Ford LSPI Prove Out Operational Data Plots

11-20-15

Kevin O'Malley
The Lubrizol Corporation

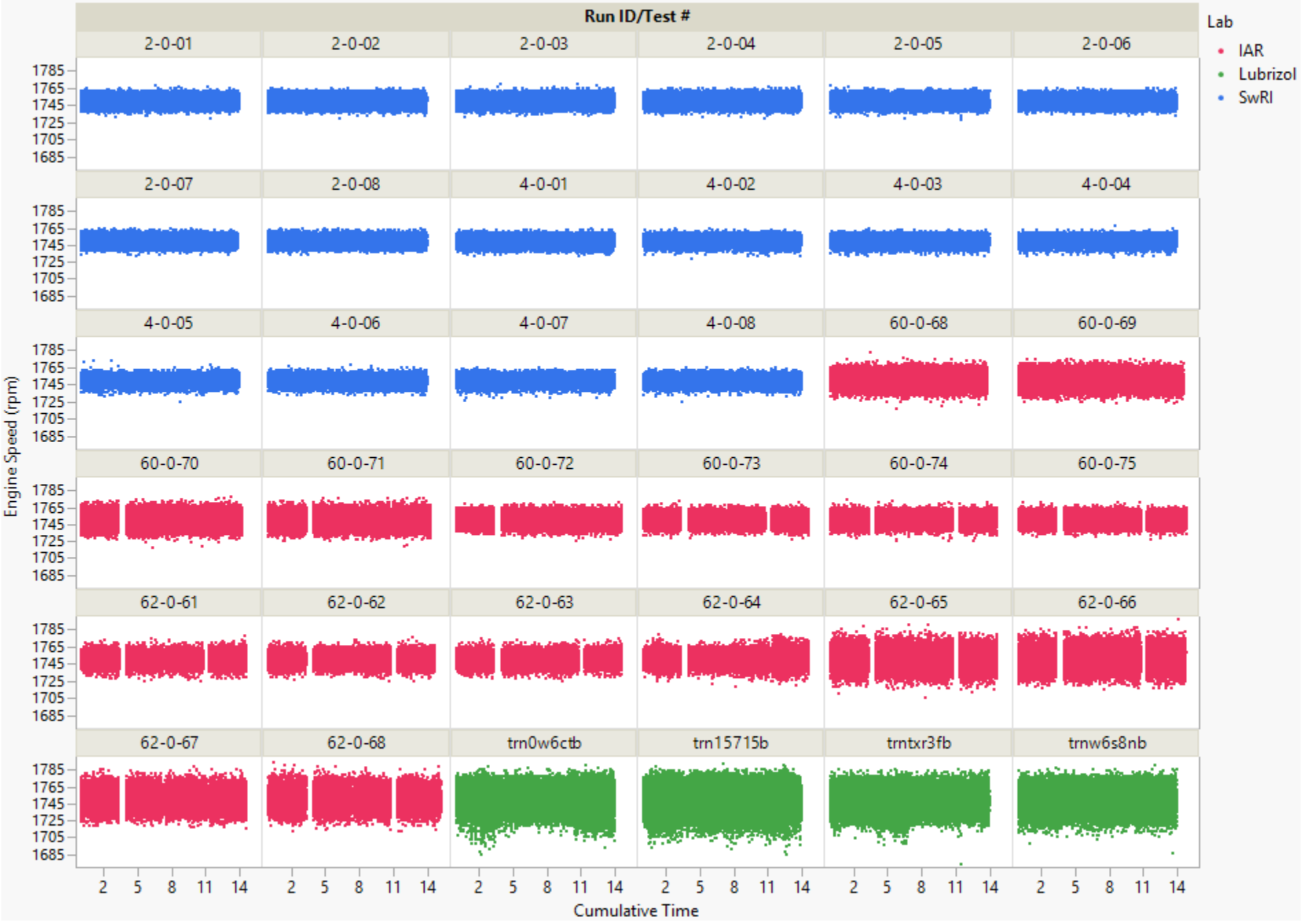
Overview

- 36 tests included
  - 16 IAR (2 stands; 8 tests per stand; 2 engine builds per stand)
  - 16 SwRI (2 stands; 8 tests per stand; 2 engine builds per stand)
  - 4 LZ (1 stand; 1 engine build)

- 2 oils tested (low event oil and high event oil)
  - Each oil tested in duplicate within each stand-engine build combination

- Operational parameters are plotted versus cumulative time
  - Cumulative time is a combination of time from valid iterations A, B, C, and D; time at start of iteration A = 0hrs
  - Each RunID/Test # is plotted in a separate pane

- CAN data are plotted with and without stand 62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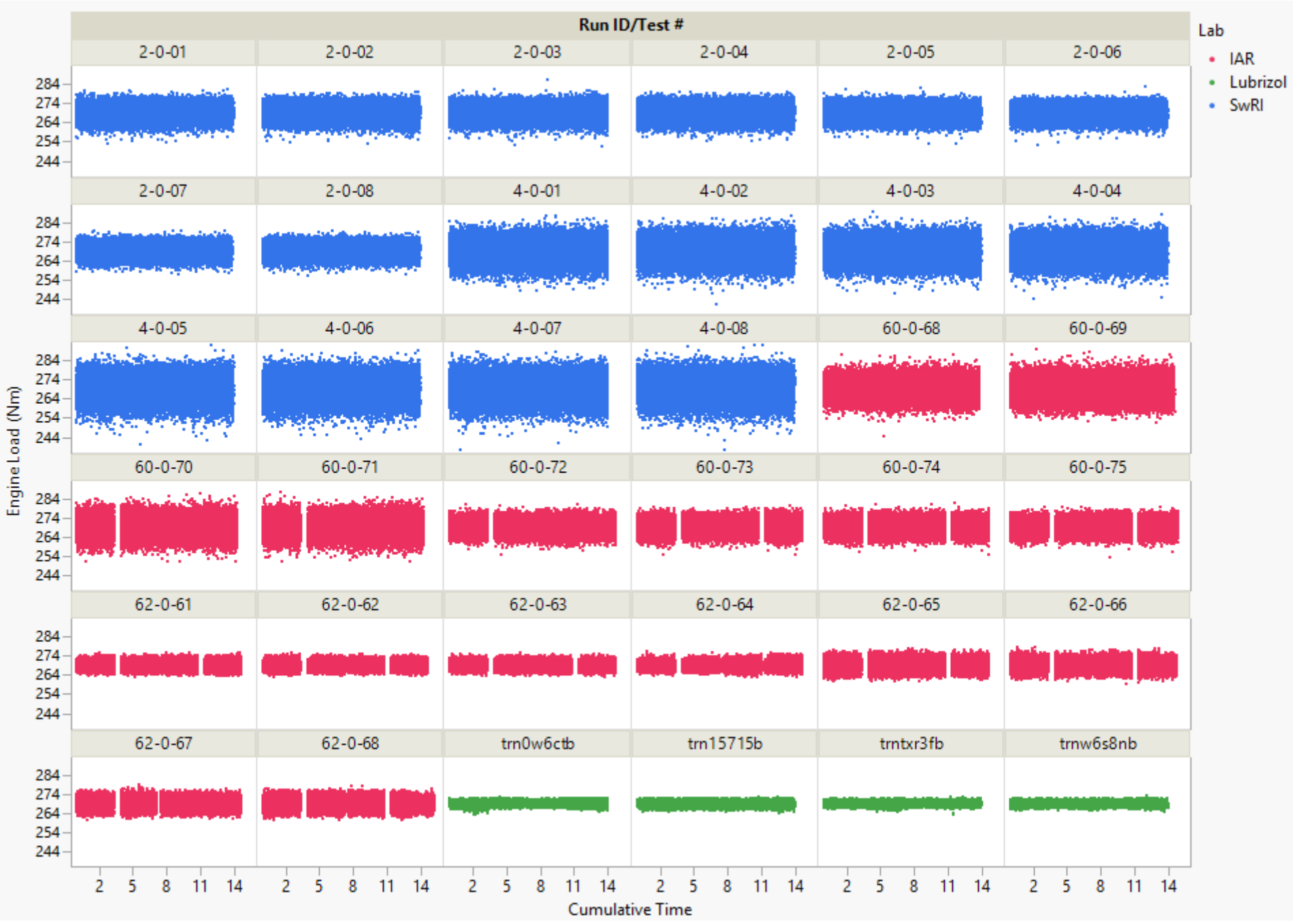
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Engine Speed (rpm)
1785
1765
1745
1725
1705
1685
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
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2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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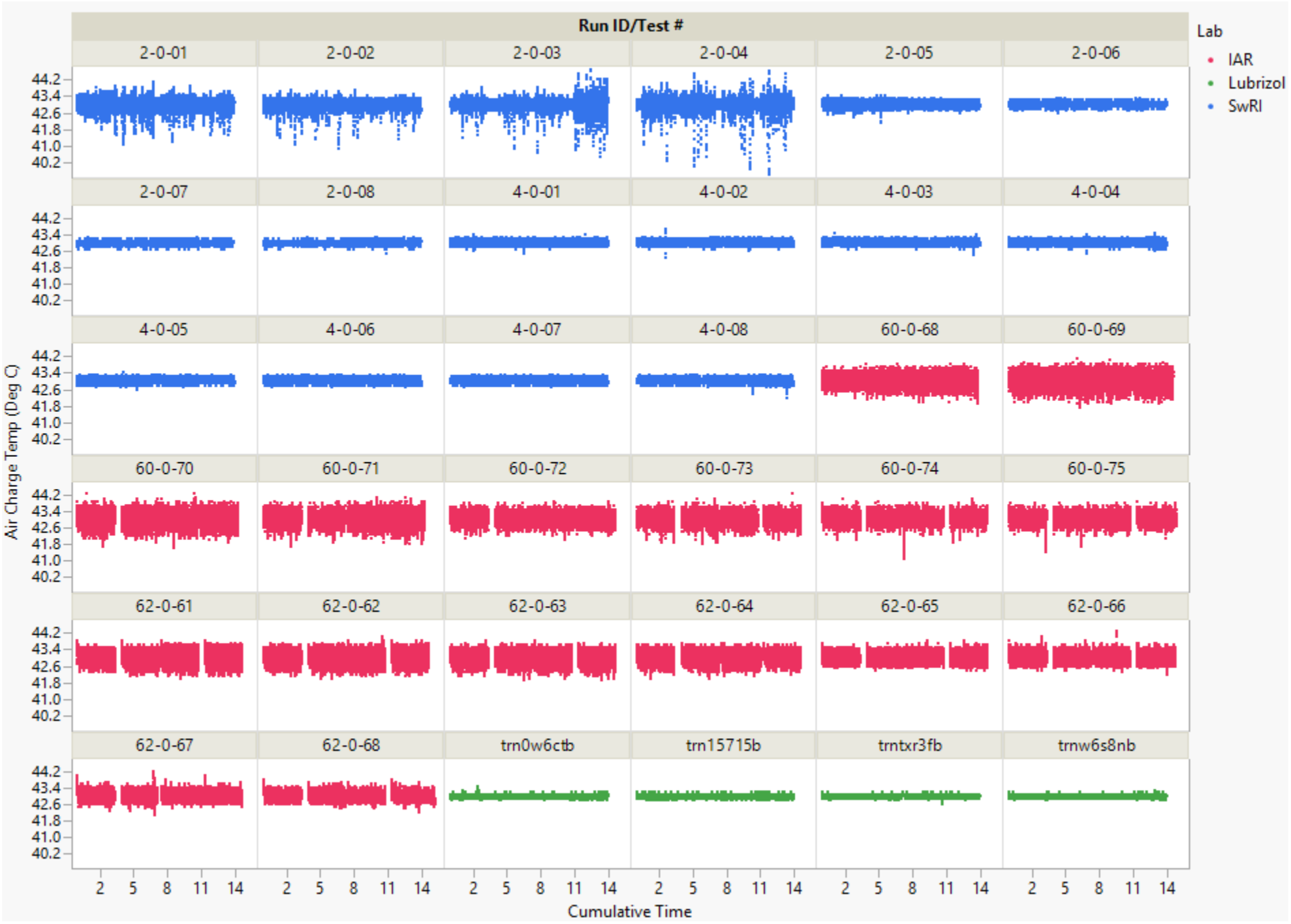
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Engine Load (Nm)
284
274
264
254
244
2
5
8
11
14
Cumulative Time

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
96.6
96.0
95.4
94.8
94.2
2
5
8
11
14
Cumulative Time
Coolant Out Temp (Deg C)
Lab
IAR
Lubrizol
SwRI

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
96.0
95.6
95.2
94.8
94.4
Oil Gallery Temp (Deg C)
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
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2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Air Charge Temp (Deg C)
44.2
43.4
42.6
41.8
41.0
40.2
2
5
8
11
14
Cumulative Time

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
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60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Inlet Air Temp (Deg C)
31.0
29.5
28.0
26.5
25.0
2
5
8
11
14
Cumulative Time

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
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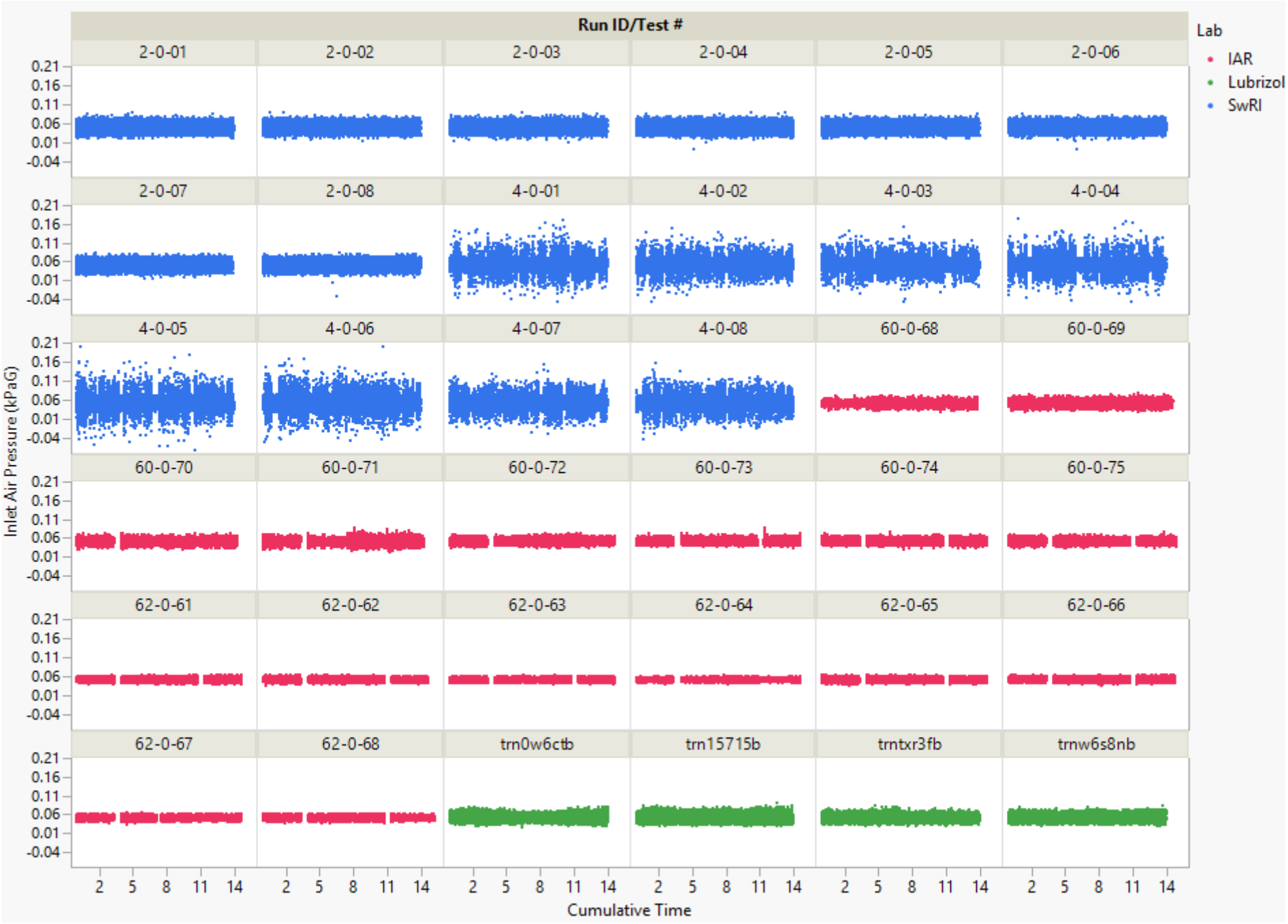
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
31.0
30.5
30.0
29.5
Inlet Air Temp (Deg C) ZOOMED IN
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI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2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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4-0-02
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4-0-08
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60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Inlet Air Pressure (kPaG)
0.21
0.16
0.11
0.06
0.01
-0.04
2
5
8
11
14
Cumulative Time

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
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4-0-08
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62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
105.1
104.7
104.3
103.9
2
5
8
11
14
Cumulative Time
Exhaust Back Pressure (kPaA)
Lab
IAR
Lubrizol
SwRI

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
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60-0-75
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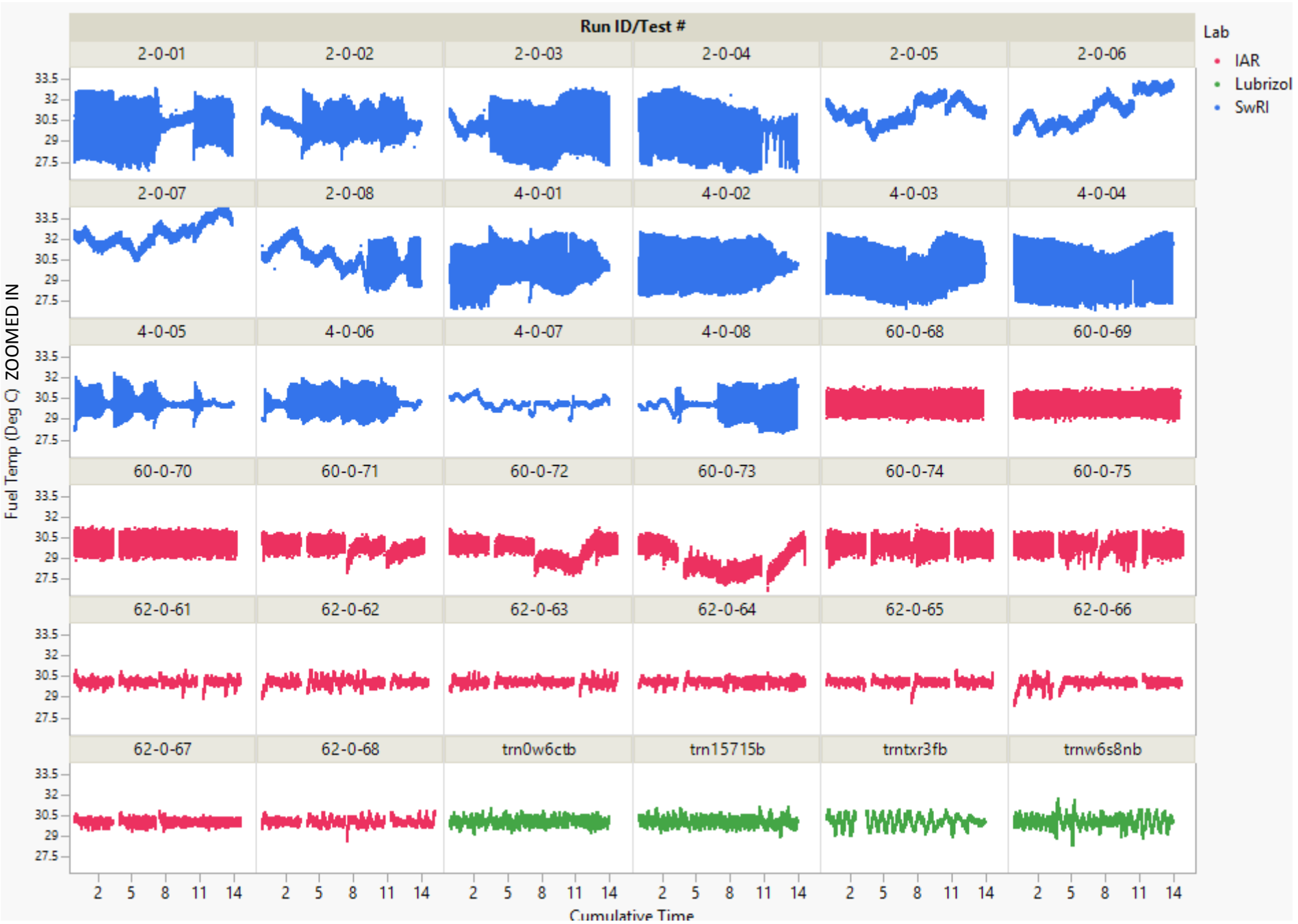
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
9.5e+19
7.5e+19
5.5e+19
3.5e+19
1.5e+19
Fuel Temp (Deg C)
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI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2-0-02
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2-0-04
2-0-05
2-0-06
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62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
33.5
32
30.5
29
27.5
2
5
8
11
14
Cumulative Time
Fuel Temp (Deg C) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
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60-0-75
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62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Fuel Flow (kg/hr)
Cumulative Time
Lab
IAR
Lubrizol
SwRI

