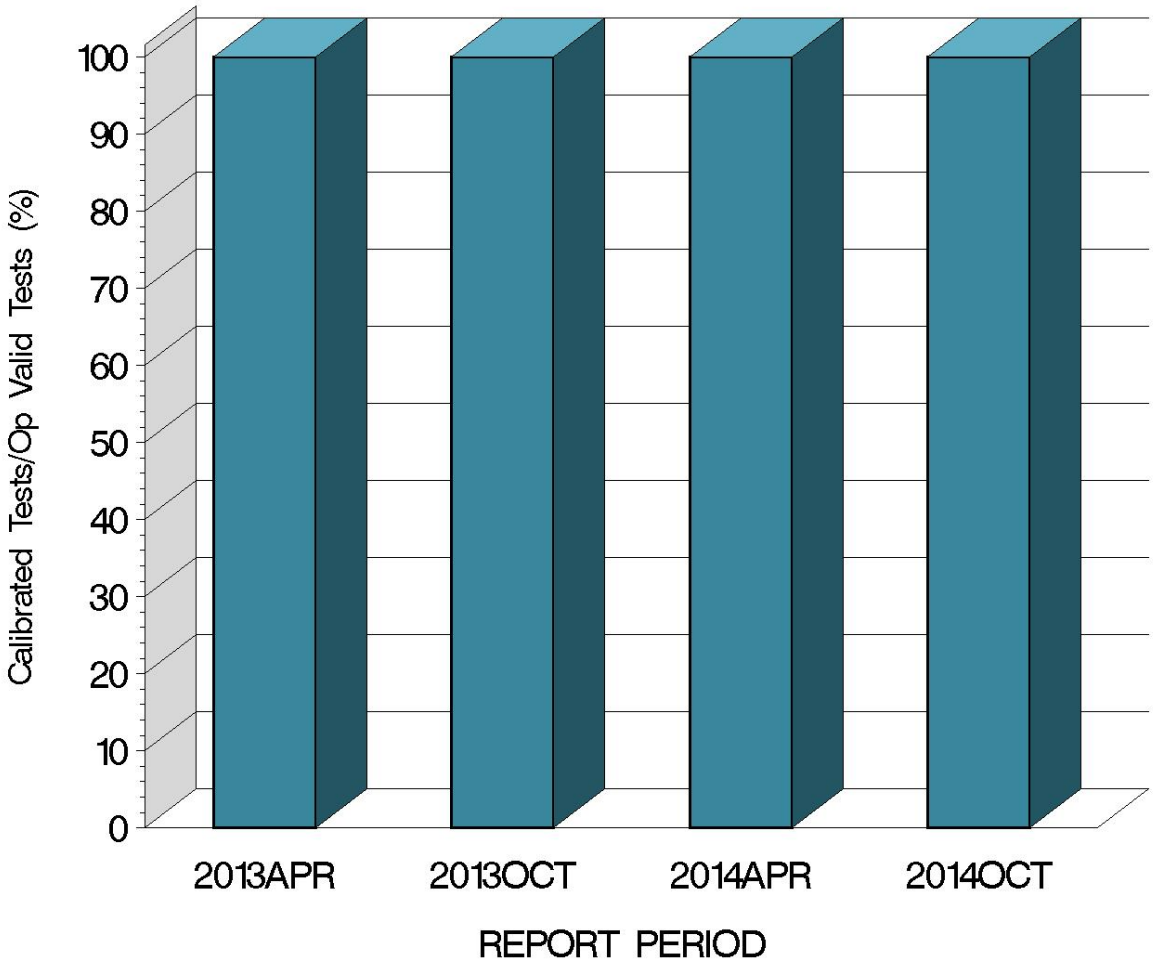
Calibration Attempt Detail

	Gear Batch	Acceptable	Failed	Total
LUBRITED	V1L500/P4T813	0	0	0
	V1L528/P4T883A	2	0	2
	Total	2	0	2
NONLUBRITED	V1L500/P4T813	0	0	0
	V1L528/P4T883A	8	0	8
	Total	8	0	8

L-37 (D6121)


CALIBRATION ATTEMPT SUMMARY
Tests Per Start (%)
100
90
80
70
60
50
40
30
20
10
0
Calibrated
Failed
Invalid
Resolution
2013APR
2013OCT
2014APR
2014OCT
Report Period
14:27:59 14OCT2014

L-37 (D6121)


OPERATIONALLY VALID TESTS
MEETING ACCEPTANCE CRITERIA
Calibrated Tests/Op Valid Tests (%)
100
90
80
70
60
50
40
30
20
10
0
2013APR
2013OCT
2014APR
2014OCT
REPORT PERIOD
14:27:59 14OCT2014

L-37 (D6121)

CAUSES FOR LOST TESTS

		Oil					Validity			Loss Rate		
Lab	Cause	134	152-1	152-2	155	155-1	RC	LC	XI	Lost	Starts	%
B	Pinion seal leak	●							●	1	5	20%
D	Post-EOT review found test ran incorrect torque					●	●			1	11	9%
	Lost	1	0	0	0	1	1	0	1			
	Starts	13	0	5	0	5	23	23	23			
	%	8%	0%	0%	0%	20%	4%	0%	4%			

L-37 (D6121)

GEAR BATCH SEVERITY

LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s[A]	Overall Δ/s	Overall Shift (in Merits)[B]
RIDG	V1L528/P4T883A	2	-0.889	2.481	-0.889	-1.271
RIPP	V1L528/P4T883A	2	-0.977	0.381	-0.977	-0.465
SPIT	V1L528/P4T883A	2	0.549	0.777	0.549	0.318
WEAR	V1L528/P4T883A	2	0.185	0.262	0.185	0.096

[A] Because the number of tests completed this period was too small to compute a representative pooled standard deviation, the straight standard deviation is shown.

[B] As computed using SA standard deviation published in the LTMS document.

L-37 (D6121)

GEAR BATCH SEVERITY (continued)

NON-LUBRITED HARDWARE						
Parameter	Gear Batch	N	Δ/s	s[A]	Overall Δ/s	Overall Shift (in Merits)[B]
RIDG	V1L528/P4T883A	8	-0.133	0.558	-0.133	-0.088
RIPP	V1L528/P4T883A	8	0.157	0.504	0.157	0.087
SPIT	V1L528/P4T883A	8	-0.019	0.850	-0.019	-0.016
WEAR	V1L528/P4T883A	8	-0.632	0.816	-0.632	-0.450

[A] Because the number of tests completed this period was too small to compute a representative pooled standard deviation, the straight standard deviation is shown.

[B] As computed using SA standard deviation published in the LTMS document.

L-37 (D6121)

LAB SEVERITY

LUBRITED HARDWARE						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
V1L528/P4T883A	A	2	-0.889	-0.977	0.549	0.185

NON-LUBRITED HARDWARE						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
V1L528/P4T883A	B	1	-0.239	-0.447	-1.214	-0.671
	D	6	-0.220	0.192	0.050	-0.435
	G	1	0.499	0.552	0.760	-1.769

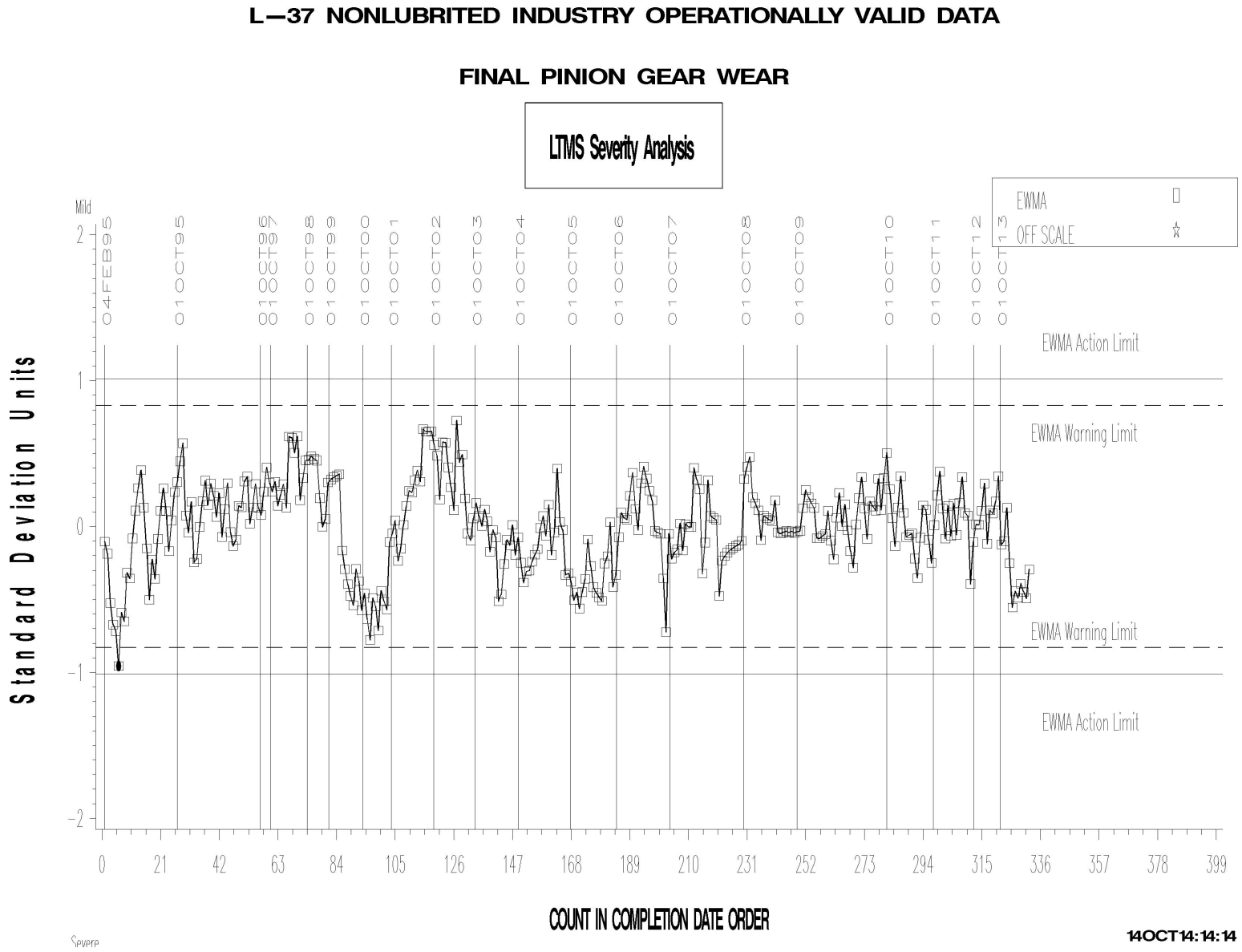
L-37 (D6121)

SUMMARY OF SEVERITY & PRECISION

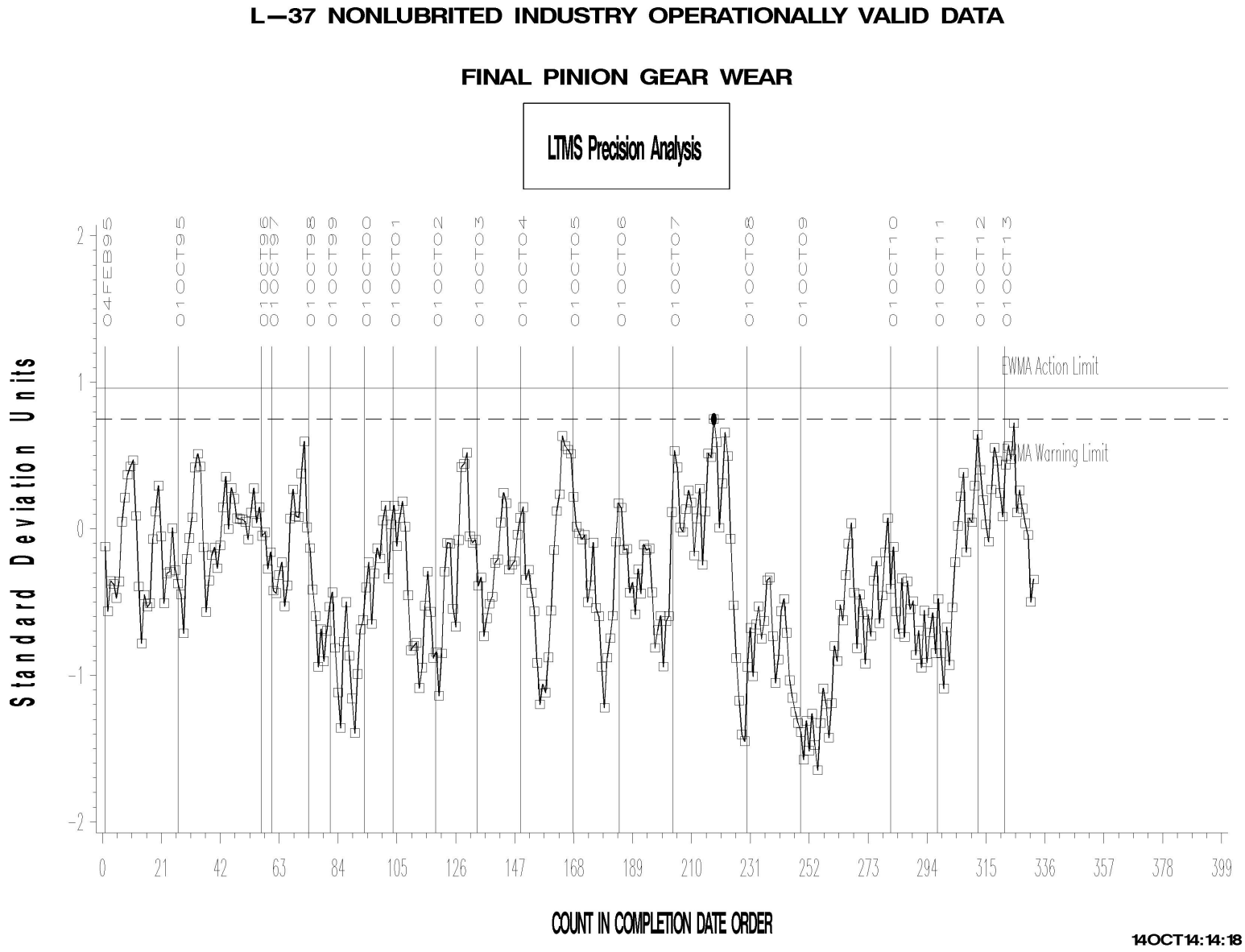
Severity
Testing on both lubrited and non-lubrited hardware remained within control chart limits this period.
Precision
Precision performance for both hardware types also remained within control chart limits.

