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Test Monitoring Center

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

MEMORANDUM: 17-014

DATE: May 16, 2017

TO: Wes Venhoff, Chairman, L-37 Surveillance Panel

FROM: Scott Parke

SUBJECT: L-37 Testing from October 1, 2016 through March 31, 2017

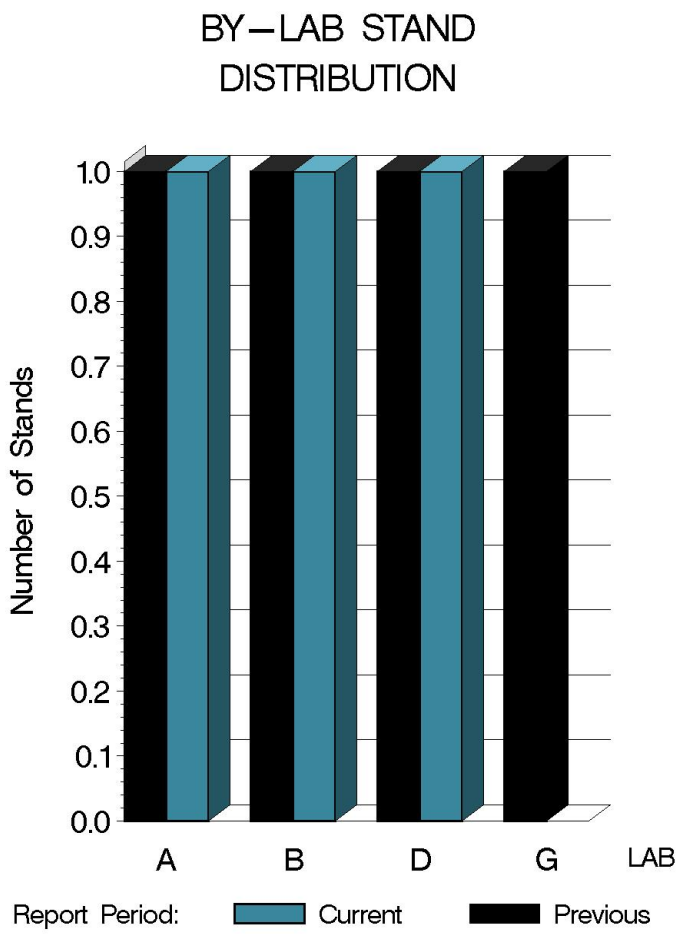
Attached is a summary of reference oil testing activity this period.

SDP/sdp/mem17-014.sdp.doc
cc: Frank Farber
Jeff Clark
L-37 Surveillance Panel
ftp://ftp.astmtmc.cmu.edu/docs/gear/l37/semiannualreports/l37-04-2017.pdf

Distribution: email

L-37 (D6121)

	Reporting Data	Calibrated on 3-31-17
Number of Labs	3	3
Number of Stands	3	3



L-37 (D6121)

Test Distribution by Oil and Validity

		134	134-1	152-2	155	155-1	Totals Last Period	Totals This Period
Accepted for calibration	AC	0	1	2	2	0	15	5
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	1	0	0	0	1
Acceptable info run	NI	0	0	0	0	0	3	0
Unacceptable info run	MI	0	0	0	0	0	8	0
Aborted info run	XI	0	0	0	0	0	0	0
Total		0	1	3	2	0	26	6

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Calibration Attempt Detail

	Gear Batch	Acceptable	Failed	Total
LUBRITED	V1L500/P4T813	0	0	0
	V1L528/P4T883A	3	0	3
	Total	3	0	3
NONLUBRITED	V1L500/P4T813	0	0	0
	V1L528/P4T883A	2	0	2
	Total	2	0	2

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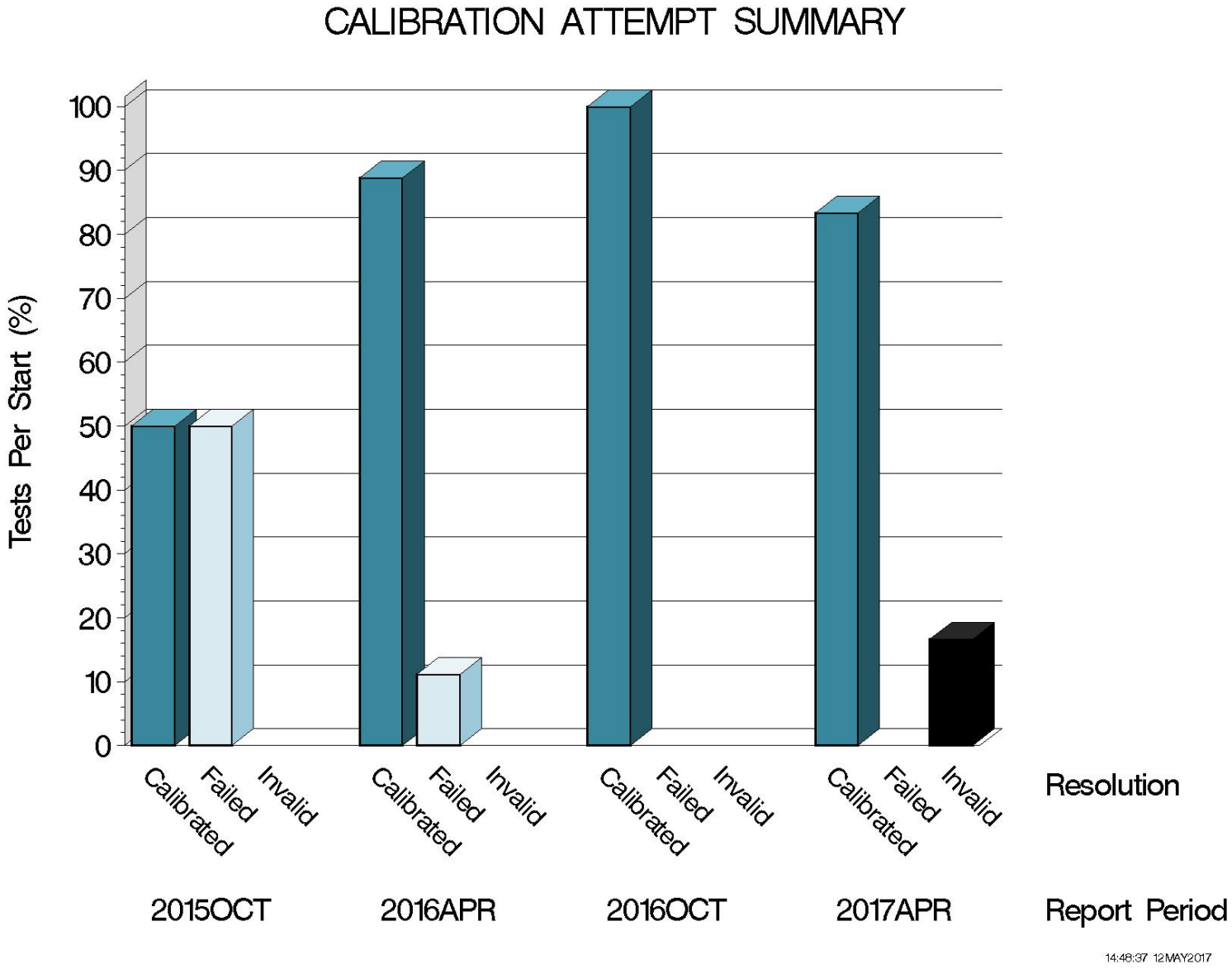
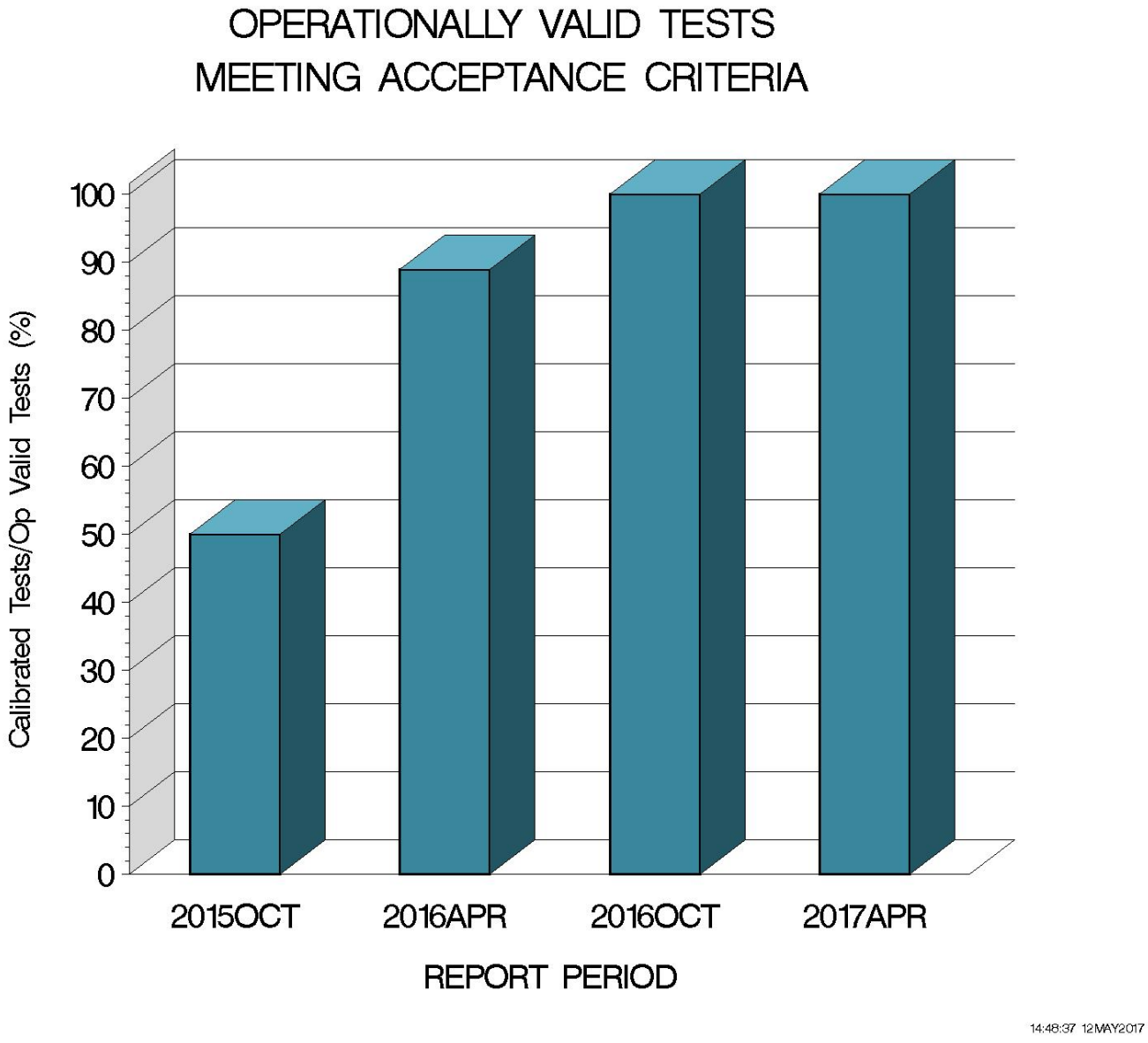

CALIBRATION ATTEMPT SUMMARY
Tests Per Start (%)
100
90
80
70
60
50
40
30
20
10
0
Calibrated
Failed
Invalid
Resolution
2015OCT
2016APR
2016OCT
2017APR
Report Period
14:48:37 12MAY2017

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
2015OCT
2016APR
2016OCT
2017APR
REPORT PERIOD
14:48:37 12MAY2017

L-37 (D6121)

CAUSES FOR LOST TESTS

			Oil					Validity			Loss Rate		
Lab	Cause		134	134-1	152-2	155	155-1	RC	LC	XI	Lost	Starts	%
B	Run at wrong torque setting.				●			●			1	3	33%
		Lost	0	0	1	0	0	1	0	0			
		Starts	0	1	3	2	0	6	6	6			
		%	0%	0%	33%	0%	0%	17%	0%	0%			

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	3	-0.527	0.914	-0.527	-0.754
RIPP	V1L528/P4T883A	3	0.829	0.672	0.829	0.395
SPIT	V1L528/P4T883A	3	0.691	0.353	0.691	0.400
WEAR	V1L528/P4T883A	3	-1.377	2.386	-1.377	-0.715

[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.

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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	2	-0.068	0.802	-0.068	-0.045
RIPP	V1L528/P4T883A	2	0.552	0.000	0.552	0.308
SPIT	V1L528/P4T883A	2	0.665	0.045	0.665	0.564
WEAR	V1L528/P4T883A	2	-0.635	1.603	-0.635	-0.453

[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.

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LAB SEVERITY

LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
V1L528/P4T883A	A	1	0.000	0.707	1.099	0.000
	B	1	-1.582	1.554	0.488	-4.132
	D	1	0.000	0.226	0.488	0.000

NON-LUBRITED HARDWARE AVERAGE Δ/s						
Gear Batch	Lab	N	RIDG	RIPP	SPIT	WEAR
V1L528/P4T883A	B	1	0.499	0.552	0.697	0.499
	D	1	-0.635	0.552	0.634	-1.769

L-37 (D6121)

SUMMARY OF SEVERITY & PRECISION

Severity
Nonlubrited – SPIT has exhibited occasional spikes in performance either mild or severe (though usually mild). When used with oil 134, the current hardware often produces either spalling (an extremely low merit result) or only mild pitting (a high merit result). This phenomena does not affect all labs equally and is suspected to be build-related. Such results occasionally adversely impact the SPIT precision chart. Results reported this period were all within control chart alarm limits. Lubrited – A succession of 5 severe tests from lab B in April and October of 2015 resulted in WEAR, RIDG, and SPIT charts exceeding the severe EWMA action limit. These alarms have all now cleared. Results reported this period were all within control chart alarm limits.