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
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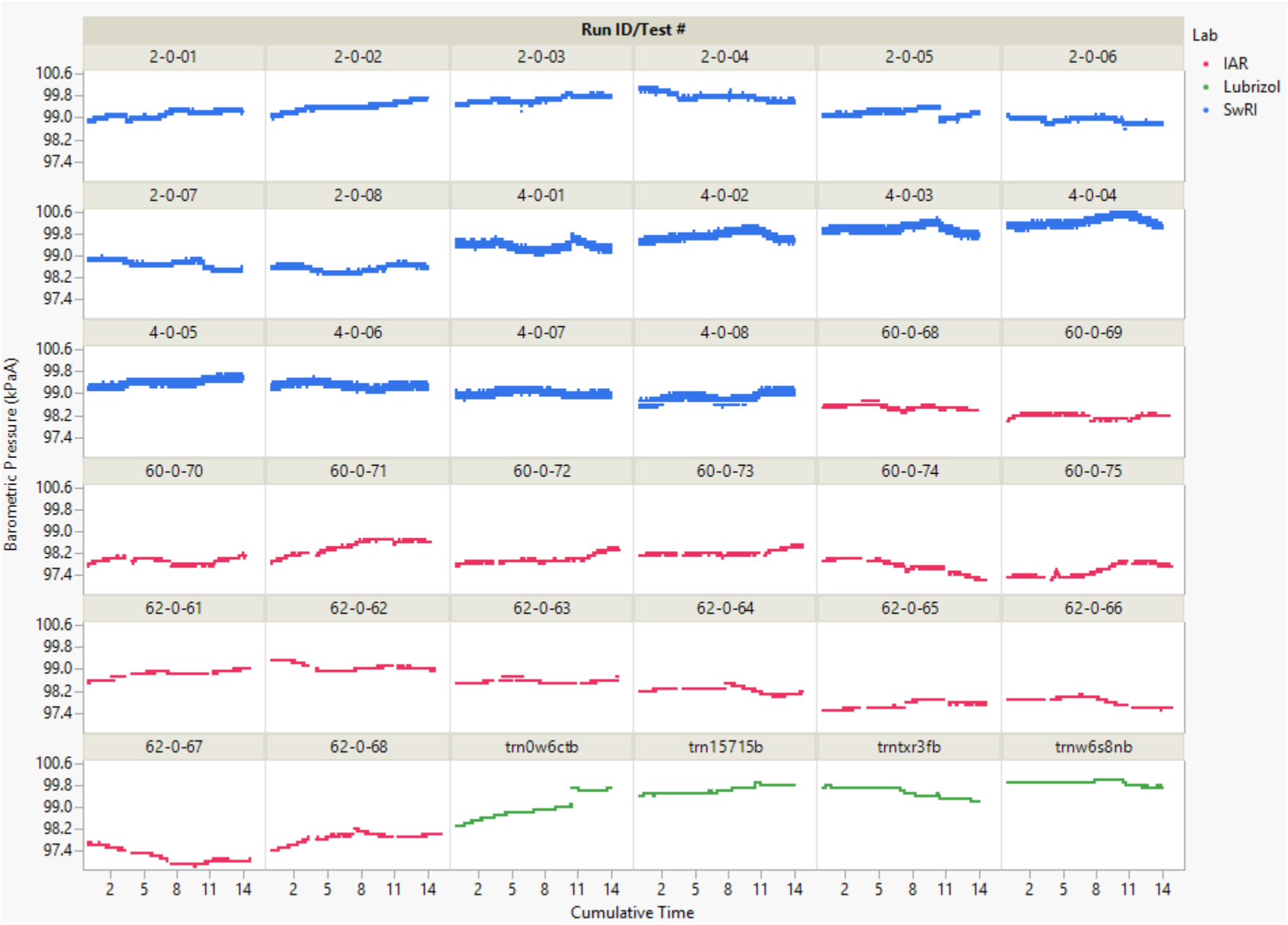
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Air Charge Pressure Abs
220
214
208
202
196
190
184
0 1 2 3 4 5 6 7 8 9 11 13 15
Cumulative Time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2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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4-0-02
4-0-03
4-0-04
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4-0-08
60-0-68
60-0-69
60-0-70
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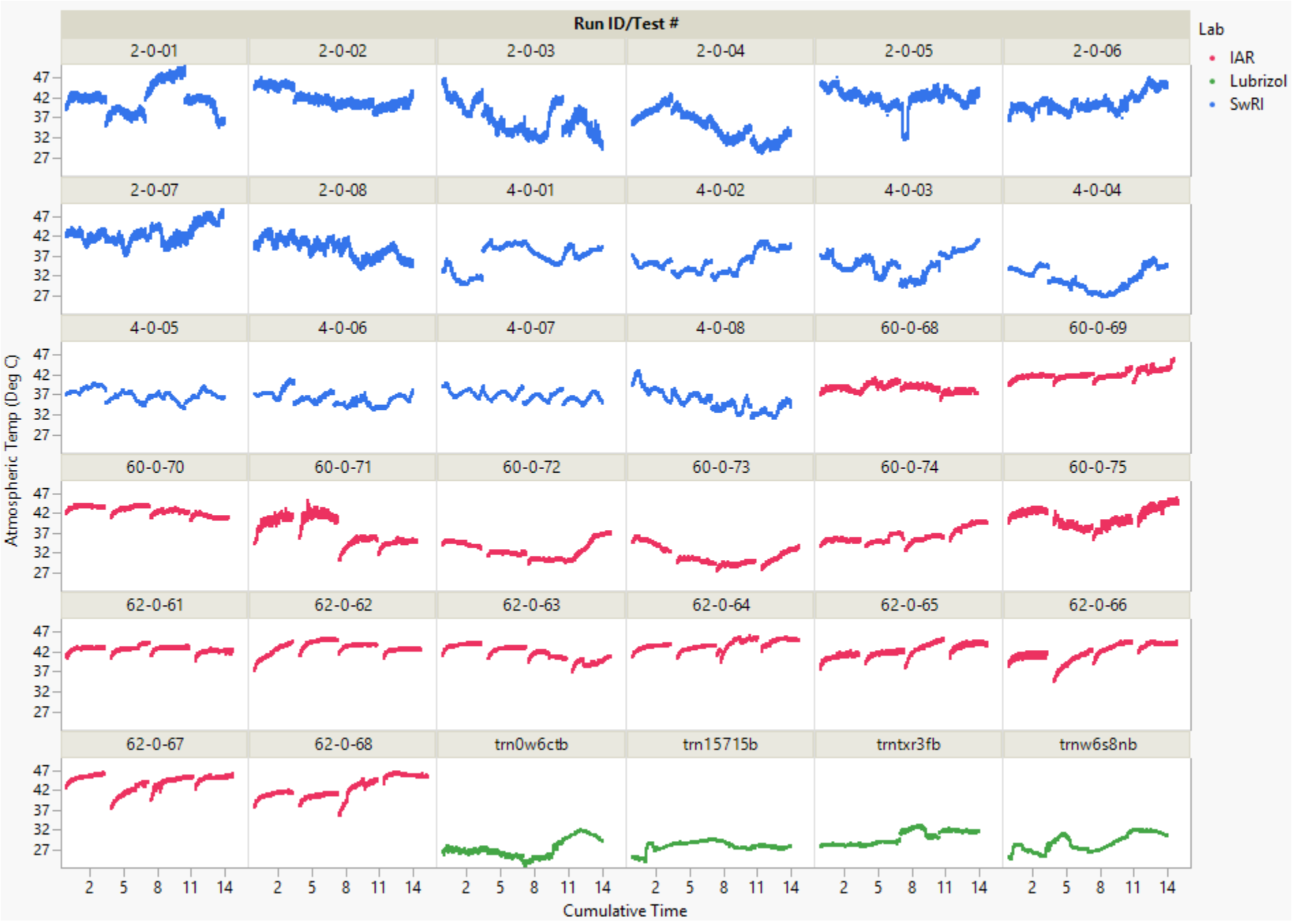
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
100.6
99.8
99.0
98.2
97.4
2
5
8
11
14
Barometric Pressure (kPaA)
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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4-0-01
4-0-02
4-0-03
4-0-04
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60-0-73
60-0-74
60-0-75
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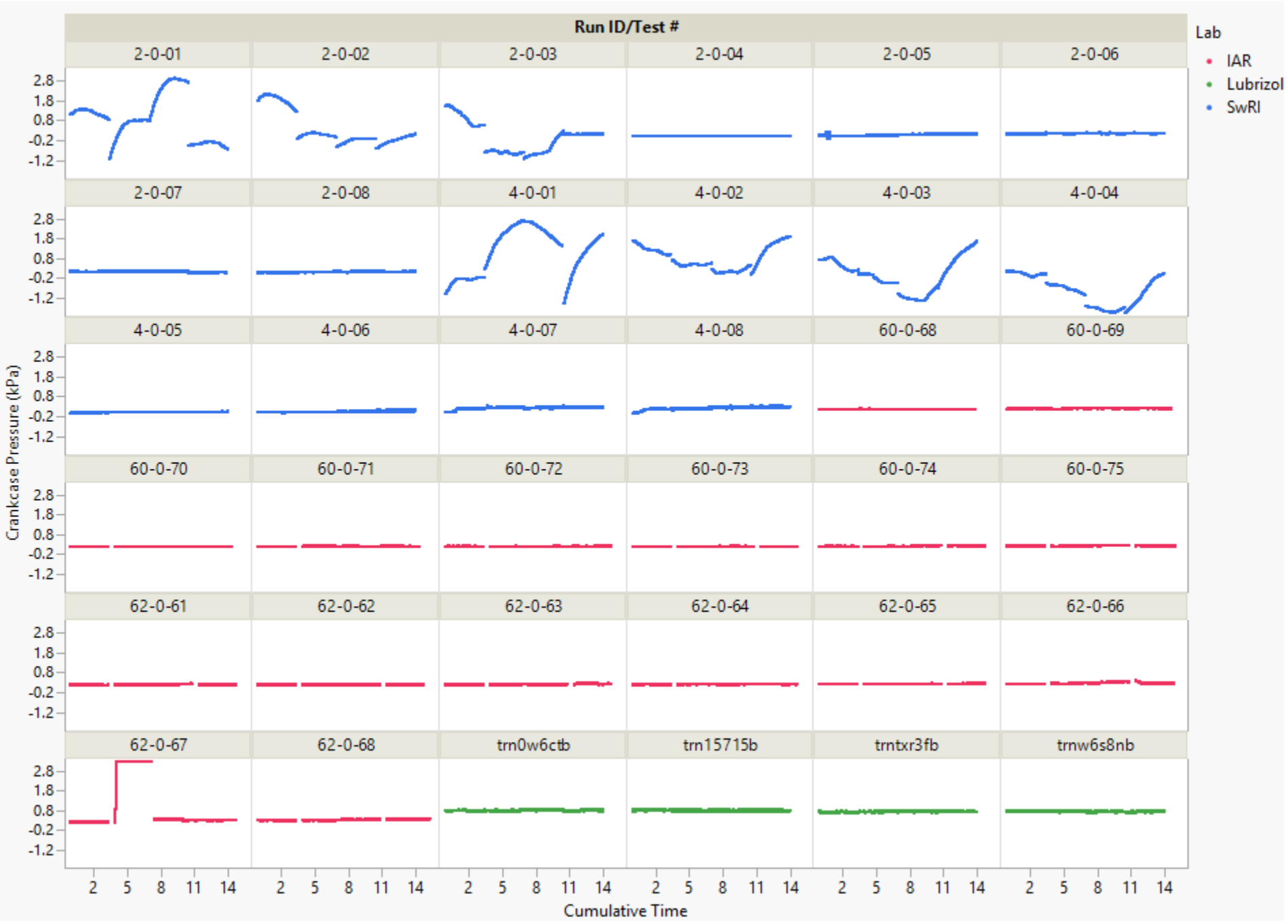
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
47
42
37
32
27
2
5
8
11
14
Atmospheric Temp (Deg C)
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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4-0-02
4-0-03
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60-0-75
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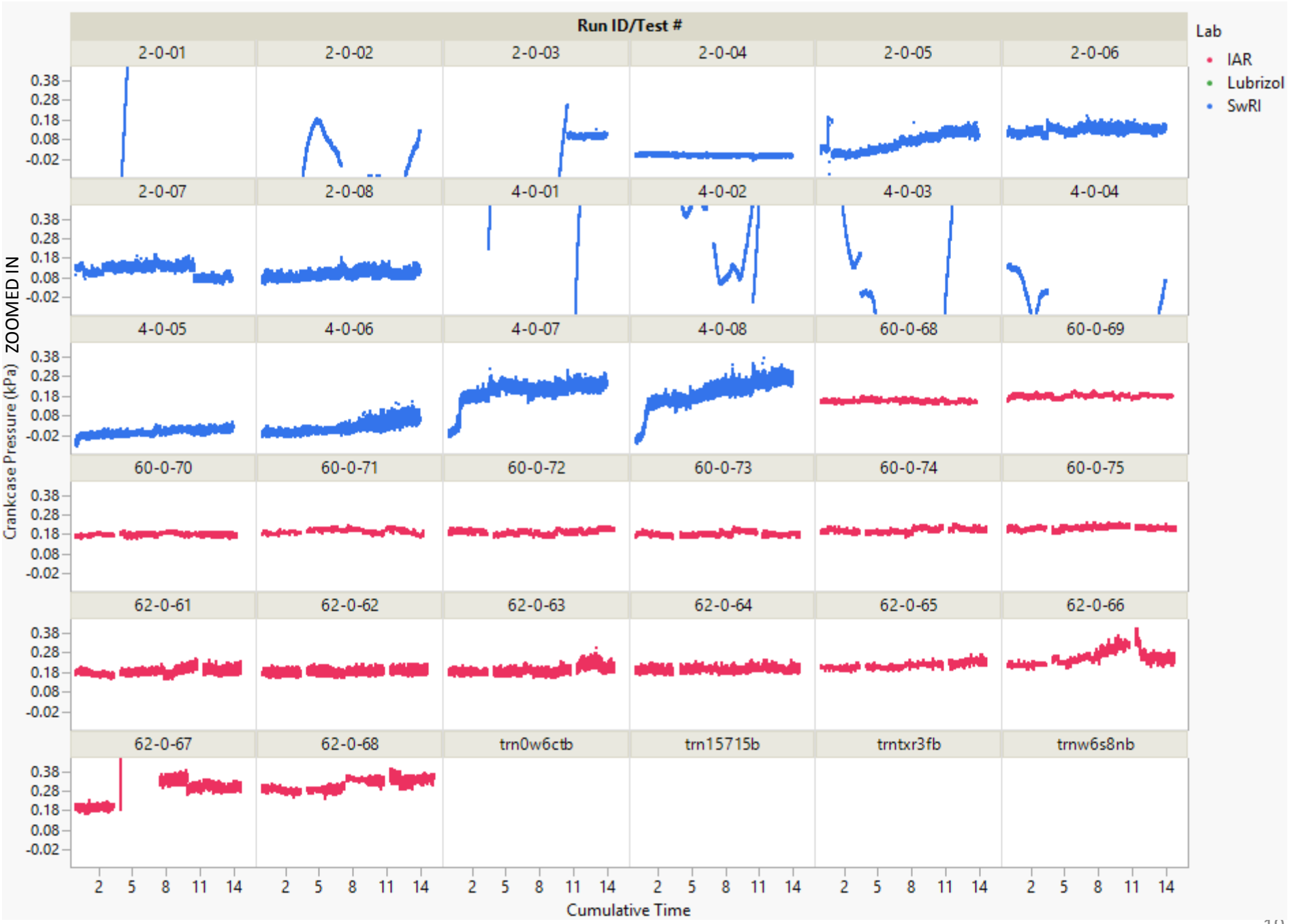
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
2.8
1.8
0.8
-0.2
-1.2
2
5
8
11
14
Crankcase Pressure (kPa)
Cumulative Time
Lab
IAR
Lubrizol
SwRI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2-0-01
2-0-02
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2-0-06
2-0-07
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60-0-75
62-0-61
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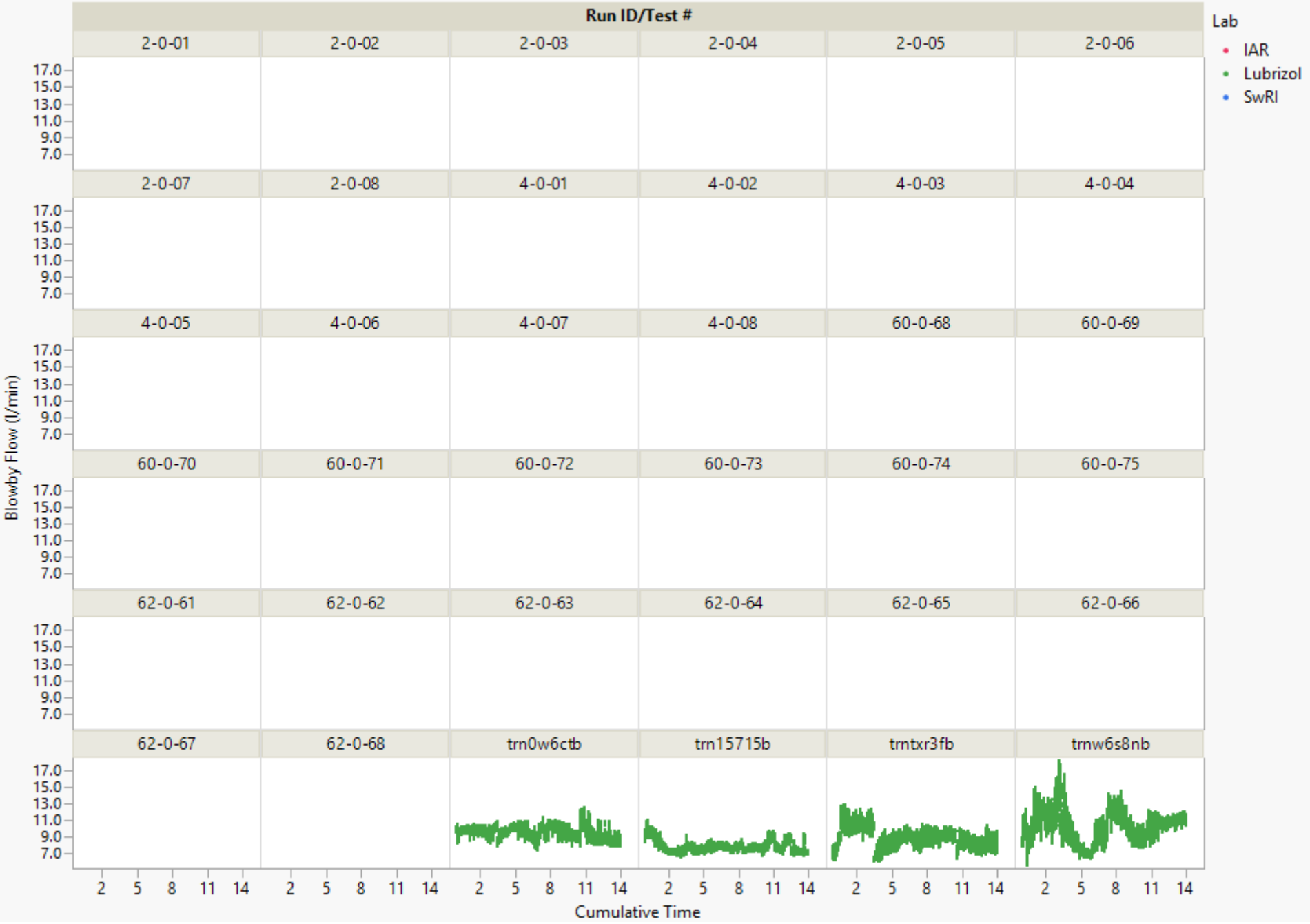
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
0.38
0.28
0.18
0.08
-0.02
2
5
8
11
14
Cumulative Time
Crankcase Pressure (kPa) ZOOMED IN
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
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2-0-02
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2-0-04
2-0-05
2-0-06
2-0-07
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4-0-01
4-0-02
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4-0-04
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60-0-68
60-0-69
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60-0-71
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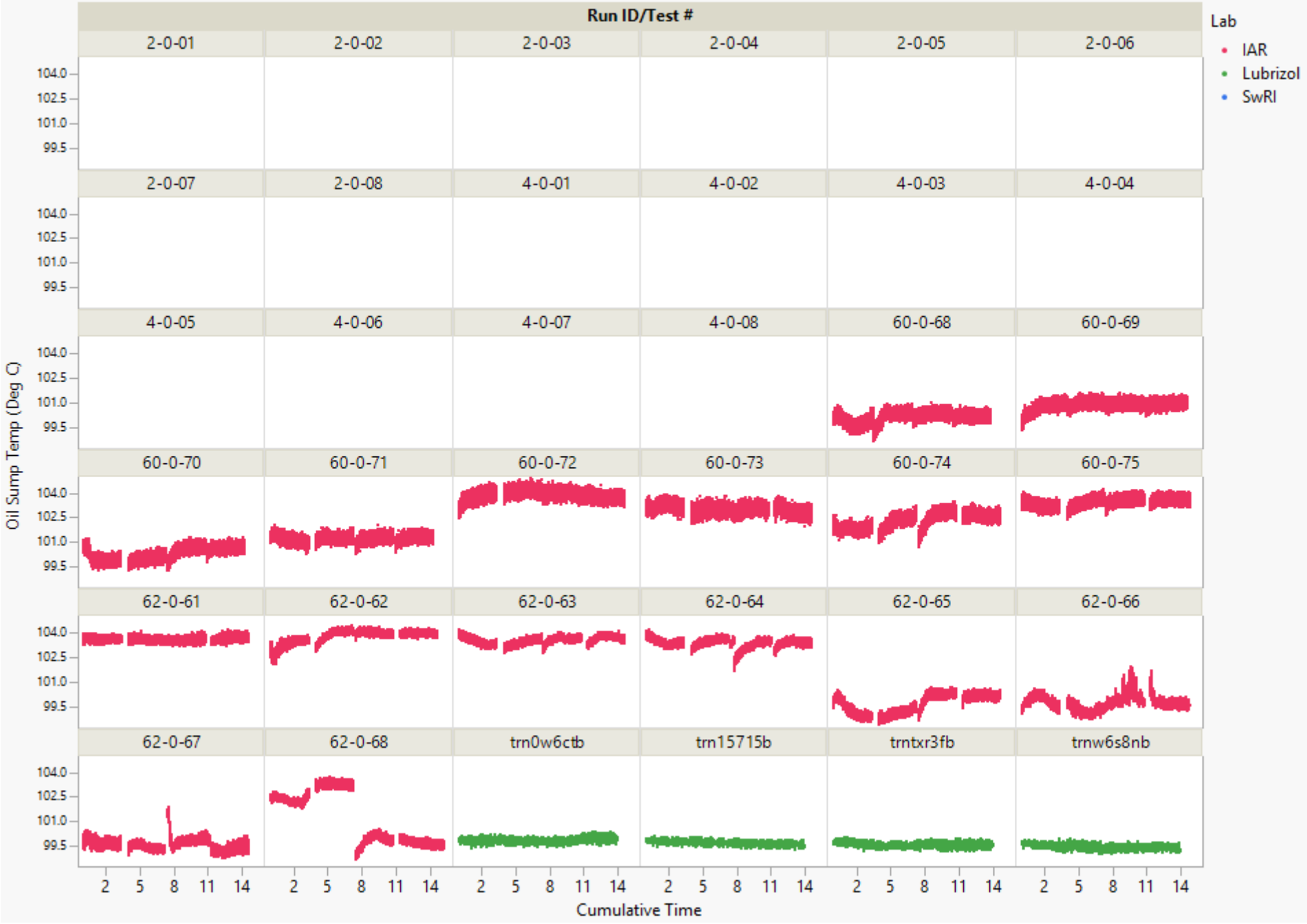
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
17.0
15.0
13.0
11.0
9.0
7.0
Blowby Flow (l/min)
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
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2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
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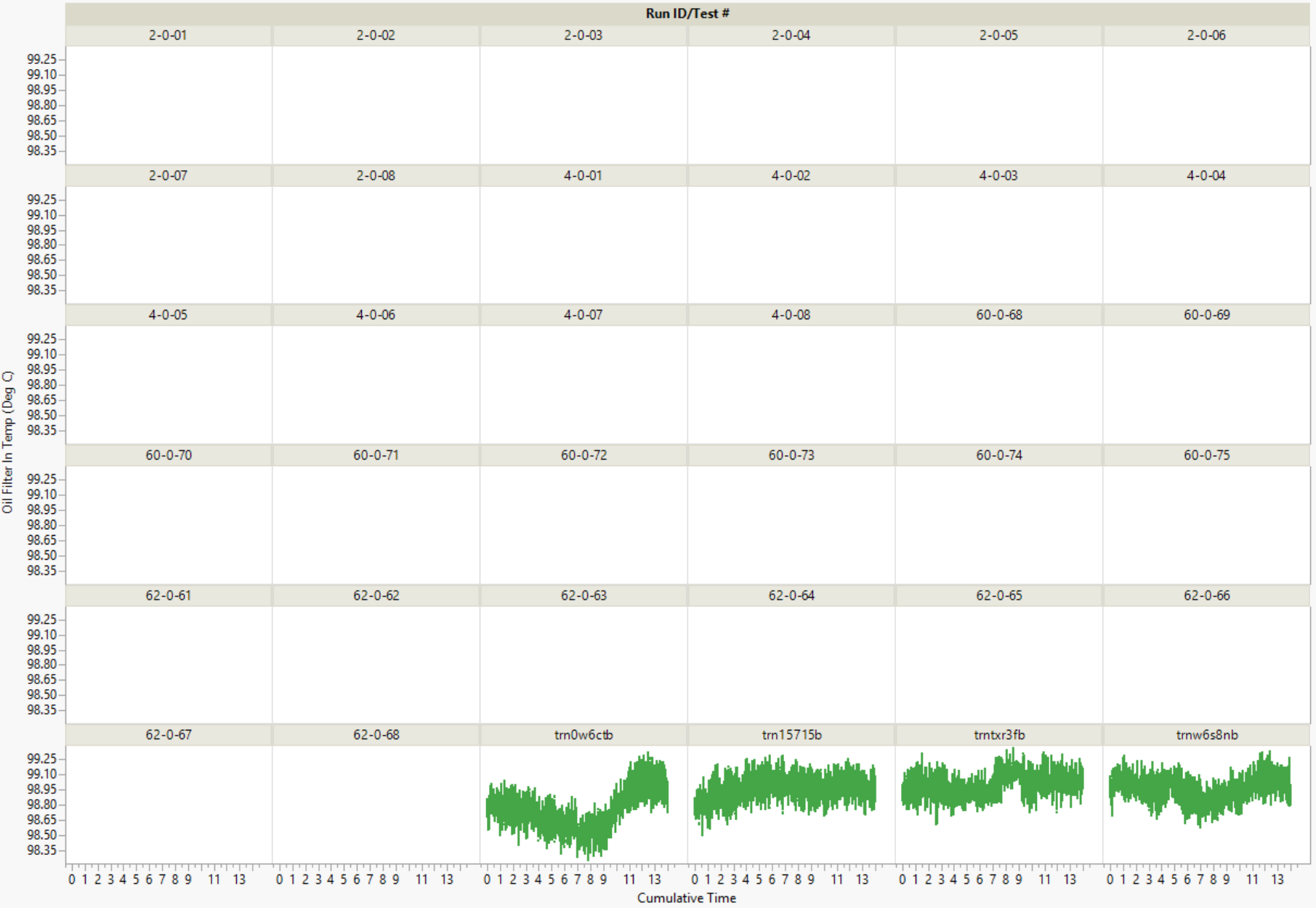
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
104.0
102.5
101.0
99.5
2
5
8
11
14
Oil Sump Temp (Deg C)
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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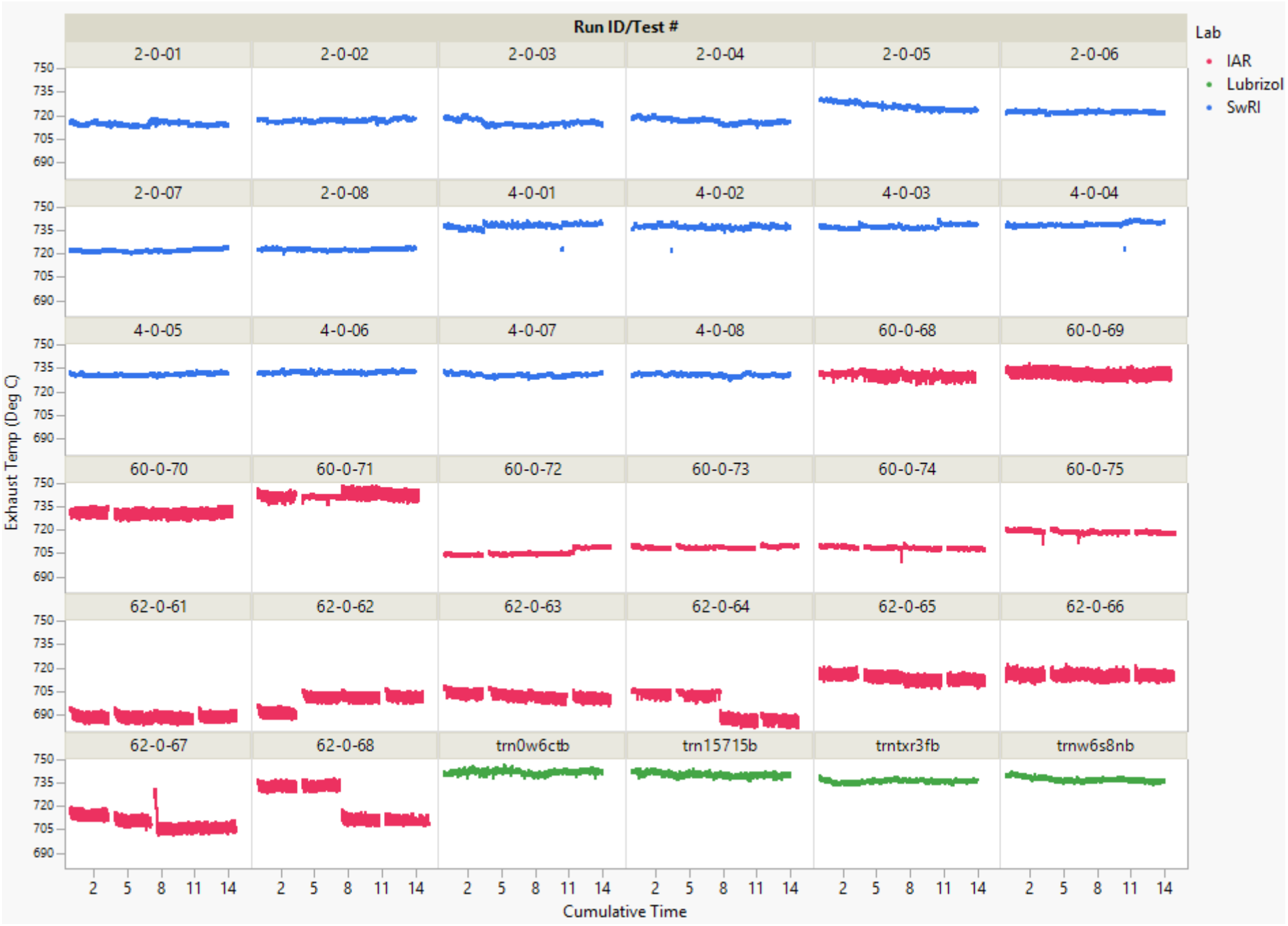
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
99.25
99.10
98.95
98.80
98.65
98.50
98.35
0 1 2 3 4 5 6 7 8 9 11 13
Oil Filter In Temp (Deg C)
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
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2-0-04
2-0-05
2-0-06
2-0-07
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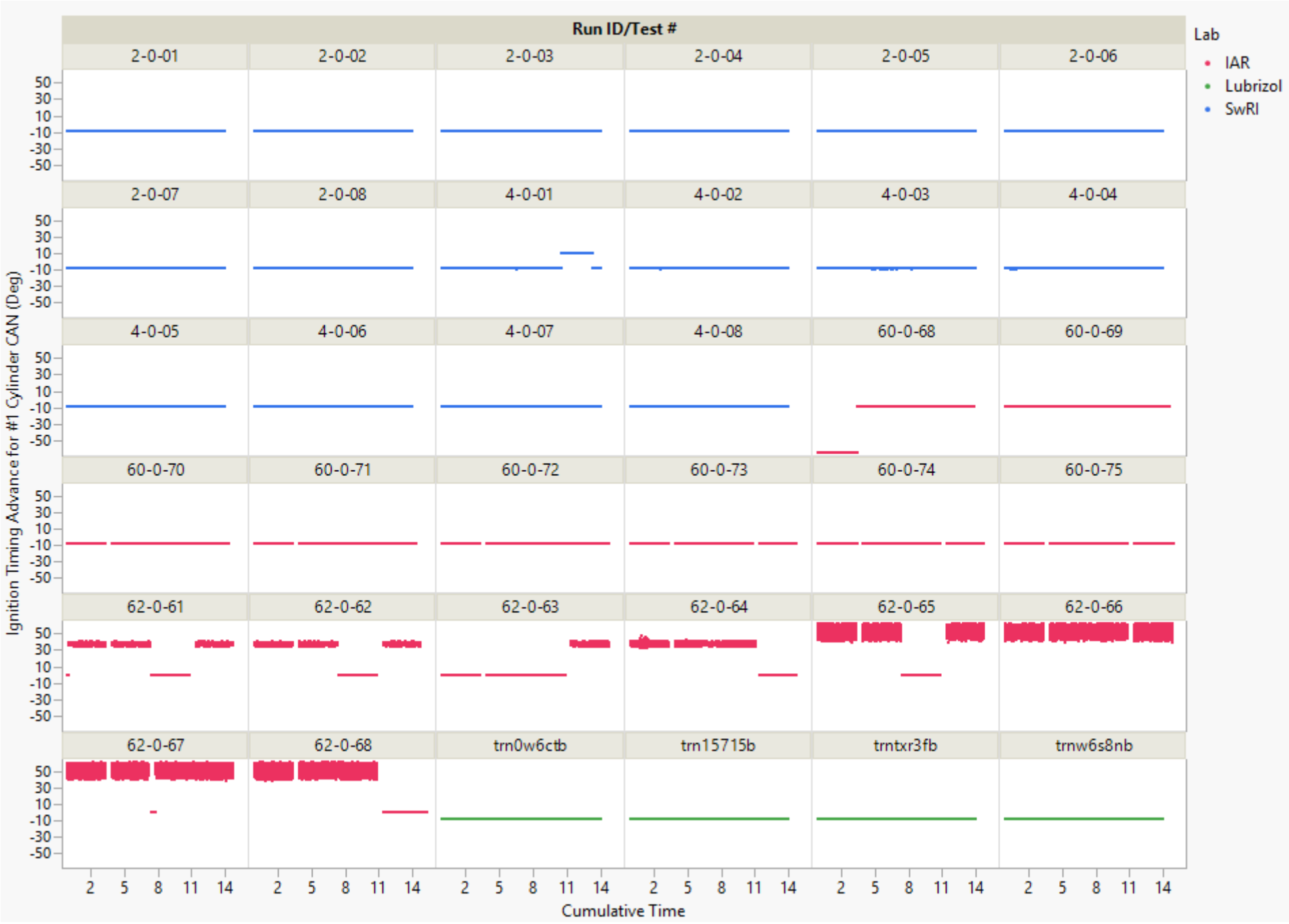
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Exhaust Temp (Deg C)
750
735
720
705
690
2
5
8
11
14
Cumulative Time