Industry control charts follow.

L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
Mild
Severe
2
1
0
-1
-2
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
COUNT IN COMPLETION DATE ORDER
14OCT14:14:14

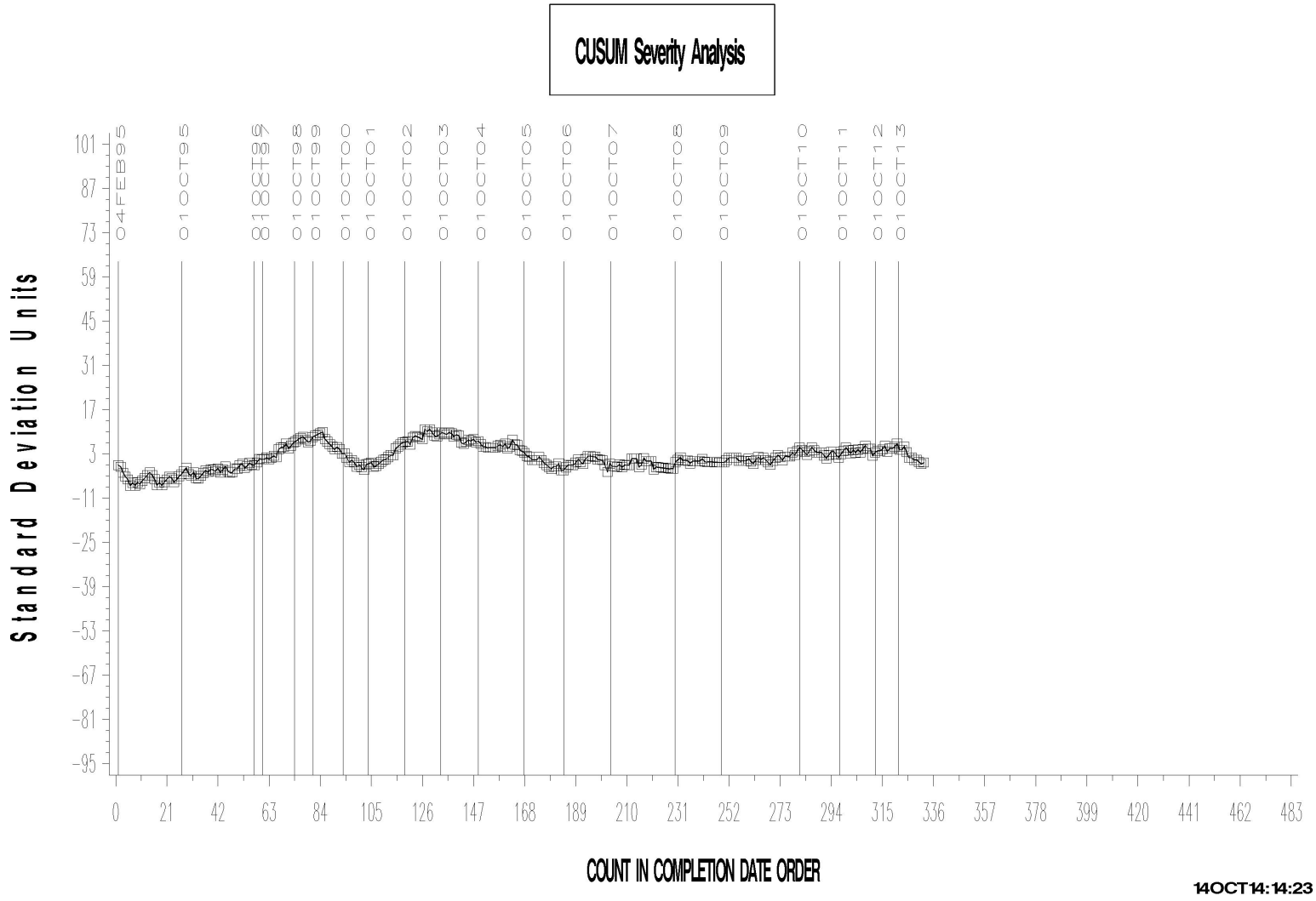
L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Precision Analysis
Standard Deviation Units
04FEB95
01OCT95
01OCT96
01OCT97
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
EWMA Action Limit
EWMA Warning Limit
2
1
0
-1
-2
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
COUNT IN COMPLETION DATE ORDER
14OCT14:14:18

L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR



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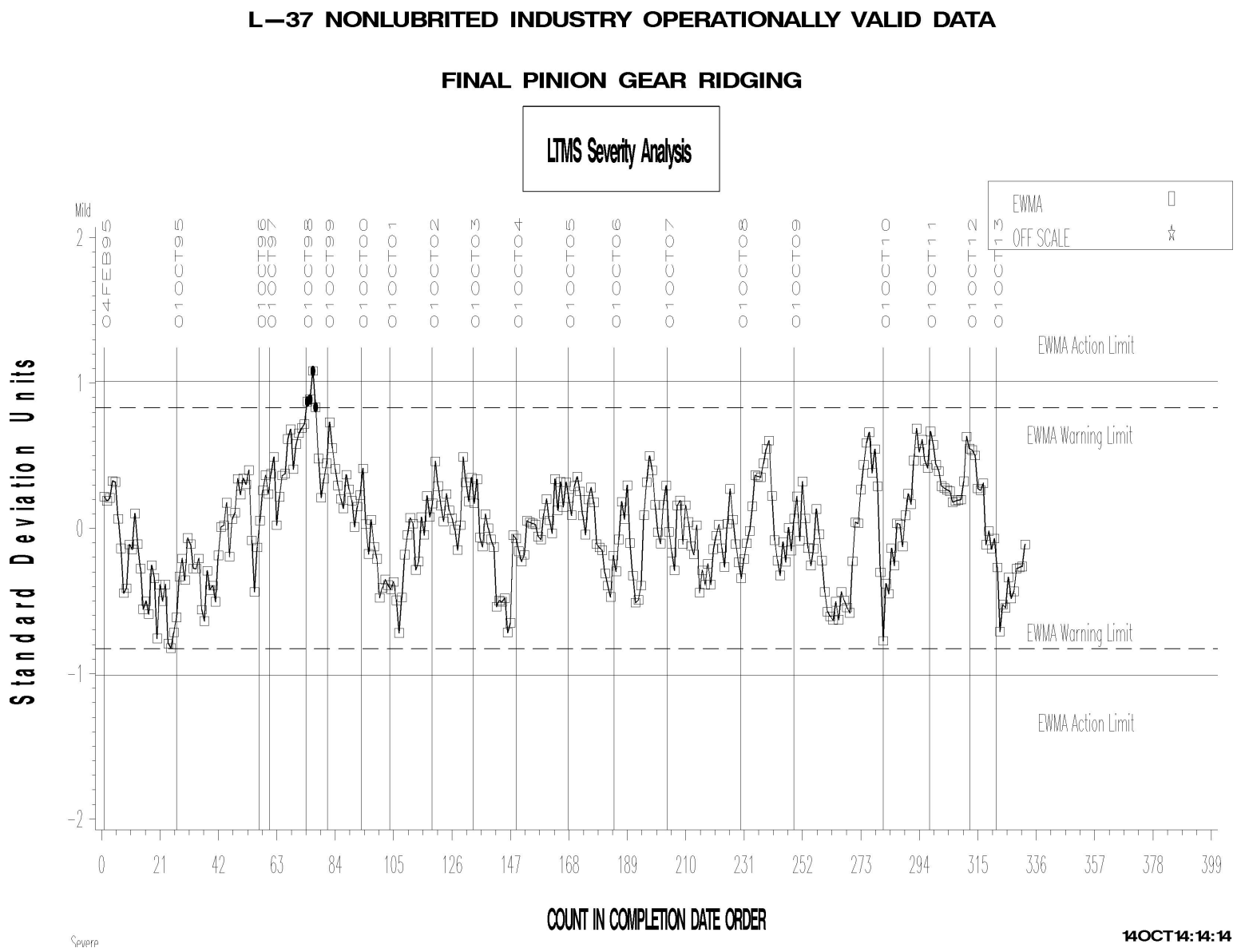
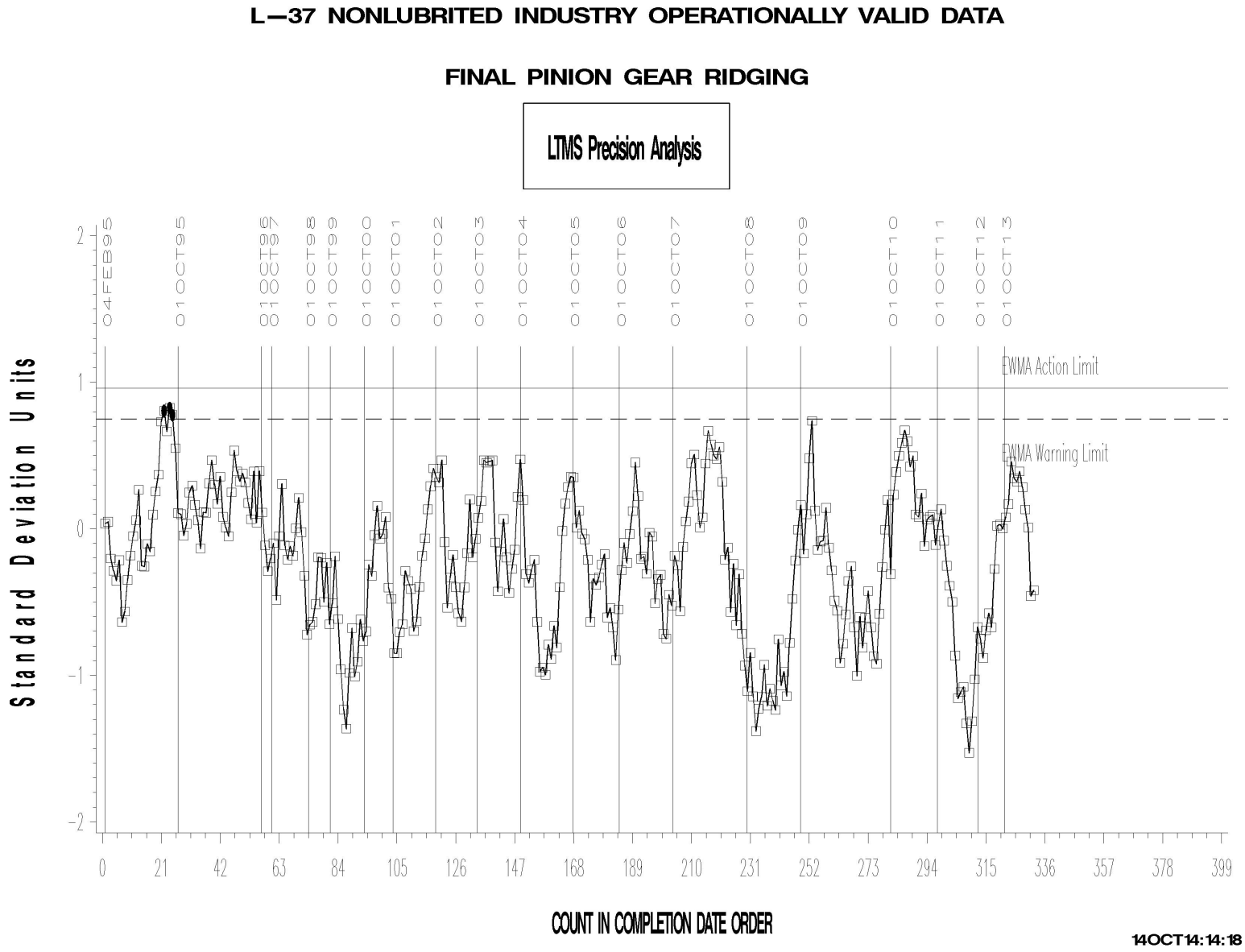
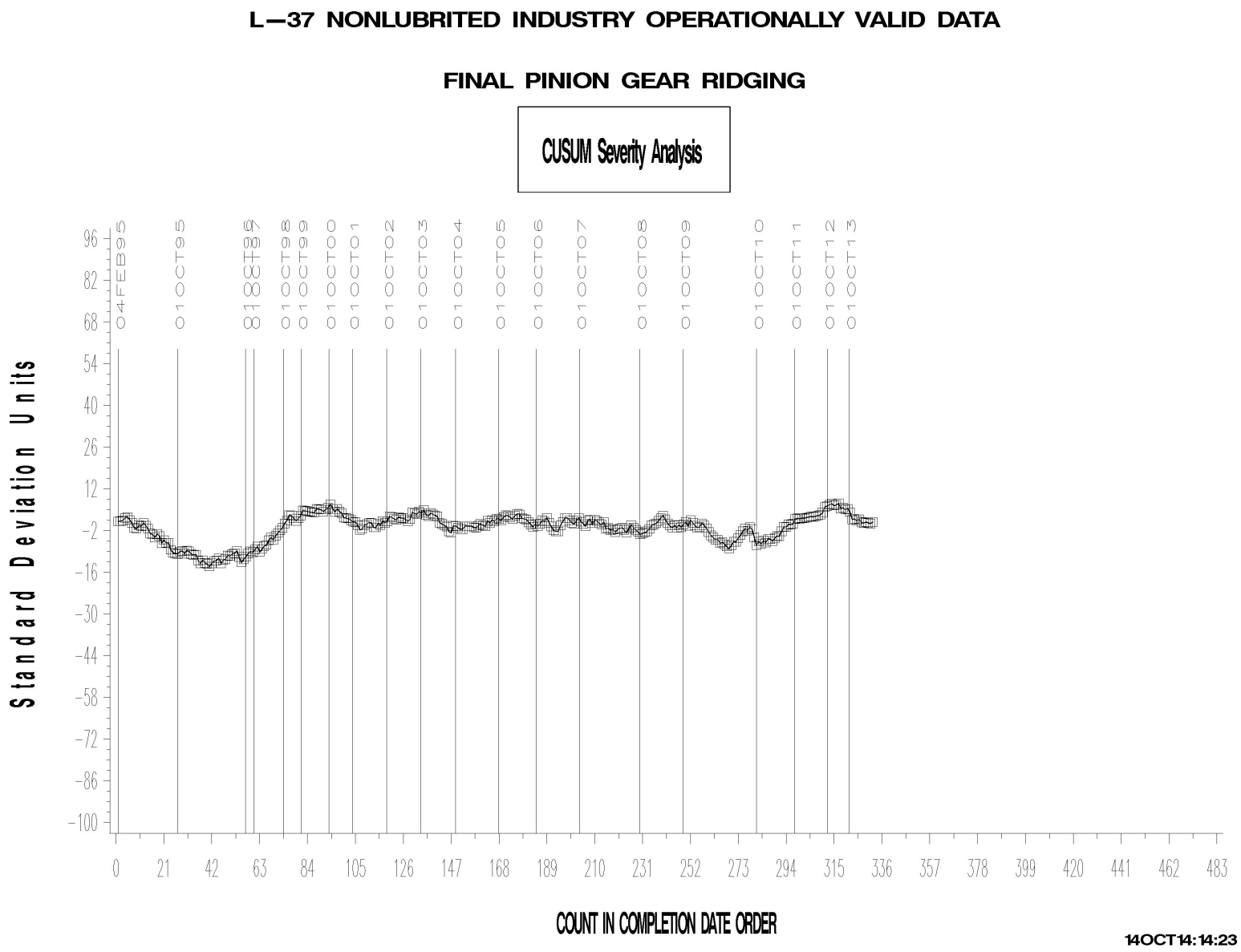
L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
Mild
Severe
2
1
0
-1
-2
04FEB95
01OCT95
01OCT96
01OCT97
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
COUNT IN COMPLETION DATE ORDER
14OCT14:14:14