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SUMMARY OF SEVERITY & PRECISION (cont.)

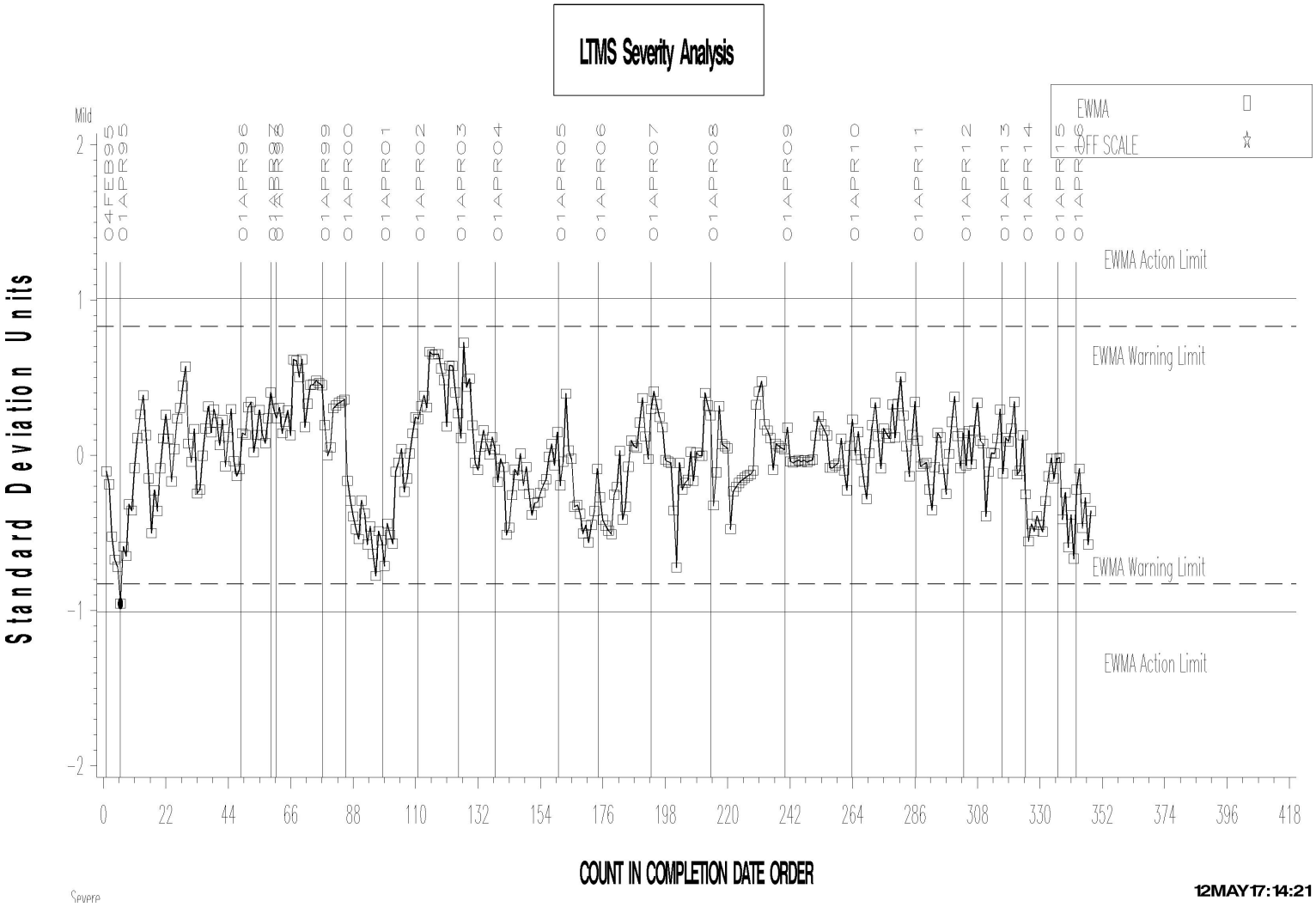
Precision
Nonlubrited – As mentioned previously, SPIT precision experiences periods beyond control chart limits due to alternately mild and severe results with the current hardware. Recent testing has brought SPIT within limits. WEAR precision has also suffered from alternately mild and severe results (unrelated to oil type) and is currently showing an EWMA action alarm. Lubrited – As with the nonlubrited hardware, WEAR currently exceeds the EWMA action limit.

Industry control charts follow.

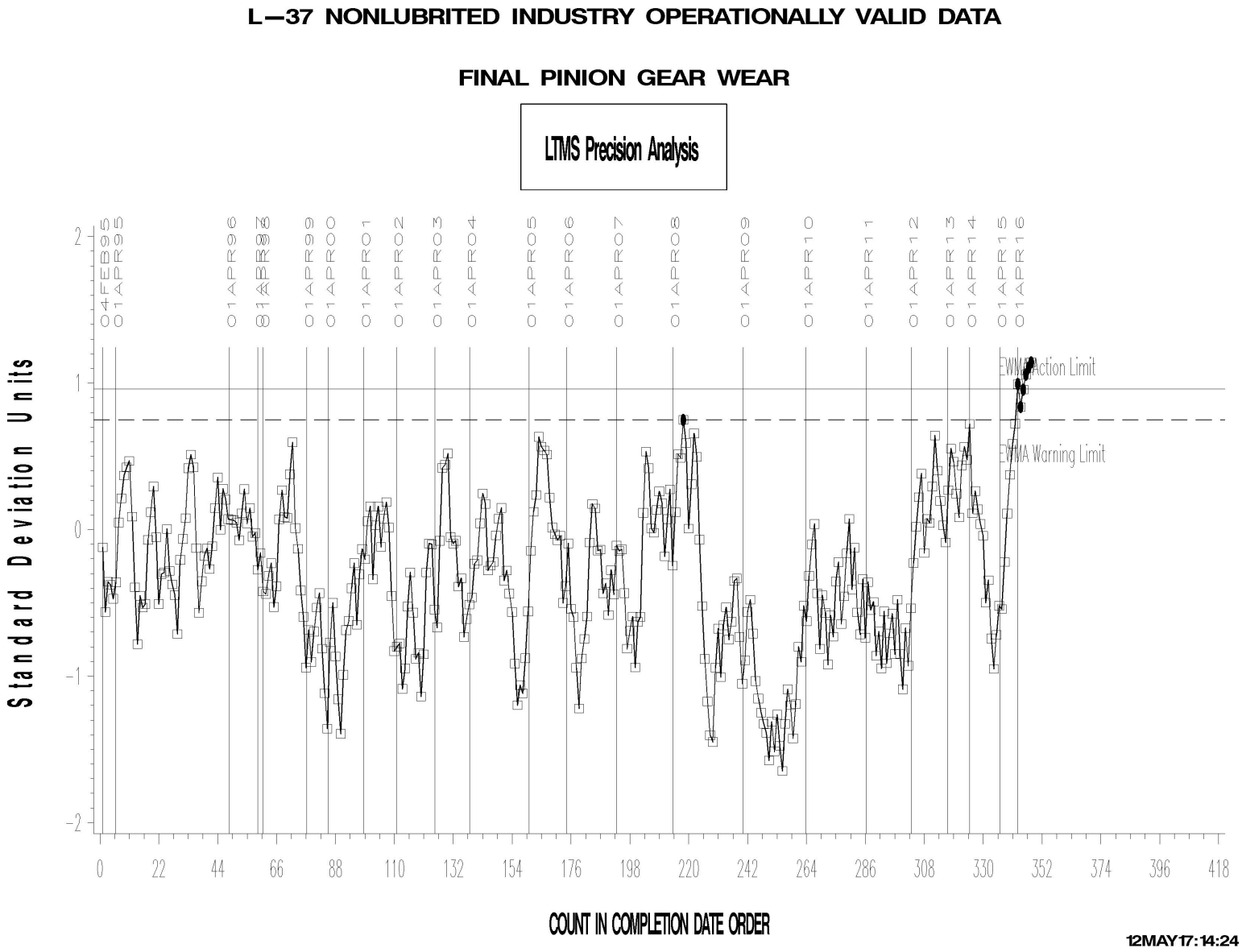
L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR



L-37 (D6121)

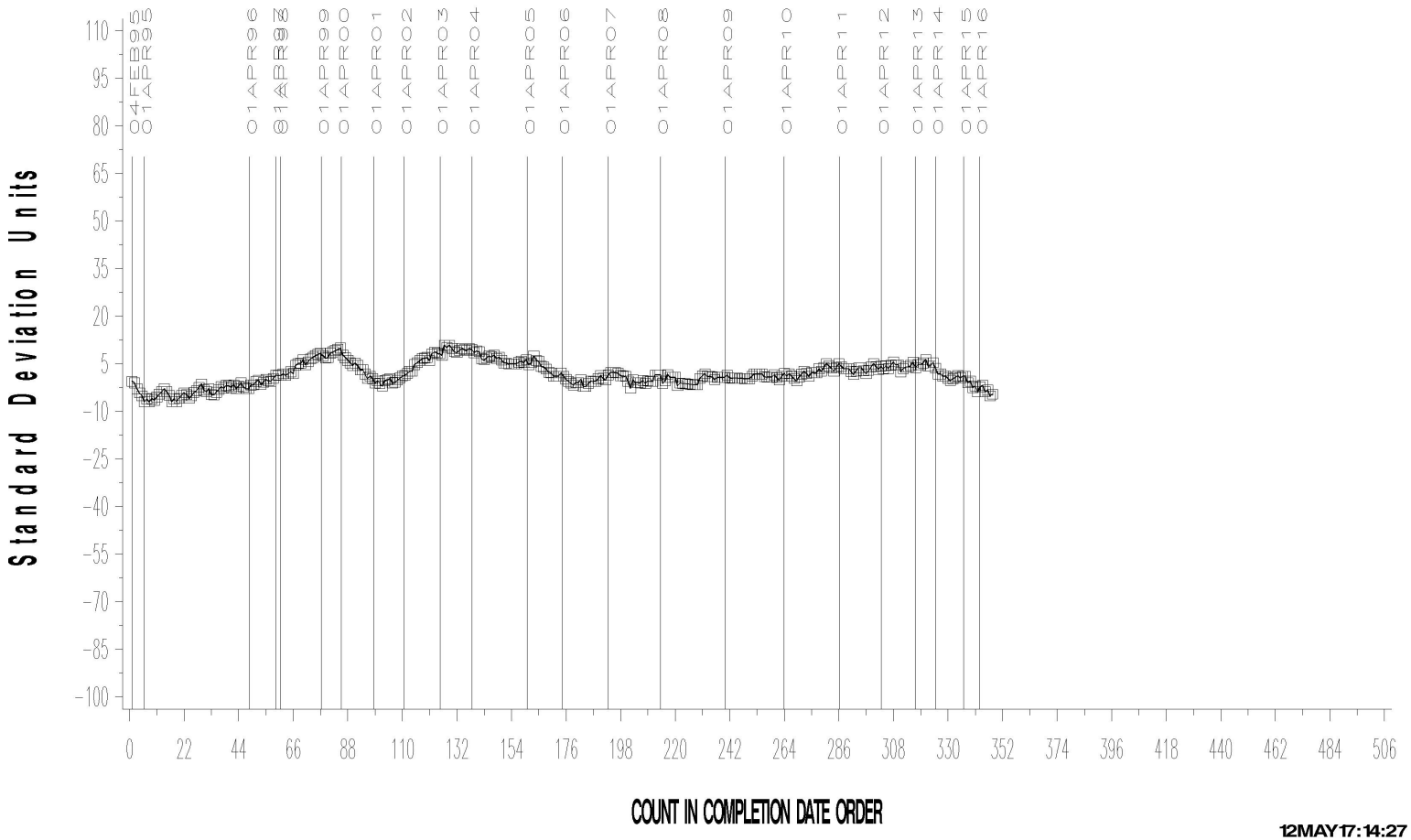

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
04FEB95
01APR95
01APR96
01APR97
01APR98
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR08
01APR09
01APR10
01APR11
01APR12
01APR13
01APR14
01APR15
01APR16
EWMA Action Limit
EWMA Warning Limit
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
COUNT IN COMPLETION DATE ORDER
12MAY17:14:24

L-37 (D6121)