Run ID/Test #
2-0-01
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2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
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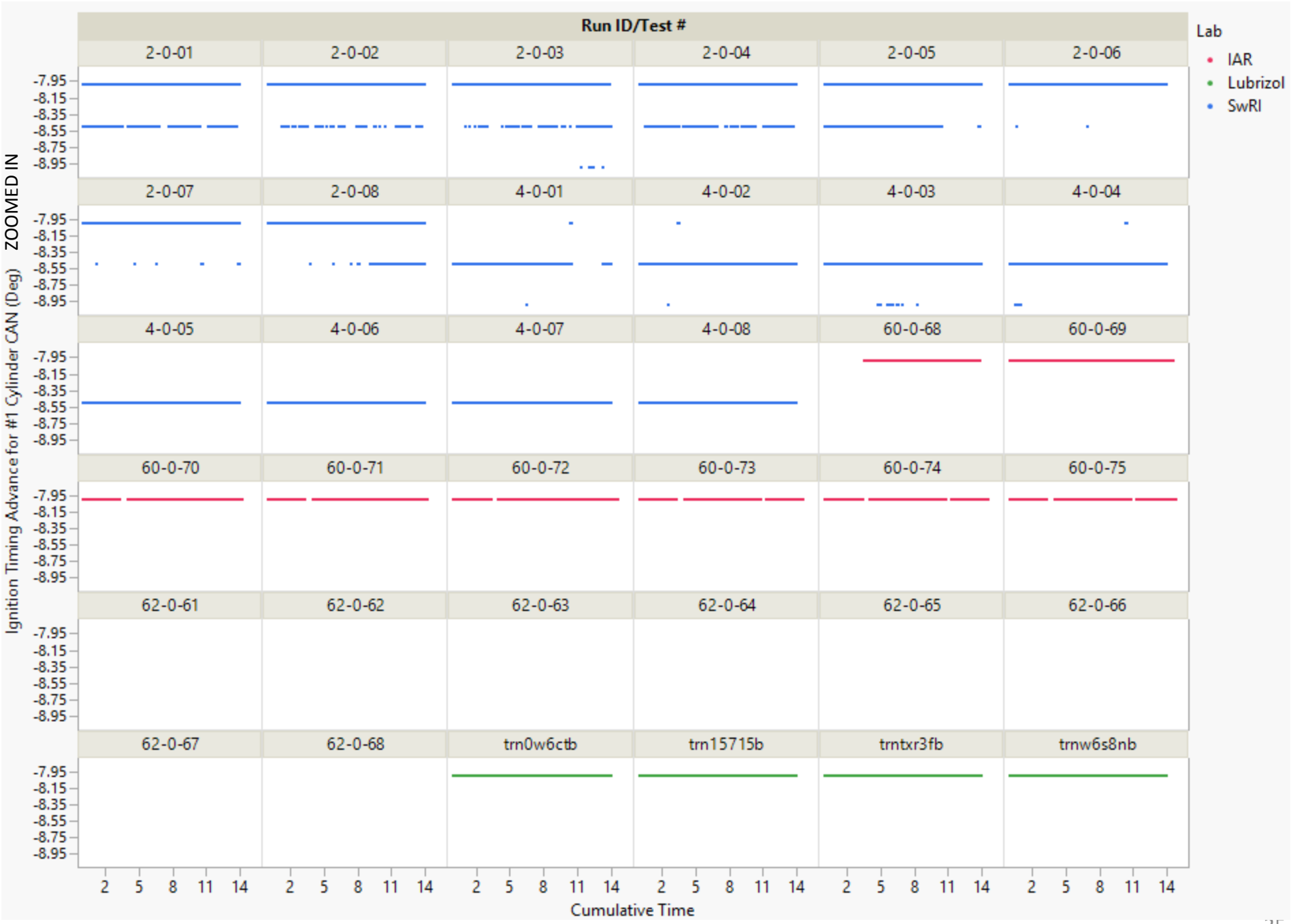
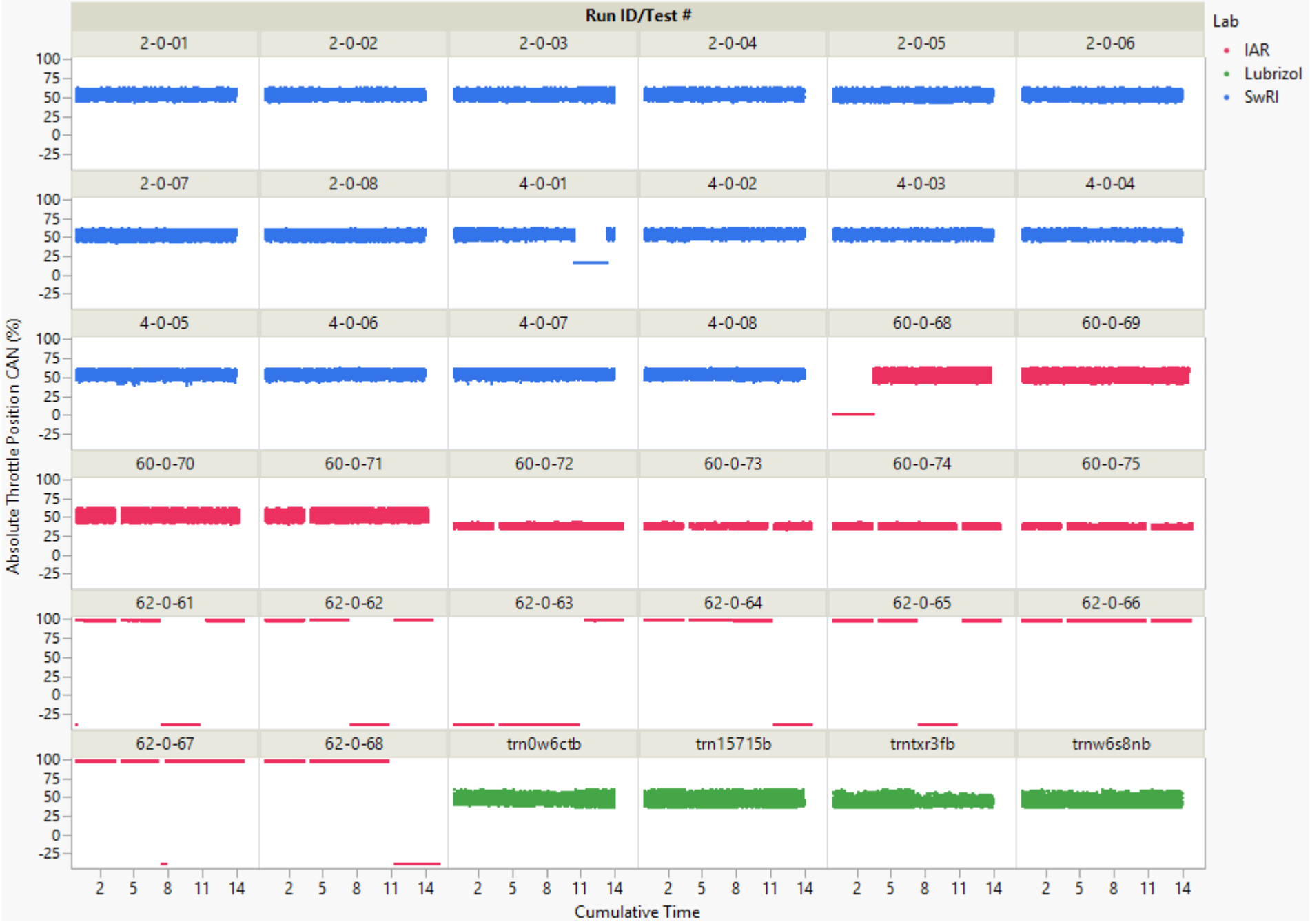
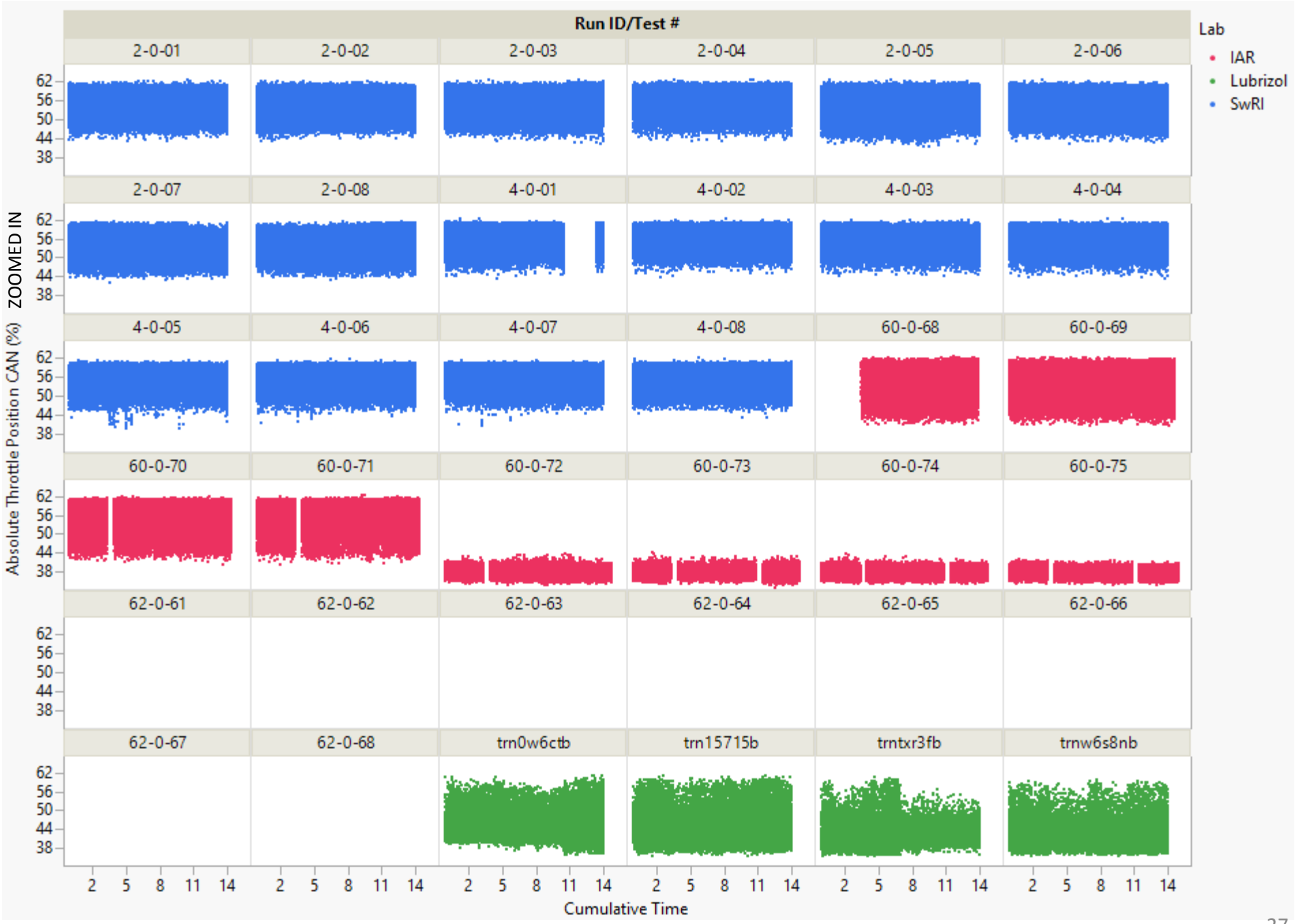
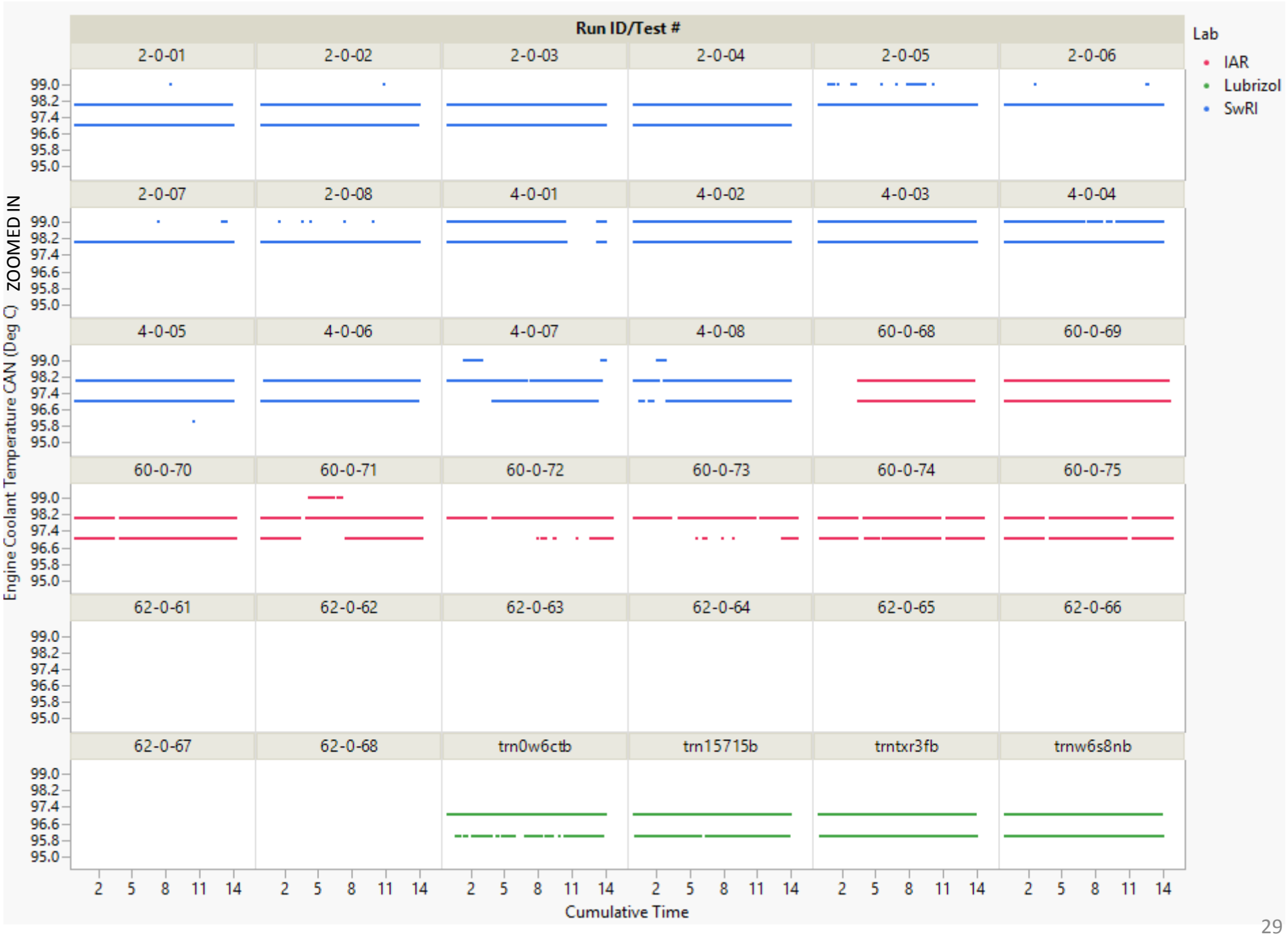
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
50
30
10
-10
-30
-50
2
5
8
11
14
Cumulative Time
Ignition Timing Advance for #1 Cylinder CAN (Deg)
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
-7.95
-8.15
-8.35
-8.55
-8.75
-8.95
2
5
8
11
14
Cumulative Time
Ignition Timing Advance for #1 Cylinder CAN (Deg) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

