
Chapter 14

Reference

1.0 Setup Parameter Hierarchy

This section contains a comprehensive listing of all configurable parameters in the Inter-Loc V. The list contains an example of one dynamometer controller and one throttle controller. The factory default value of each parameter is listed.

```
+-[ Inter-Loc V ]
|   0 Firmware Version = 1.062
|   1 Mode Conflict Controller Pairing = Auto-Select
|   2 F1 Key Function = None
|
+---+-[ Slot 1 - Dyno ]
| |   0 Status = ACTIVATED
| |   1 Description = DYNO Controller - D1
| |   2 Active Parameter Set Number = 0
| |   3 Calculated Power Units = HP
| |   4 Calculated Power Display Resolution = 1
| |   5 Hard Over-speed Limit = 0.0 RPM
| |   6 Hard Over-torque Limit = 0.0 LB-FT
| |   7 At Speed Threshold 1 = 0.0 RPM
| |   8 At Speed Threshold 2 = 0.0 RPM
| |   9 At Speed Deadband 1 = 0.0 RPM
| |  10 At Speed Deadband 2 = 0.0 RPM
| |  11 Loss of Speed Feedback Start Delay = 1.0 seconds
| |  30 Dynamometer Type = Eddy-Current
| |  31 Dyno Rated Horsepower = 0.0 HP
| |  32 Dyno Error Output Invert Polarity = No
| |  33 Powerup Absorb-Only State = On
| |  34 Powerup Mode = Speed
| |  35 Timeout Value - Coolant ILK = 2.0 seconds
| |  36 Timeout Value - PAU ON = 2.0 seconds
| |  37 Shaft A/B Selection Source = Shaft A (Always)
| |  38 BSTOP Braking Force = 100 % of ESTOP braking force
| |  39 Eddy-Current Dropout Speed = 0.0 RPM
| |
+---+-[ Control Variables ]
| |
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+----[ Speed ]
  0 Display Resolution = 1
  1 Display Units = RPM
  2 Display Filter = 1 Sec Averaging
 10 SPEED Input Connector = C1 (this controller, ALWAYS)
 11 Transducer Type = Encoder
 12 Transducer PPR = 60 pulses/rev
 13 Direction Type (if Encoder) = Quadrature
 14 RPM Input Dynamic Range = 10,000 RPM
 15 Speed Scaling = 1.0
 16 Invert Polarity = No
 17 Digital Noise Filter = None
 18 Reference Source = OCS or COMPUTER (default)

+----[ Torque ]
  0 Display Resolution = 1
  1 Display Units = LB-FT
  2 Display Filter = 4 Sec Averaging
 10 TORQUE Input Connector = C1 (this controller, ALWAYS)
 11 Transducer Type = Load Cell
 12 Calibration Type = Zero + 1-Sided Span
 13 Torque Sensor Sensitivity = 0.1 volts/(torque unit)
 14 Load Cell Full Scale Value = 50.0
 15 Load Cell MvV = 4.0
 16 Load Cell Radius = 1.0
 17 Setup Force Units = LB
 18 Setup Length Units = FT
 19 Torque Calculation = None
 20 Dyno Inertia = 0.0
 21 Dyno Inertia Units = slug-ft2
 22 Invert Polarity = No
 23 Reference Source = OCS or COMPUTER (default)

+---+[ Faults ]
  +----[ Hard Over-speed ]
    0 Main Action = ESTOP
    1 Controller Fault = Yes
    2 General Fault = No
    3 IGNORE (overrides other settings) = No

  +----[ Hard Over-torque ]
    0 Main Action = ESTOP
    1 Controller Fault = Yes
    2 General Fault = No
    3 IGNORE (overrides other settings) = No

  +----[ Loss of Speed Feedback ]
    0 Main Action = ESTOP
    1 Controller Fault = Yes
    2 General Fault = No
    3 IGNORE (overrides other settings) = No

  +----[ Loss of Master Enable ]
    0 Main Action = Dyno OFF
    1 Controller Fault = Yes

```

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2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Loss of PAU OK ]
0 Main Action = Dyno OFF
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ External Input #1 ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ External Input #2 ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Shaft Break ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Computer Watchdog ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Hardware - A/D Timeout ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Hardware - D/A Timeout ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Loss of PAU ON ]
0 Main Action = Dyno OFF
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Loss of Coolant ILK ]
0 Main Action = Dyno OFF
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

```

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+-----[ Timeout - PAU ON ]
|      0 Main Action = Dyno OFF
|      1 Controller Fault = Yes
|      2 General Fault = No
|      3 IGNORE (overrides other settings) = No
+-----[ Timeout - Coolant ILK ]
|      0 Main Action = Dyno OFF
|      1 Controller Fault = Yes
|      2 General Fault = No
|      3 IGNORE (overrides other settings) = No
+-----[ Dyno Power Limit Exceeded ]
|      0 Main Action = Dyno OFF
|      1 Controller Fault = Yes
|      2 General Fault = No
|      3 IGNORE (overrides other settings) = No
+-----[ Wrong Direction ]
|      0 Main Action = ESTOP
|      1 Controller Fault = Yes
|      2 General Fault = No
|      3 IGNORE (overrides other settings) = No
+---+-[ Parameter Sets ]
|
| +---+-[ Set 0 ]
| |      0 Description = <undefined>
| |
| | +-----[ Speed Parameters ]
| | |      0 P = 0.0
| | |      1 I = 0.0
| | |      2 D = 0.0
| | |      3 Feedback Filter = 5      ( 10 Hz )
| | |      4 FF = 0.0
| |
| | +-----[ Torque Parameters ]
| | |      0 P = 0.0
| | |      1 I = 0.0
| | |      2 D = 0.0
| | |      3 Feedback Filter = 5      ( 10 Hz )
| | |      4 FF = 0.0
| |
| +---+-[ Set 1 ]
| |      0 Description = <undefined>
| |
| | +-----[ Speed Parameters ]
| | |      0 P = 0.0
| | |      1 I = 0.0
| | |      2 D = 0.0
| | |      3 Feedback Filter = 5      ( 10 Hz )
| | |      4 FF = 0.0
| |
| | +-----[ Torque Parameters ]
| | |      0 P = 0.0