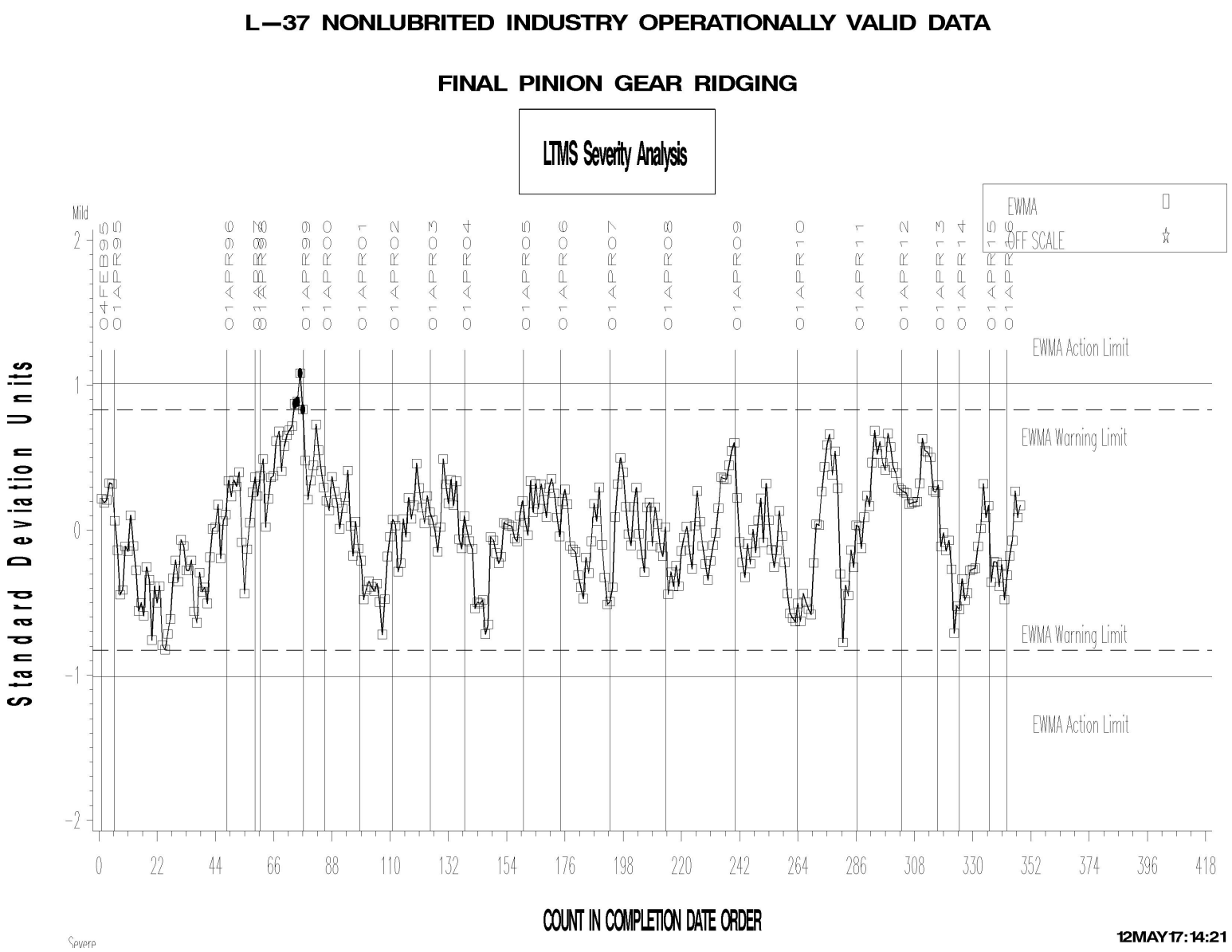
L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

CUSUM Severity Analysis



L-37 (D6121)

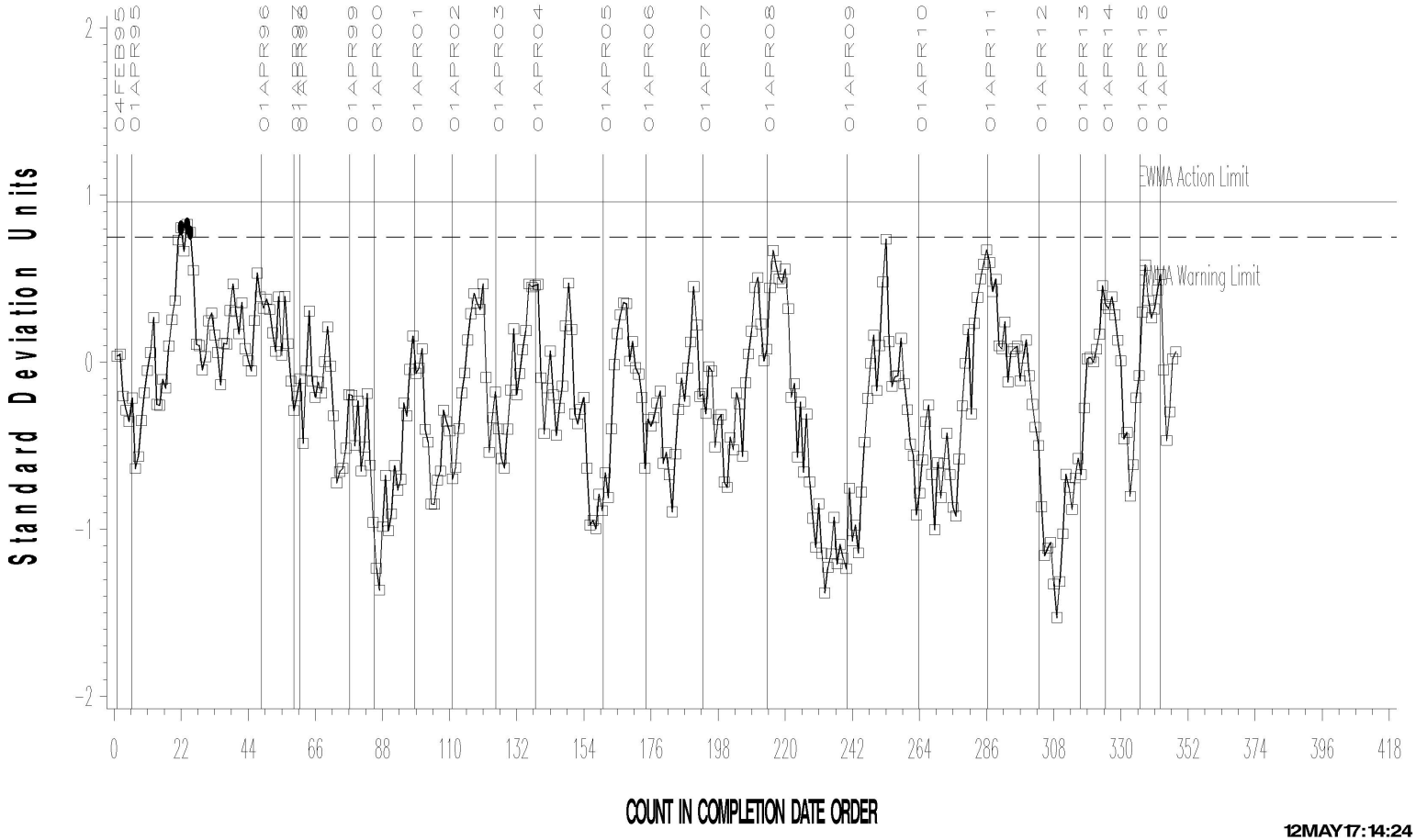

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
COUNT IN COMPLETION DATE ORDER
12MAY17:14:21

L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING

LTMS Precision Analysis



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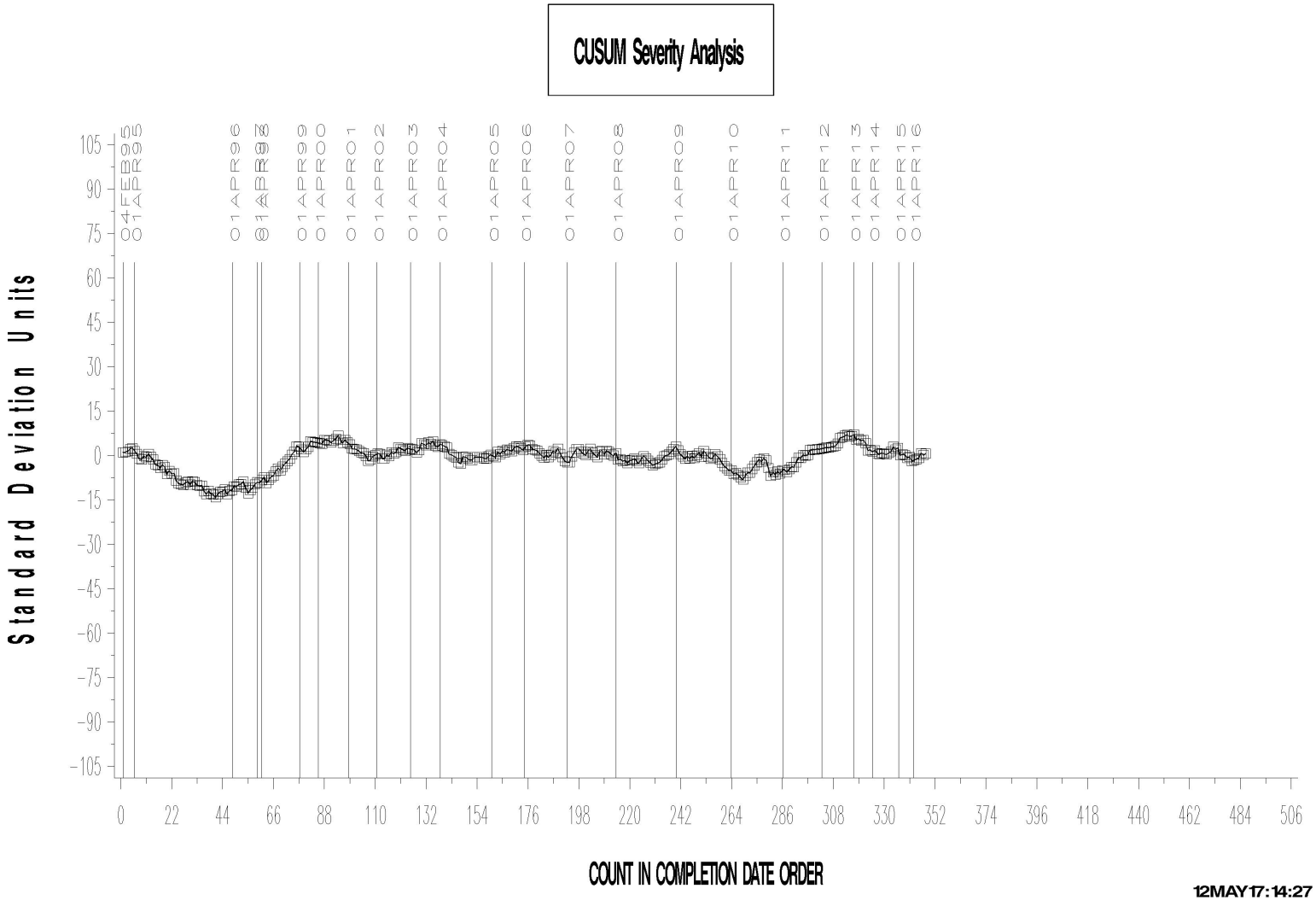
L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIDGING



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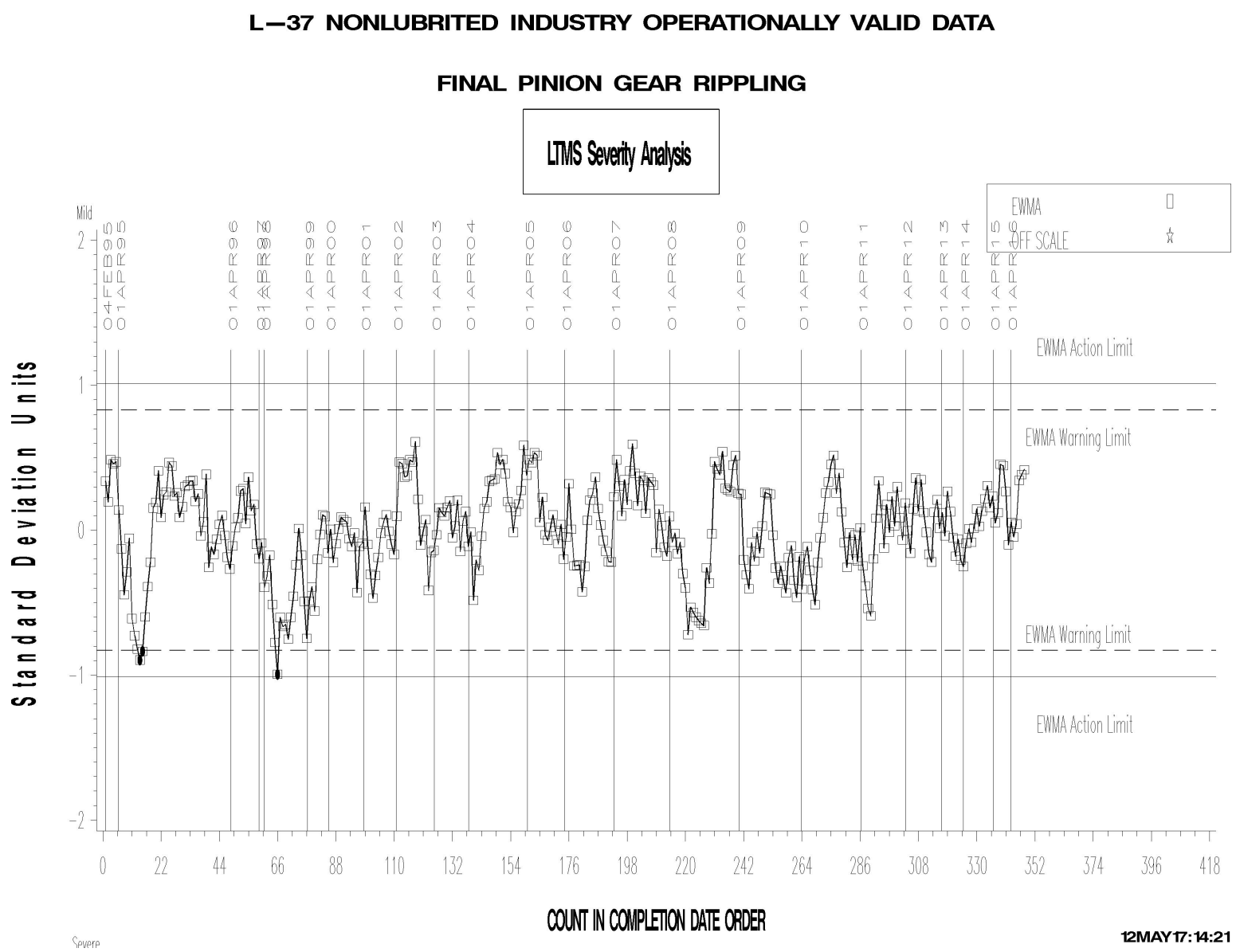
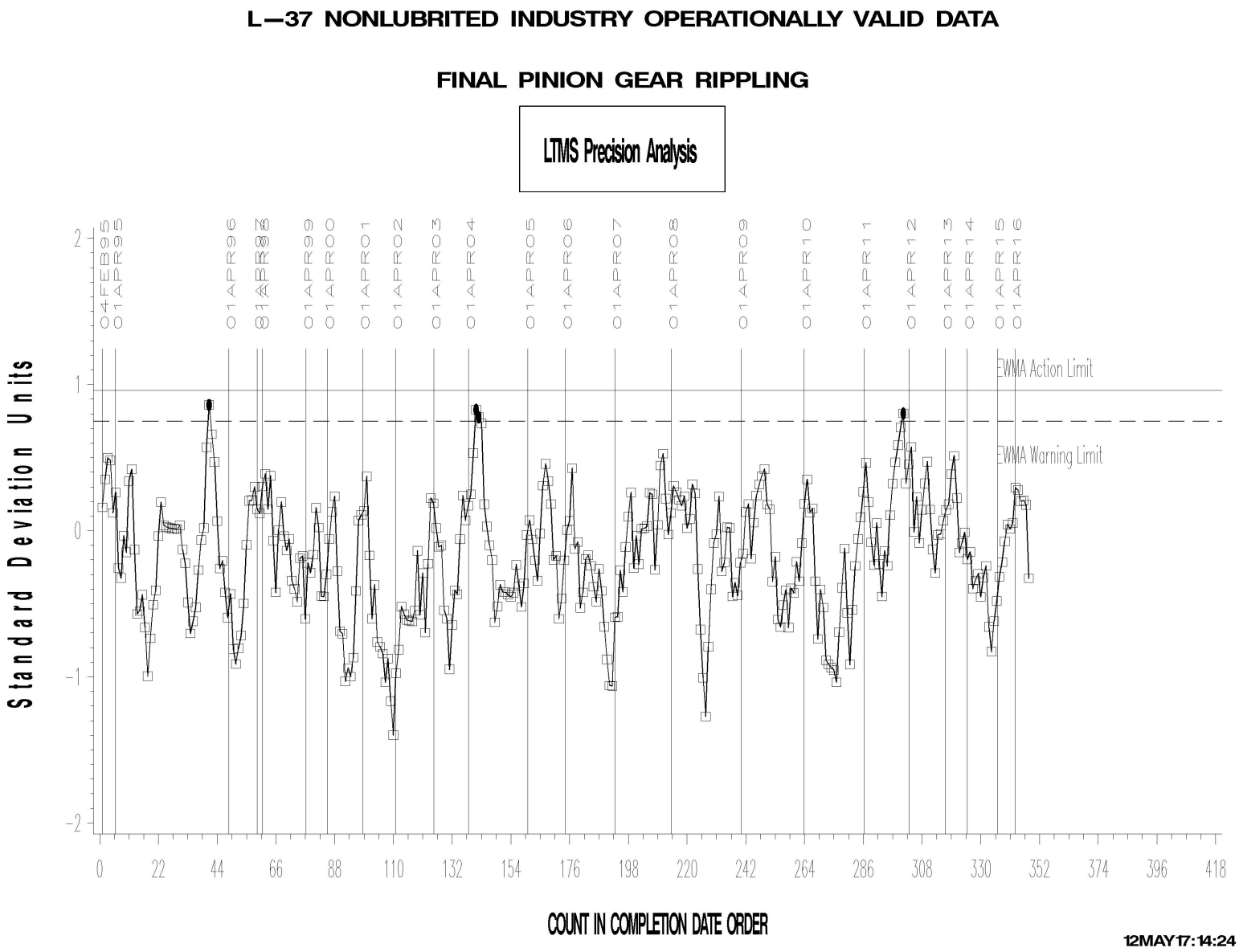

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Severity Analysis
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
Mild
2
1
0
-1
-2
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
COUNT IN COMPLETION DATE ORDER
12MAY17:14:21

L-37 (D6121)

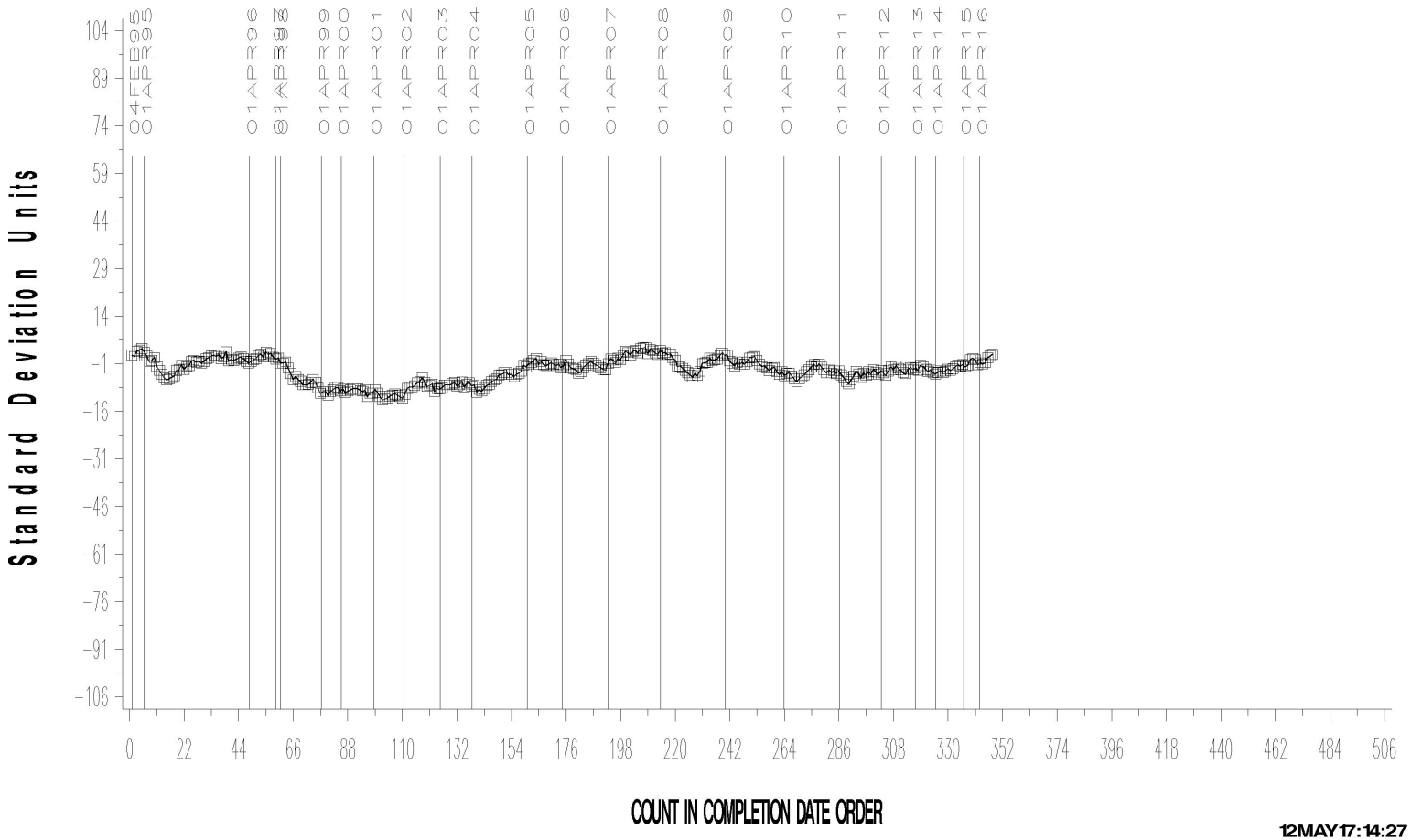

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
04FEB95
01APR95
01APR96
01APR97
01APR98
01APR99
01APR00
01APR01
01APR02
01APR03
01APR04
01APR05
01APR06
01APR07
01APR08
01APR09
01APR10
01APR11
01APR12
01APR13
01APR14
01APR15
01APR16
EWMA Action Limit
EWMA Warning Limit
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
COUNT IN COMPLETION DATE ORDER
12MAY17:14:24

L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

CUSUM Severity Analysis



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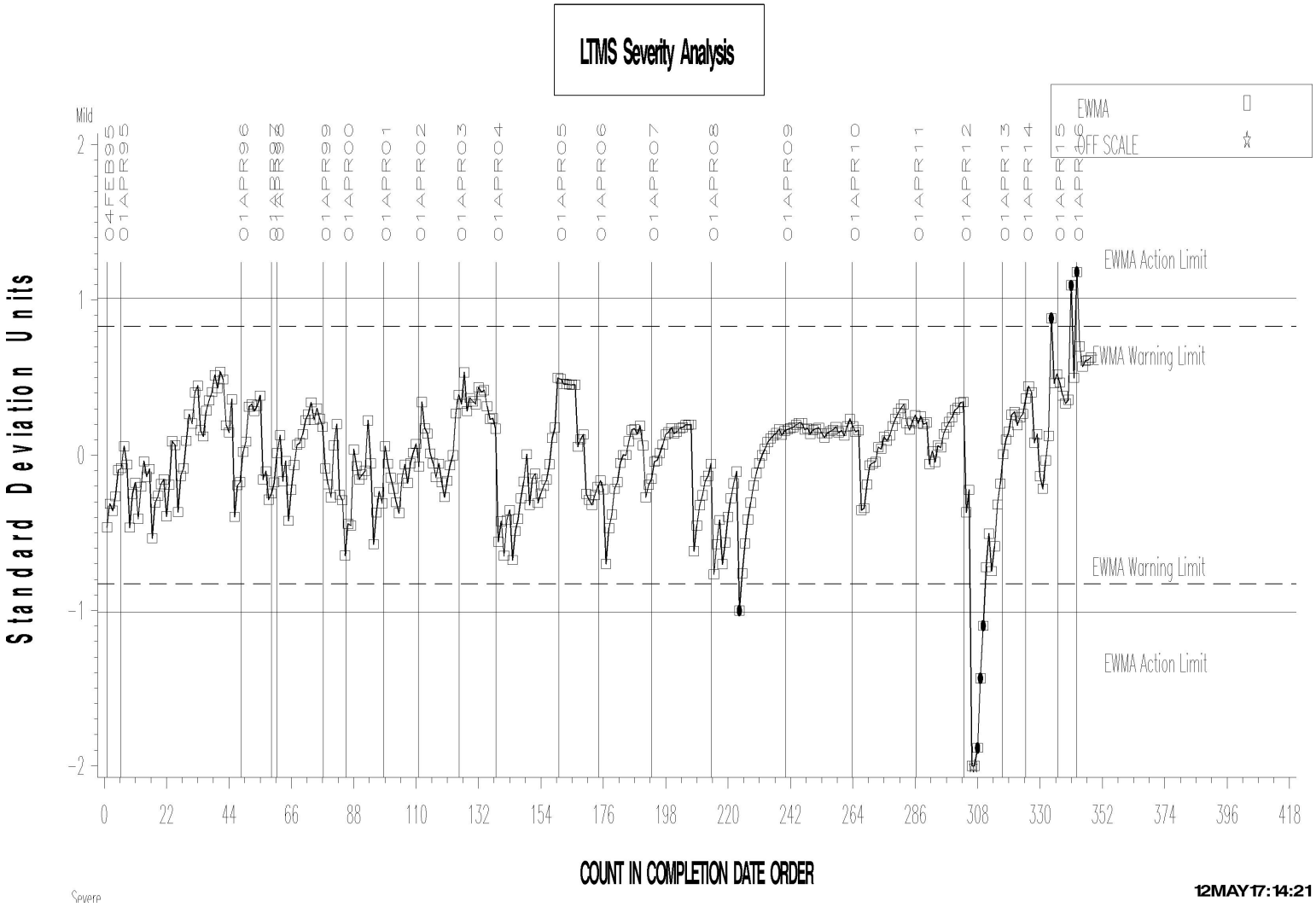
L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING



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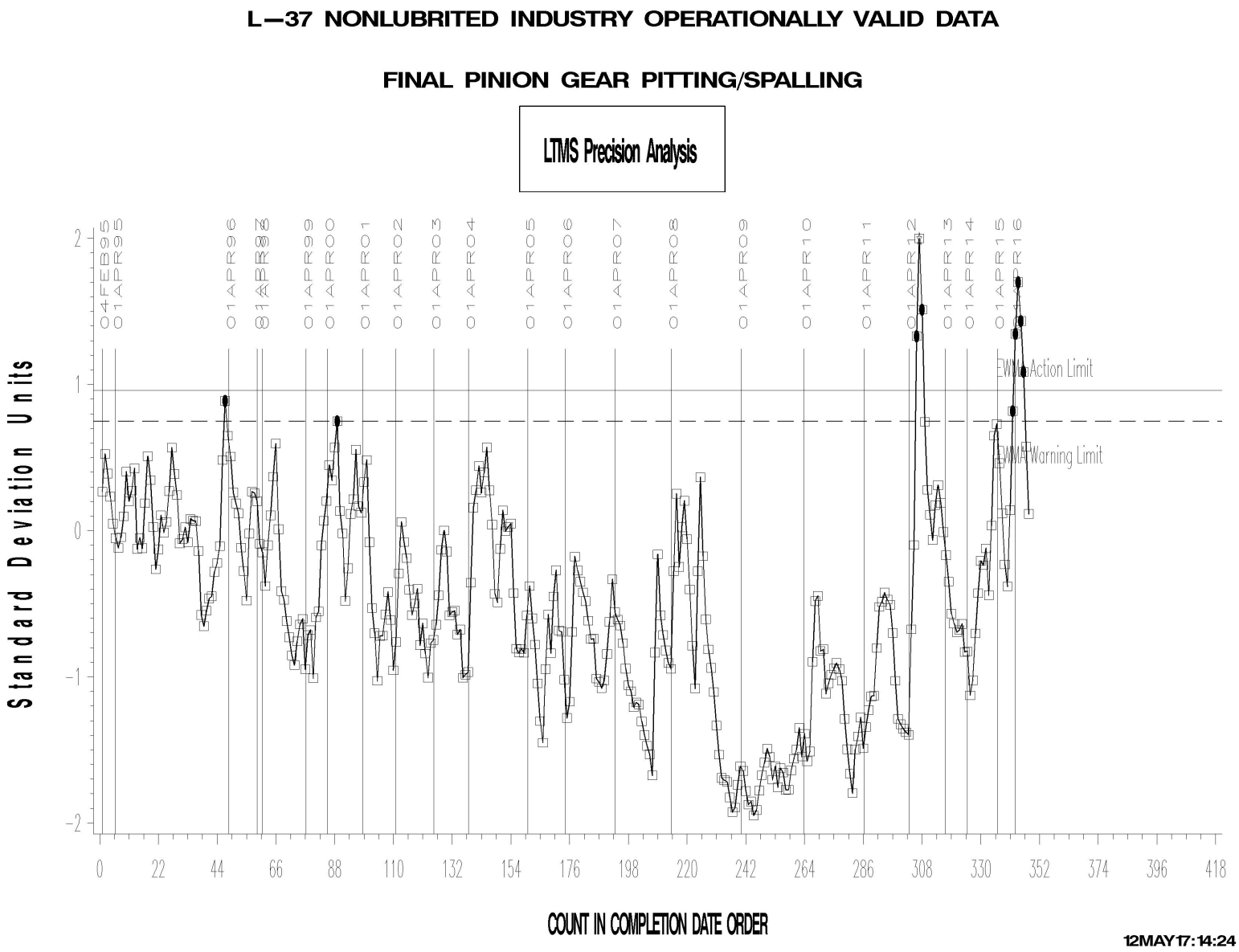
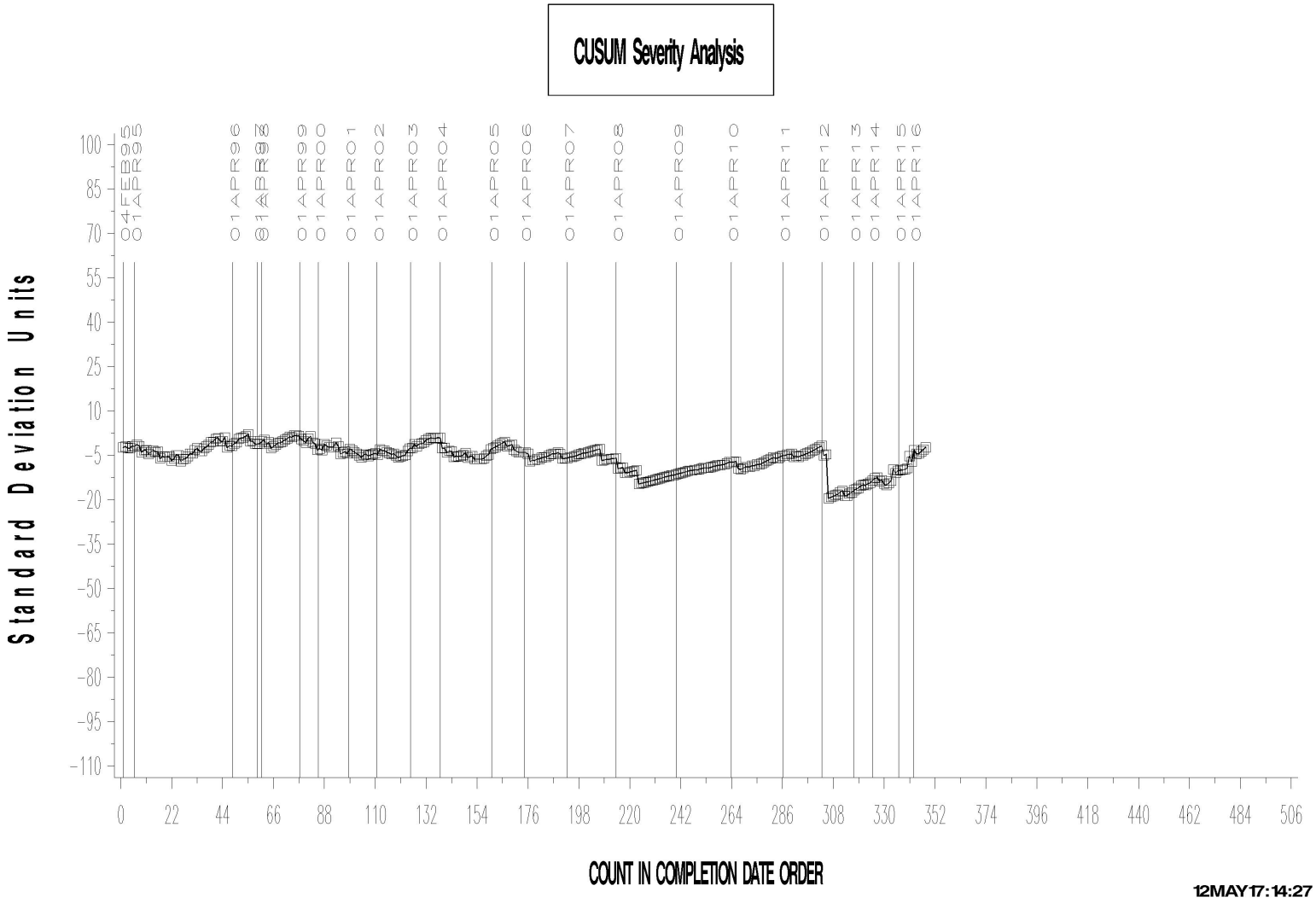

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Precision Analysis
Standard Deviation Units
2
1
0
-1
-2
EWMA Action Limit
EWMA Warning Limit
0
22
44
66
88
110
132
154
176
198
220
242
264
286
308
330
352
374
396
418
COUNT IN COMPLETION DATE ORDER
12MAY17:14:24

L-37 (D6121)

L—37 NONLUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR PITTING/SPALLING



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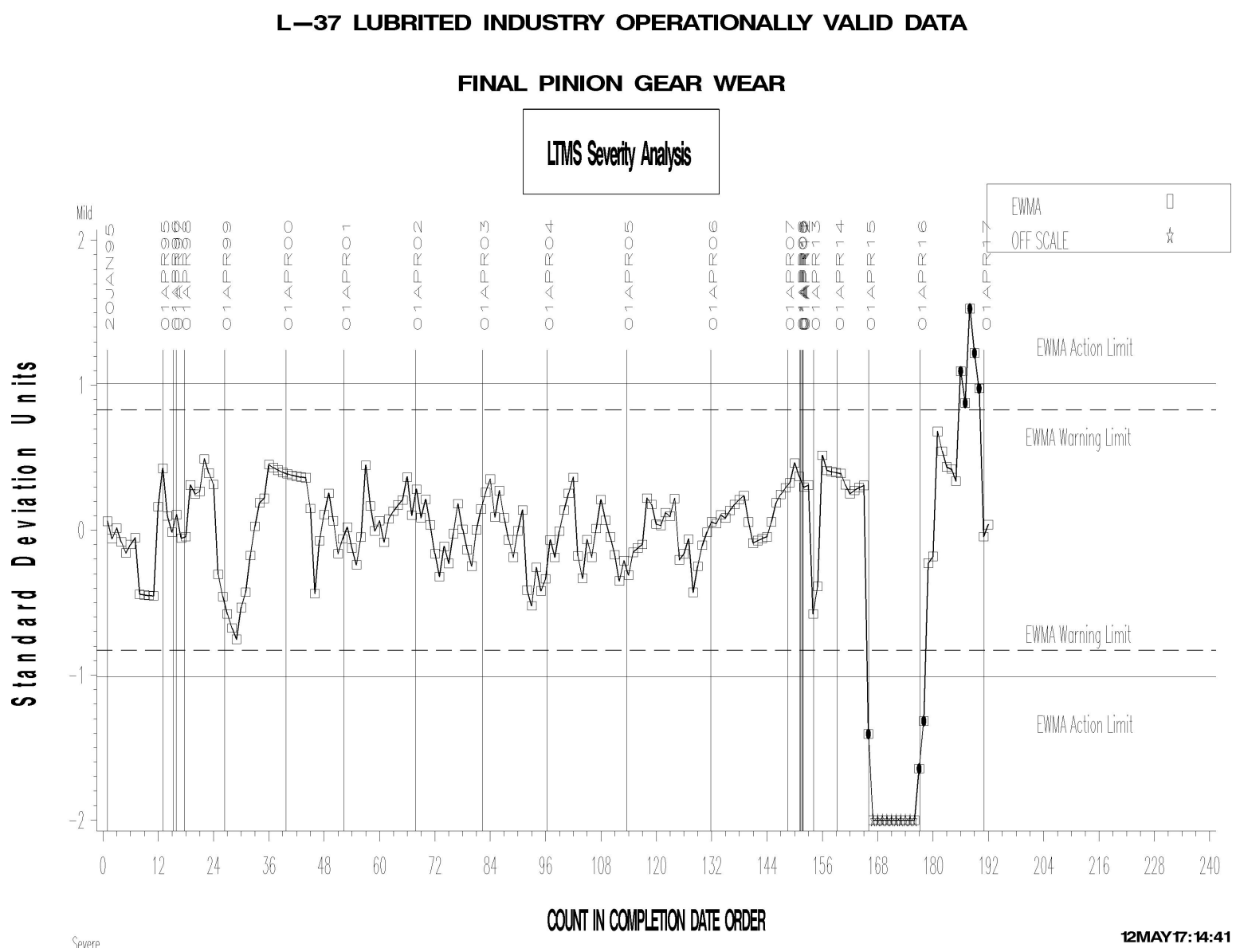
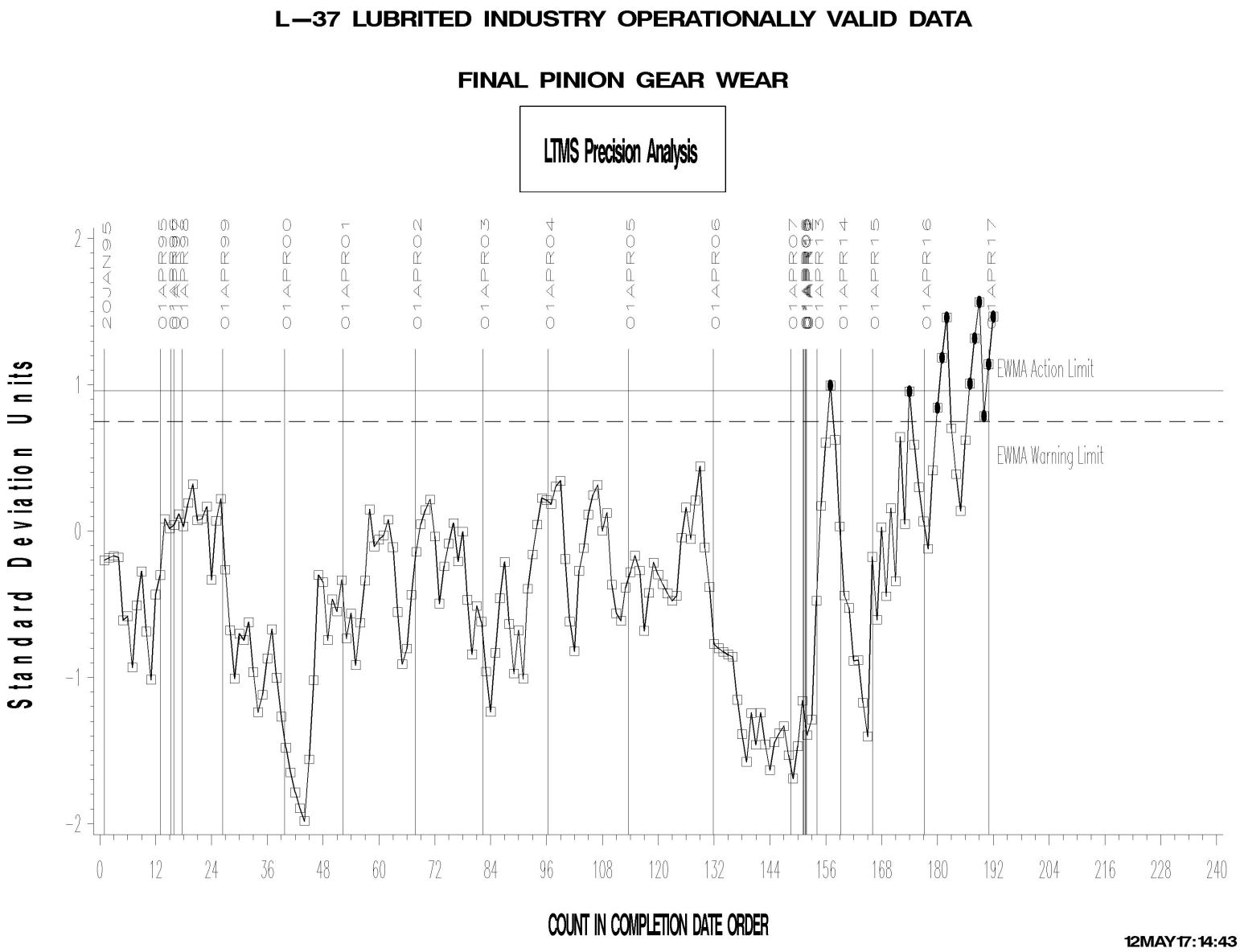