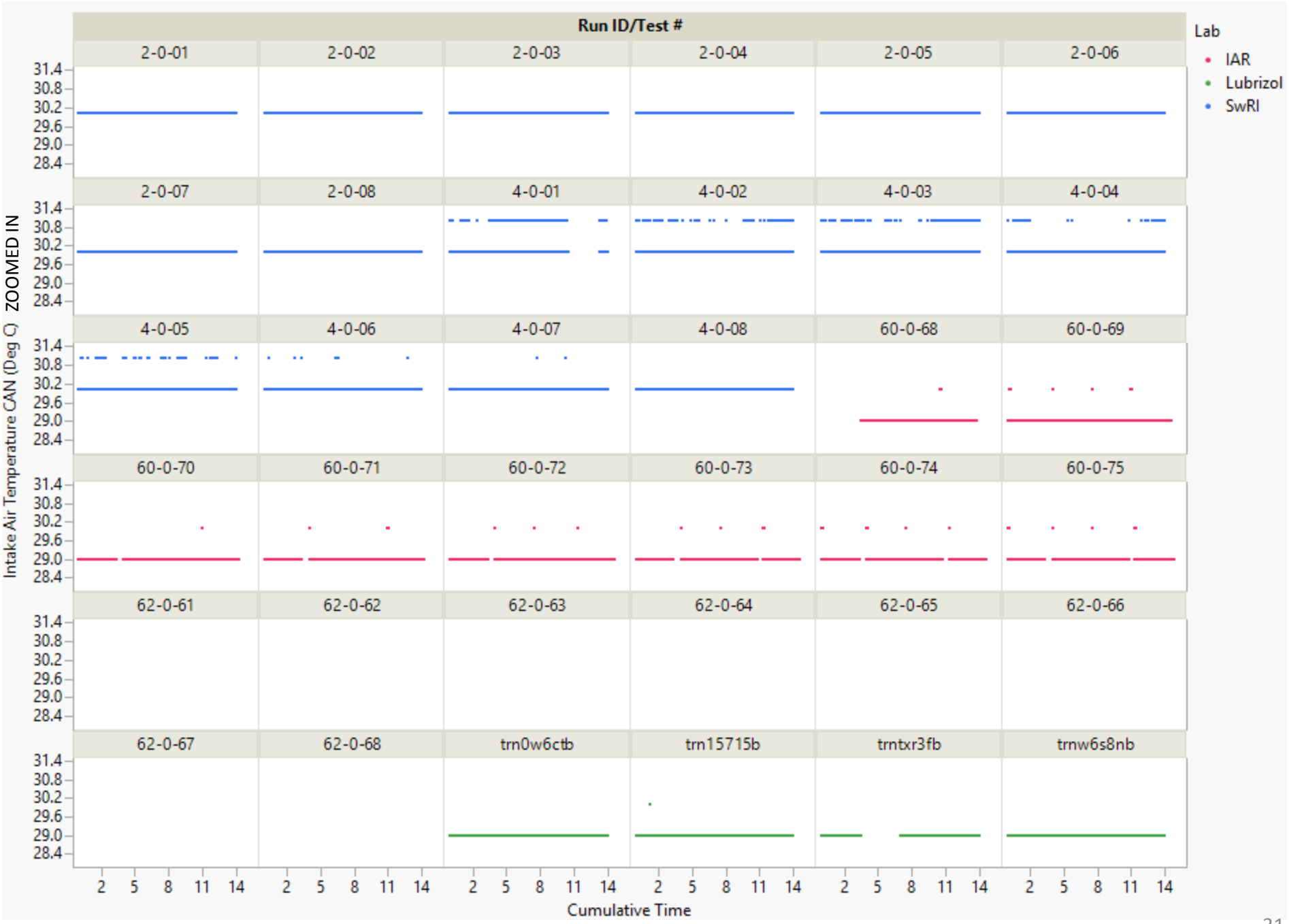

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
100
75
50
25
0
-25
2
5
8
11
14
Absolute Throttle Position CAN (%)
Cumulative Time
Lab
IAR
Lubrizol
SwRI

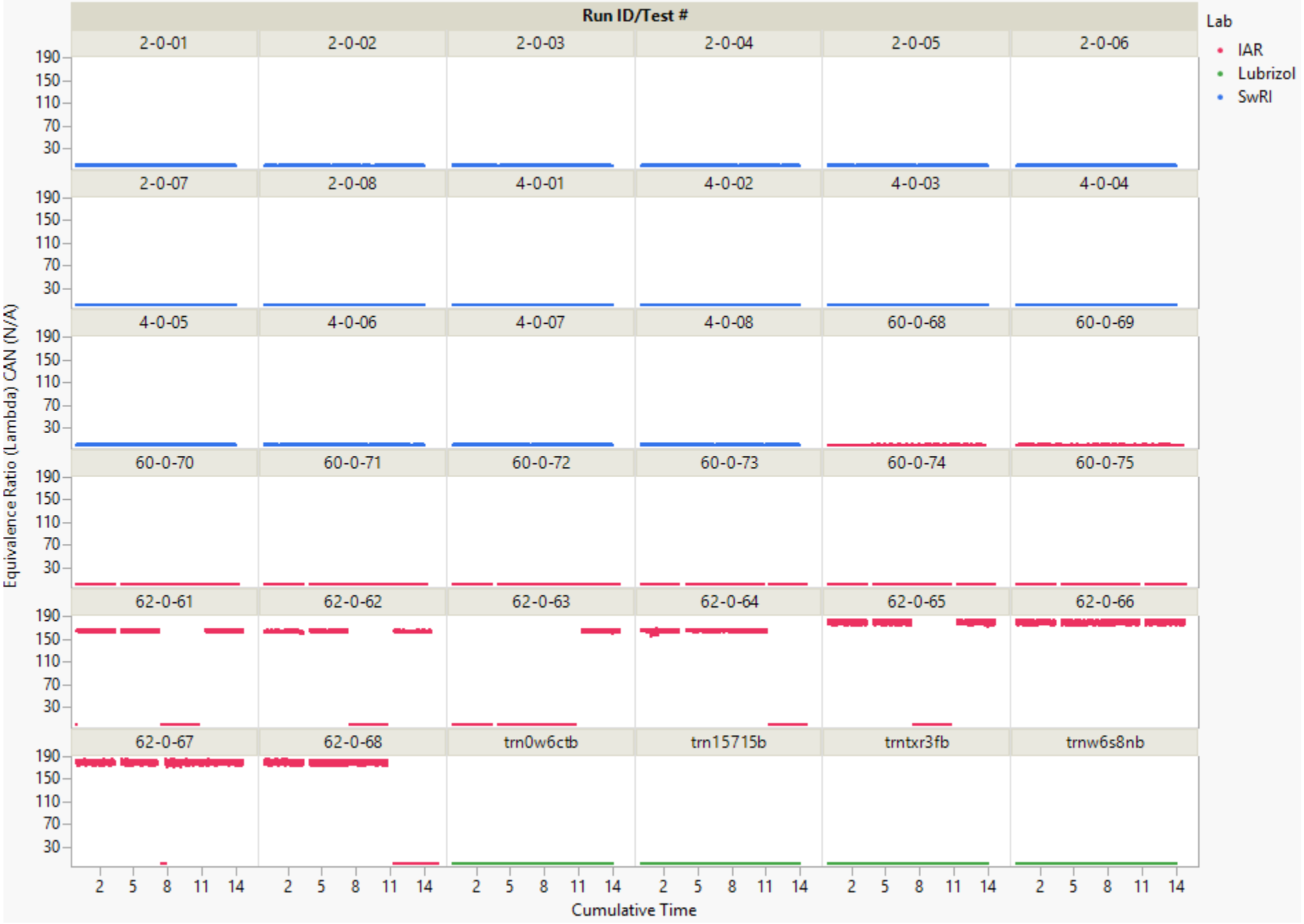

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
ZOOMED IN
Absolute Throttle Position CAN (%)
62
56
50
44
38
2
5
8
11
14
Cumulative Time

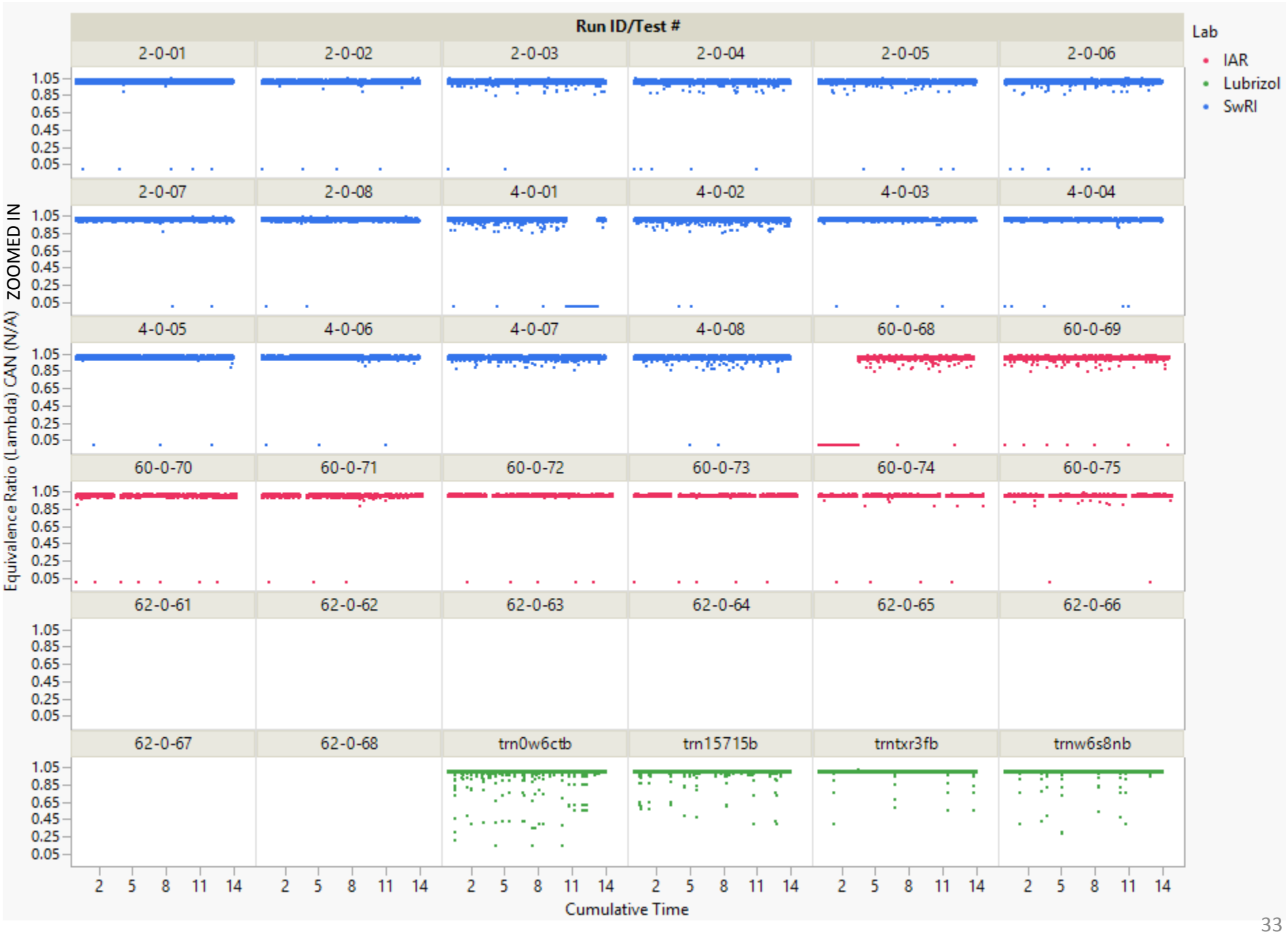
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
100
75
50
25
0
-25
2
5
8
11
14
Engine Coolant Temperature CAN (Deg C)
Cumulative Time
Lab
IAR
Lubrizol
SwRI

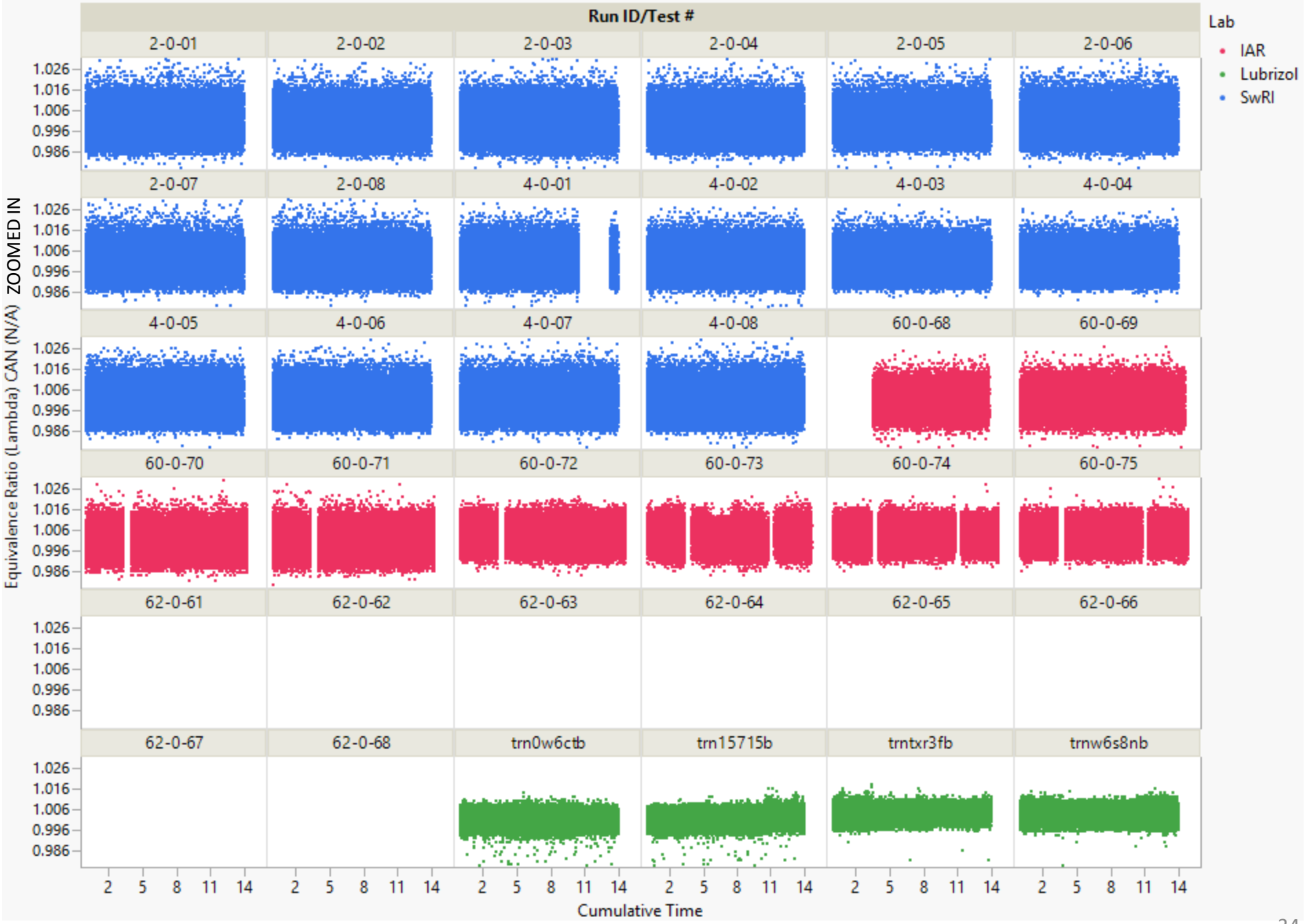

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
99.0
98.2
97.4
96.6
95.8
95.0
2
5
8
11
14
Cumulative Time
Engine Coolant Temperature CAN (Deg C) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