L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Precision Analysis
Standard Deviation Units
04FEB95
01OCT95
01OCT96
01OCT97
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
EWMA Action Limit
EWMA Warning Limit
2
1
0
-1
-2
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
COUNT IN COMPLETION DATE ORDER
14OCT14:14:18

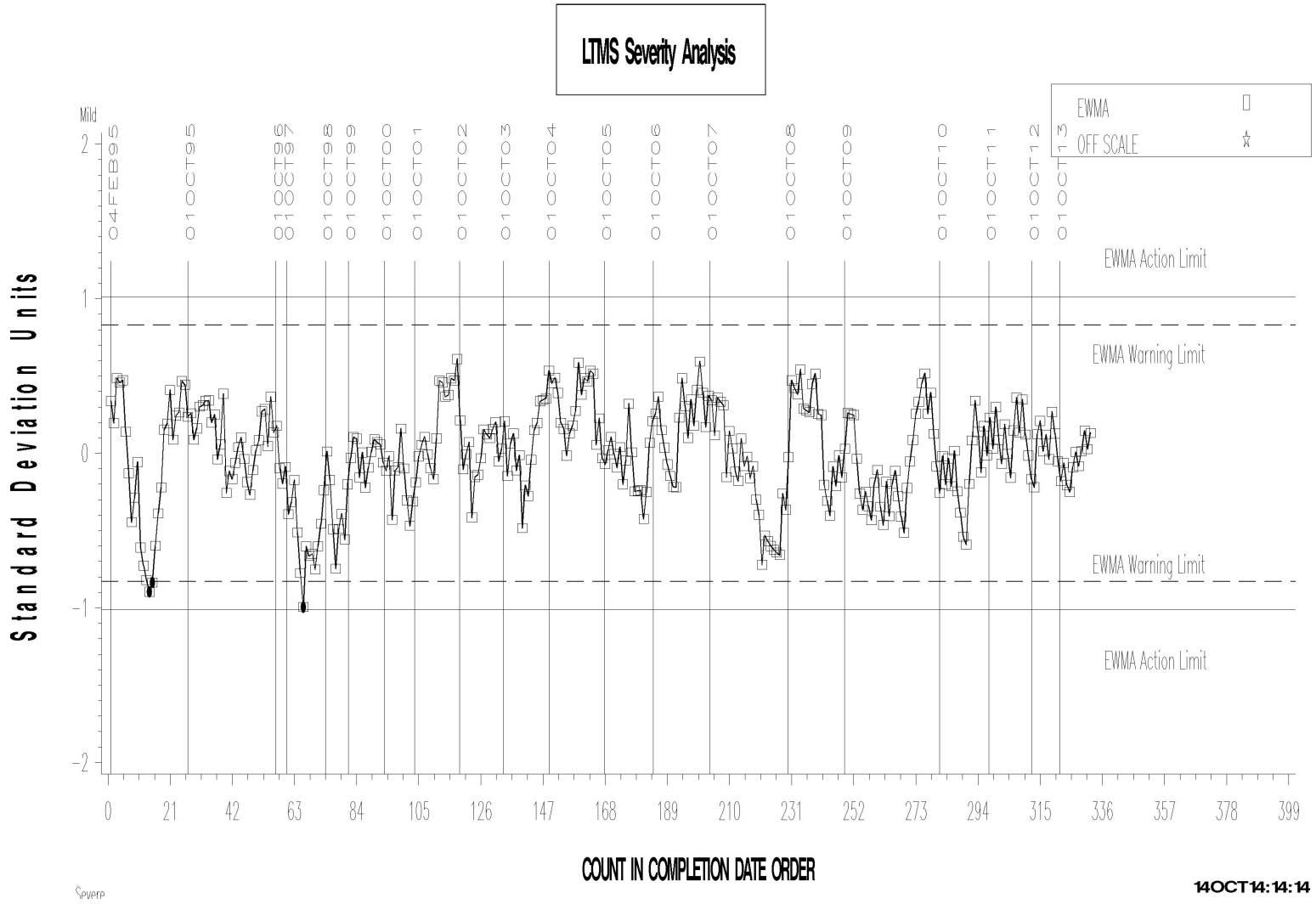
L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
CUSUM Severity Analysis
Standard Deviation Units
96
82
68
54
40
26
12
-2
-16
-30
-44
-58
-72
-86
-100
04FEB95
01OCT95
81881886
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
420
441
462
483
COUNT IN COMPLETION DATE ORDER
14OCT14:14:23

L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING



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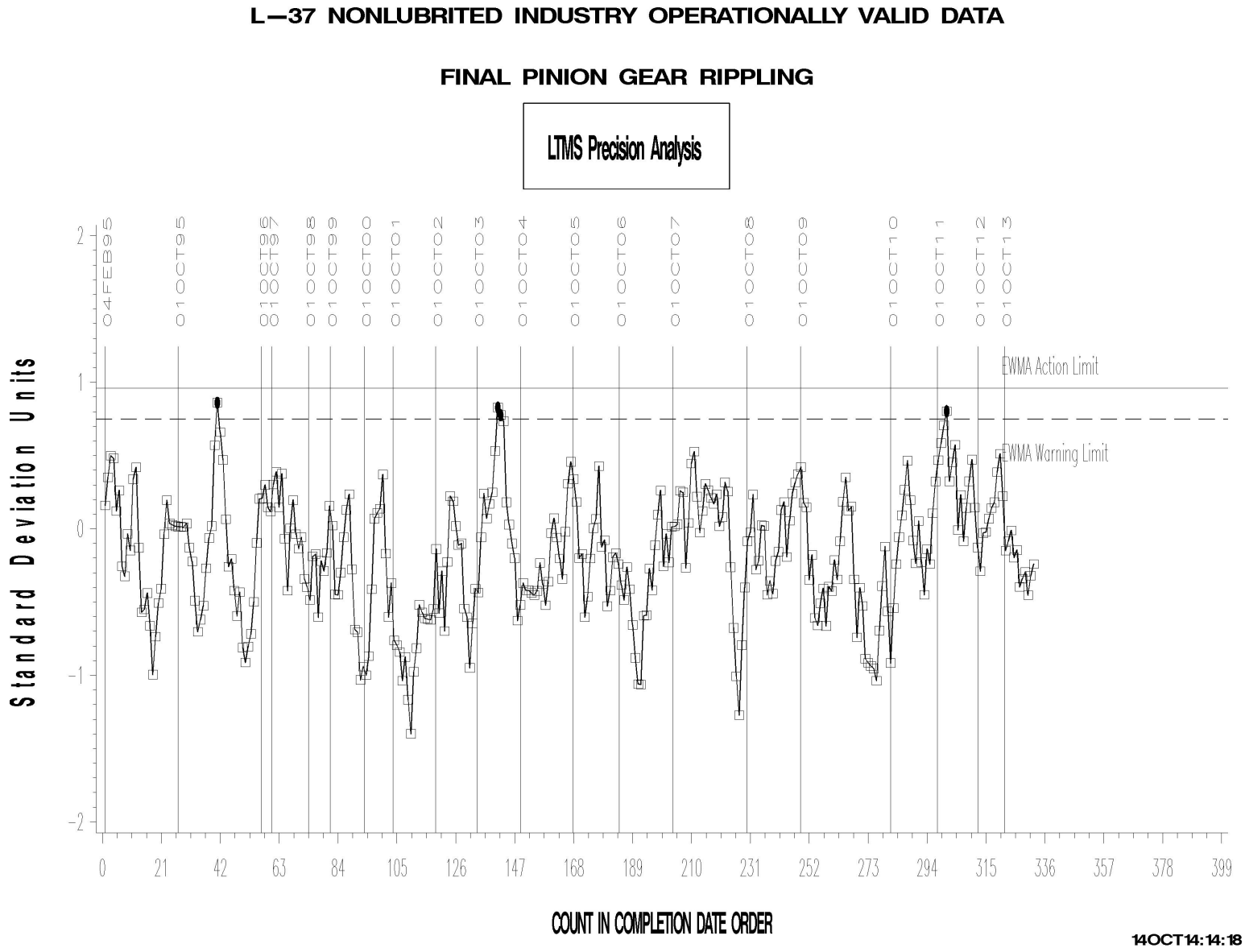
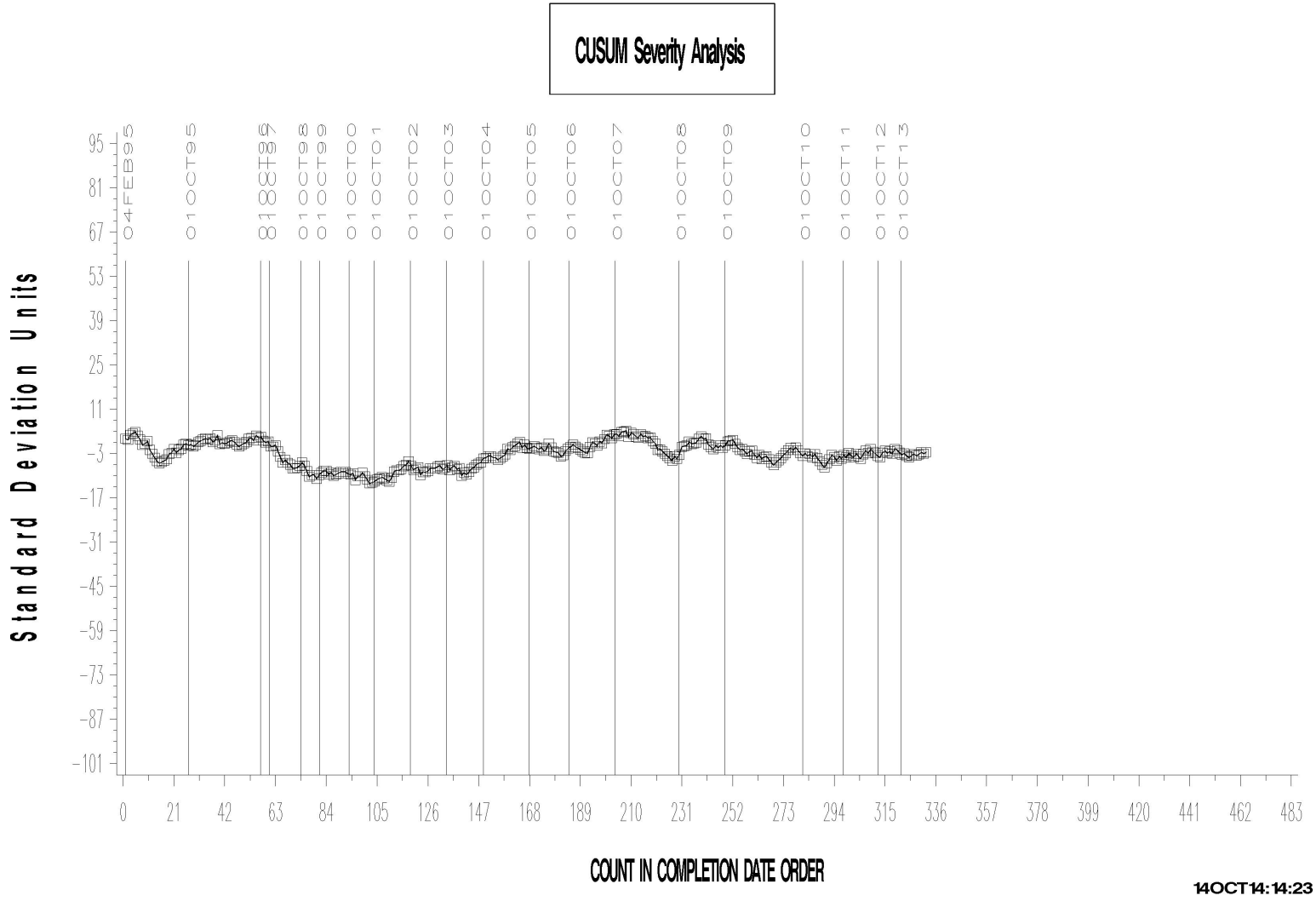