```

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1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0

+---+-[ Set 2 ]
| 0 Description = <undefined>
|
+-----[ Speed Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Torque Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0

+---+-[ Set 3 ]
| 0 Description = <undefined>
|
+-----[ Speed Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Torque Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0

+---+-[ Set 4 ]
| 0 Description = <undefined>
|
+-----[ Speed Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Torque Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0

```

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+---+-[ Set 5 ]
|   0 Description = <undefined>
|
+-----[ Speed Parameters ]
|   0 P = 0.0
|   1 I = 0.0
|   2 D = 0.0
|   3 Feedback Filter = 5    ( 10 Hz )
|   4 FF = 0.0
|
+-----[ Torque Parameters ]
|   0 P = 0.0
|   1 I = 0.0
|   2 D = 0.0
|   3 Feedback Filter = 5    ( 10 Hz )
|   4 FF = 0.0
|
+---+-[ Set 6 ]
|   0 Description = <undefined>
|
+-----[ Speed Parameters ]
|   0 P = 0.0
|   1 I = 0.0
|   2 D = 0.0
|   3 Feedback Filter = 5    ( 10 Hz )
|   4 FF = 0.0
|
+-----[ Torque Parameters ]
|   0 P = 0.0
|   1 I = 0.0
|   2 D = 0.0
|   3 Feedback Filter = 5    ( 10 Hz )
|   4 FF = 0.0
|
+---+-[ Set 7 ]
|   0 Description = <undefined>
|
+-----[ Speed Parameters ]
|   0 P = 0.0
|   1 I = 0.0
|   2 D = 0.0
|   3 Feedback Filter = 5    ( 10 Hz )
|   4 FF = 0.0
|
+-----[ Torque Parameters ]
|   0 P = 0.0
|   1 I = 0.0
|   2 D = 0.0
|   3 Feedback Filter = 5    ( 10 Hz )
|   4 FF = 0.0
|
+---+-[ Set 8 ]
|   0 Description = <undefined>
|
+-----[ Speed Parameters ]
|   0 P = 0.0

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```

      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+-----[ Torque Parameters ]
      0 P = 0.0
      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+---+[ Set 9 ]
      0 Description = <undefined>
+-----[ Speed Parameters ]
      0 P = 0.0
      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+-----[ Torque Parameters ]
      0 P = 0.0
      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+---+[ Programmable Analog Outputs ]
+-----[ Output 1 ]
      0 Source = None
      1 Gain Adjustment = 1.0
      2 Offset Adjustment = 0.0 volts
+-----[ Output 2 ]
      0 Source = None
      1 Gain Adjustment = 1.0
      2 Offset Adjustment = 0.0 volts
+-----[ Output 3 ]
      0 Source = None
      1 Gain Adjustment = 1.0
      2 Offset Adjustment = 0.0 volts
+---+[ Analog Inputs ]
+-----[ Input 1 ]
      0 Offset Adjustment = 0.0 volts
      1 Gain Adjustment = 1.0
      2 Input Filter = None
+-----[ Input 2 ]
      0 Offset Adjustment = 0.0 volts
      1 Gain Adjustment = 1.0

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|           2 Input Filter = None
|
| +---+-[ Programmable Digital Outputs ]
| |
| | +-----[ Output 1 ]
| | |     0 Source = None
| | |     1 Invert Polarity = No
| | |
| | +-----[ Output 2 ]
| | |     0 Source = None
| | |     1 Invert Polarity = No
| | |
| | +-----[ Output 3 ]
| | |     0 Source = None
| | |     1 Invert Polarity = No
| | |
| | +-----[ Output 4 ]
| | |     0 Source = None
| | |     1 Invert Polarity = No
| |
| +-----[ Chassis Roll ]
| |     0 Diameter = 0.0
| |     1 Diameter Units = in
| |     2 Inertia = 0.0
| |     3 Inertia Units = slug-ft2
| |     4 B0 Spin Loss Coefficient = 0.0
| |     5 B1 Spin Loss Coefficient = 0.0
| |     6 B2 Spin Loss Coefficient = 0.0
| |     7 Bx Units = lb-ft, lb-ft/mph, lb-ft/mph2
| |     8 Spin Loss Compensation Starting Speed = 1.0
| |
| +-----[ Field Control ]
| |     0 Field Weakening Start Speed = 1750.0 RPM
| |     1 Field Weakening End Speed = 2.0 x Start Speed
| |
| +-----[ 4-Quadrant Control ]
| |     0 Allow Negative Speed Setpoints = Off
| |     1 Control ABS( speed ) + ABS( torque ) = Off
| |
| +-----[ Inertia Simulation ]
| |     0 Display Units = slug-ft2
| |     1 Display Resolution = 0.1
| |     2 Torque Filter = None
| |     3 Simulation Enable Selection Source = Always OFF
| |     4 Simulation Starting Speed (RPM) = 5.0
| |     5 Spin Loss Source = Bx Coefficients (i.e. internal)
| |     6 B0 Spin Loss Coefficient = 0.0
| |     7 B1 Spin Loss Coefficient (x1000) = 0.0
| |     8 B2 Spin Loss Coefficient (x1000) = 0.0
| |     9 Bx Units = lb-ft, lb-ft/rpm, lb-ft/rpm2
| |    10 External Spin Loss Sensitivity = 1.0 units/volt
| |    11 External Spin Loss Units = lb-ft
| |
| +---+-[ Slot 3 - Throttle ]
| |     0 Status = ACTIVATED
| |     1 Description = THROTTLE Controller - T3