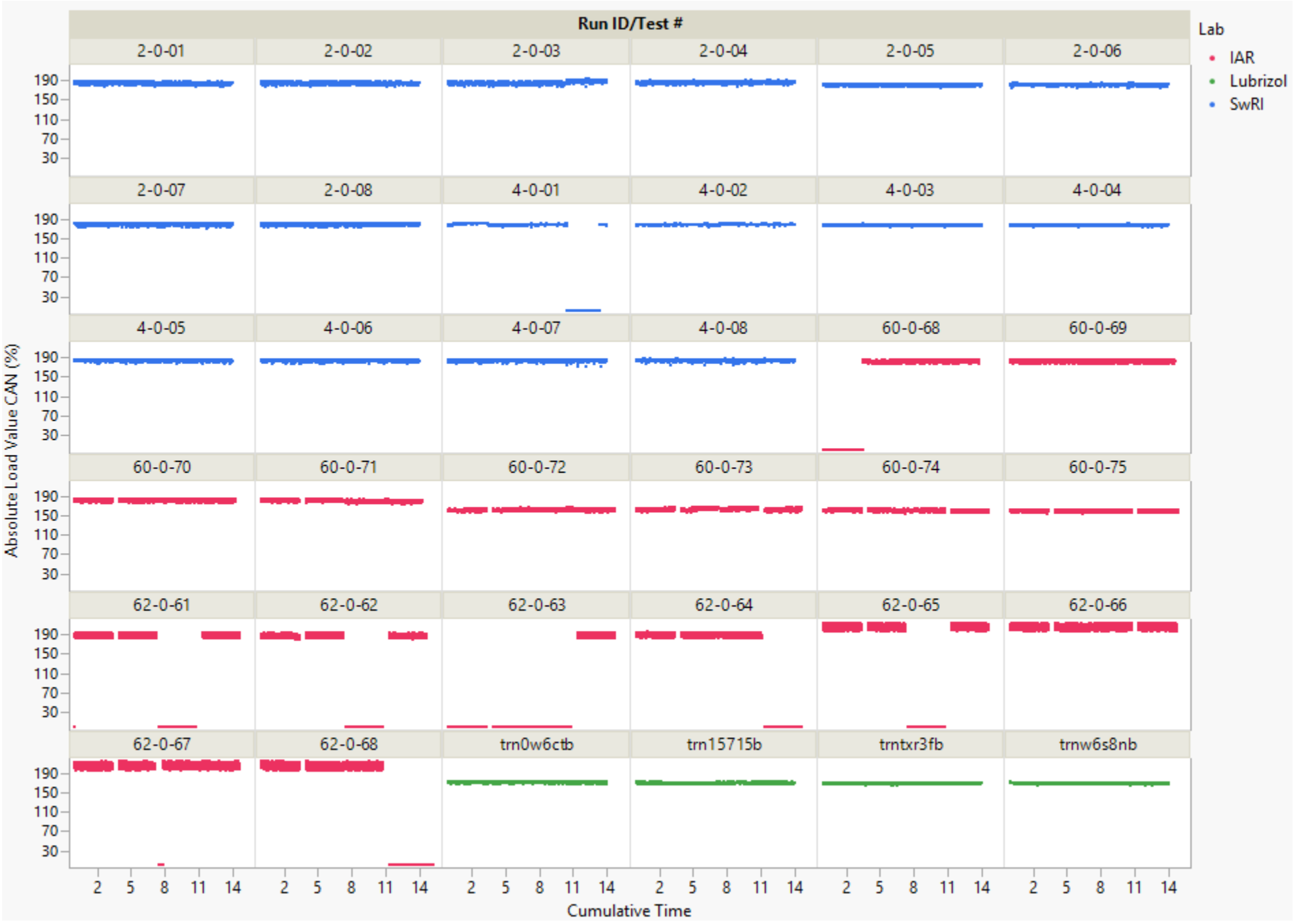
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
30
15
0
-15
-30
2
5
8
11
14
Cumulative Time
Intake Air Temperature CAN (Deg C)
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
31.4
30.8
30.2
29.6
29.0
28.4
Intake Air Temperature CAN (Deg C) ZOOMED IN
2 5 8 11 14
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
190
150
110
70
30
2
5
8
11
14
Cumulative Time
Equivalence Ratio (Lambda) CAN (N/A)
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
1.05
0.85
0.65
0.45
0.25
0.05
2
5
8
11
14
Cumulative Time
Equivalence Ratio (Lambda) CAN (N/A) ZOOMED IN
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
1.026
1.016
1.006
0.996
0.986
2
5
8
11
14
Cumulative Time
Equivalence Ratio (Lambda) CAN (N/A) ZOOMED IN
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
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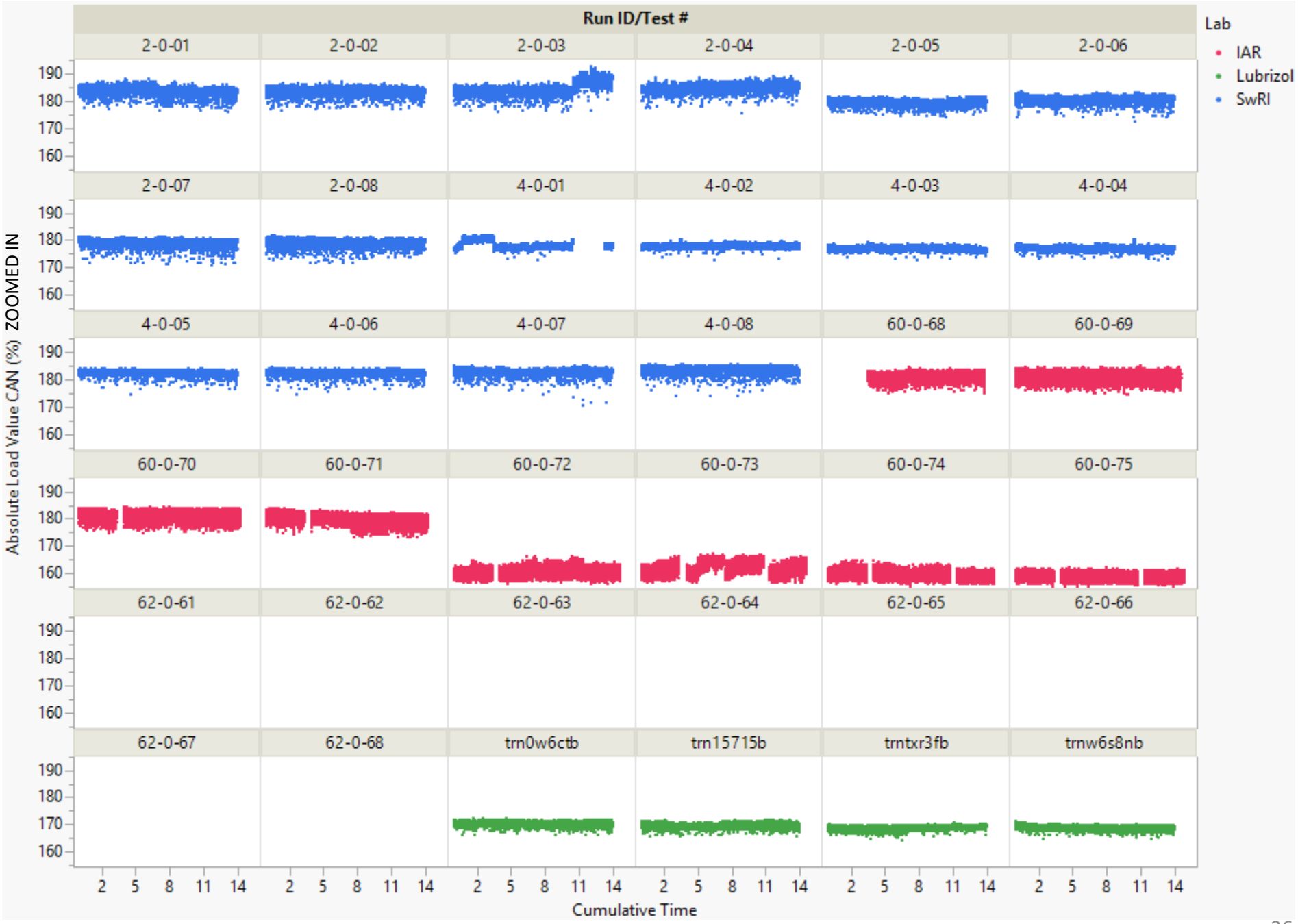
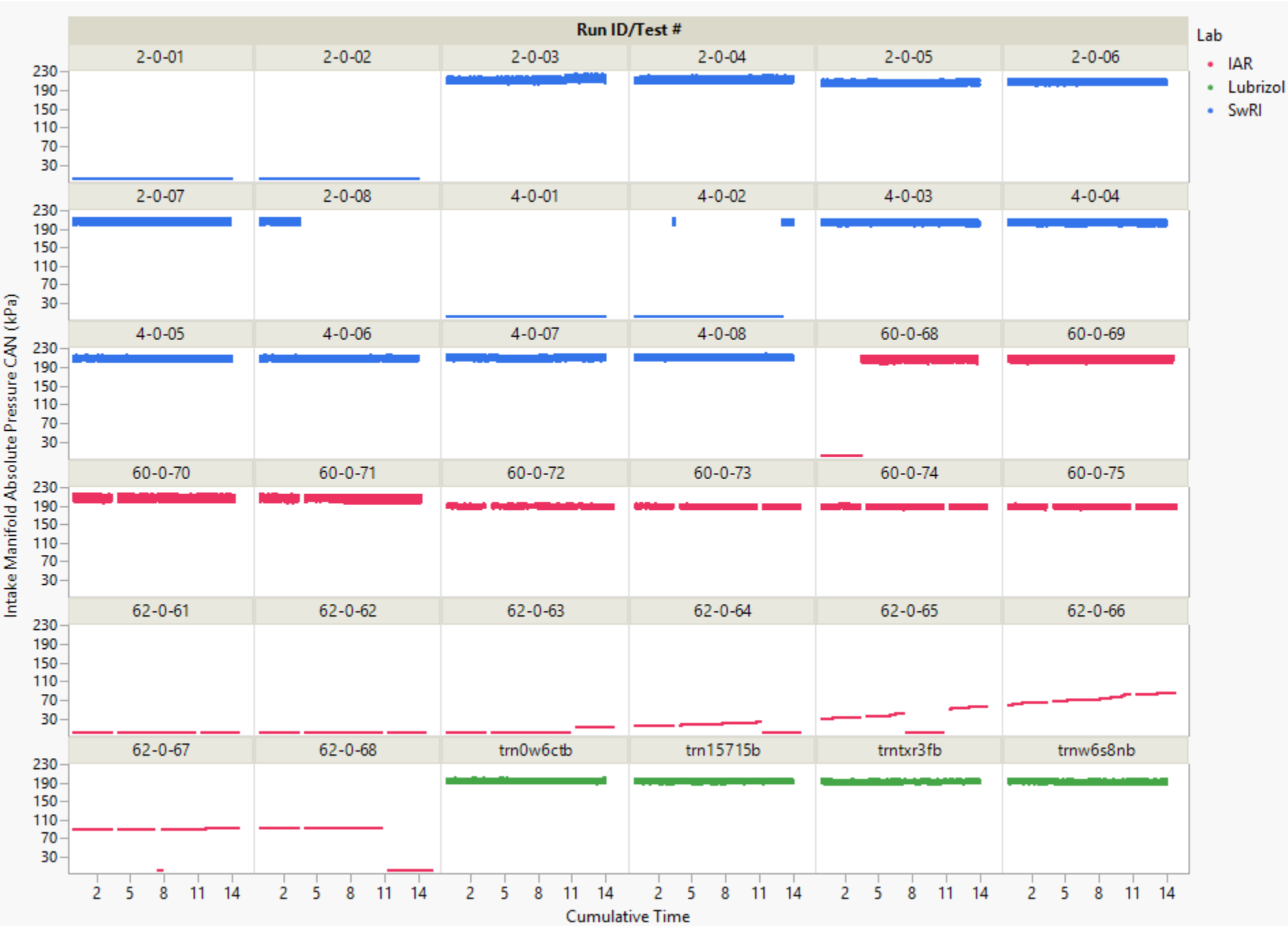
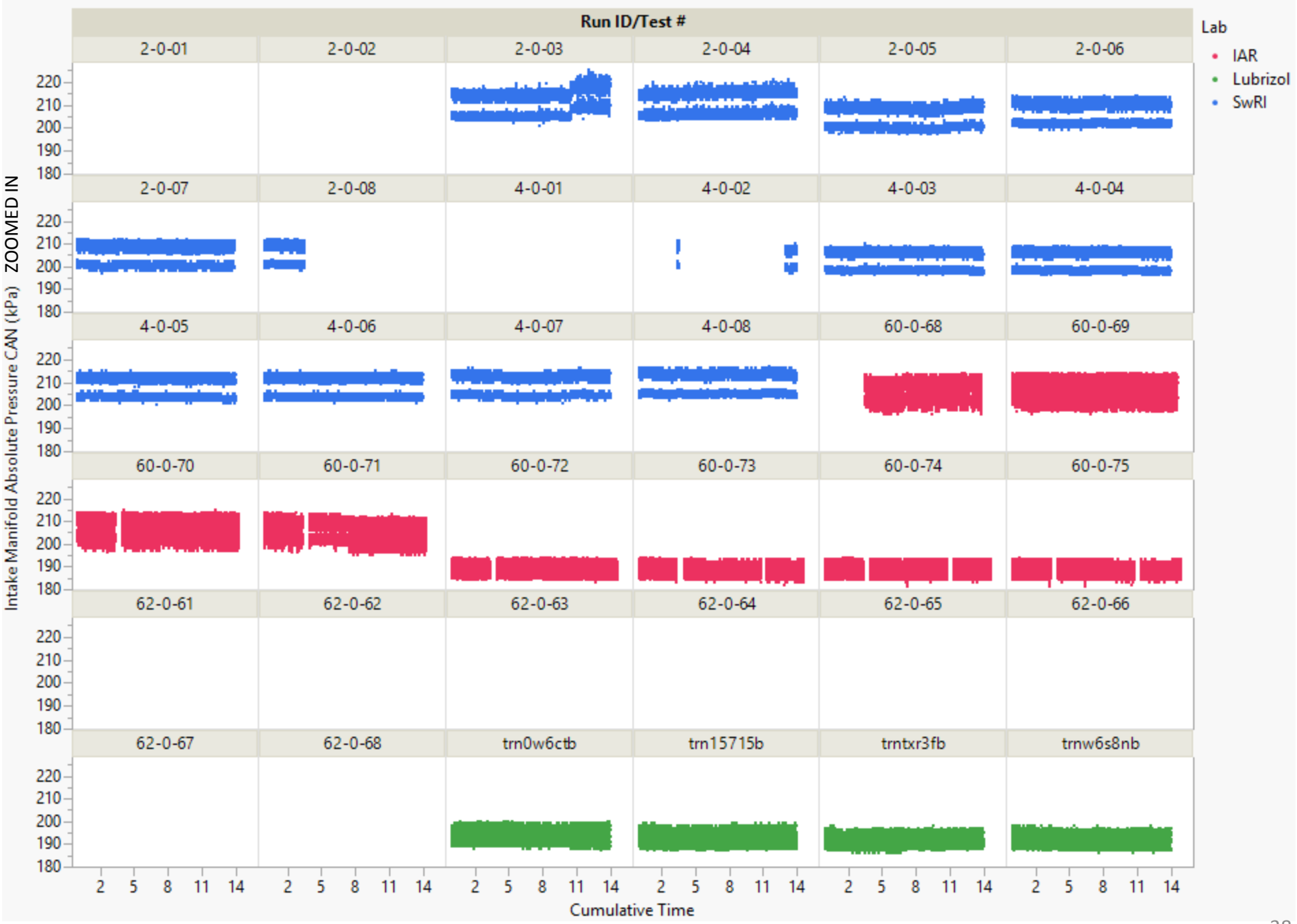
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Absolute Load Value CAN (%)
190
150
110
70
30
2
5
8
11
14
Cumulative Time


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
190
180
170
160
2 5 8 11 14
Cumulative Time
Absolute Load Value CAN (%) ZOOMED IN
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
230
190
150
110
70
30
2
5
8
11
14
Cumulative Time
Intake Manifold Absolute Pressure CAN (kPa)
Lab
IAR
Lubrizol
SwRI

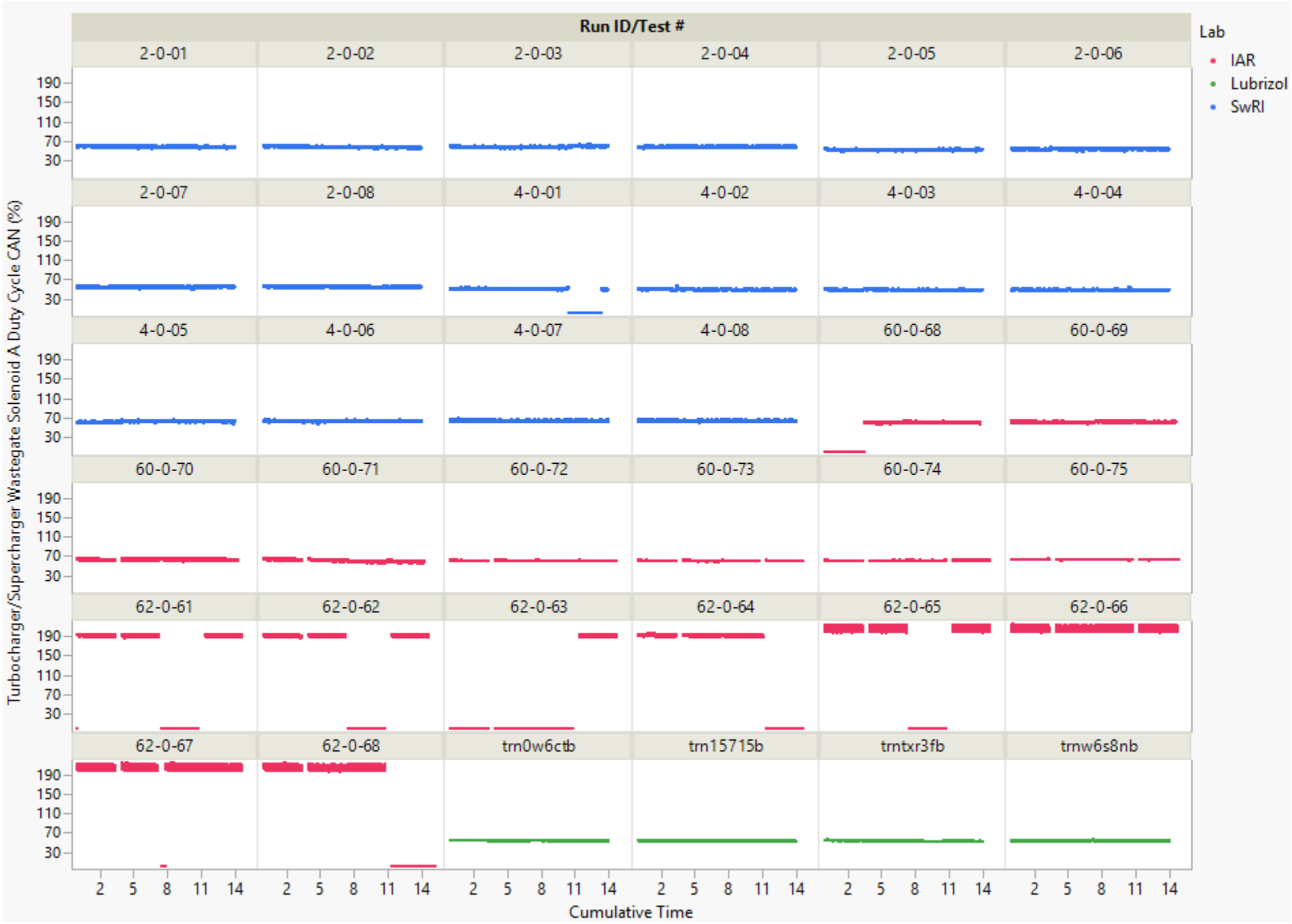

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Intake Manifold Absolute Pressure CAN (kPa) ZOOMED IN
180
190
200
210
220
2
5
8
11
14
Cumulative Time

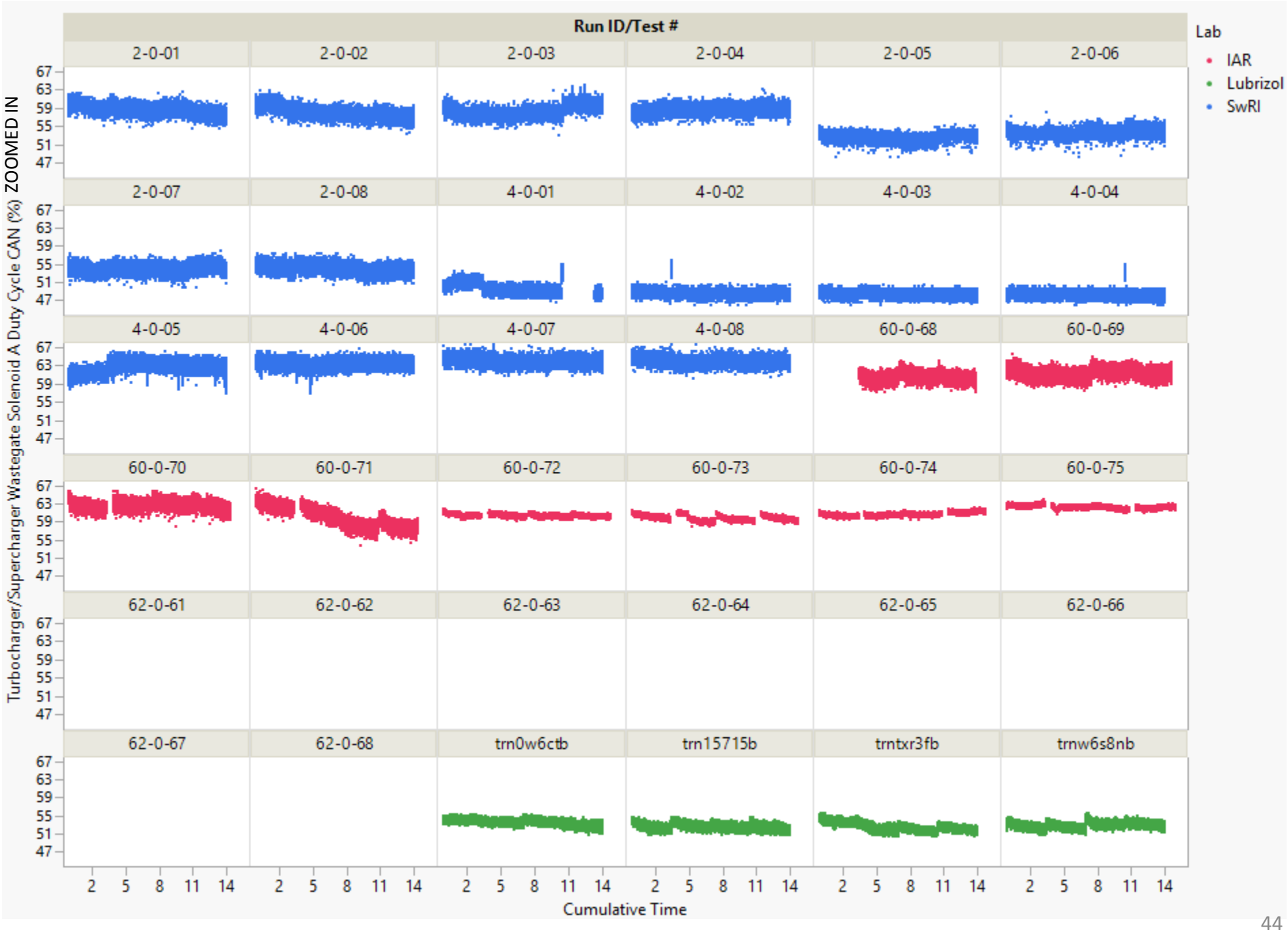
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
9500
7500
5500
3500
1500
2
5
8
11
14
Fuel Rail Pressure CAN (kPa)
Cumulative Time
Lab
IAR
Lubrizol
SwRI