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Precision Analysis
Standard Deviation Units
04FEB95
01OCT95
01OCT96
01OCT97
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
EWMA Action Limit
EWMA Warning Limit
2
1
0
-1
-2
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
COUNT IN COMPLETION DATE ORDER
14OCT14:14:18

L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING



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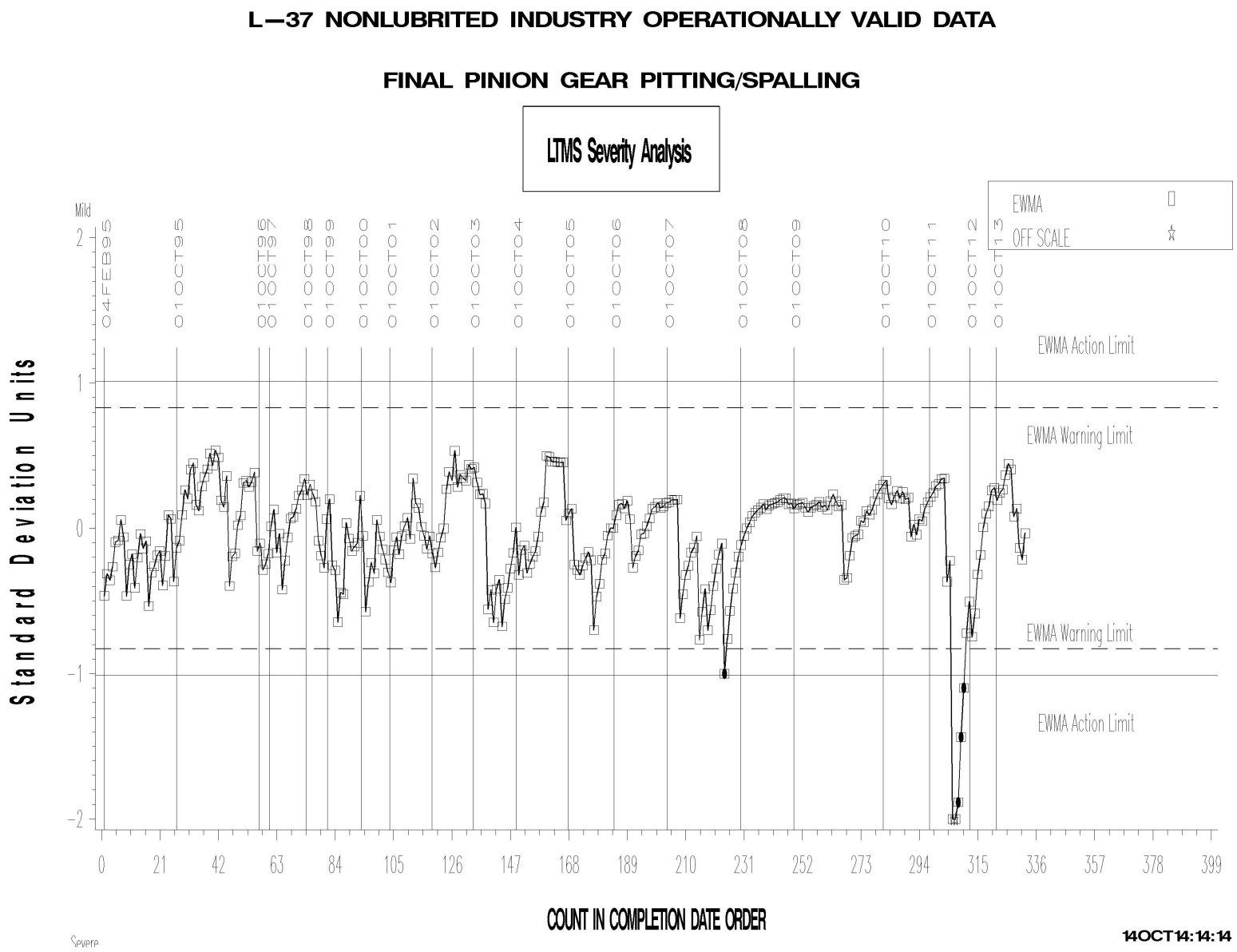
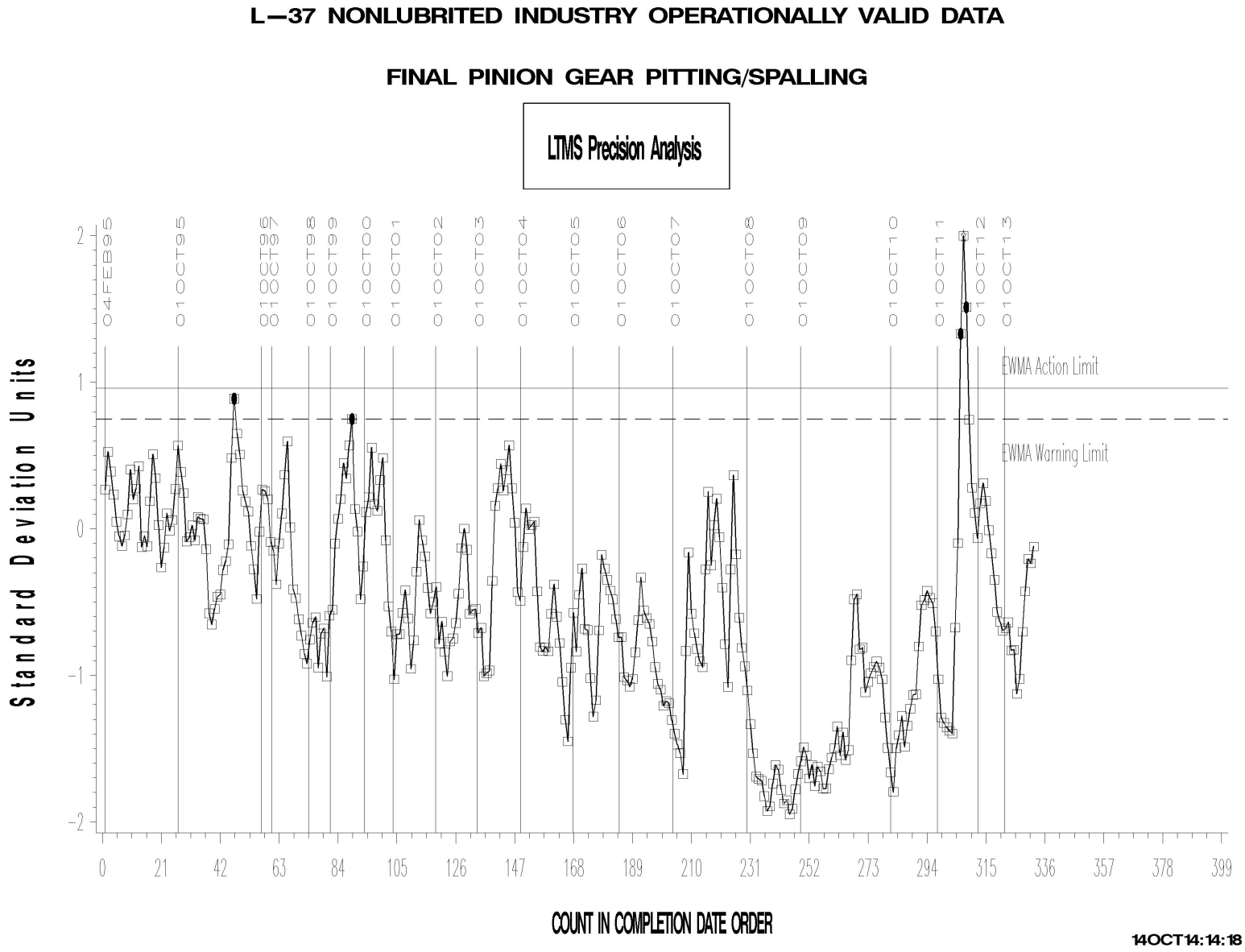
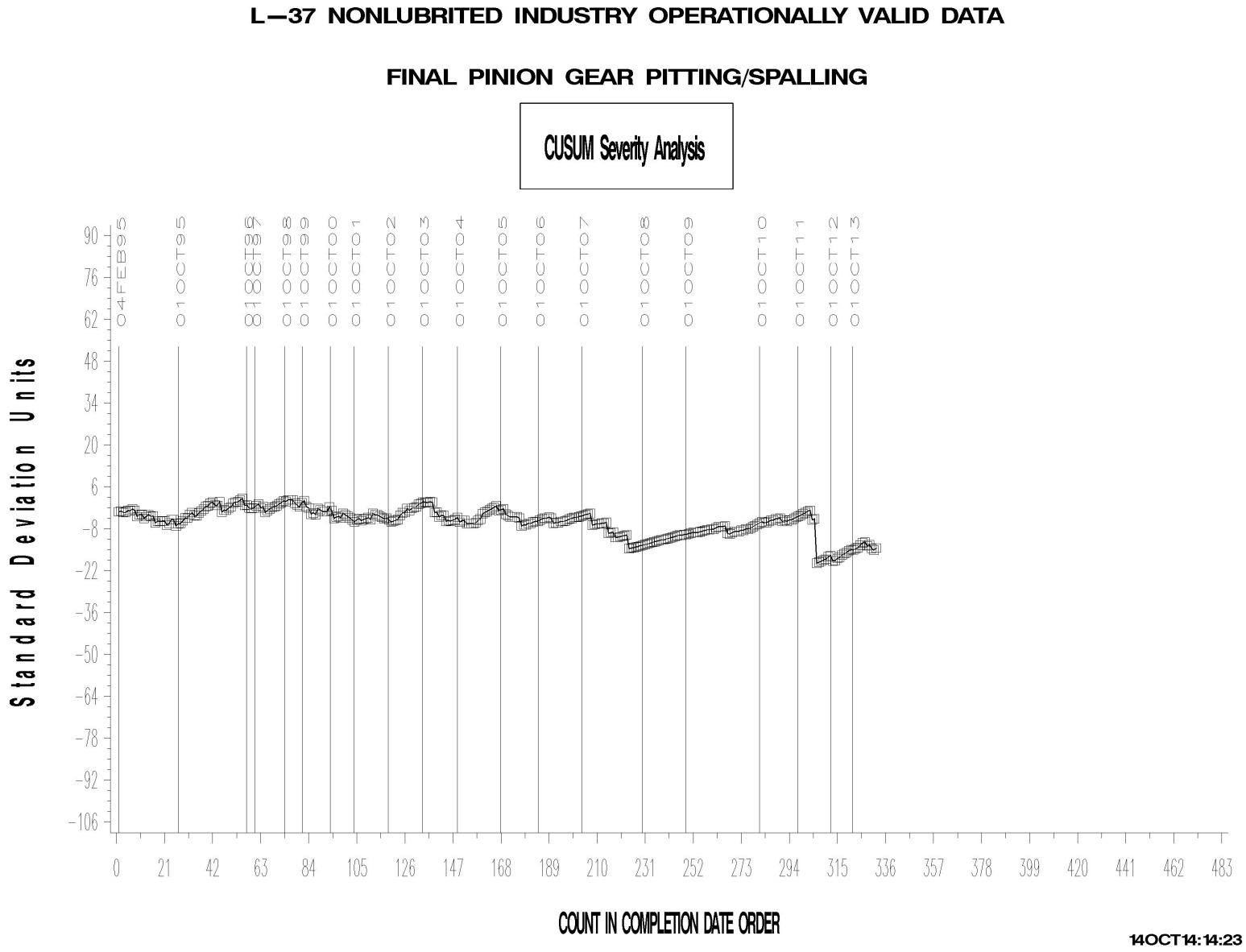