```

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2 Active Parameter Set Number = 0
3 Calculated Power Units = HP
4 Calculated Power Display Resolution = 1
5 Hard Over-speed Limit = 0.0 RPM
6 Hard Over-torque Limit = 0.0 LB-FT
7 At Speed Threshold 1 = 0.0 RPM
8 At Speed Threshold 2 = 0.0 RPM
9 At Speed Deadband 1 = 0.0 RPM
10 At Speed Deadband 2 = 0.0 RPM
11 Loss of Speed Feedback Start Delay = 1.0 seconds
30 Control Output Type = Actuator Motor => Engine
31 Soft Over-speed Detection = On
32 Soft Over-speed Limit = 0.0
33 Mode Conflict Default Mode = Torque
+---+[ Control Variables ]
+----[ Speed ]
0 Display Resolution = 1
1 Display Units = RPM
2 Display Filter = 1 Sec Averaging
10 SPEED Input Connector = Auto-Select
11 Transducer Type = Encoder
12 Transducer PPR = 60 pulses/rev
13 Direction Type (if Encoder) = Quadrature
14 RPM Input Dynamic Range = 10,000 RPM
15 Speed Scaling = 1.0
16 Invert Polarity = No
17 Digital Noise Filter = None
18 Reference Source = OCS or COMPUTER (default)
+----[ Torque ]
0 Display Resolution = 1
1 Display Units = LB-FT
2 Display Filter = 4 Sec Averaging
10 TORQUE Input Connector = Auto-Select
11 Transducer Type = Load Cell
12 Calibration Type = Zero + 1-Sided Span
13 Torque Sensor Sensitivity = 0.1 volts/(torque unit)
14 Load Cell Full Scale Value = 50.0
15 Load Cell MvV = 4.0
16 Load Cell Radius = 1.0
17 Setup Force Units = LB
18 Setup Length Units = FT
19 Torque Calculation = None
20 Dyno Inertia = 0.0
21 Dyno Inertia Units = slug-ft2
22 Invert Polarity = No
23 Reference Source = OCS or COMPUTER (default)
+----[ Position ]
0 Display Resolution = 0.1
1 Display Units = %
2 Display Filter = None
10 Feedback Source = Digital Encoder
11 Actuator Direction = Clockwise

```

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12 Input Voltage (100 %) = 10.0 volts
13 Input Voltage (0 %) = 0.0 volts
14 Reference Source = OCS or COMPUTER (default)
+-----[ Map/Vac ]
0 Display Resolution = 0.01
1 Display Units = PSI
2 Display Filter = None
10 Transducer Type = None
11 Low Voltage Input = 0.0 volts
12 Low Pressure Value = 0.0
13 High Voltage Input = 5.0 volts
14 High Pressure Value = 50.0
15 Setup Pressure Units = PSI
16 Invert Polarity = No
17 Reference Source = OCS or COMPUTER (default)
+-----[ Faults ]
+-----[ Hard Over-speed ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No
+-----[ Hard Over-torque ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No
+-----[ Loss of Speed Feedback ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No
+-----[ Loss of Master Enable ]
0 Controller Fault = Yes
1 General Fault = No
2 RTZ = Yes
3 IGNORE (overrides other settings) = No
+-----[ Loss of PAU OK ]
0 Controller Fault = Yes
1 General Fault = No
2 RTZ = Yes
3 IGNORE (overrides other settings) = No
+-----[ External Input #1 ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No

```

```

3 RTZ = Yes
4 IGNORE (overrides other settings) = No

+-----[ External Input #2 ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No

+-----[ Shaft Break ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Computer Watchdog ]
0 Main Action = ESTOP
1 Controller Fault = Yes
2 General Fault = No
3 IGNORE (overrides other settings) = No

+-----[ Hardware - A/D Timeout ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No

+-----[ Hardware - D/A Timeout ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No

+-----[ Throttle PAU Power Fail ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No

+-----[ Loss of Actuator Encoder ILK ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No

+-----[ Stalled ]
0 ESTOP = Yes
1 Controller Fault = Yes
2 General Fault = No
3 RTZ = Yes
4 IGNORE (overrides other settings) = No