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Severity Analysis
Mild
EWMA
OFF SCALE
EWMA Action Limit
EWMA Warning Limit
EWMA Warning Limit
EWMA Action Limit
Standard Deviation Units
2
1
0
-1
-2
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
240
COUNT IN COMPLETION DATE ORDER
12MAY17:14:41

L-37 (D6121)

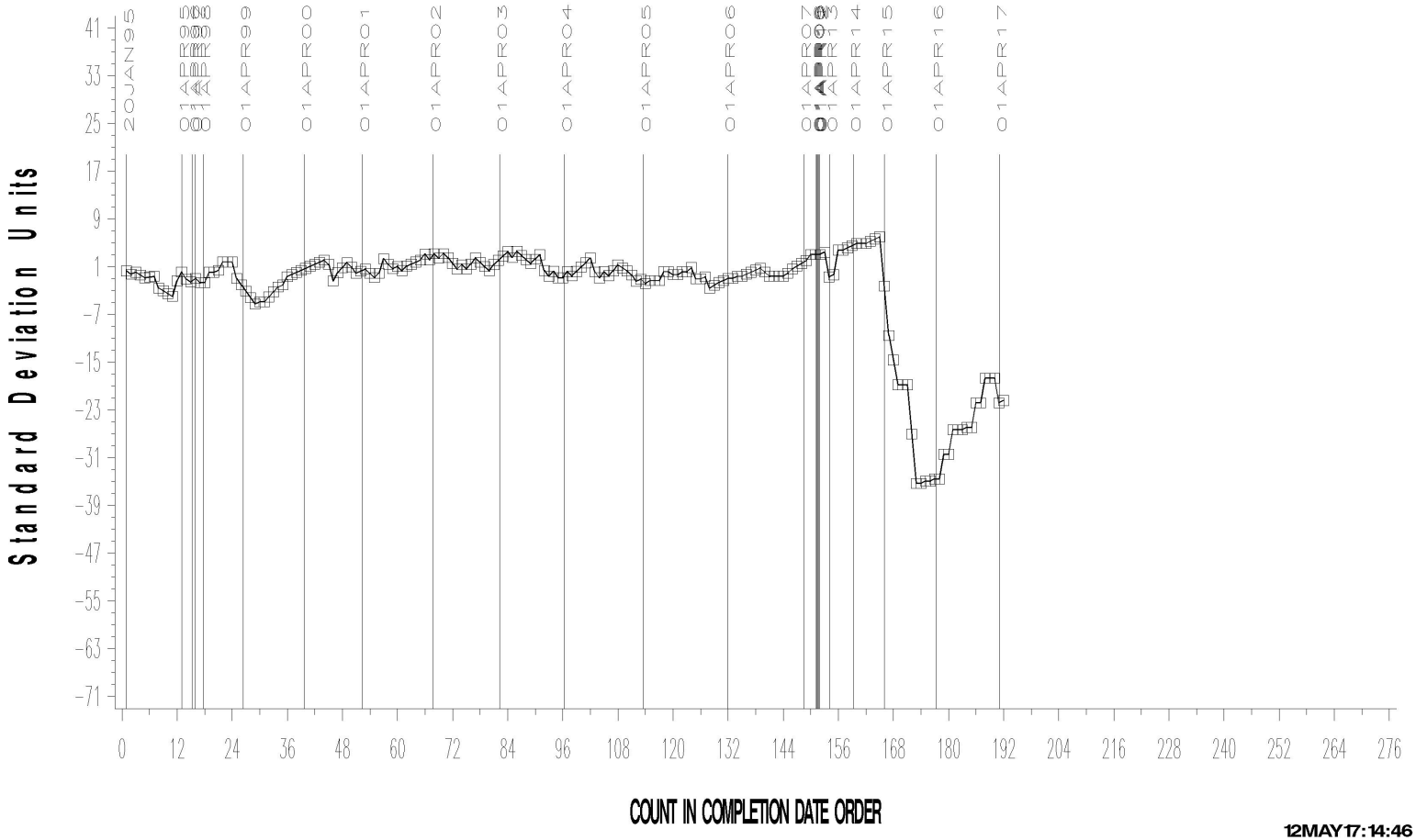

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR WEAR
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
12MAY17:14:43

L-37 (D6121)

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR WEAR

CUSUM Severity Analysis



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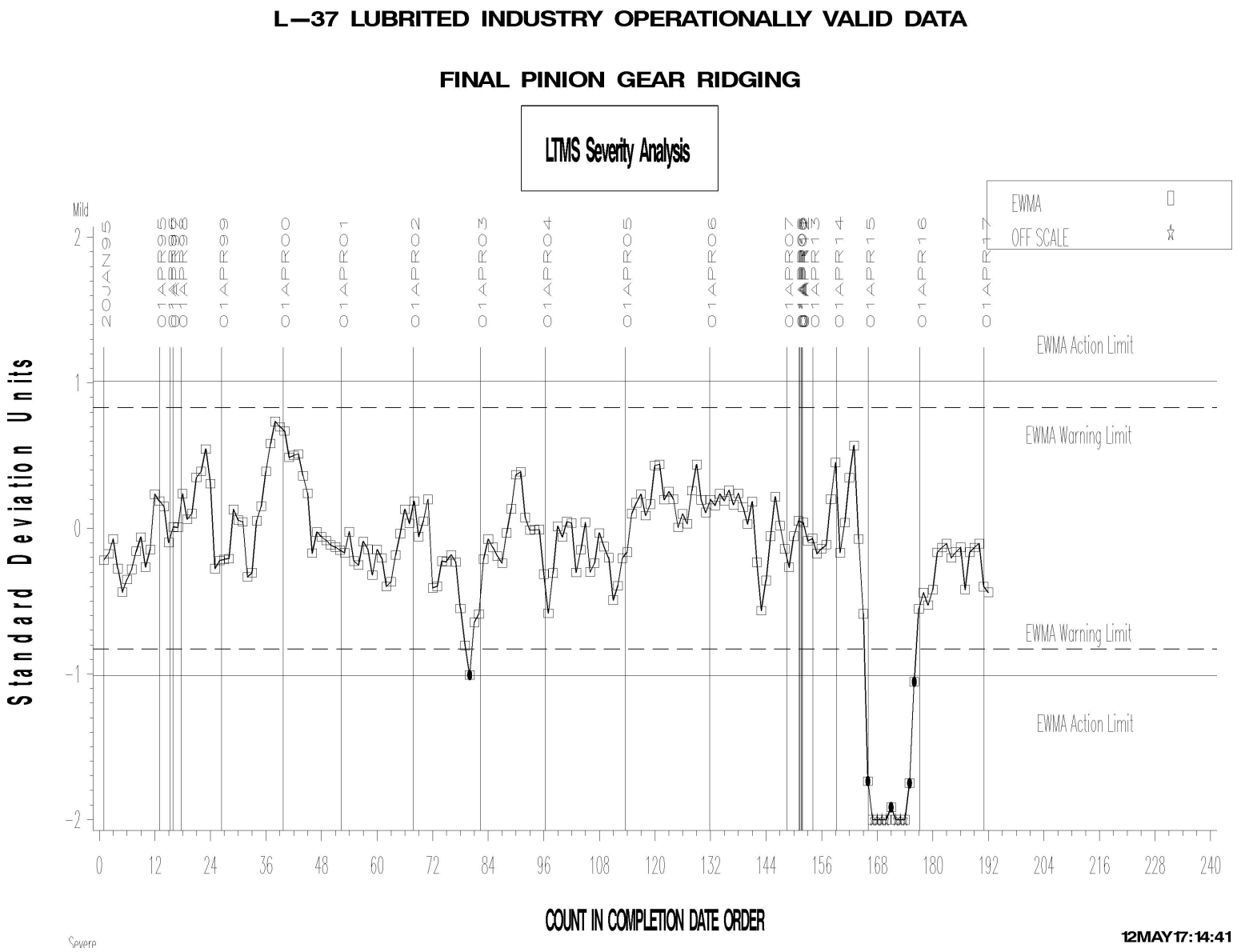
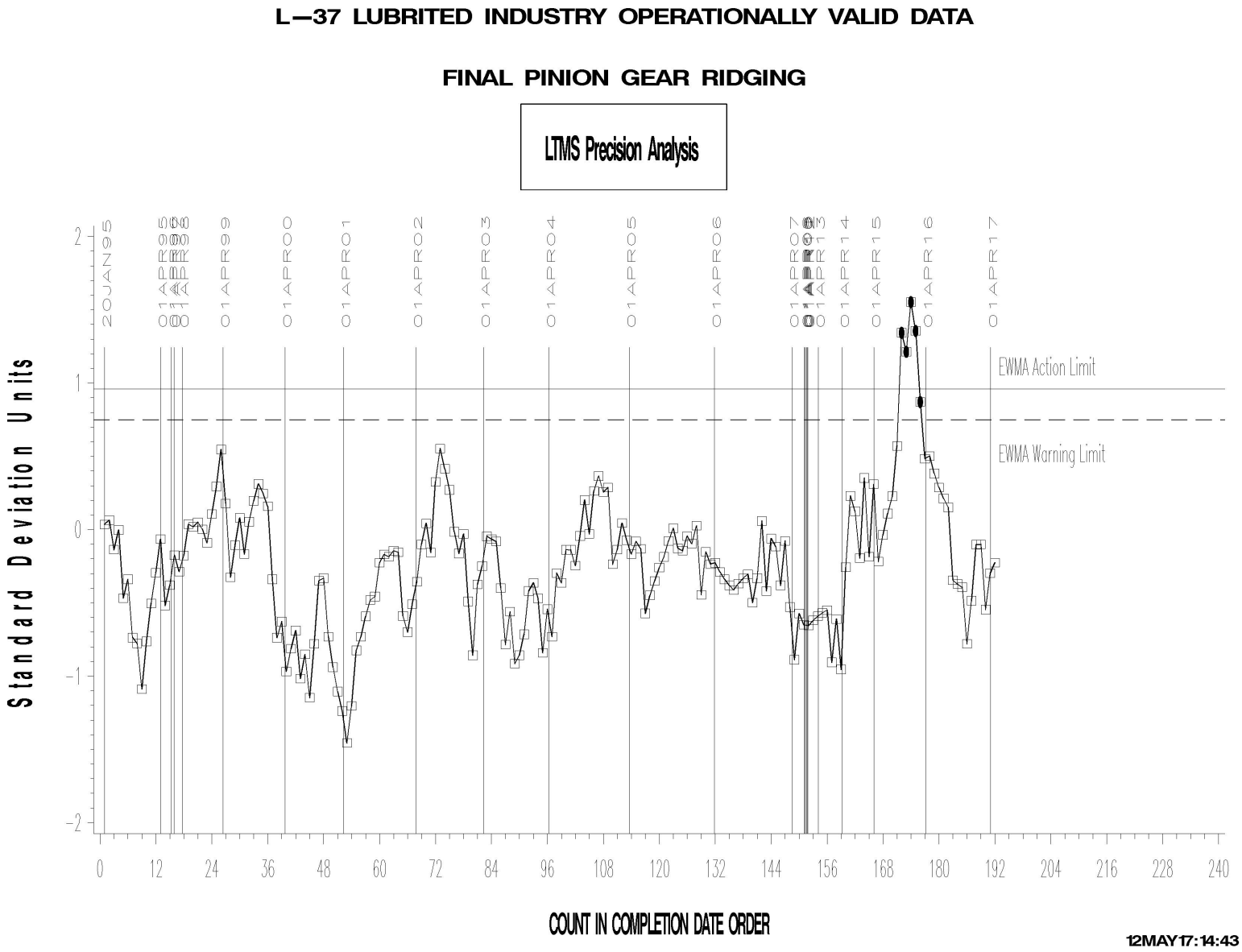
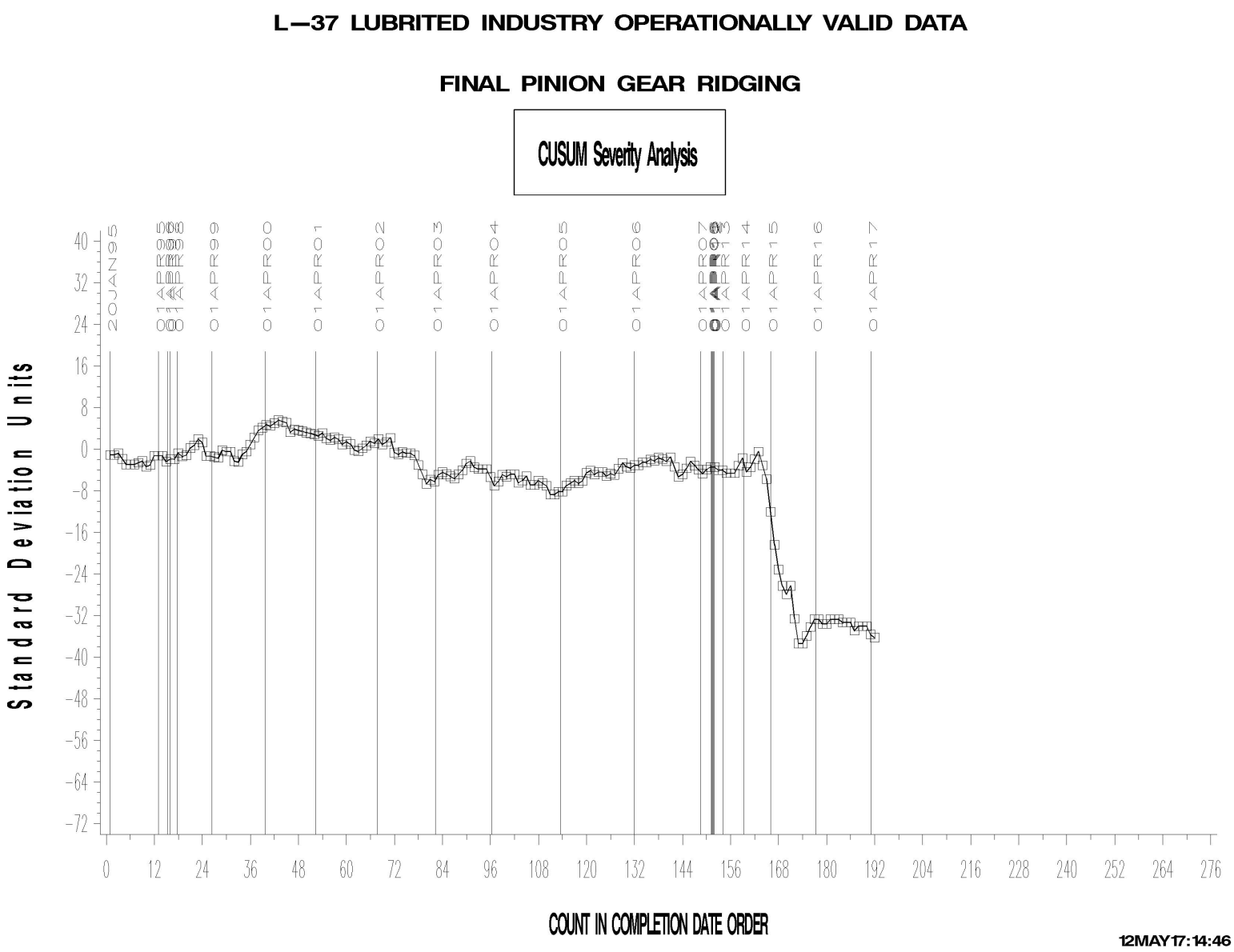
L-37 (D6121)