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Severity Analysis
Mild
Severe
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
14OCT14:14:14

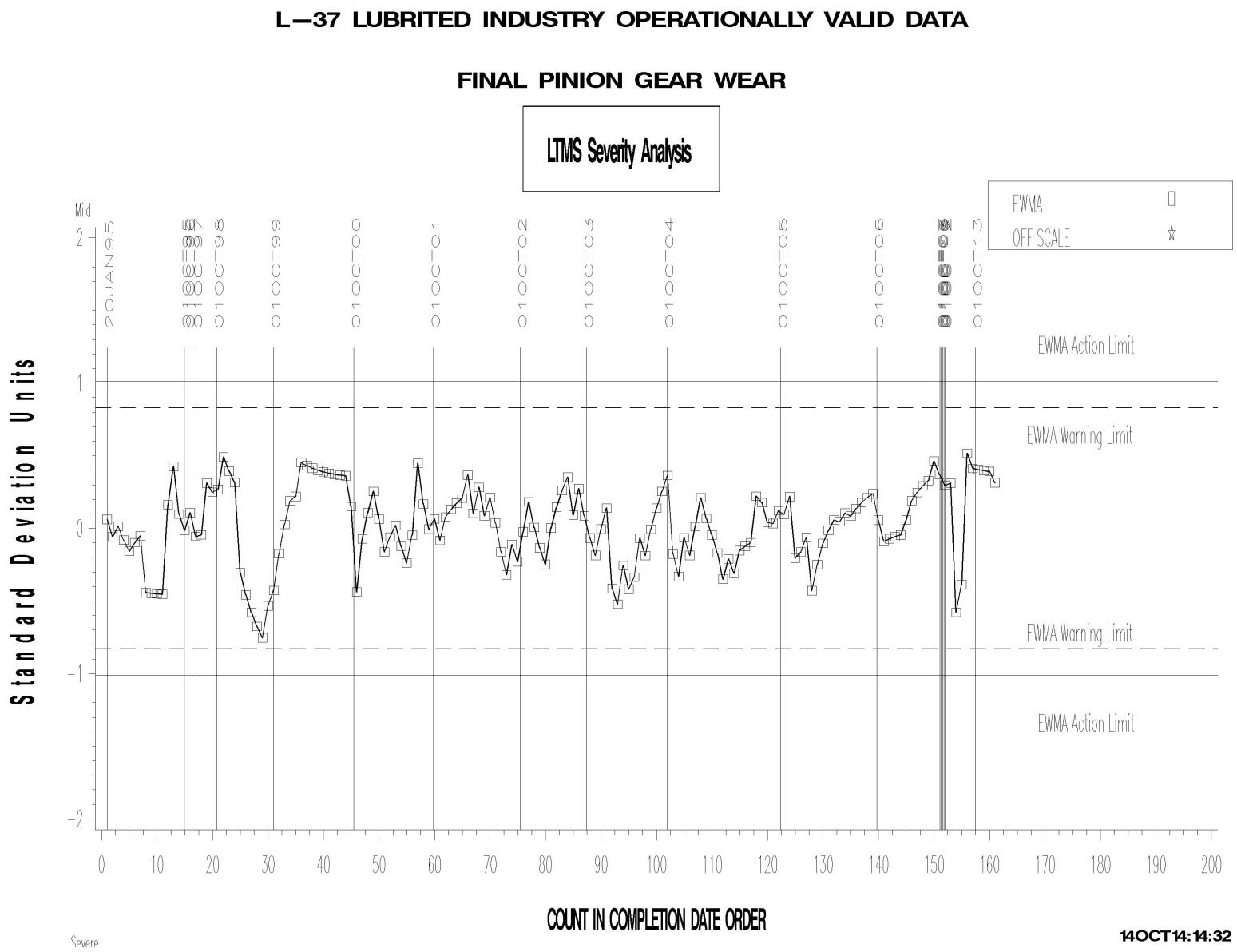
L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
04FEB95
01OCT95
01OCT96
01OCT97
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
EWMA Action Limit
EWMA Warning Limit
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
COUNT IN COMPLETION DATE ORDER
14OCT14:14:18

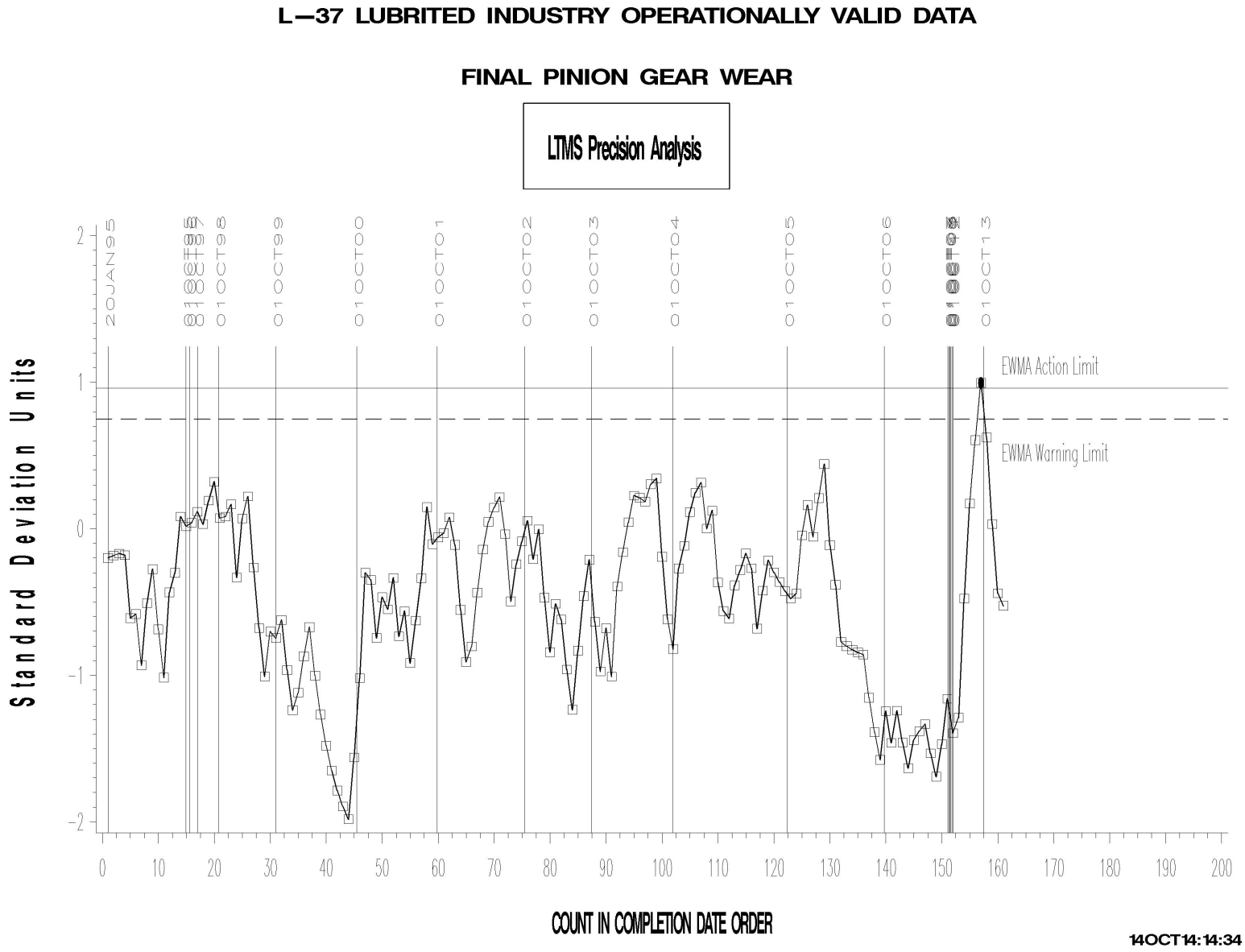
L-37 (D6121)


L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
CUSUM Severity Analysis
Standard Deviation Units
90
76
62
48
34
20
6
-8
-22
-36
-50
-64
-78
-92
-106
04FEB95
01OCT95
81OCT96
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT07
01OCT08
01OCT09
01OCT10
01OCT11
01OCT12
01OCT13
0
21
42
63
84
105
126
147
168
189
210
231
252
273
294
315
336
357
378
399
420
441
462
483
COUNT IN COMPLETION DATE ORDER
14OCT14:14:23

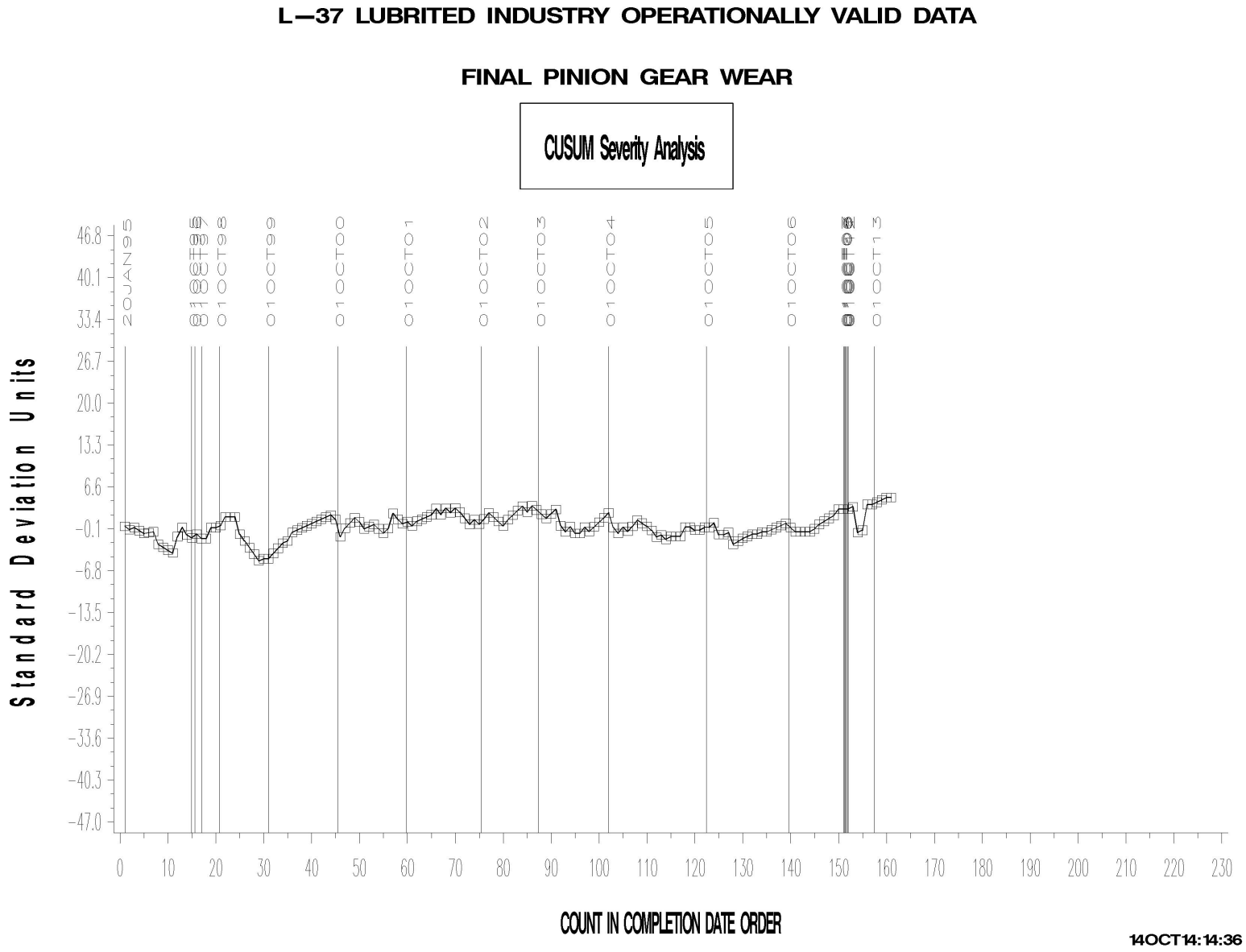
L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
Mild
Severe
2
1
0
-1
-2
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
COUNT IN COMPLETION DATE ORDER
14OCT14:14:32