```

```

|
| +---+-[ Parameter Sets ]
| |
| | +---+-[ Set 0 ]
| | | 0 Description = <undefined>
| | |
| | | +-----[ Speed Parameters ]
| | | | 0 P = 0.0
| | | | 1 I = 0.0
| | | | 2 D = 0.0
| | | | 3 Feedback Filter = 5    ( 10 Hz )
| | | | 4 FF = 0.0
| | |
| | | +-----[ Torque Parameters ]
| | | | 0 P = 0.0
| | | | 1 I = 0.0
| | | | 2 D = 0.0
| | | | 3 Feedback Filter = 5    ( 10 Hz )
| | | | 4 FF = 0.0
| | |
| | | +-----[ Map/Vac Parameters ]
| | | | 0 P = 0.0
| | | | 1 I = 0.0
| | | | 2 D = 0.0
| | | | 3 Feedback Filter = 5    ( 10 Hz )
| | | | 4 FF = 0.0
| | |
| | | +---+-[ Set 1 ]
| | | | 0 Description = <undefined>
| | | |
| | | | +-----[ Speed Parameters ]
| | | | | 0 P = 0.0
| | | | | 1 I = 0.0
| | | | | 2 D = 0.0
| | | | | 3 Feedback Filter = 5    ( 10 Hz )
| | | | | 4 FF = 0.0
| | | |
| | | | +-----[ Torque Parameters ]
| | | | | 0 P = 0.0
| | | | | 1 I = 0.0
| | | | | 2 D = 0.0
| | | | | 3 Feedback Filter = 5    ( 10 Hz )
| | | | | 4 FF = 0.0
| | | |
| | | | +-----[ Map/Vac Parameters ]
| | | | | 0 P = 0.0
| | | | | 1 I = 0.0
| | | | | 2 D = 0.0
| | | | | 3 Feedback Filter = 5    ( 10 Hz )
| | | | | 4 FF = 0.0
| | | |
| | | | +---+-[ Set 2 ]
| | | | | 0 Description = <undefined>
| | | | |
| | | | | +-----[ Speed Parameters ]
| | | | | | 0 P = 0.0

```



```

2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+-----[ Map/Vac Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+---+[ Set 5 ]
0 Description = <undefined>
+-----[ Speed Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+-----[ Torque Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+-----[ Map/Vac Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+---+[ Set 6 ]
0 Description = <undefined>
+-----[ Speed Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+-----[ Torque Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0
3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+-----[ Map/Vac Parameters ]
0 P = 0.0
1 I = 0.0
2 D = 0.0

```

```

3 Feedback Filter = 5    ( 10 Hz )
4 FF = 0.0
+---+-[ Set 7 ]
| 0 Description = <undefined>
|
+-----[ Speed Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Torque Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Map/Vac Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
+---+-[ Set 8 ]
| 0 Description = <undefined>
|
+-----[ Speed Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Torque Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
|
+-----[ Map/Vac Parameters ]
| 0 P = 0.0
| 1 I = 0.0
| 2 D = 0.0
| 3 Feedback Filter = 5    ( 10 Hz )
| 4 FF = 0.0
+---+-[ Set 9 ]
| 0 Description = <undefined>
|
+-----[ Speed Parameters ]
| 0 P = 0.0

```

```

      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+-----[ Torque Parameters ]
      0 P = 0.0
      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+-----[ Map/Vac Parameters ]
      0 P = 0.0
      1 I = 0.0
      2 D = 0.0
      3 Feedback Filter = 5      ( 10 Hz )
      4 FF = 0.0
+---+[ Programmable Analog Outputs ]
+-----[ Output 1 ]
      0 Source = None
      1 Gain Adjustment = 1.0
      2 Offset Adjustment = 0.0  volts
+-----[ Output 2 ]
      0 Source = None
      1 Gain Adjustment = 1.0
      2 Offset Adjustment = 0.0  volts
+-----[ Output 3 ]
      0 Source = None
      1 Gain Adjustment = 1.0
      2 Offset Adjustment = 0.0  volts
+---+[ Analog Inputs ]
+-----[ Input 1 ]
      0 Offset Adjustment = 0.0  volts
      1 Gain Adjustment = 1.0
      2 Input Filter = None
+-----[ Input 2 ]
      0 Offset Adjustment = 0.0  volts
      1 Gain Adjustment = 1.0
      2 Input Filter = None
+-----[ Chassis Roll ]
      0 Diameter = 48.0
      1 Diameter Units = in
      2 Inertia = 0.0
      3 Inertia Units = slug-ft2
      4  $\beta_0$  Spin Loss Coefficient = 0.0
      5  $\beta_1$  Spin Loss Coefficient = 0.0
      6  $\beta_2$  Spin Loss Coefficient = 0.0

```

```

|       7  $\xi$ x Units = lb-ft, lb-ft/mph, lb-ft/mph2
|       8 Spin Loss Compensation Starting Speed = 1.0
|
| +-----[ Actuator Parameters ]
|       0 P = 7.0
|       1 I = 70.0
|       2 D = 5.0
|       3 Feedback Filter = 3    ( 20 Hz )
|       4 Ramp Rate (non-position modes) = 500.0  % per second
|
| +-----[ By-Wire Control ]
|       0 Command Voltage (100 %) = 10.0  volts
|       1 Command Voltage (0 %) = 0.0  volts
|
| +---+[ Slot 4 - General Purpose I/O ]
|       0 Ignore Master Enable Input = No
|
| +-----[ COMPUTER Port ]
|       0 Baud Rate = 115200
|       1 Connected Device Type = Host Computer
|
| +---+[ Programmable Digital Outputs ]
|
| +-----[ Output 1 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 2 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 3 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 4 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 5 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 6 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 7 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 8 ]
|       0 Source = None
|       1 Invert Polarity = No
|
| +-----[ Output 9 ]