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
2
1
0
-1
-2
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
240
COUNT IN COMPLETION DATE ORDER
12MAY17:14:41

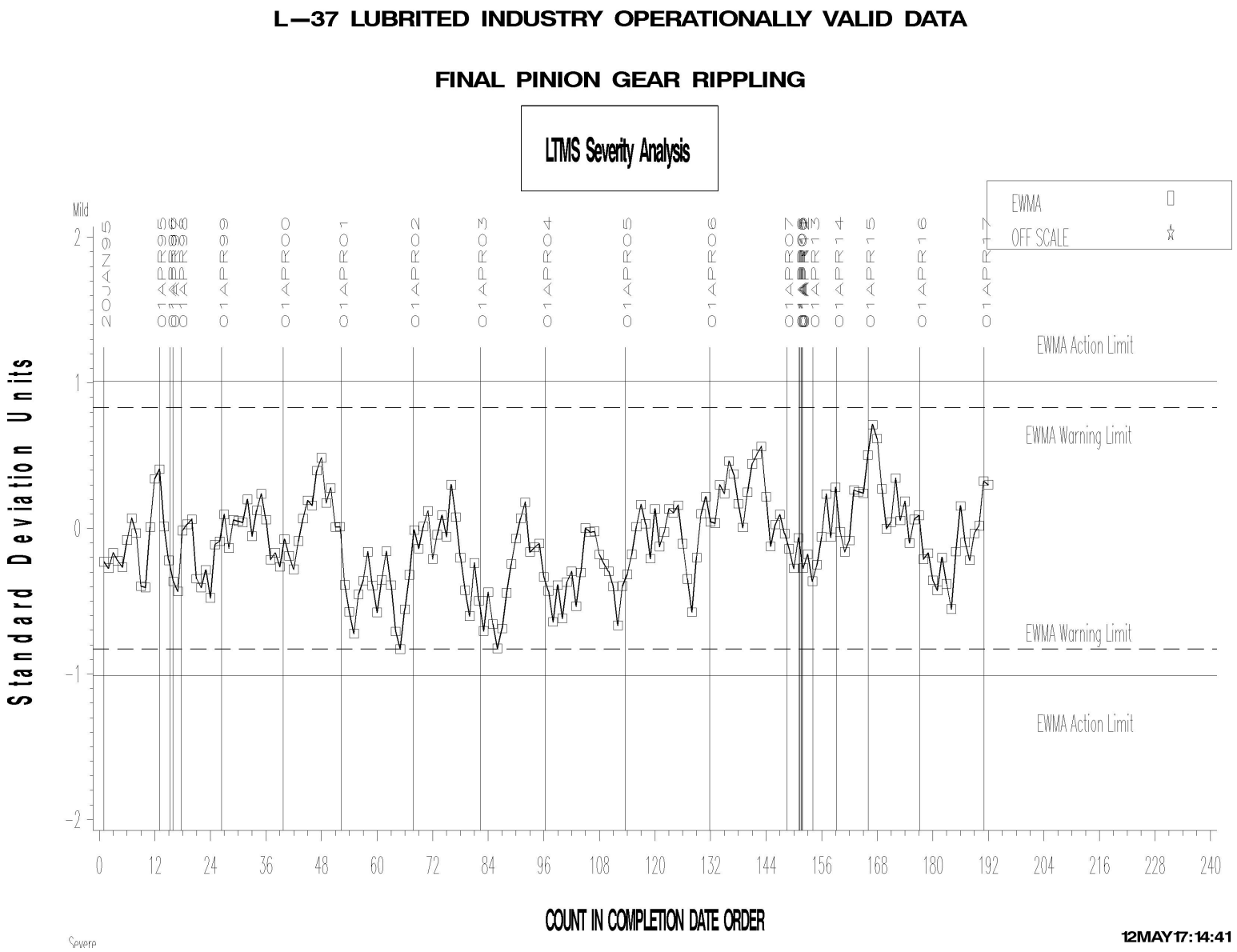
L-37 (D6121)



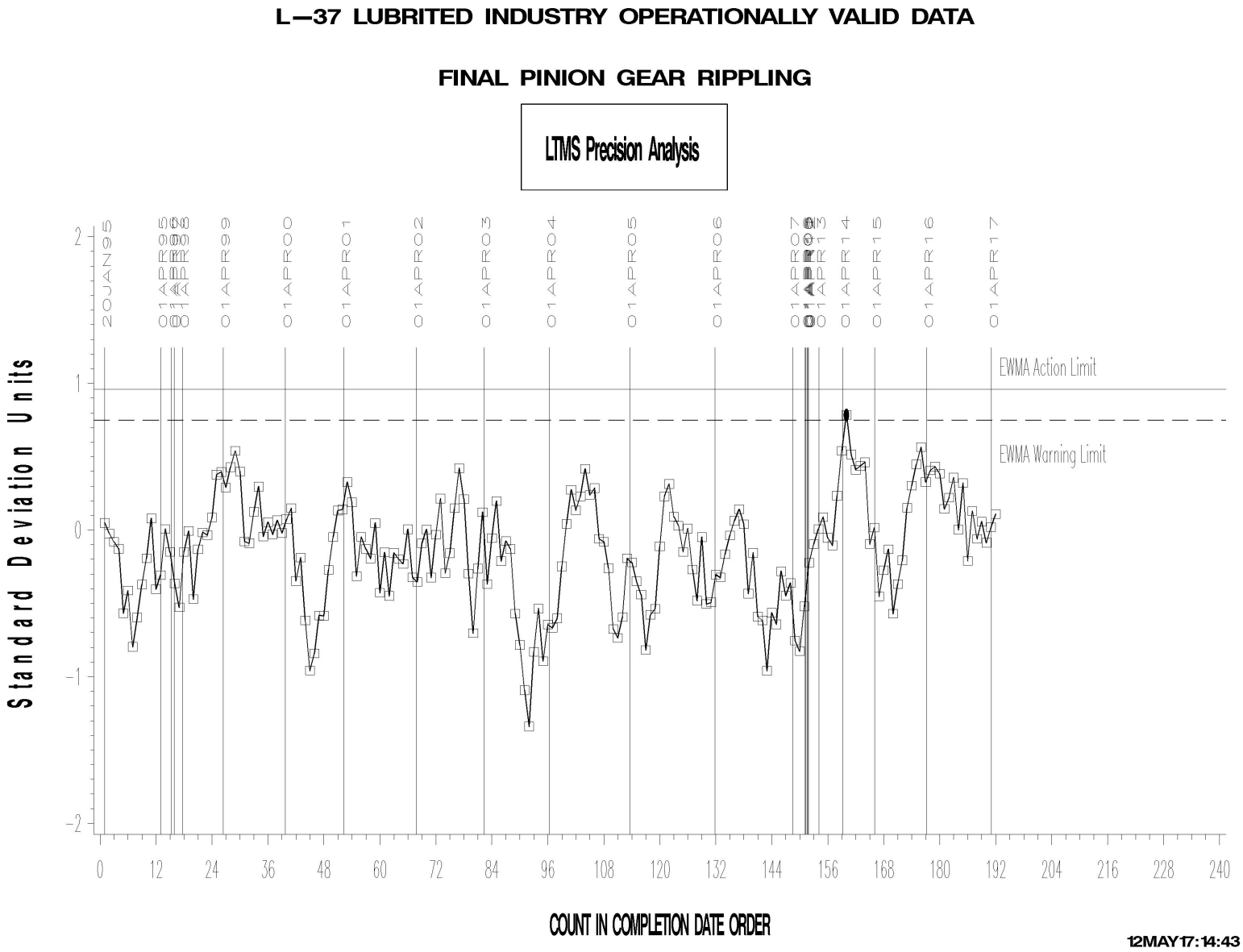
L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIDGING
CUSUM Severity Analysis
Standard Deviation Units
40
32
24
16
8
0
-8
-16
-24
-32
-40
-48
-56
-64
-72
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
240
252
264
276
COUNT IN COMPLETION DATE ORDER
12MAY17:14:46

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
2
1
0
-1
-2
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
240
COUNT IN COMPLETION DATE ORDER
12MAY17:14:41

L-37 (D6121)

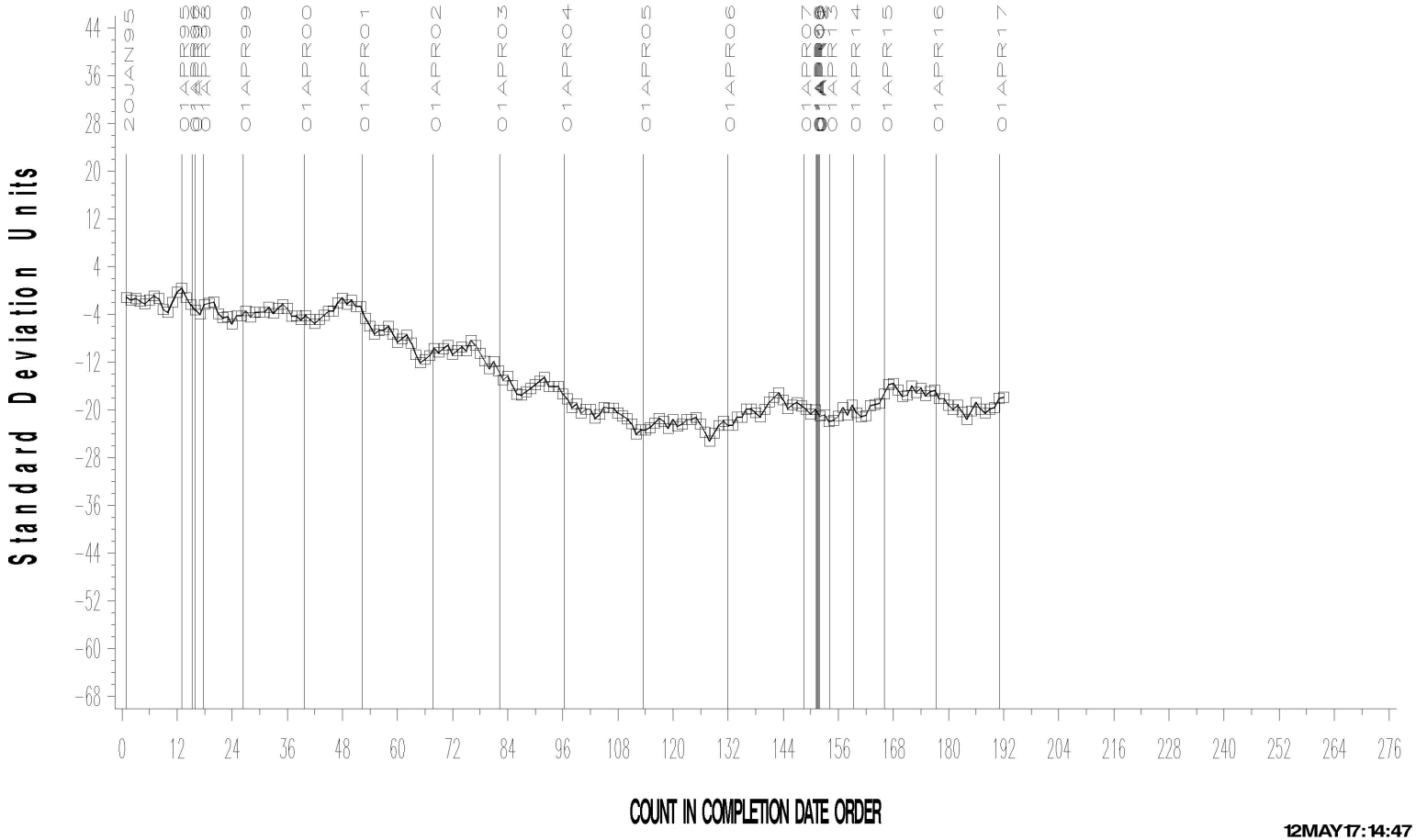

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR RIPPLING
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
12MAY17:14:43