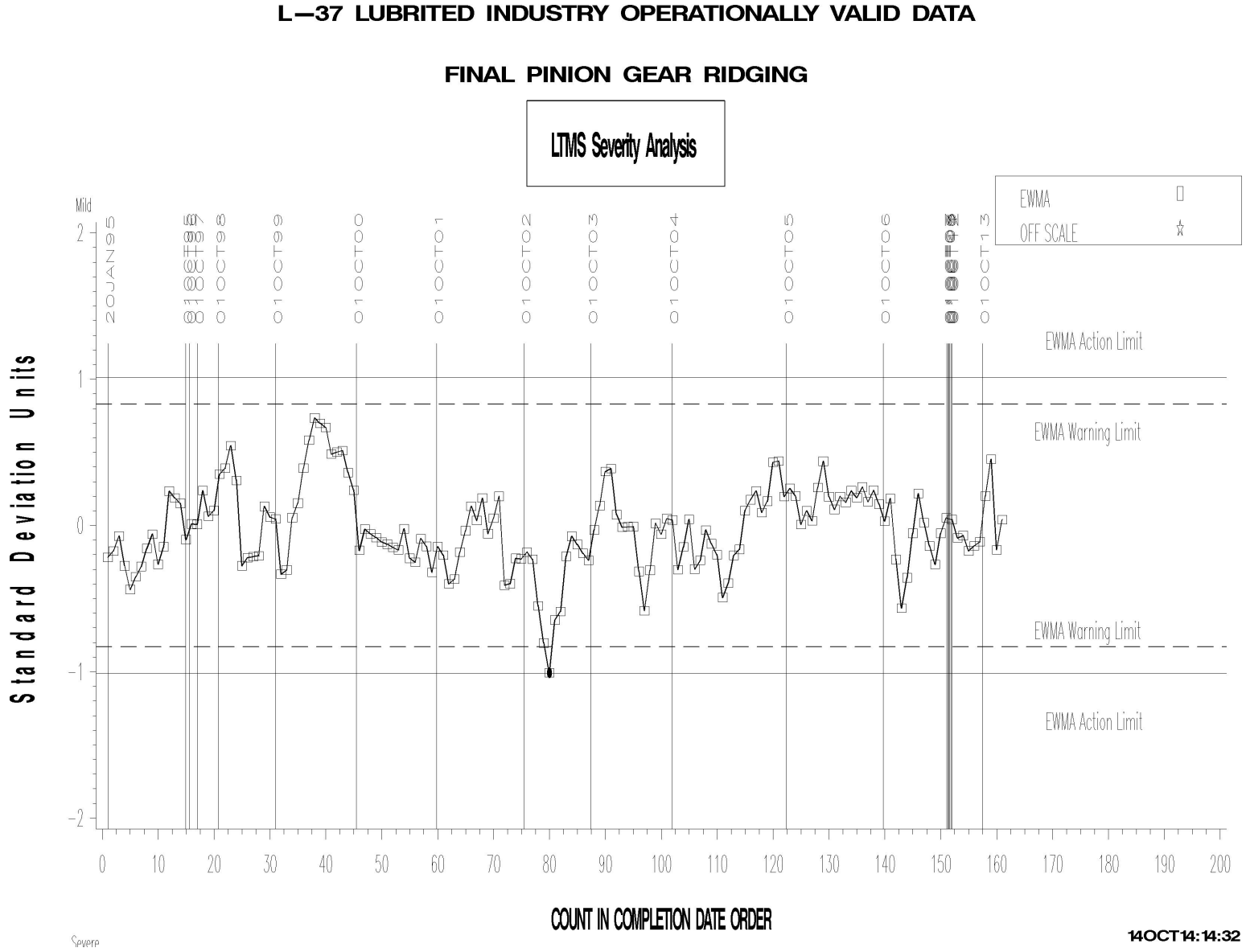
L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
14OCT14:14:34

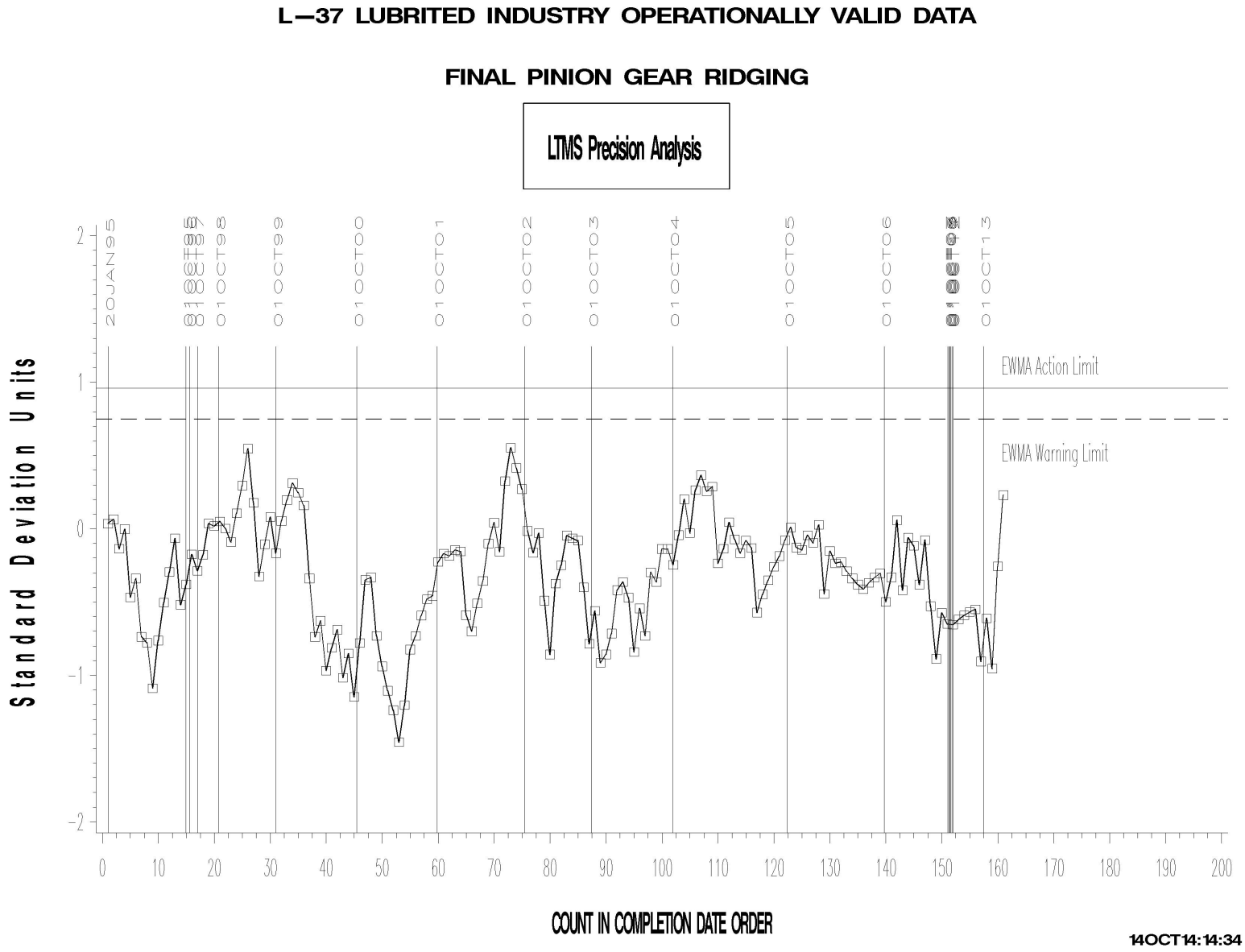
L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
CUSUM Severity Analysis
Standard Deviation Units
46.8
40.1
33.4
26.7
20.0
13.3
6.6
-0.1
-6.8
-13.5
-20.2
-26.9
-33.6
-40.3
-47.0
20JAN95
01OCT96
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT13
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230
COUNT IN COMPLETION DATE ORDER
14OCT14:14:36

L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
Mild
Severe
COUNT IN COMPLETION DATE ORDER
14OCT14:14:32

L-37 (D6121)

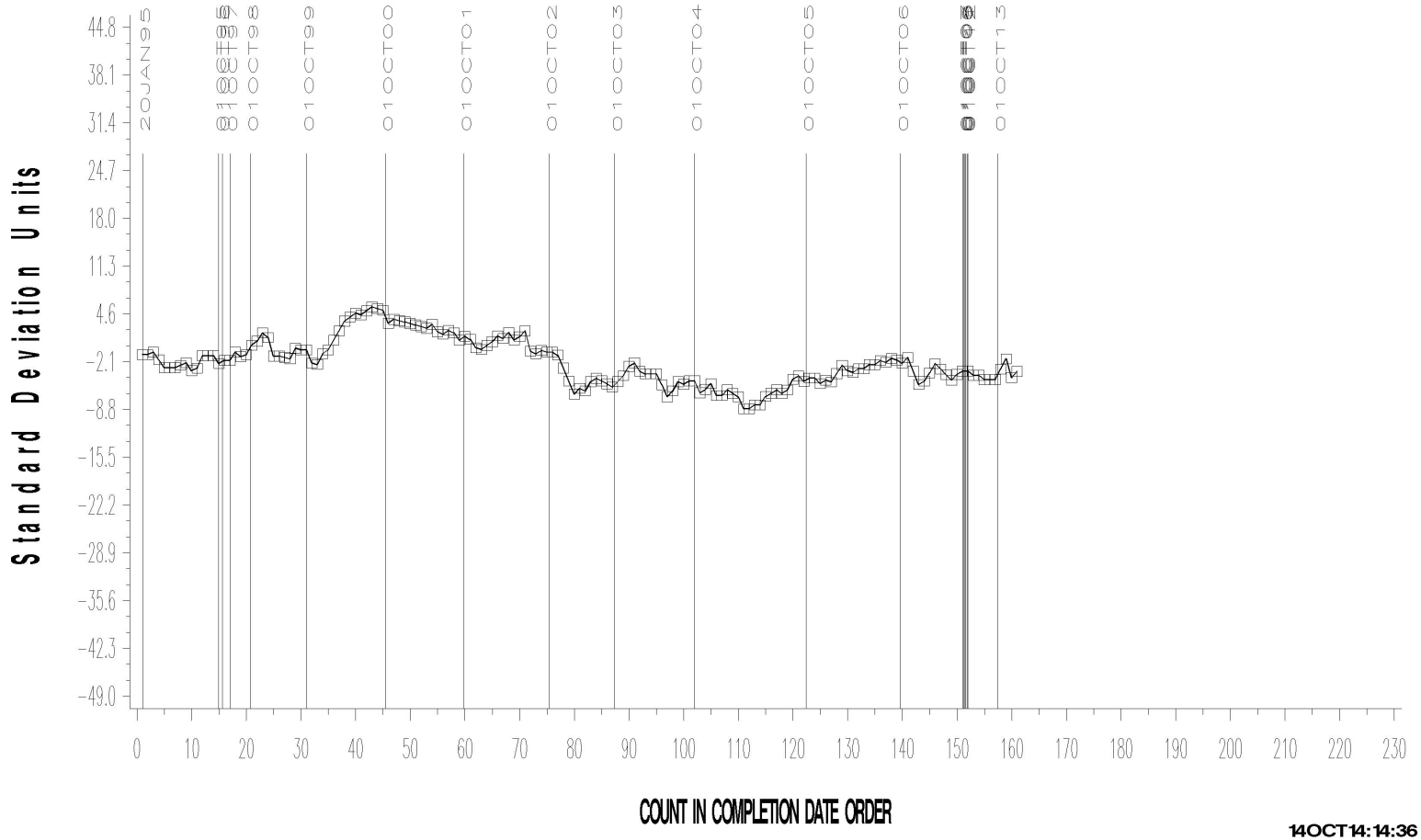

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
14OCT14:14:34

L-37 (D6121)