```

```

| | | 0 Source = None
| | | 1 Invert Polarity = No
| | |
| | | +-----[ Output 10 ]
| | | | 0 Source = None
| | | | 1 Invert Polarity = No
| | |
| | | +-----[ Output 11 ]
| | | | 0 Source = None
| | | | 1 Invert Polarity = No
| | |
| | | +-----[ Output 12 ]
| | | | 0 Source = None
| | | | 1 Invert Polarity = No
| | |
| | | +-----[ Output 13 ]
| | | | 0 Source = None
| | | | 1 Invert Polarity = No
| | |
| | | +-----[ Output 14 ]
| | | | 0 Source = None
| | | | 1 Invert Polarity = No
| | |
| | | +-----[ Output 15 ]
| | | | 0 Source = None
| | | | 1 Invert Polarity = No
| | |
| | | +---+-[ Programmable Digital Inputs ]
| | | |
| | | | +-----[ Input 1 ]
| | | | | 0 Function = None
| | | | | 1 Invert Polarity = No
| | | |
| | | | +-----[ Input 2 ]
| | | | | 0 Function = None
| | | | | 1 Invert Polarity = No
| | | |
| | | | +-----[ Input 3 ]
| | | | | 0 Function = None
| | | | | 1 Invert Polarity = No
| | | |
| | | | +-----[ Input 4 ]
| | | | | 0 Function = None
| | | | | 1 Invert Polarity = No
| | | |
| | | | +-----[ Input 5 ]
| | | | | 0 Function = None
| | | | | 1 Invert Polarity = No
| | |
| | | +---+-[ System ]
| | | |
| | | | +---+-[ Faults ]
| | | | |
| | | | | +-----[ IL5 Power Fail ]
| | | | | | 0 Main Action - All Dynos = Dyno OFF
| | | | | | 1 Main Action - All Throttles = RTZ

```

```

| | | 2 ESTOP = Yes
| | | 3 General Fault = Yes
| | | 4 IGNORE (overrides other settings) = No
| | +-----[ Remote PLC Communications Error ]
| | | 0 Main Action - All Dynos = Dyno OFF
| | | 1 Main Action - All Throttles = RTZ
| | | 2 ESTOP = Yes
| | | 3 General Fault = Yes
| | | 4 IGNORE (overrides other settings) = No
| +-----[ Shaft Break Detection ]
| | 0 Status = Off
| | 1 Speed Source 1 (S1) = None
| | 2 Speed Source 2 (S2) = None
| | 3 Normal Speed Ratio (S1/S2) = 1.0
| | 4 Activation Speed = 100.0 RPM
| | 5 Maximum Speed Difference = 5.0 RPM
| +-----[ Security ]
| | 0 Secure Mode = Off
| | 1 Password = *****
| | 2 Secure SETUP ? = Yes (Always)
| | 3 Secure CALIBRATE ? = Yes
| | 4 Secure TUNE ? = Yes
| | 5 Powerup Secure Mode = Off
| +-----[ Hardware ]
| | 0 CPU Type = EPM-CPU-3 (i.e. BobCat board)
| | 1 EPLD Version (Slot 1) (DS606 board) = ???
| | 2 EPLD Version (Slot 2) (DS606 board) = ???
| | 3 EPLD Version (Slot 3) (DS606 board) = ???
| | 4 EPLD Version (Slot 4) (DS605 board) = ???
+-----[ Optional Features ]
| 0 Inertia Simulation = Disabled
| 1 Road Load = Disabled

```

2.0 Error Messages

The Inter-Loc V may return errors in response to operator actions; these errors are referred to as synchronous errors because they are synchronized to a button press or other operator action. The error message text directs the operator towards a solution. The Inter-Loc V may also return asynchronous errors and notifications; these errors may appear at any time. Asynchronous errors are sent when the Inter-Loc V detects an error condition that is not due to an operator action (e.g. hard over-speed fault).

The format of all error messages and notifications is displayed below.

```
(nnn) sss: text.
```

nnn is a 3-digit error code. This code should be used to look up the error in this manual if additional information is needed. This code should also be referenced when contacting Dyne Systems for additional assistance.

sss indicates the source of the error (if any). A list of valid source identifiers is presented in Table 2.1. This field may be blank for some errors.

The **text** field gives a brief single-line explanation of the error. Section 3.0 should be consulted for additional information.

Table 2.1: Error Source Identifiers

sss	Source
D1	Dyno Controller 1
D2	Dyno Controller 2
D3	Dyno Controller 3
T1	Throttle Controller 1
T2	Throttle Controller 2
T3	Throttle Controller 3
GPIO	GPIO Card

3.0 Error Codes

Error codes are logically organized into the groups listed below.

Notification Codes (1 – 29)

The Inter-Loc V returns these codes to one or more connected OCS's when they need to be notified of an event. The OCS usually needs to refresh various displayed values in response to these codes.