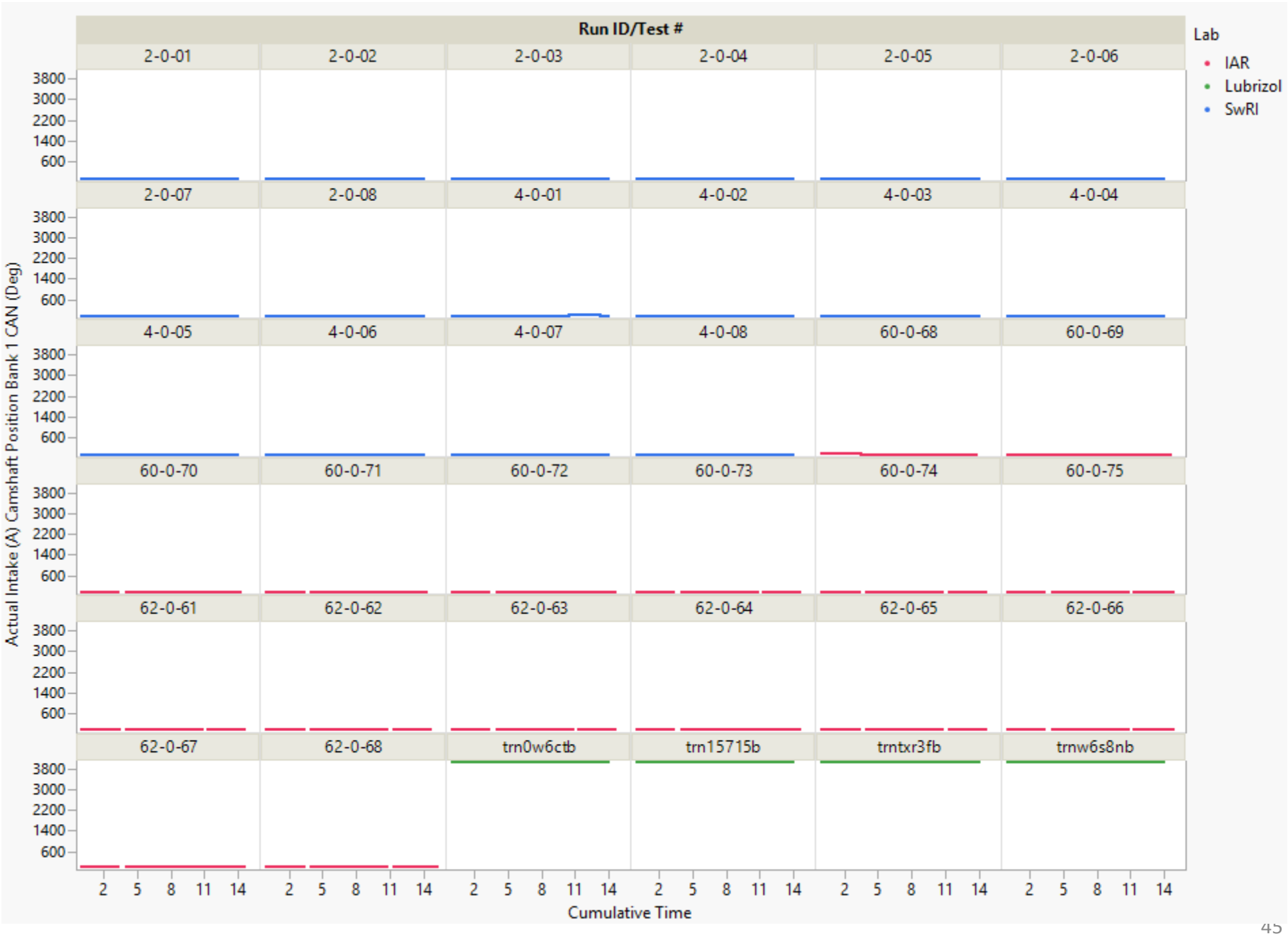
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
10400
9800
9200
8600
8000
2
5
8
11
14
Cumulative Time
Fuel Rail Pressure CAN (kPa) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

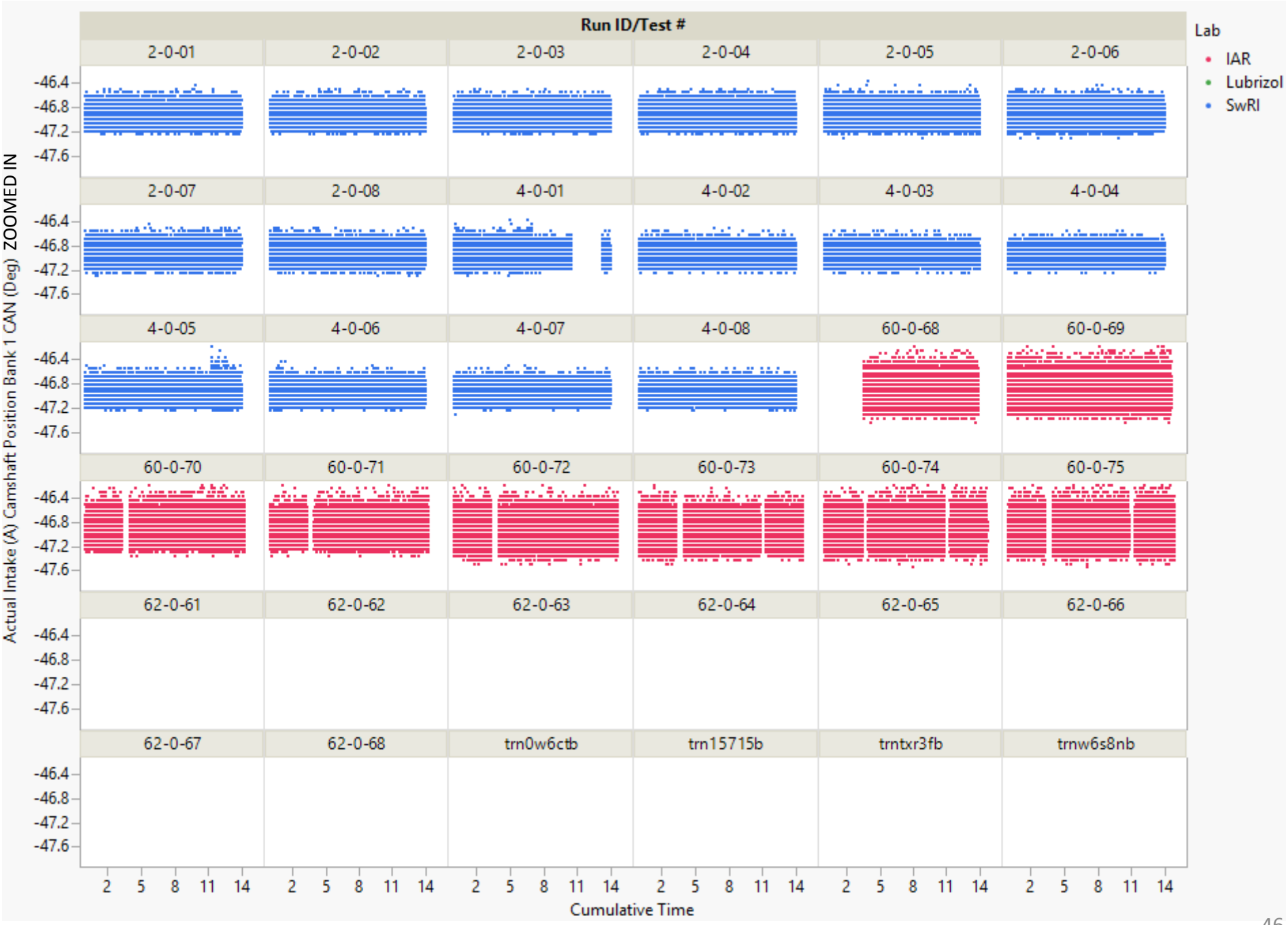
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Boost Absolute Pressure - Raw Value CAN (kPa)
190
150
110
70
30
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI

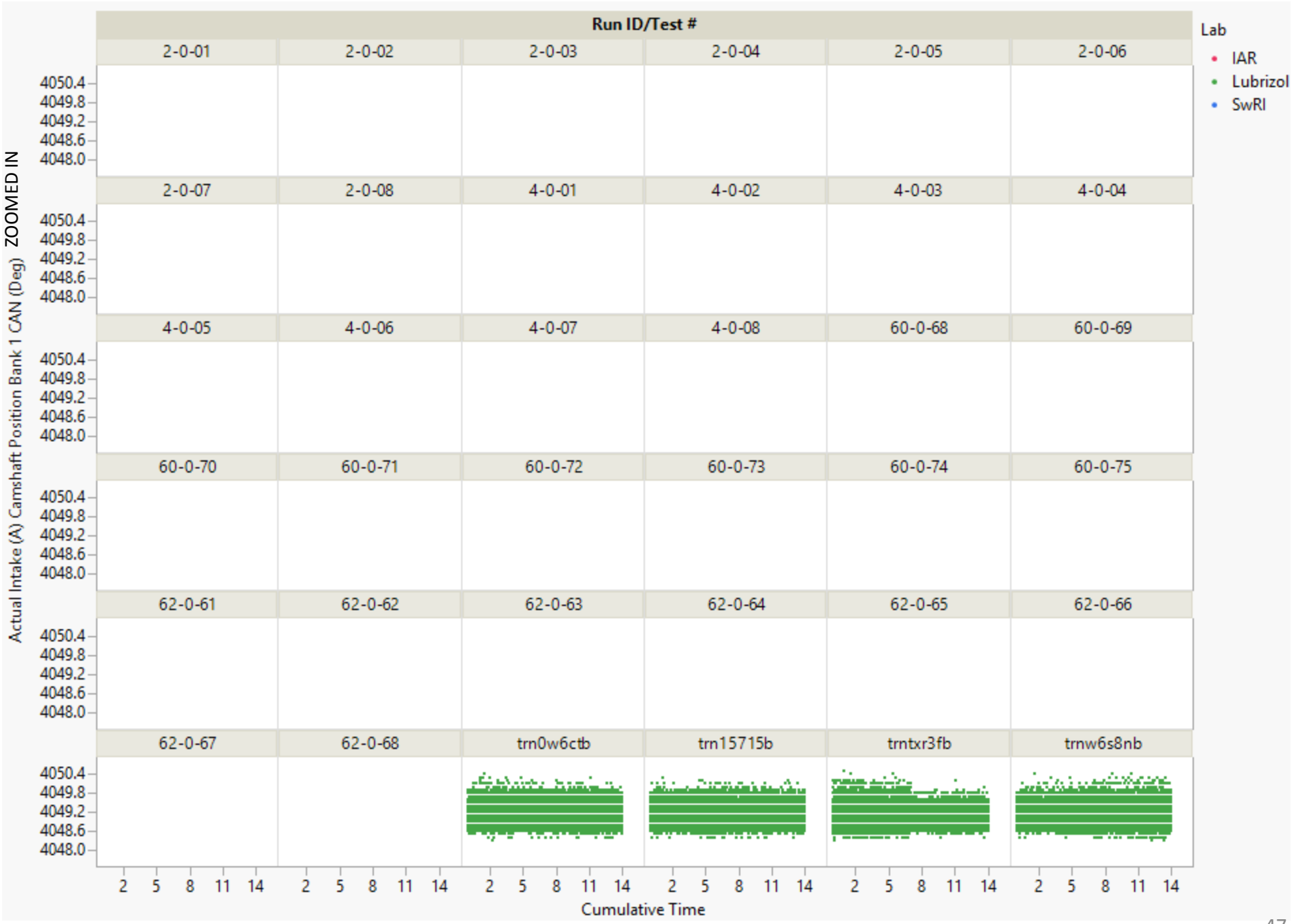
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
218
210
202
194
2 5 8 11 14
Cumulative Time
Boost Absolute Pressure - Raw Value CAN (kPa) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

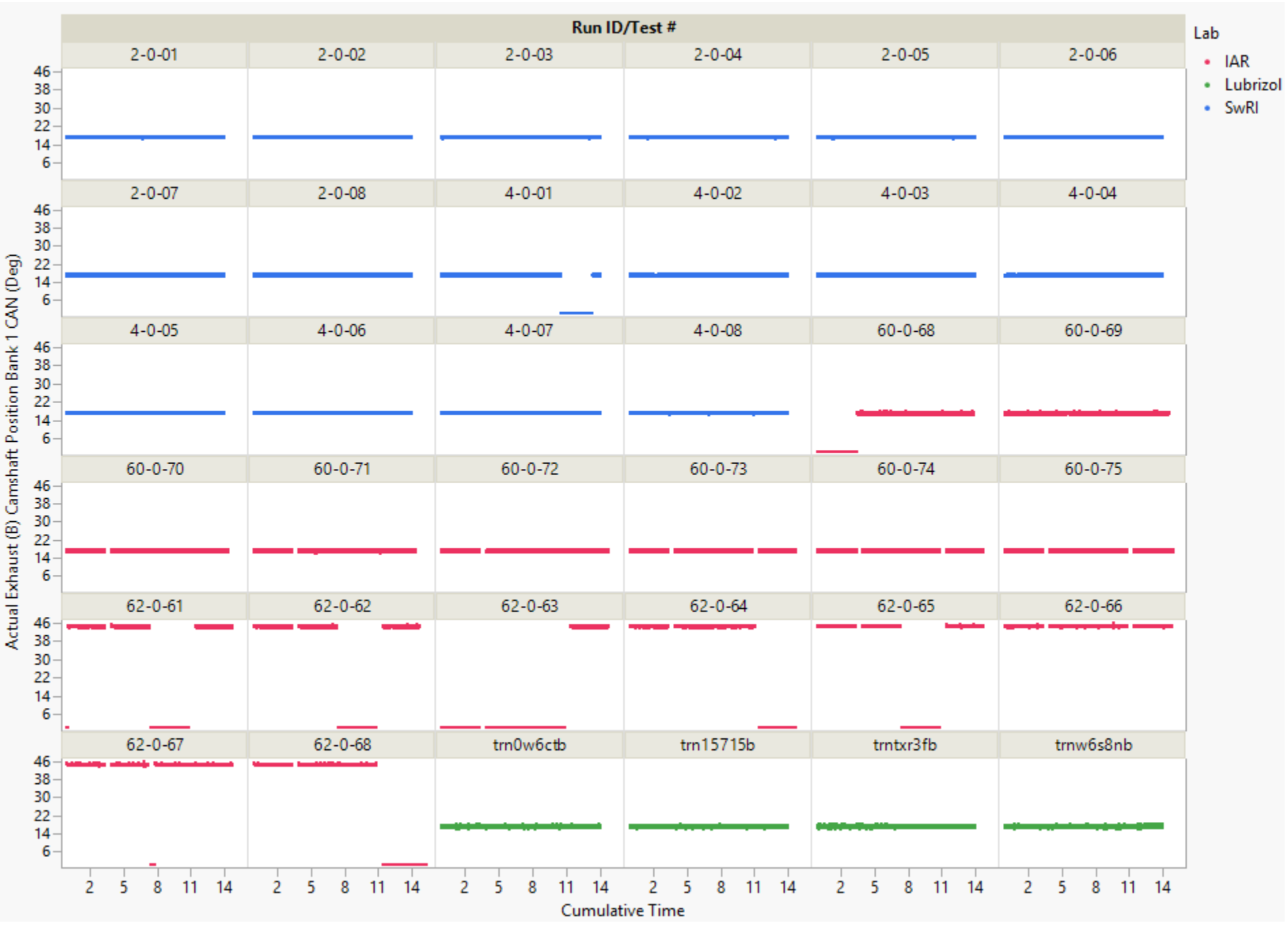

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
190
150
110
70
30
2
5
8
11
14
Cumulative Time
Turbocharger/Supercharger Wastegate Solenoid A Duty Cycle CAN (%)
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Turbocharger/Supercharger Wastegate Solenoid A Duty Cycle CAN (%) ZOOMED IN
67
63
59
55
51
47
2
5
8
11
14
Cumulative Time

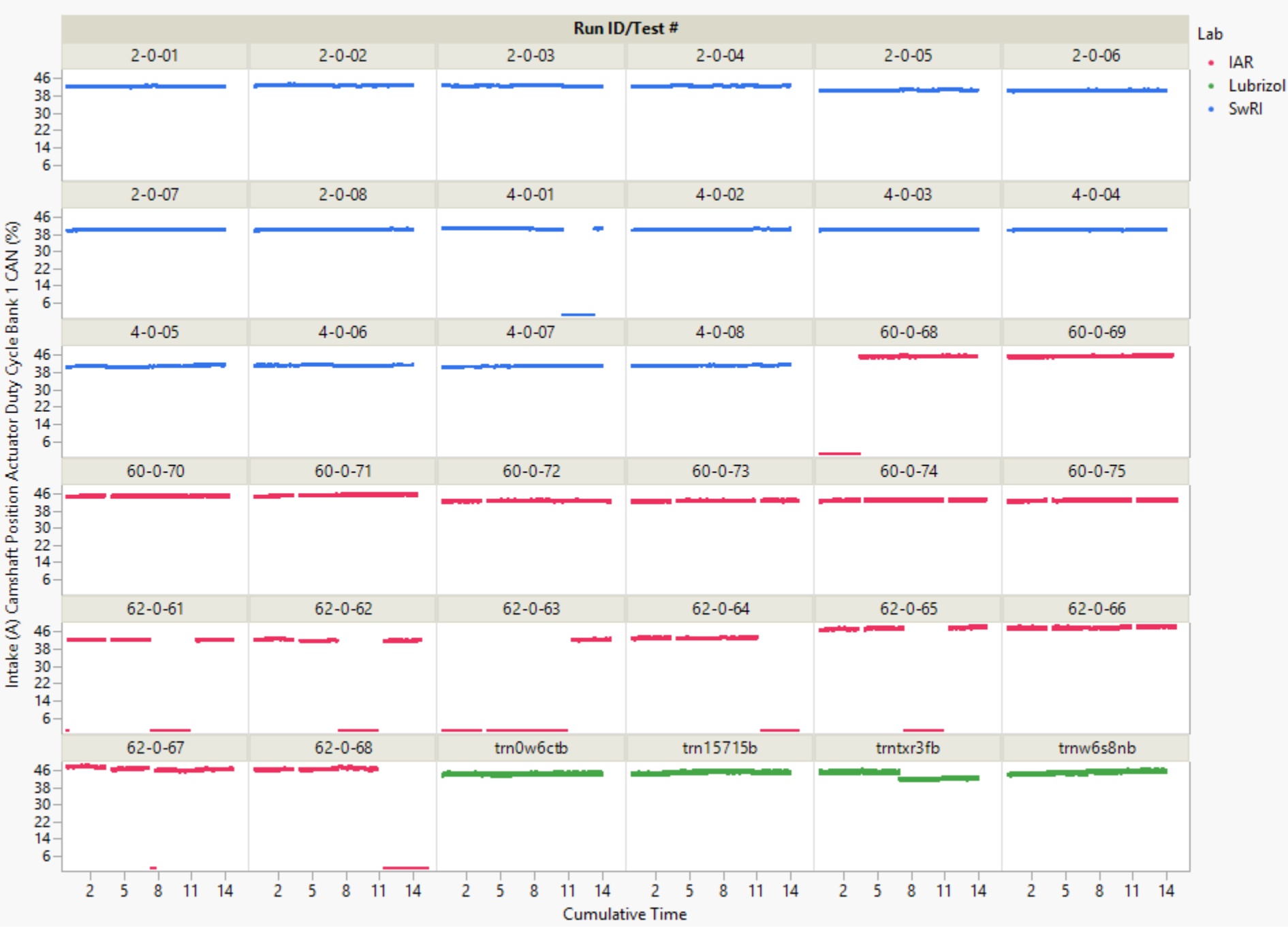

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
3800
3000
2200
1400
600
2
5
8
11
14
Actual Intake (A) Camshaft Position Bank 1 CAN (Deg)
Cumulative Time
Lab
IAR
Lubrizol
SwRI

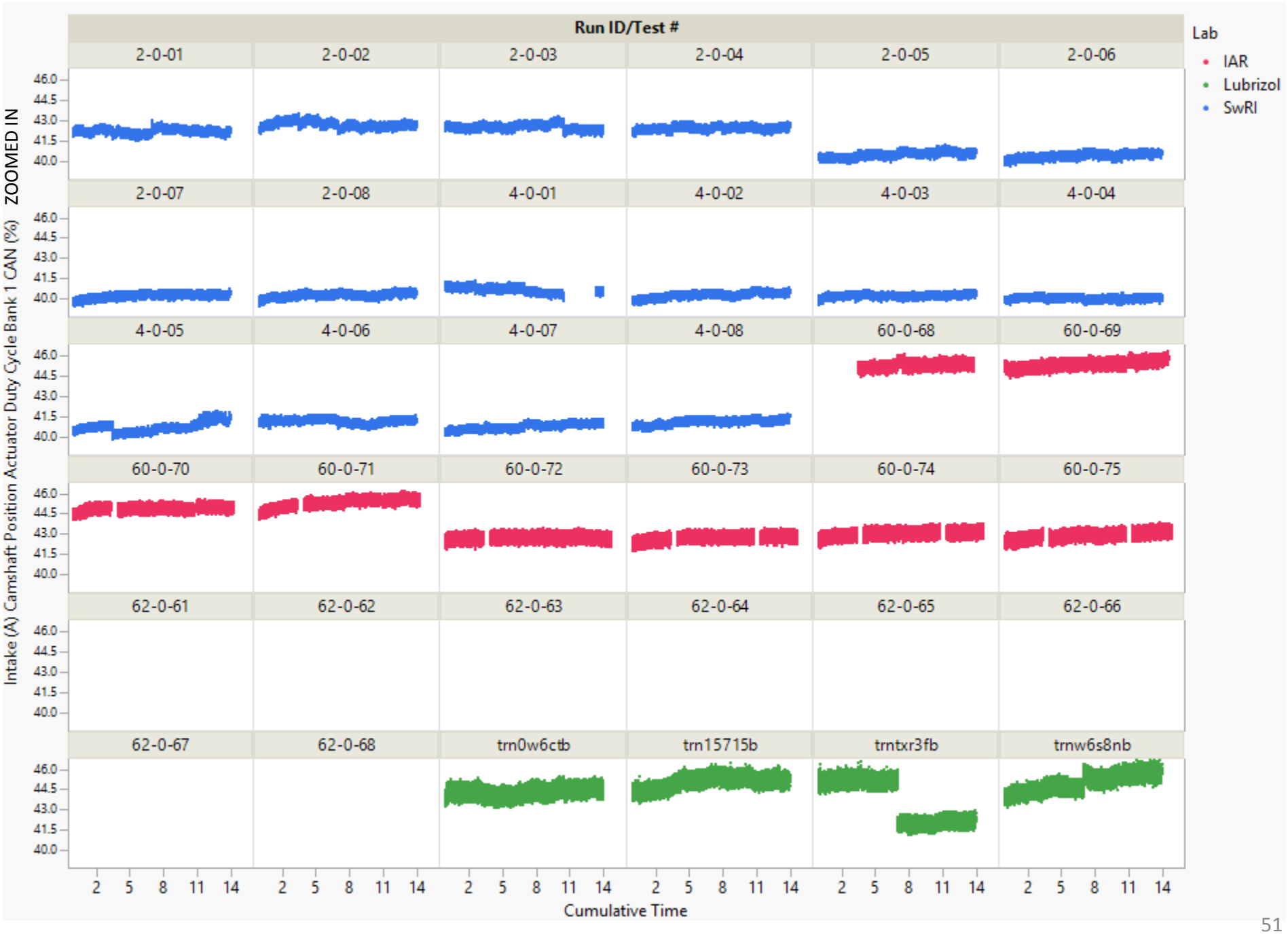

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
-46.4
-46.8
-47.2
-47.6
2
5
8
11
14
Cumulative Time
Actual Intake (A) Camshaft Position Bank 1 CAN (Deg) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