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

CUSUM Severity Analysis



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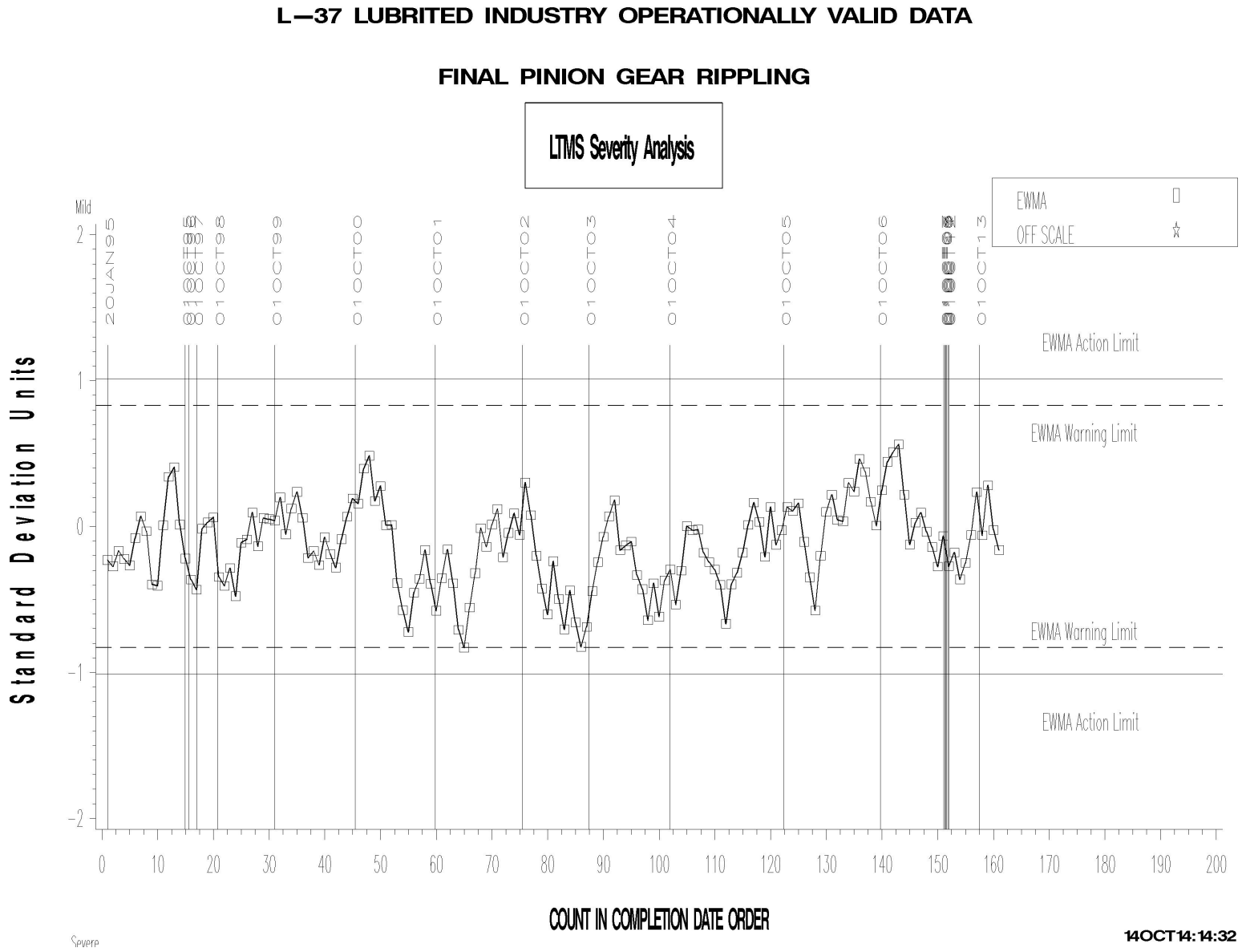
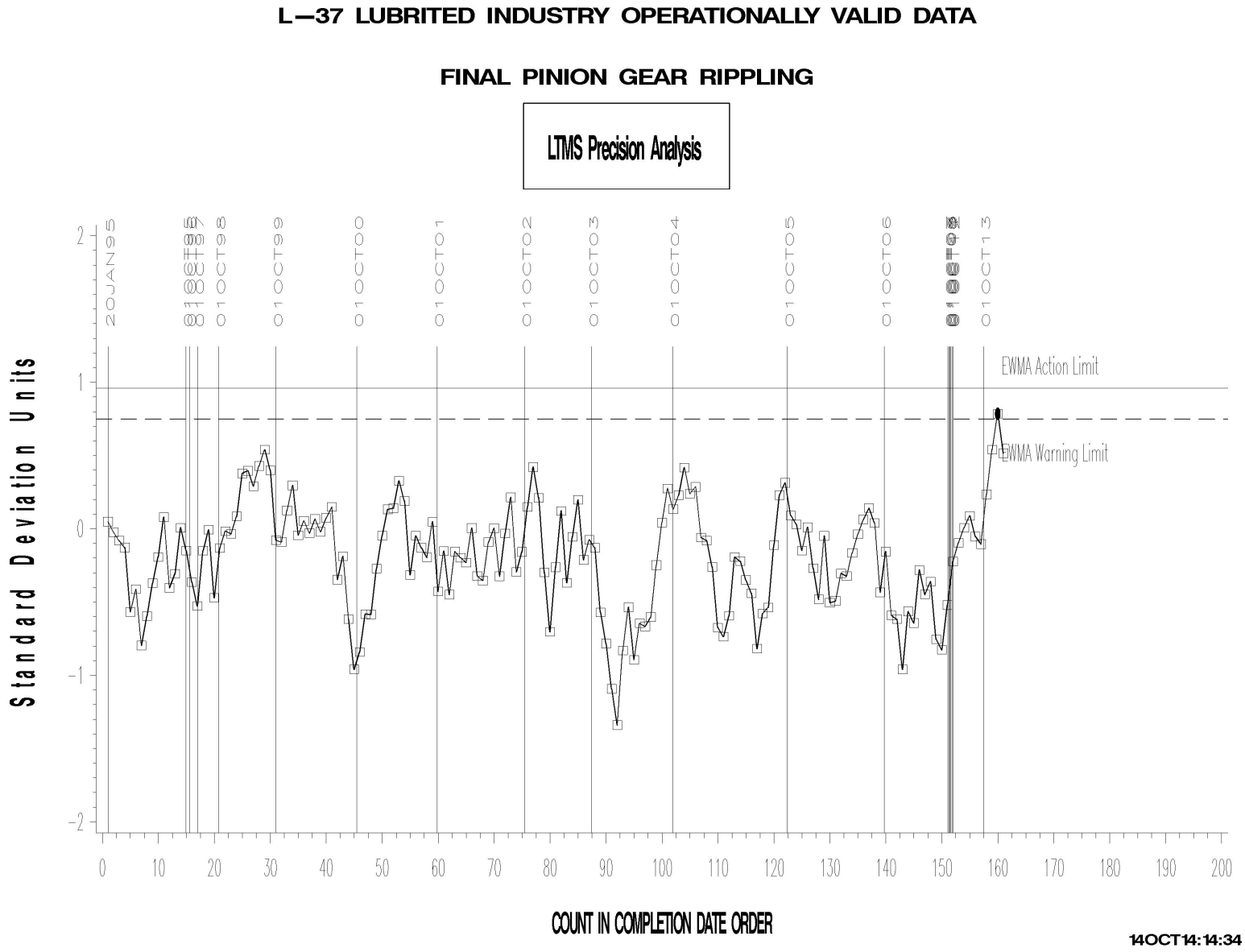
L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
Mild
Severe
COUNT IN COMPLETION DATE ORDER
14OCT14:14:32

L-37 (D6121)

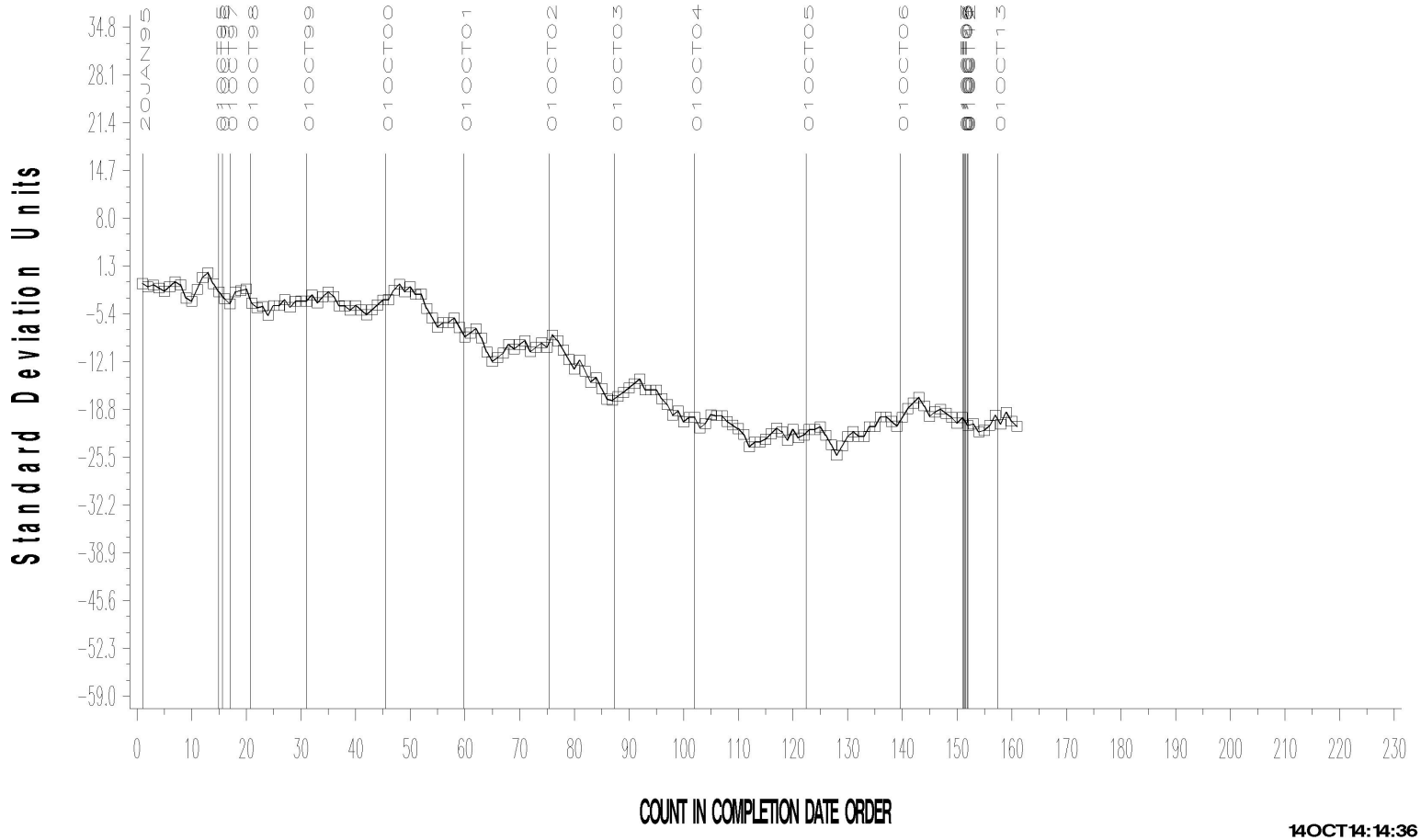

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
14OCT14:14:34

L-37 (D6121)