Error Code	Text	Description
1	Boot errors exist	Sent to all connected OCS's when the Inter-Loc V is initially powered up and one or more fatal hardware errors have been detected. Each OCS then polls the Inter-Loc V for a detailed list of the boot errors that were detected and displays them to the operator. No controller commands will be accepted until all boot errors have been corrected. The Inter-Loc V must be rebooted to clear out this error condition.
2	IL5 configuration has changed	Sent to all connected OCS's when one of the OCS's has entered setup mode and changed a parameter. Each OCS will refresh the currently displayed page in order for the configuration changes to take effect.
3	EEPROM erase completed	Sent only to the OCS that issued an erase EEPROM command to the Inter-Loc V. This is a factory mode operation that can only be performed at Dyne Systems.
4	Configuration erase completed	Sent only to the OCS that issued an "erase configuration" command to the Inter-Loc V. This is a factory mode operation that can only be performed at Dyne Systems.
5	Configuration save completed	Sent after the "Save" button has been pressed in setup mode and all configuration data has been successfully saved to non-volatile memory. Only sent to the OCS that issued the save command.
6	Ramp rate has changed	Sent to all connected OCS's when the ramp rate of any control variable of any installed controller has changed. Each OCS will refresh the currently displayed ramp rate values (if necessary).
7	<blank line>	This notification code is never displayed since it is a blank line. It is sent to all connected OCS's when the Reset button is pressed in order to clear the message line.
8	Password required	Sent to an OCS that attempts to enter setup mode and secure mode is active. The OCS will then display the "Enter Password" dialog requiring the operator to "log in" before any changes to the current setup can be made.
9 - 19	UNDEFINED	
20	Soft Over-speed occurred	Sent to all connected OCS's to inform the operator that a soft over-speed has occurred for the specified throttle controller.

Error Code	Text	Description
21	RTZ timed out	Sent to all connected OCS's to inform the operator that an actuator Return To Zero (RTZ) operation failed to complete in the required amount of time. The actuator may require some slight tuning modifications, the actuator may be stuck, and/or the throttle cable may be sticking. In general, the actuator should return (and settle) to the 0% position in approximately 0.2 seconds; anything that hinders actuator movement may cause this error during RTZ operations.
22	Soft Shutdown occurred	Sent to all connected OCS's to inform the operator that a soft shutdown state has been entered.
23	At lower limit. Switch to "Manual" setup mode.	During "Local" or "Remote Station" actuator setup modes, the DOWN button can be used to jog the actuator past the existing lower limit. This is allowed only until the actuator reaches the absolute lower limit of the actuator position encoder. This notification message is then displayed. It informs the operator that jogging is no longer allowed and that they should switch to "Manual" setup mode if additional lowering of the lower limit is required.
24	At upper limit. Switch to "Manual" setup mode.	During "Local" or "Remote Station" actuator setup modes, the UP button can be used to jog the actuator past the existing upper limit. This is allowed only until the actuator reaches the absolute upper limit of the actuator position encoder. This notification message is then displayed. It informs the operator that jogging is no longer allowed and that they should switch to "Manual" setup mode if additional raising of the upper limit is required.
25-29	UNDEFINED	

Controller Run-Time Errors (30 – 99)

These errors are usually returned after a button press or operator action that is not permitted at this time.

Error Code	Text	Description
30	ESTOP exits	Mode change and controller enable requests are denied when the Inter-Loc V is currently in an ESTOP state. The ESTOP condition must be cleared before the mode change or enable request will be accepted.
31	General fault exists	Requests to enable a controller are denied when a general fault condition exists. The general fault condition must be cleared before the enable request will be accepted.
32	Controller fault exists	Requests to enable a controller are denied when a controller fault condition exists. The controller fault condition must be cleared before the enable request will be accepted.

Error Code	Text	Description
33	Master enable not asserted	Requests to enable a controller are denied when the Master Enable input is not asserted. The Master Enable input is an input pin on the GENERAL PURPOSE I/O connector. It must be tied to a +24 volt source (directly or via a PLC) for the enable request to be accepted. NOTE: The Master Enable input requirement can be bypassed as explained in Chapter 8 (section 2.0)
34	PAU OK not asserted	Requests to enable a controller are denied when the PAU OK input is not asserted. The PAU OK input is an input pin on the DYNO CONTROL and THROTTLE CONTROL connectors, respectively. It must be tied to a +24 volt source (directly or via a PLC) for the enable request to be accepted.
35	UNDEFINED	
36	Controller NOT in master mode	Many controller commands (e.g. mode changes, enable/disable, etc.) from an OCS are rejected if the controller is not in Master mode. Press the Master/Computer button to return the Inter-Loc V to Master mode, then retry the original command.
37	IL5 in configuration mode	All controller run-time commands are rejected when the Inter-Loc V is in configuration mode. This error occurs when multiple OCS's are connected to the Inter-Loc V and one OCS is currently accessing setup parameters. No run-time commands (e.g. enable/disable) will be accepted from any of the other attached OCS's until setup is exited.
38	IL5 in calibration mode	All controller run-time commands are rejected when the Inter-Loc V is in calibration mode. This error occurs when multiple OCS's are connected to the Inter-Loc V and one OCS is currently calibrating a transducer. No run-time commands (e.g. enable/disable) will be accepted from any of the other attached OCS's until calibration is exited.
39	IL5 in factory setup mode	All controller run-time commands are rejected when the Inter-Loc V is in factory mode. This error occurs when multiple OCS's are connected to the Inter-Loc V and one OCS is currently accessing factory information. No run-time commands (e.g. enable/disable) will be accepted from any of the other attached OCS's until factory mode is exited. NOTE: Factory mode is only available to in-house technicians at Dyne Systems. This error should not occur at a customer site
40	Enabled controllers exist	Some operations are not allowed unless all controllers are disabled. For example, access to Inter-Loc V setup parameters is not allowed when any installed controllers are currently enabled. Other operations such as accessing calibration, changing the dyno shaft selection, etc. will also be rejected and report this error message.
41	IL5 is busy processing a previous command	This error may occur if an operator tries to save setup data to non-volatile memory while a previous save is still in progress. It should rarely occur and is harmless. Simply wait a few seconds and retry the command.