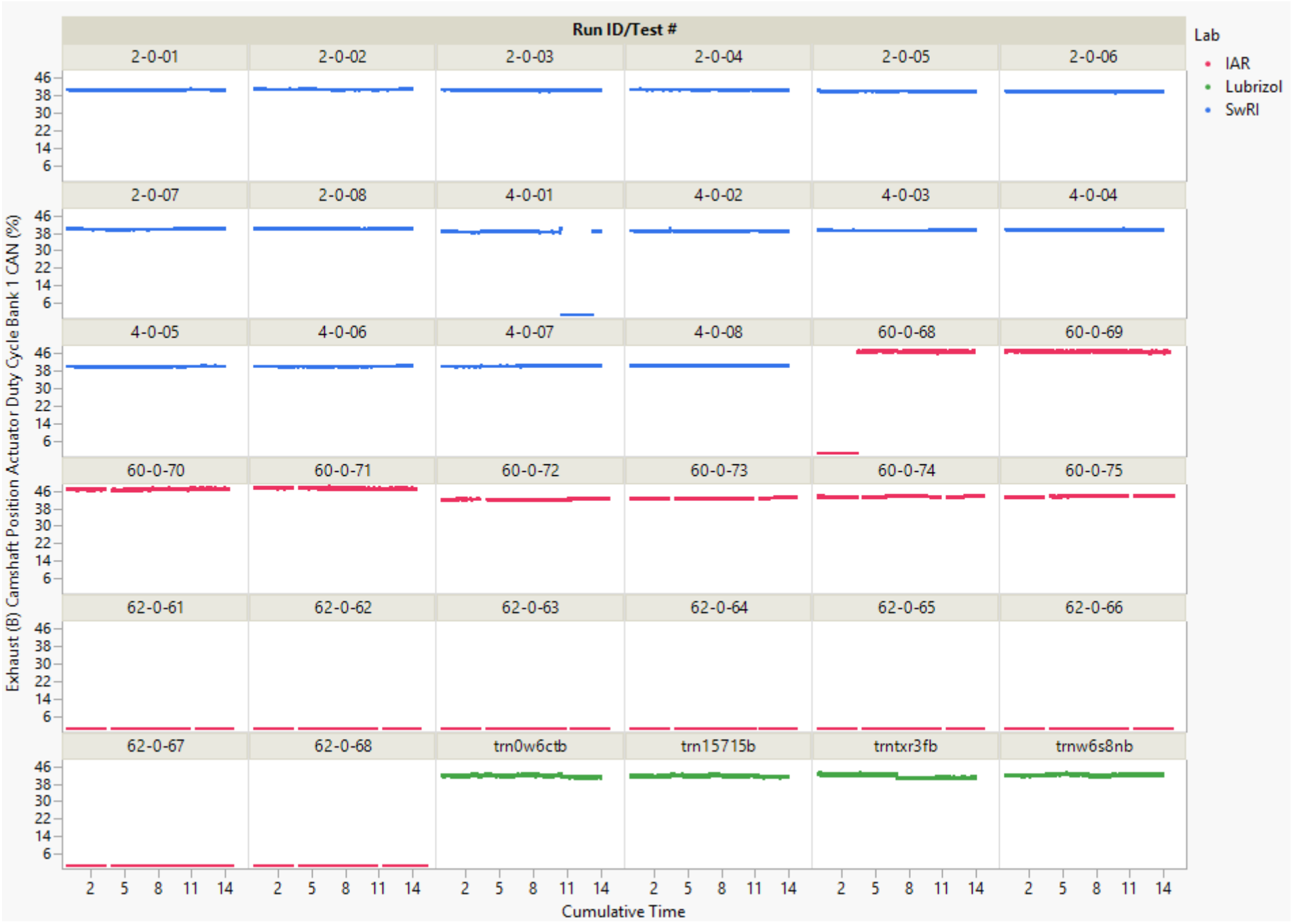

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
4050.4
4049.8
4049.2
4048.6
4048.0
2 5 8 11 14
Cumulative Time
Actual Intake (A) Camshaft Position Bank 1 CAN (Deg) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

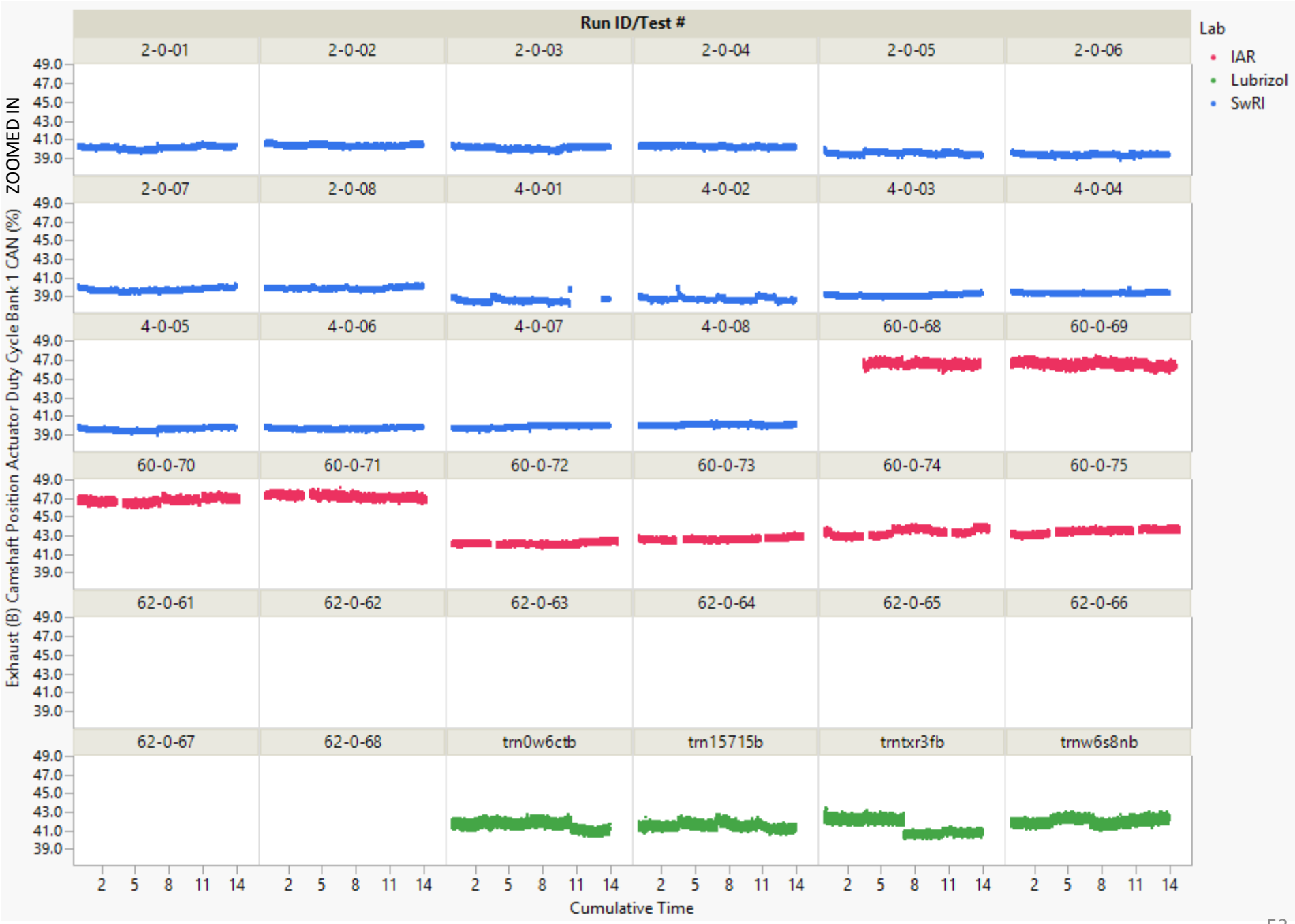

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Actual Exhaust (B) Camshaft Position Bank 1 CAN (Deg)
46
38
30
22
14
6
2
5
8
11
14
Cumulative Time

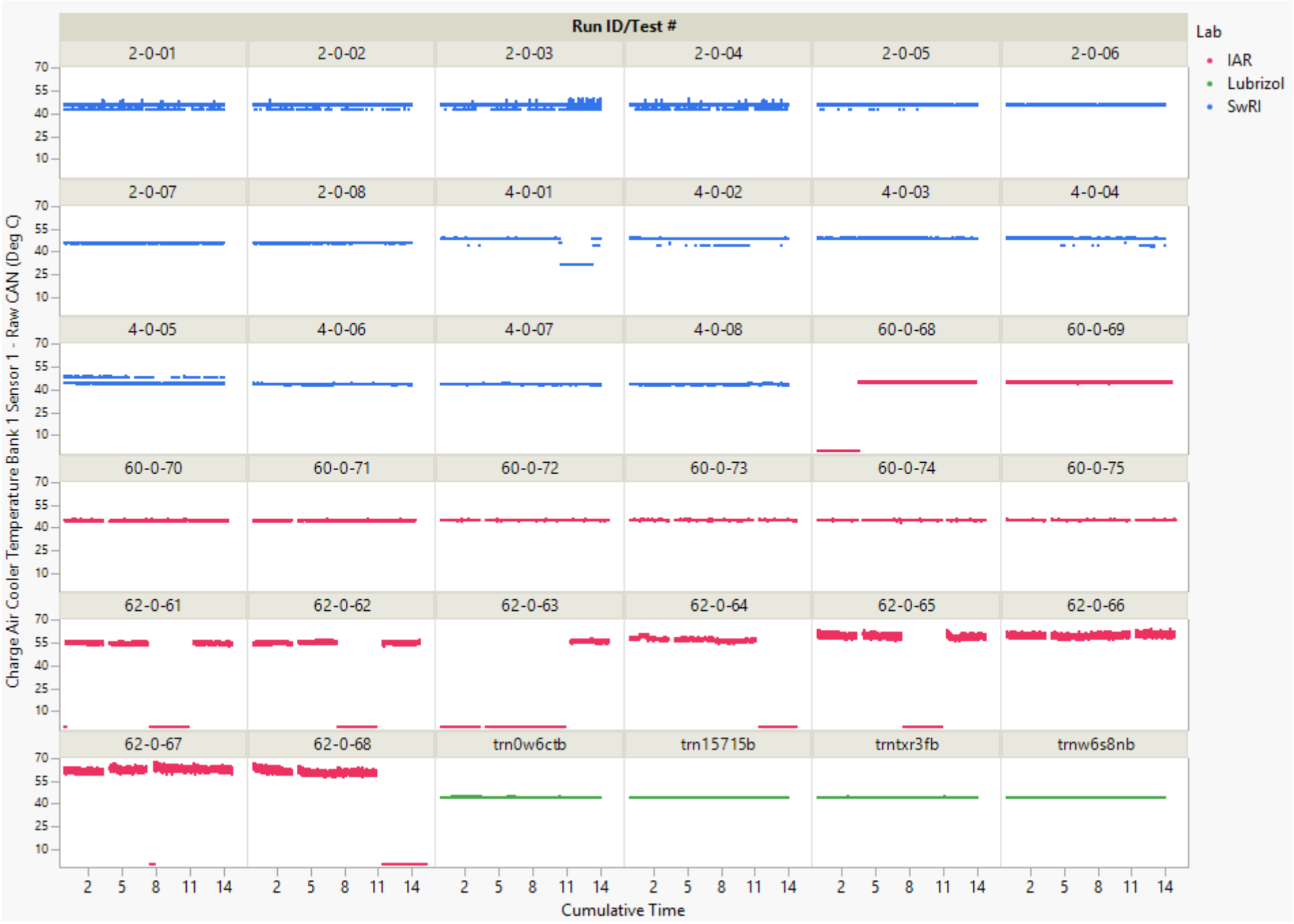
Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
18.2
17.8
17.4
17.0
16.6
16.2
2 5 8 11 14
Cumulative Time
Actual Exhaust (B) Camshaft Position Bank 1 CAN (Deg) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

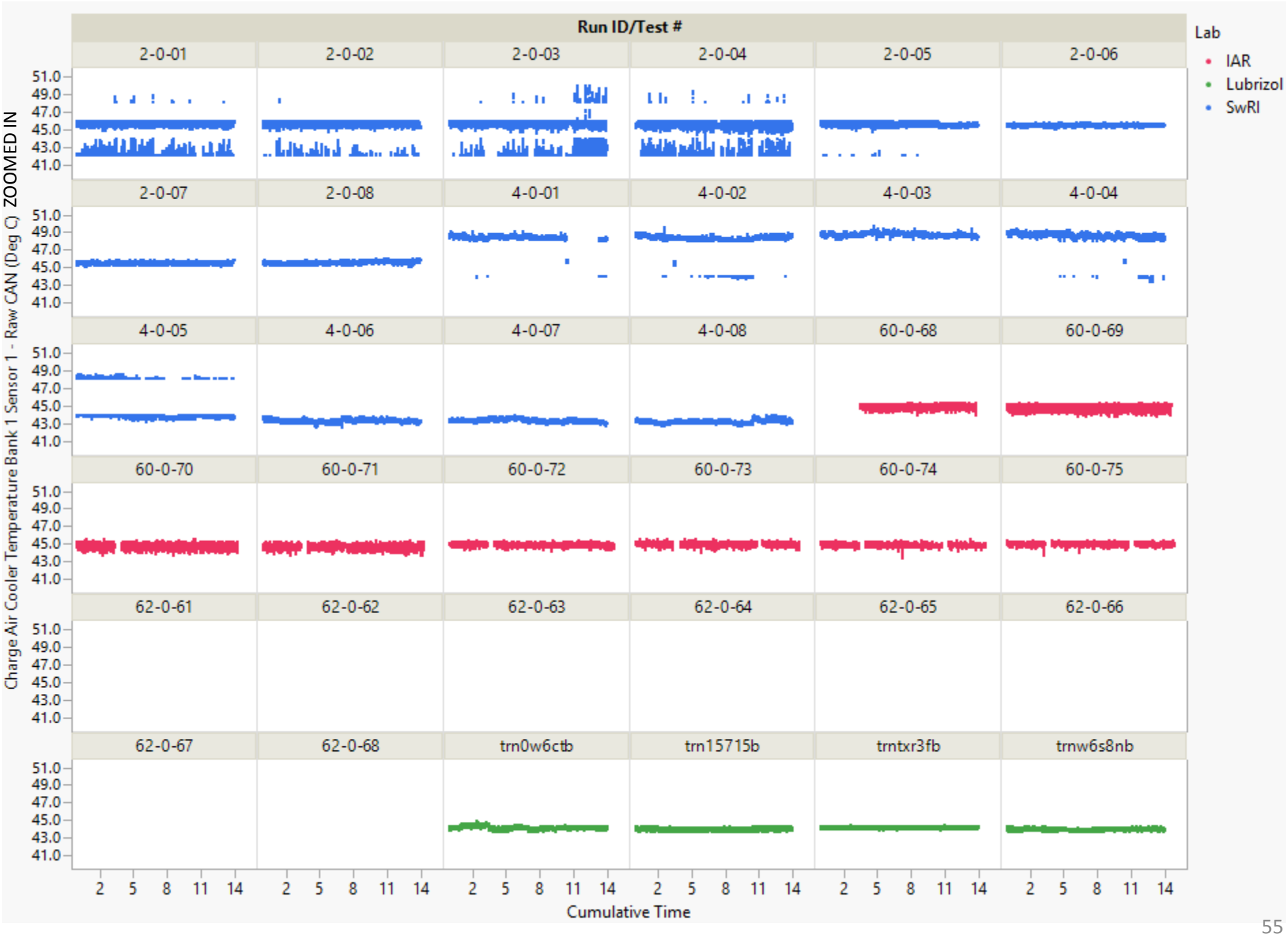

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Intake (A) Camshaft Position Actuator Duty Cycle Bank 1 CAN (%)
46
38
30
22
14
6
2
5
8
11
14
Cumulative Time
Lab
IAR
Lubrizol
SwRI

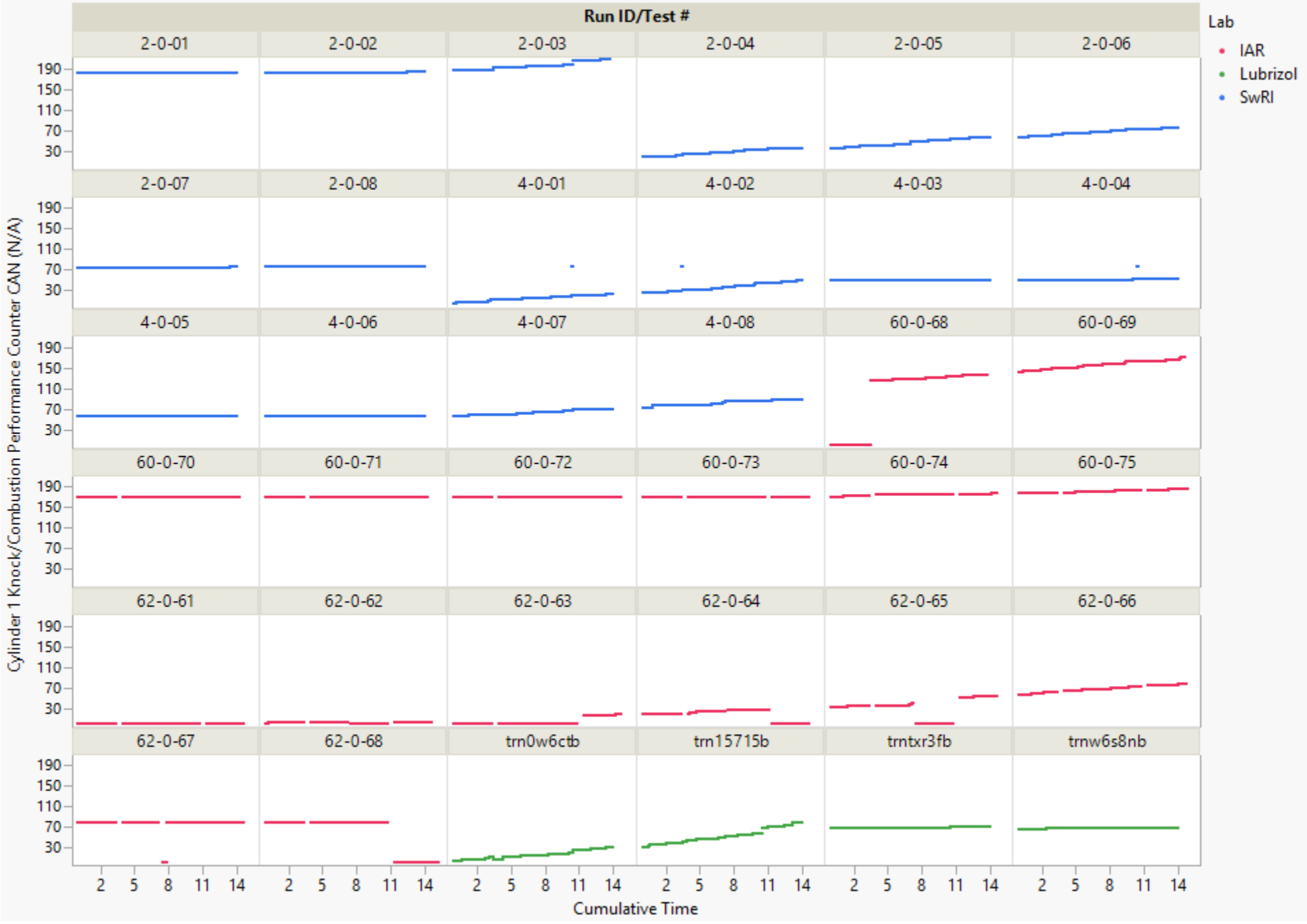

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Intake (A) Camshaft Position Actuator Duty Cycle Bank 1 CAN (%) ZOOMED IN
46.0
44.5
43.0
41.5
40.0
2
5
8
11
14
Cumulative Time

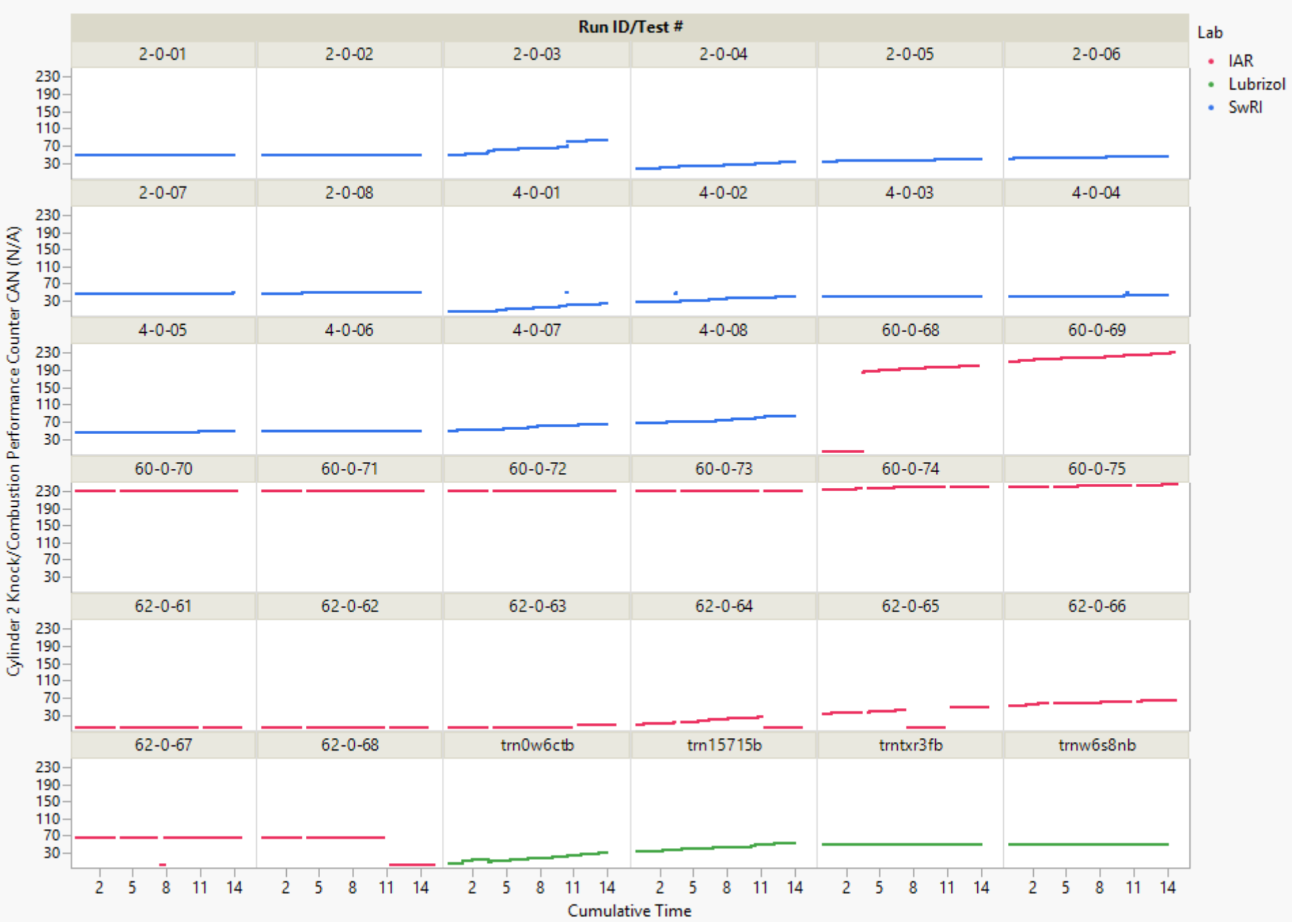

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Exhaust (B) Camshaft Position Actuator Duty Cycle Bank 1 CAN (%)
46
38
30
22
14
6
2
5
8
11
14
Cumulative Time