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

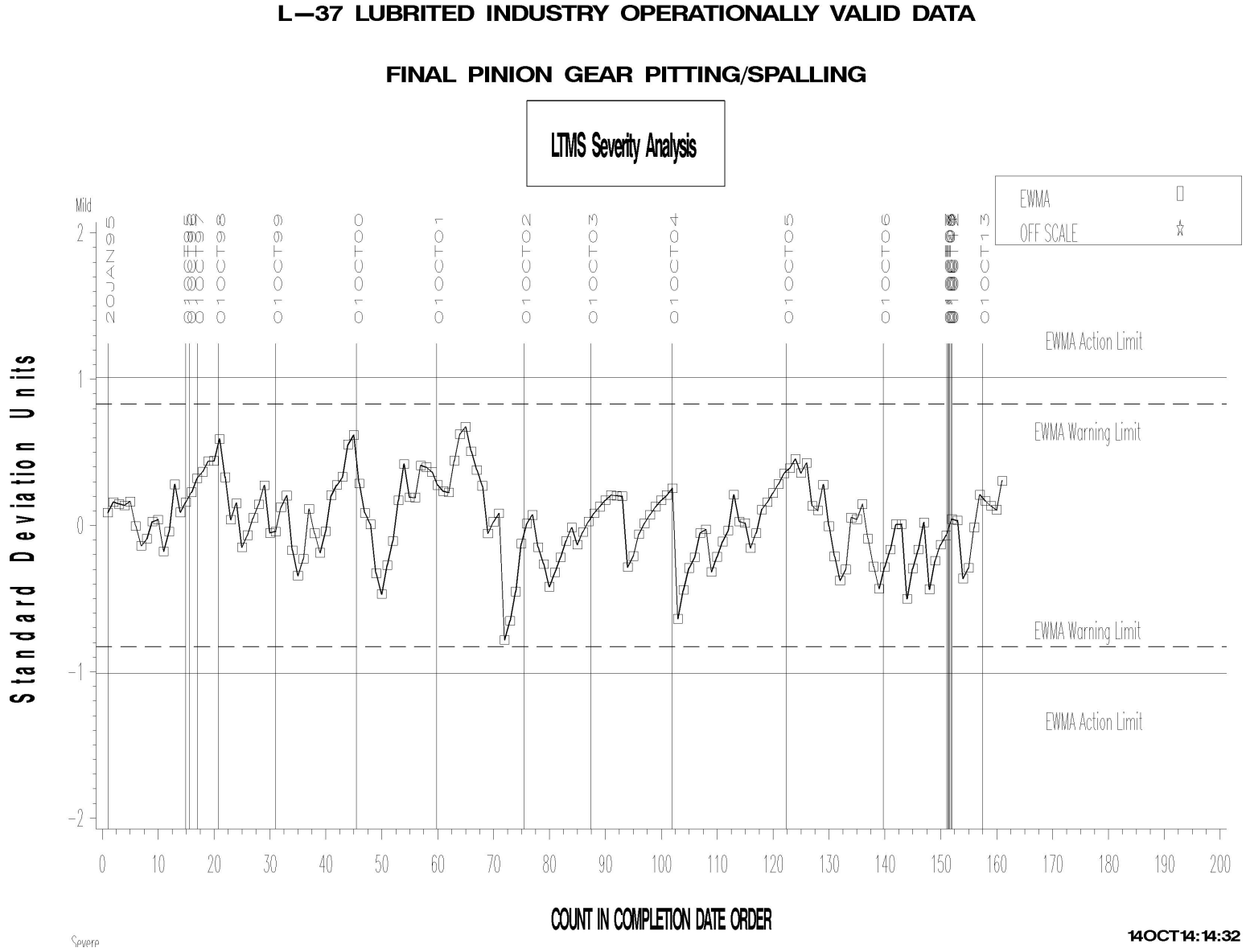
FINAL PINION GEAR RIPPLING

CUSUM Severity Analysis

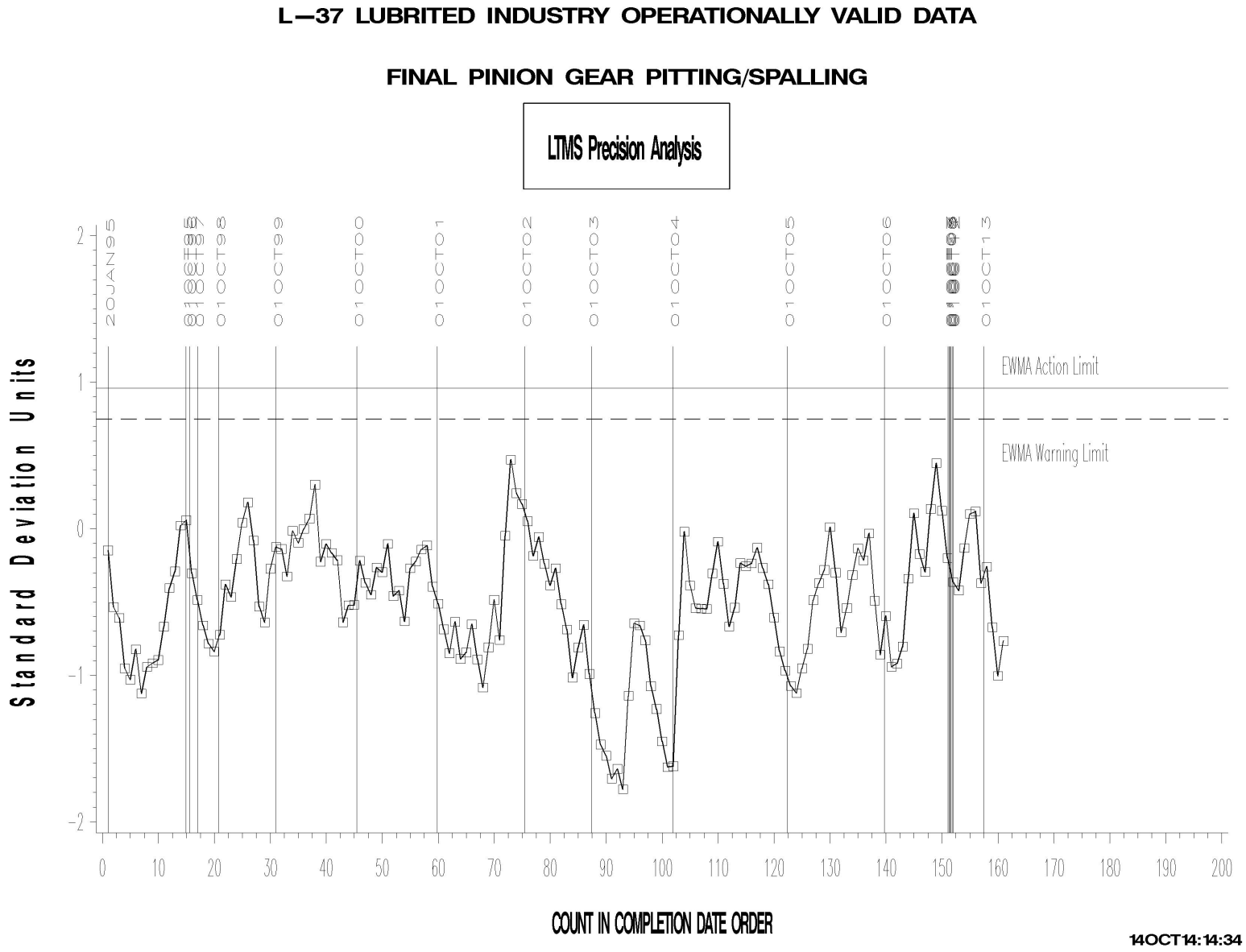


14OCT14:14:36

L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
14OCT14:14:32

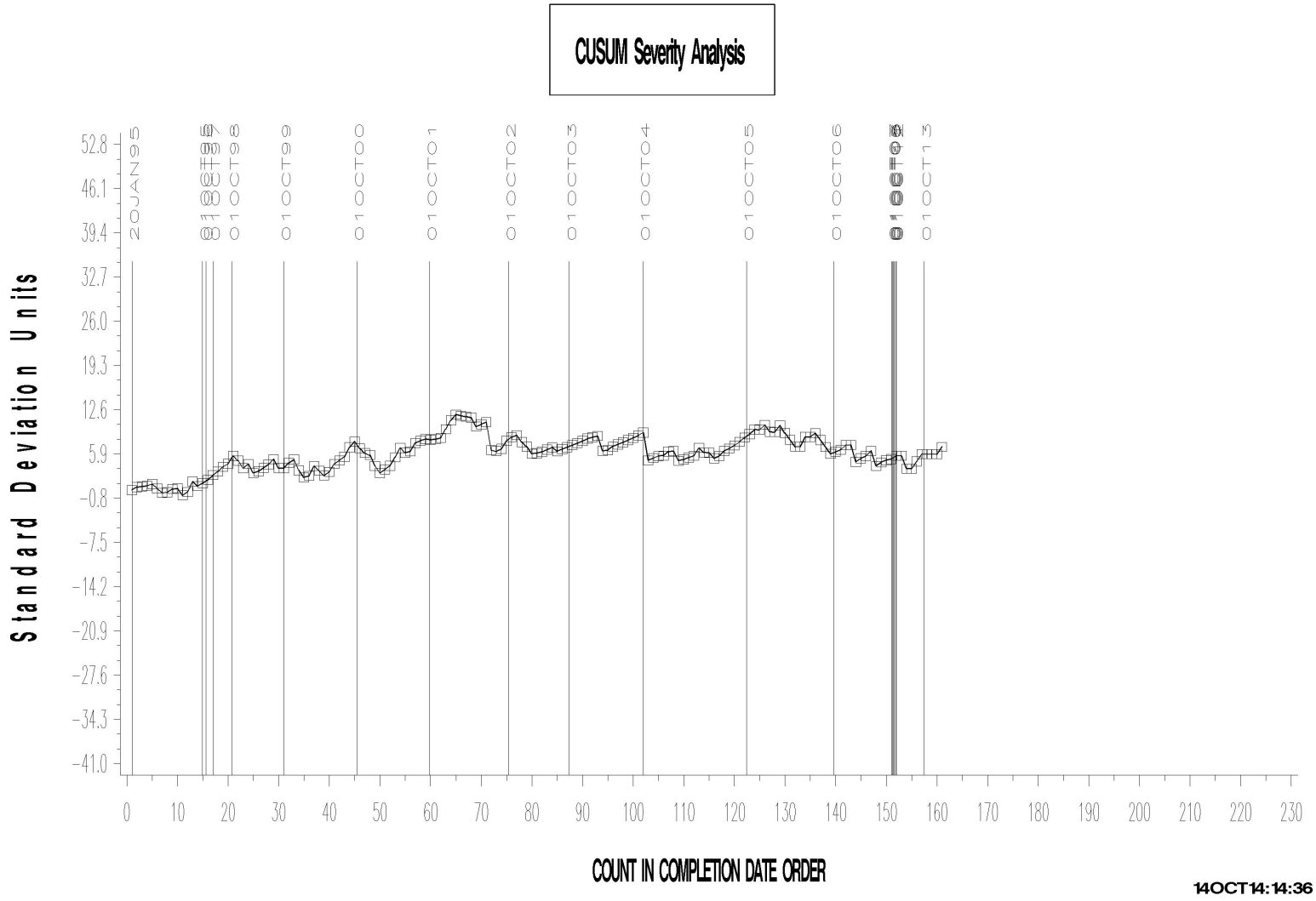
L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
20JAN95
01OCT96
01OCT97
01OCT98
01OCT99
01OCT00
01OCT01
01OCT02
01OCT03
01OCT04
01OCT05
01OCT06
01OCT13
EWMA Action Limit
EWMA Warning Limit
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
COUNT IN COMPLETION DATE ORDER
14OCT14:14:34

L-37 (D6121)

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING



L-37 (D6121)

TIMELINE ADDITIONS

Effective Date	Information Letter	Event
20140601	14-1	Requirements for using lab-assembled axle units.
20140718	14-2	Standardized wording describing the role of the TMC.

L-37 (D6121)

LAB VISITS

Two L-37 lab visits were conducted during this period with particular attention to procedures implemented to assure that the appropriate torque is applied for the given gear batch and hardware type. No procedural non-conformances were found.

Discussion: Early this period, TMC review discovered that a non-lubrited V1L528 test that was reported as valid had used the reduced torque setting of 1213 lb·ft; this hardware combination is required to apply 1740 lb·ft of torque. Given the multiplicity of torque/hardware type combinations used in this test, the TMC felt it necessary to verify that labs are configured to correctly match torque and hardware type to ensure that the validity of future testing is not jeopardized.

L-37 (D6121)

INFORMATION LETTERS

Two L-37 information letters were issued this reporting period.

Information Letter 14-1 was issued 20140601 to document the process to be used for a lab to be approved for using lab-built axle assemblies.

Information Letter 14-2 was issued 20140718 to incorporate standardized wording describing the role of the TMC.

L-37 (D6121)

LTMS DEVIATIONS

One LTMS deviation was written this period to calibrate a test stand generating a precision alarm on RIDG using lubrited hardware.

For test acceptance, the L-37 surveillance panel has approved the use of acceptance bands that are not derived from calculations using the target mean, standard deviation, and k-value. This can produce widely divergent Shewhart severity values on successive tests and thereby result in precision alarms.

If this approach results in recurring alarms, it may be necessary for the surveillance panel to readdress how precision is evaluated for this test.

L-37 (D6121)

STATUS OF REFERENCE OIL SUPPLY

		@ TMC	
Oil	Cans @ Labs	Cans	Gallons
127	2	1	1.0
134	16	49	49.8
151-2	4	1	1.9
151-3	3	0	0.0
152-1	0	0	0.0
152-2	15	223	223.9
152-3	0	54	54.8
153-1	39	57	58.0
155	13	21	21.0
155-1	8	321	321.0
Total	100	727	731.2

The TMC quantity remaining presumes usage only for L-37 testing. Oil 155/155-1 is also used in other test areas (L-33-1 and HTCT). The 155-1 total also reflects that the L-60-1 surveillance panel has requested that TMC reserve a quantity of that oil (currently 41.75 gal) for use in that test.