Error Code	Text	Description
42	Setpoint rejected. Controller NOT enabled.	Setpoints are only accepted when a controller is enabled. It makes no sense to accept a setpoint if the controller is disabled since the controller will do a bumpless transfer to a new setpoint when it is first enabled.
43	Not allowed when controller is enabled	Some controller commands are not allowed when the respective controller is enabled. Disable the controller and retry the original command.
44	Actuator RTZ in progress	Throttle controller enable/disable and mode change commands are rejected when the actuator is currently in the process of returning to the zero position. Wait for the RTZ to complete and retry the original command. The RTZ action is probably the result of a fault so the fault may need to be reset before the original command can be retried.
45	Position setup in progress	Throttle controller enable/disable and mode change commands are rejected when another OCS is currently in the process of calibrating the actuator position. Wait until the actuator setup is completed and retry the original command.
46	Actuator ILK not present	Requests to enable a throttle controller are denied when the ILK input is not wired to common. The ILK input is an input pin on the THROTTLE CONTROL connector. The ILK input is typically passed on to the Throttle PAU, then on to the actuator assembly. The ILK to common connection is made in the actuator. This error is most likely caused by a disconnected or broken actuator cable.
47	Mode conflict exists	Occurs in multi-controller configurations when the operator attempts to enable a controller while another controller is already enabled and in the same control mode (e.g. speed or torque). Change the mode of the disabled controller, then try again.
48	Cannot start in torque mode	Occurs in multi-controller configurations when an operator attempts to enable a controller that is currently in torque mode and no active speed controller exists. Change the mode of the selected controller to a safe mode (e.g. to speed or position), and try again. An alternate solution is to first enable one of the other controllers in speed mode, then enable the selected controller in torque mode.
49	No active speed control exists	Occurs in multi-controller configurations in response to mode change requests that would result in an enabled controller running in torque mode with no enabled controller controlling speed.
50	Soft shutdown exists	Requests to enable a controller are denied when a soft shutdown condition exists. The soft shutdown condition must be cleared before the enable request will be accepted.
51	Setpoint rejected: 0 to 100% allowed	Position setpoint values less than 0% or greater than the 100% are not allowed. If a larger range of actuator movement is required, the 0% and/or 100% actuator positions should be redefined by recalibrating the actuator.
52	Negative speed setpoints are not allowed	If the speed control variable is properly configured, the normal direction of rotation should result in positive displayed speed values; thus, negative speed values are not allowed.

Error Code	Text	Description
53	Secure mode enabled: function not allowed	Setup, calibration, and tuning may not be allowed when the Inter-Loc V is in secure mode. Contact the person responsible for security. A password is required to take the Inter-Loc V out of secure mode.
54	Inertia simulation is currently active	The requested command or function cannot be executed because the selected controller is in inertia simulation mode.
55	Road load is currently active	The requested command or function cannot be executed because the selected controller is in road load mode.
56	Speed mode not allowed	Speed mode is not allowed when the selected controller is currently in road load mode.
57	Cell Assistant is NOT the selection source.	A Cell Assistant TestPlan has attempted to change the state of an Inter-Loc V feature, but the selection source for this feature is NOT configured to allow Cell Assistant to make the change. For example, the dynamometer shaft selection (Shaft A or Shaft B) or the dynamometer inertia simulation feature can each be controlled by a running Cell Assistant TestPlan; however, the selection source for each of these items must be set to allow Cell Assistant to make these changes.
58	Torque mode not allowed.	An attempt was made to put a dynamometer controller into torque mode while the inertia simulation feature is enabled. This is not allowed. During inertia simulation, a dynamometer controller is locked in speed mode.
59	Feature NOT enabled.	A Cell Assistant TestPlan attempted to access a special feature (e.g. inertia simulation); however, this optional feature is not enabled. Contact Dyne Systems for information on purchasing and enabling any of the Inter-Loc V special features.
60	Controller is disabled.	A fault occurred which specified a main fault action of "Dyno OFF and Disable". The controller is now disabled and cannot be turned on. A reset must occur to clear the disable condition.
61	Invalid controller pairing selection value	A Cell Assistant TestPlan attempted to override the default "Mode Conflict Controller Pairing" setting (see Chapter 4 (section 1.5)), but it issued an invalid selection code.
62	BSTOP occurred	The dyno controller cannot be enabled after a BSTOP has occurred. Press RESET and then try again to enable the dyno controller.
63	BSTOP in progress	Mode changes are rejected while a dyno controller is executing a BSTOP request. Wait for the BSTOP to complete and try again.
64	Only Remote PLC can request Remote mode	An operator can change a dyno controller from Remote mode to Master mode (at an OCS), but (for safety purposes) only the remote PLC interface can return the dyno controller to Remote mode.
65	Shaft break detection configured incorrectly	Attempts to enable a controller will fail and return this error if shaft break detection is enabled but not correctly configured. Disable shaft break detection and/or correct all configuration errors. See Chapter 4 (section 1.10.1) for more information.