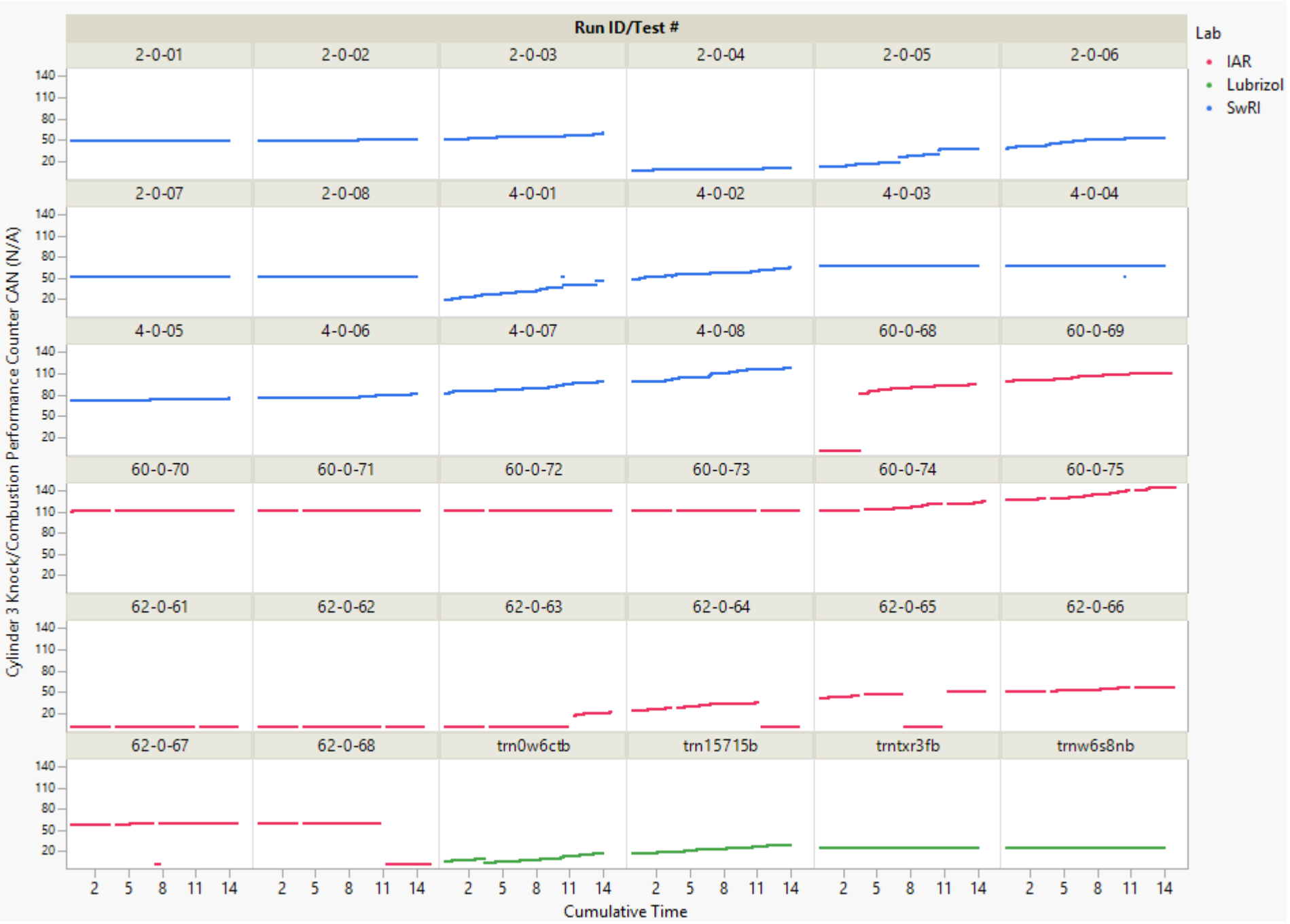

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Exhaust (B) Camshaft Position Actuator Duty Cycle Bank 1 CAN (%) ZOOMED IN
49.0
47.0
45.0
43.0
41.0
39.0
2
5
8
11
14
Cumulative Time

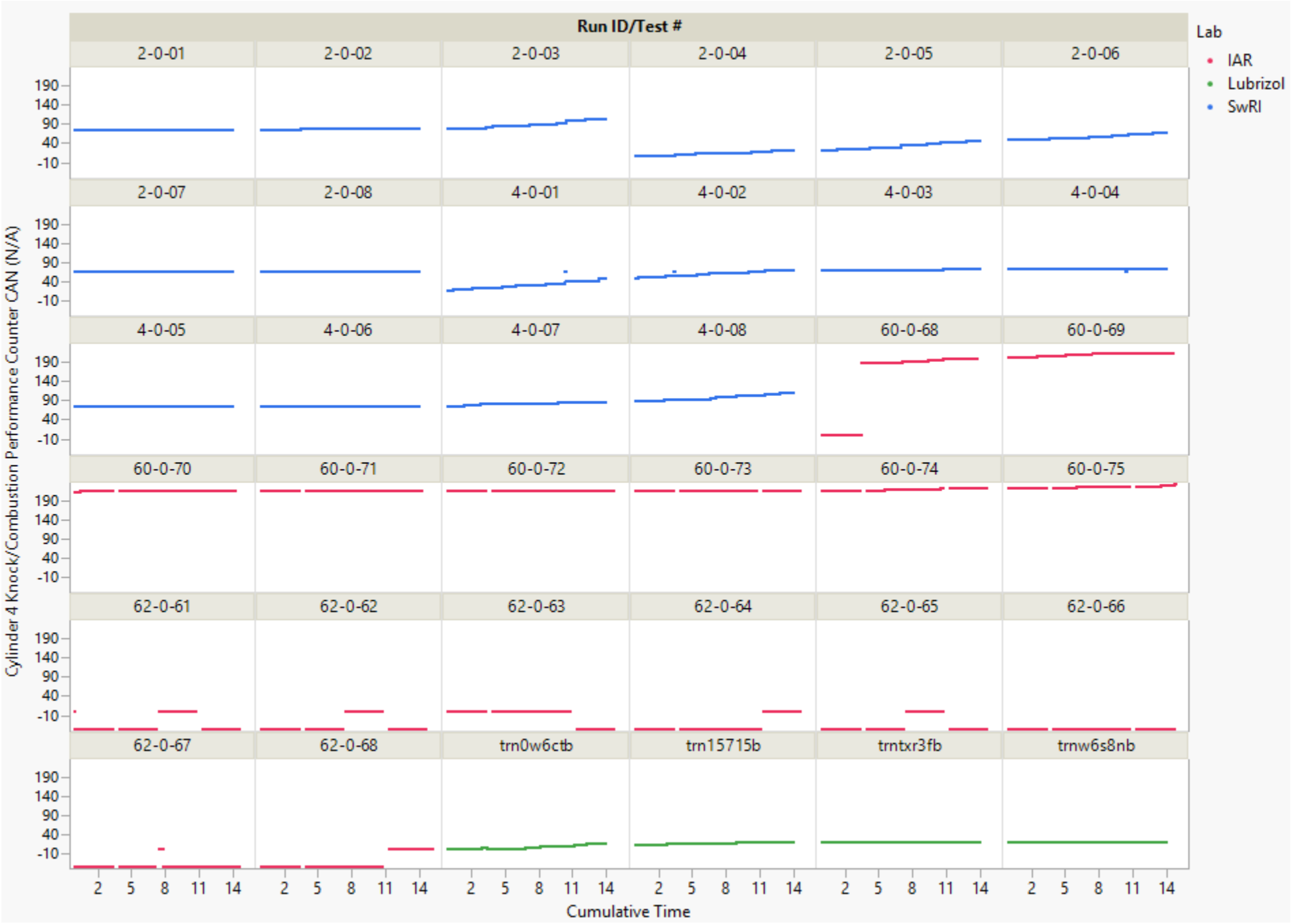

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Charge Air Cooler Temperature Bank 1 Sensor 1 - Raw CAN (Deg C)
70
55
40
25
10
2
5
8
11
14
Cumulative Time

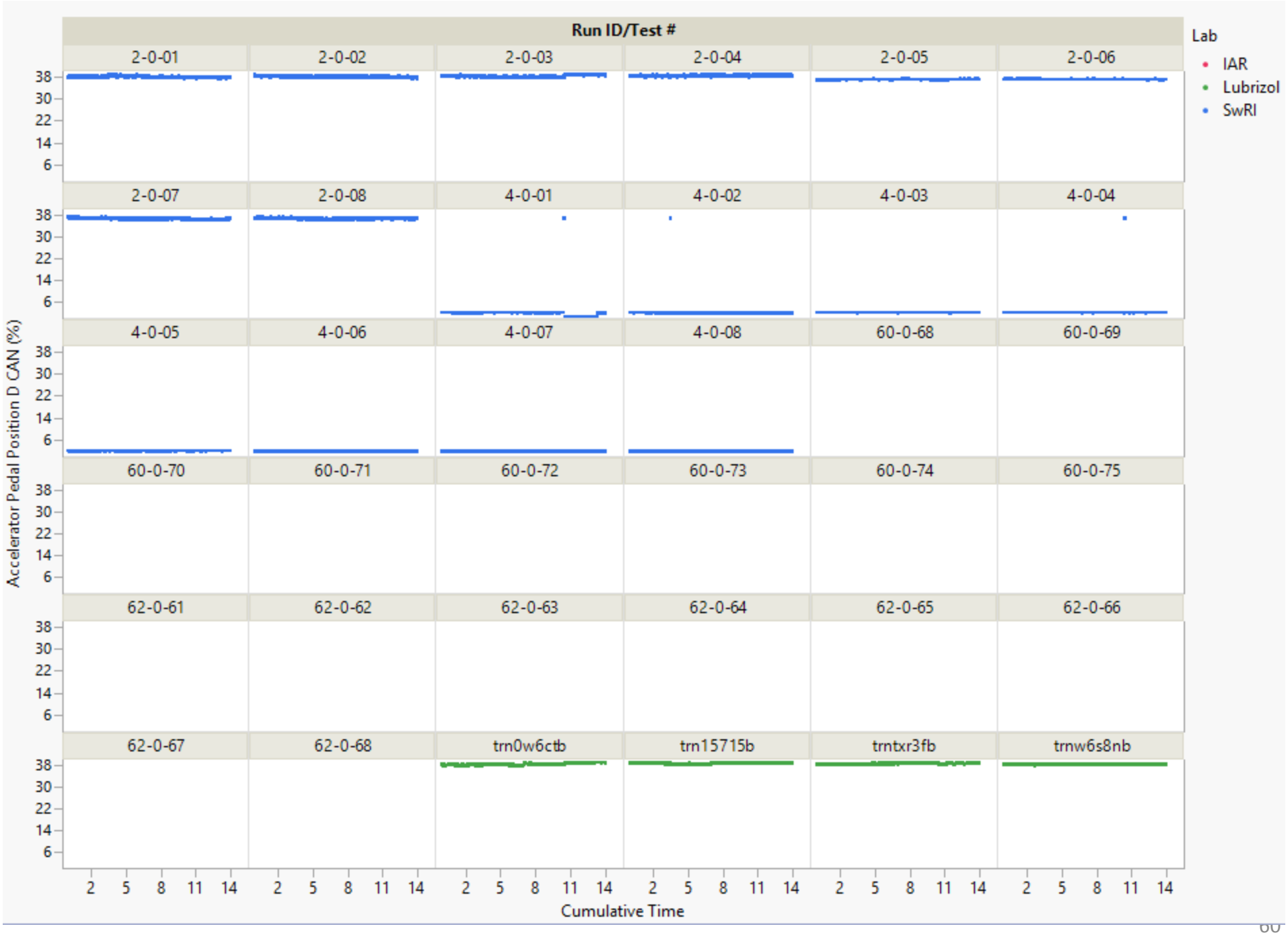

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
51.0
49.0
47.0
45.0
43.0
41.0
2 5 8 11 14
Cumulative Time
Charge Air Cooler Temperature Bank 1 Sensor 1 - Raw CAN (Deg C) ZOOMED IN
Lab
IAR
Lubrizol
SwRI

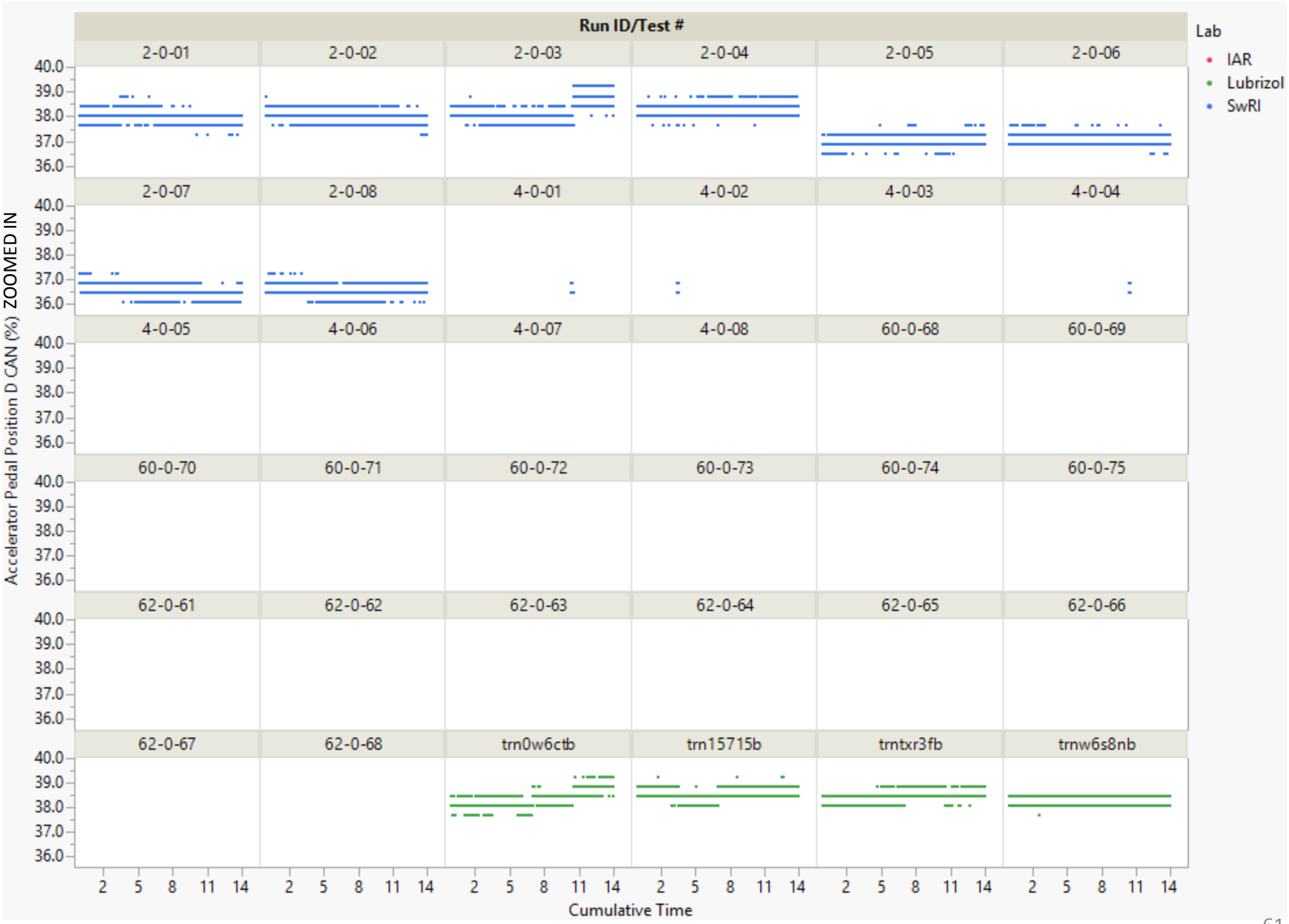

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
190
150
110
70
30
2
5
8
11
14
Cylinder 1 Knock/Combustion Performance Counter CAN (N/A)
Cumulative Time
Lab
IAR
Lubrizol
SwRI

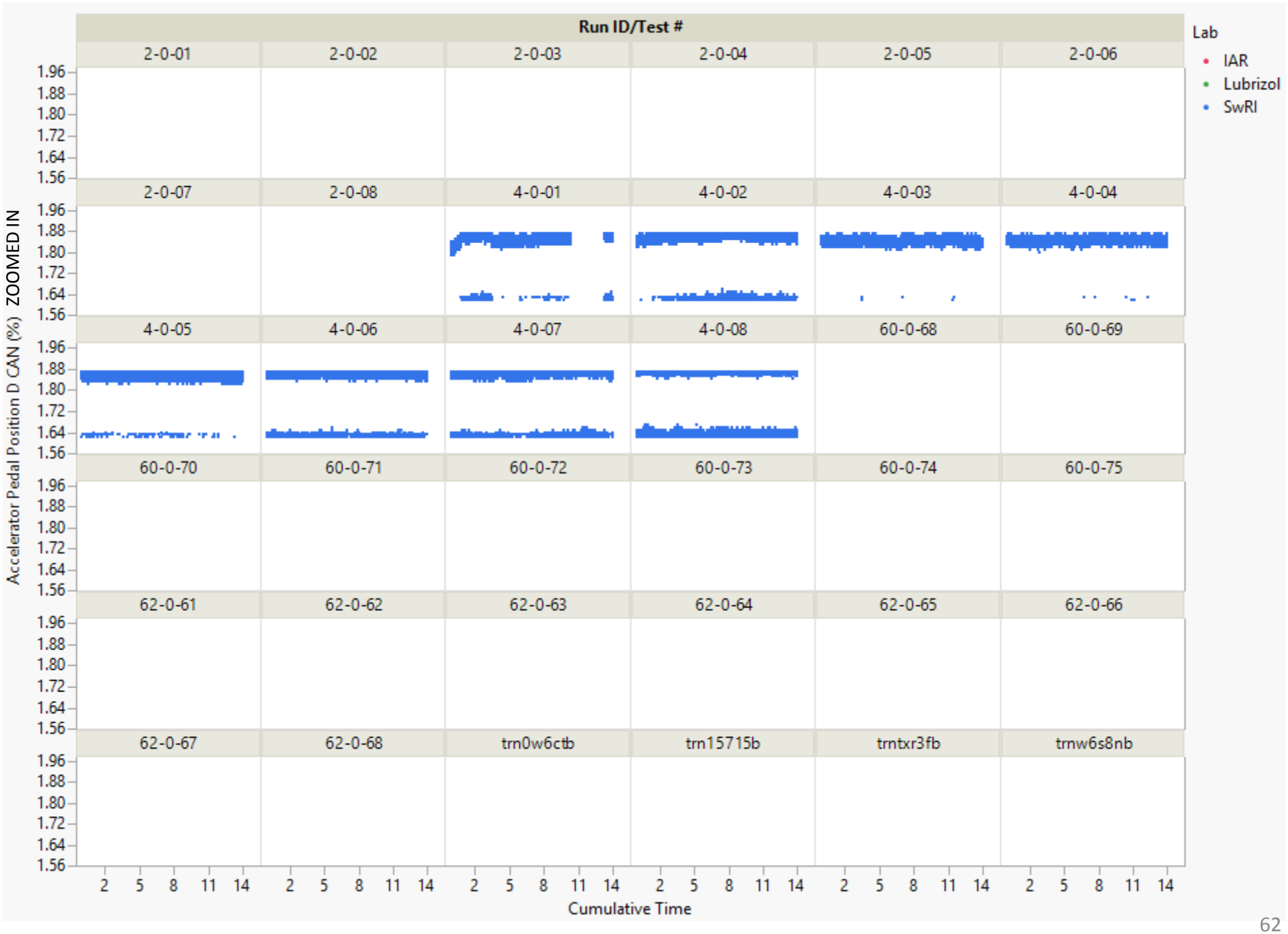

Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Cylinder 2 Knock/Combustion Performance Counter CAN (N/A)
230
190
150
110
70
30
2
5
8
11
14
Cumulative Time


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Cylinder 3 Knock/Combustion Performance Counter CAN (N/A)
Cumulative Time


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
190
140
90
40
-10
2
5
8
11
14
Cylinder 4 Knock/Combustion Performance Counter CAN (N/A)
Cumulative Time
Lab
IAR
Lubrizol
SwRI


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Accelerator Pedal Position D CAN (%)
38
30
22
14
6
2
5
8
11
14
Cumulative Time


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Accelerator Pedal Position D CAN (%) ZOOMED IN
40.0
39.0
38.0
37.0
36.0
2
5
8
11
14
Cumulative Time


Run ID/Test #
2-0-01
2-0-02
2-0-03
2-0-04
2-0-05
2-0-06
2-0-07
2-0-08
4-0-01
4-0-02
4-0-03
4-0-04
4-0-05
4-0-06
4-0-07
4-0-08
60-0-68
60-0-69
60-0-70
60-0-71
60-0-72
60-0-73
60-0-74
60-0-75
62-0-61
62-0-62
62-0-63
62-0-64
62-0-65
62-0-66
62-0-67
62-0-68
trn0w6ctb
trn15715b
trntxr3fb
trnw6s8nb
Lab
IAR
Lubrizol
SwRI
Accelerator Pedal Position D CAN (%) ZOOMED IN
1.96
1.88
1.80
1.72
1.64
1.56
2
5
8
11
14
Cumulative Time