L-37 (D6121)

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

FINAL PINION GEAR RIPPLING

CUSUM Severity Analysis



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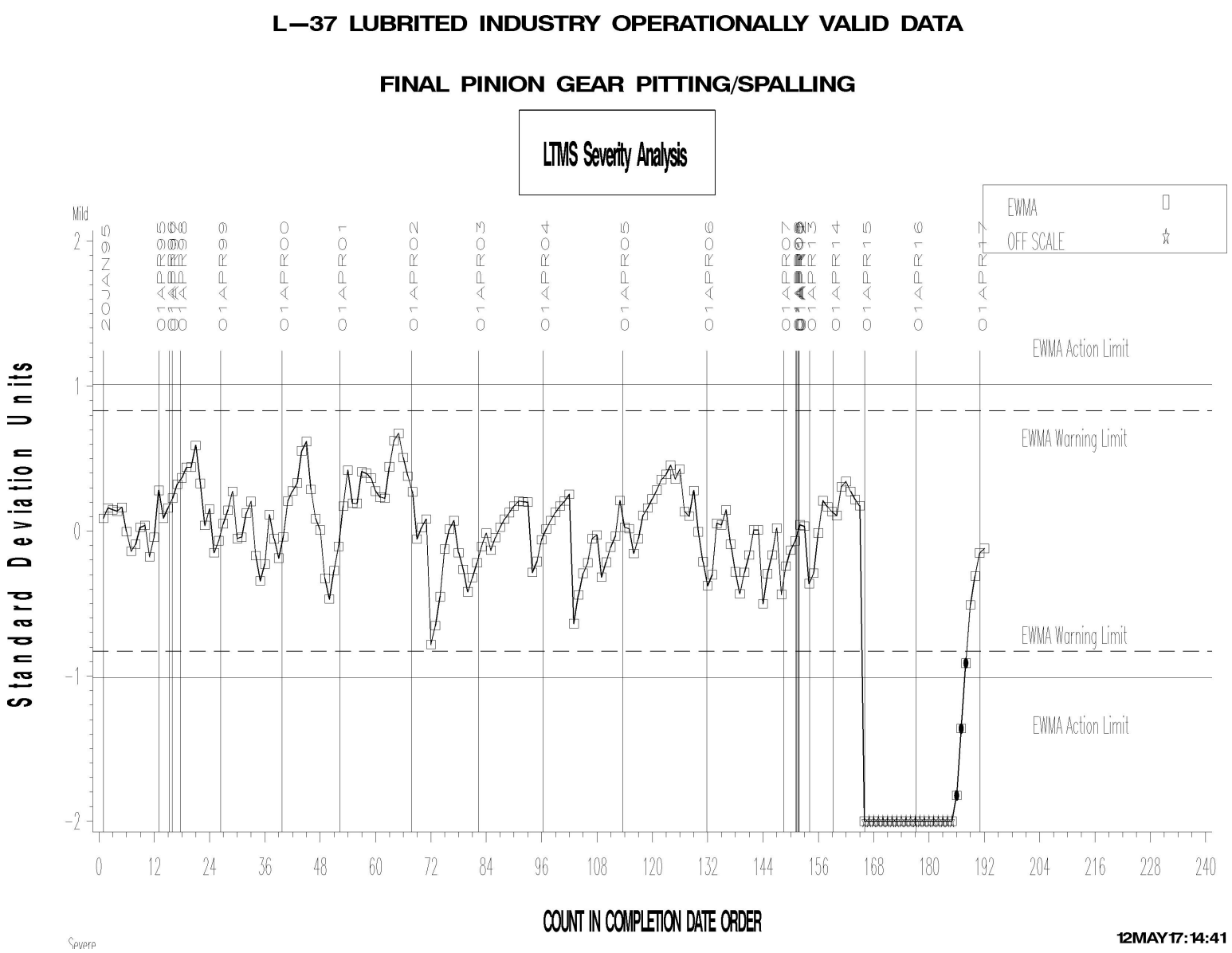
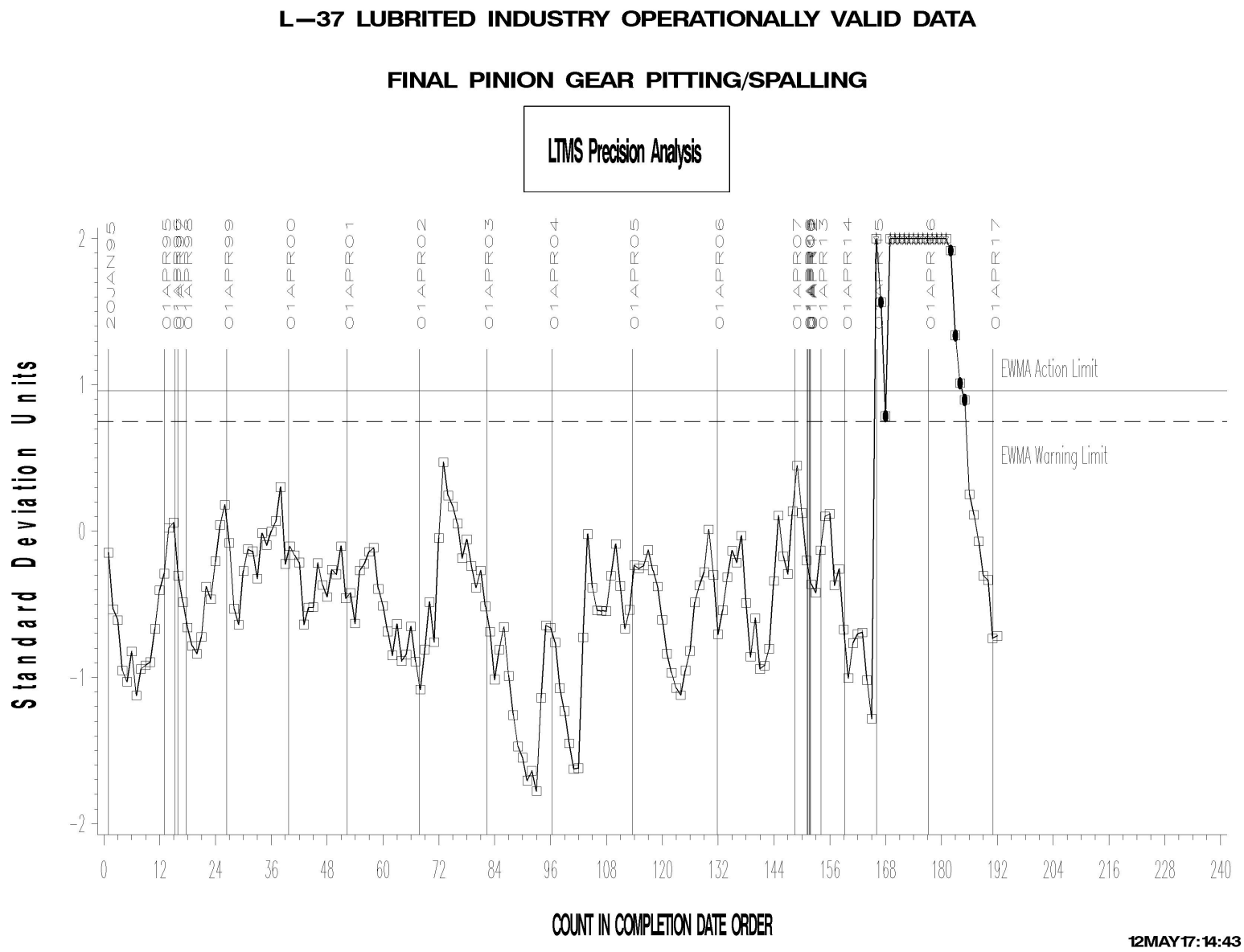
L-37 (D6121)


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
12MAY17:14:41

L-37 (D6121)


L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA
FINAL PINION GEAR PITTING/SPALLING
LTMS Precision Analysis
Standard Deviation Units
EWMA Action Limit
EWMA Warning Limit
COUNT IN COMPLETION DATE ORDER
12MAY17:14:43

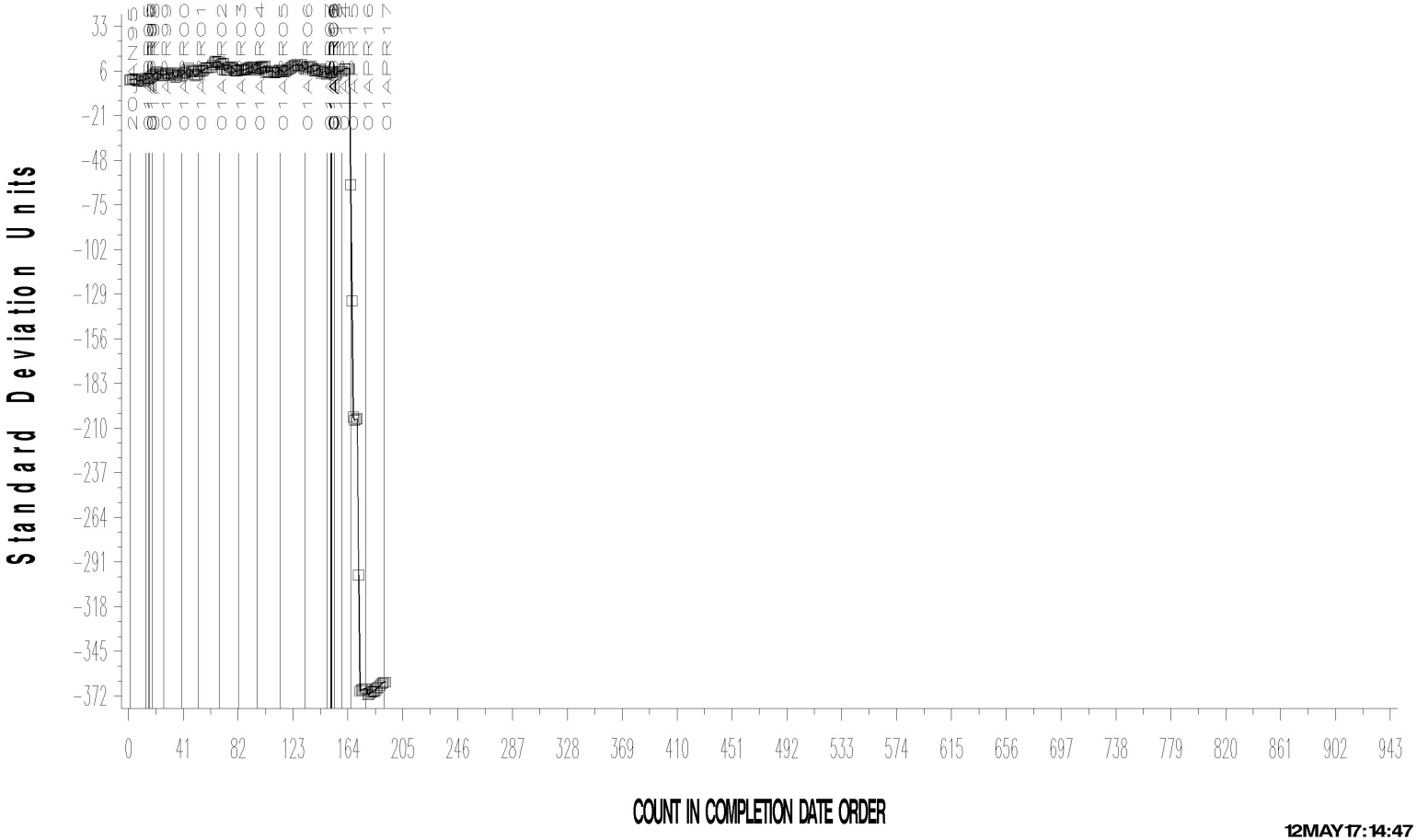
L-37 (D6121)

L—37 LUBRITED INDUSTRY OPERATIONALLY VALID DATA

A Program of ASTM International

FINAL PINION GEAR PITTING/SPALLING

CUSUM Severity Analysis



12MAY17:14:47

L-37 (D6121)

TIMELINE ADDITIONS

Effective Date	Information Letter	Event
20161102	LTMS	Removal of LTMS stand level precision alarms.

L-37 (D6121)

LAB VISITS
No L-37 lab visits were conducted this report period.

L-37 (D6121)

INFORMATION LETTERS
No information letters were issued this period.

L-37 (D6121)

LTMS DEVIATIONS

No LTMS deviations were written this report period. Until the November 2, 2016 Surveillance Panel meeting, the L-37 test used acceptance bands for severity limits while retaining standard LTMS limits on precision. Because this mismatch often created the need to consider writing an LTMS deviation, the Surveillance Panel removed stand level precision alarms from the system at that meeting.

L-37 (D6121)

STATUS OF REFERENCE OIL SUPPLY

		@ TMC	
Oil	Cans @ Labs	Cans	Gallons
117	0	399	399.0
134	4	0	0.0
134-1	6	210	210.0
152-2	12	161	161.9
152-3	0	54	54.8
155	6	15	15.0
155-1	9	186	186.5
Total	37	1025	1027.1

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, L-60-1, 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 38.6 gal) for use in that test.

TMC stocks of oil 134 have been depleted. The 134-1 reblend has been introduced to testing.