Error Code	Text	Description
66	Restricted to speed mode of operation	When a throttle controller is configured for "by-wire" speed control, no other control modes (e.g. torque or position) are allowed; similarly, when a dyno controller is configured to output a speed command voltage to an external AC or DC drive unit, the dyno controller is restricted to speed mode of operation.
67	Reset is asserted	Requests to enable a controller are denied when the Reset input (pin 35 on the GENERAL PURPOSE I/O connector) is permanently asserted. Since the Reset input is edge-triggered, it should always be de-asserted immediately after it has been asserted.
68 - 76	UNDEFINED	
77	D1 and/or D2 not installed	Differential testing requires two dyno controllers (D1 and D2). If either is missing, all attempts (by an OCS) to generate speed setpoints will be rejected (see Chapter 4 (section 2.15)).
78	D1 and D2 must have the same speed units	Differential testing requires the displayed speed units of both dyno controllers (D1 and D2) be the same; else, all attempts (by an OCS) to generate speed setpoints will be rejected (see Chapter 4 (section 2.15)).
79	Not in speed mode	Differential testing requires both dyno controllers (D1 and D2) be in speed mode; else, all attempts (by an OCS) to generate speed setpoints will be rejected (see Chapter 4 (section 2.15)).
80	Function of F1 key not defined	The F1 key (on an OCS) has been pressed; however, the function of the F1 key has not been defined. See Chapter 2 (section 4.7).
81	F1 key - Mode lock is active	A mode change attempt has been rejected because the controller is mode locked while using an analog reference input. Press the F1 key again (to disable the mode lock) and retry the mode change request.
82	F1 key - Reference source is not analog	An attempt to enable an analog reference input has been rejected because the currently active control variable (e.g. speed, torque, etc.) has NOT been configured to use an analog reference source. Reference sources are described in Chapter 7 (section 6.0).
83	Setpoint ignored - Analog reference in use	Setpoints from an OCS are ignored when the currently active control variable (e.g. speed, torque, etc.) is using an analog reference source. Reference Sources are described in Chapter 7 (section 6.0).
84	Analog reference in use	Various features are disabled when a controller is currently using an analog input as a setpoint reference.
85 - 92	UNDEFINED	
93	Controller is NOT enabled	Coastdown cannot be enabled until the dyno controller is enabled and in road load mode.
94	Speed not sufficiently above upper speed limit	System speed must be 2 mph (or kph) above the upper coastdown speed limit before coastdown can be enabled.
95	Road Load is currently not activated	Coastdown cannot be enabled until the dyno controller is enabled and in road load mode.

Error Code	Text	Description
96	Setpoints not allowed during road load	All dyno setpoint commands are rejected when road load is active since the road load feature automatically generates all force setpoints.
97	Coastdown speed limits are inverted	The specified lower speed limit is greater than or equal to the upper speed limit. This is not allowed. The specified upper speed limit must be greater than the specified lower speed limit.
98	Sine of grade angle must be -1 to +1	The specified value of sin(grade angle) is not valid. Value must be between -1 and +1 (inclusive).
99	1 to 20 Coastdown intervals allowed	The specified number of coastdown intervals is invalid.

Setup Errors (100 – 129)

These errors are displayed when the Inter-Loc V is in setup mode and invalid parameter values are entered.

Error Code	Text	Description
100	Invalid character has been entered	When entering a numeric value, the only allowable characters are '0' through '9', '+', '-', and '.'
101	No value entered	The input value was blank.
102	Negative value not allowed	Negative values are not allowed for many parameters.
103	Max coolant ILK timeout is 15.0 sec.	Allowing a dynamometer to run for more than 15 seconds with no cooling may cause permanent damage to the dynamometer.
104	1.000 < MvV < 4.000	When configuring a load cell, the "Load Cell MvV" parameter must be in the specified range. Load cell sensitivities outside the specified range are not supported.
105	Max Start Delay is 120.0 sec.	The "Loss of Speed Feedback Start Delay (sec)" parameter cannot exceed the specified value. NOTE: Allowing a controller to start with no detectable speed feedback for an extended period of time, may cause permanent damage to one or more parts of the systems.
106	Can't modify READ-only parameter	Some parameters cannot be modified for safety reasons. They are only displayed for information purposes.
107	Zero value not allowed	Zero is NOT a valid value for many parameters (e.g. encoder resolution).
108	0.02 < Speed Ratio < 50.0	When configuring shaft break detection, the normal ratio of the two speed input sources must be in the range of 50:1 to 1:50
109	Must select different speed sources	The same SPEED connector has been selected for both speed sources in the shaft break detection feature. This is not allowed (based on the way shaft break detection has been implemented).
110	This fault cannot be ignored	Some faults (e.g. "Throttle PAU Power Fail") cannot be ignored for safety reasons. This error is generated if an attempt is made to set the "IGNORE" property for non-ignorable fault. This error will also be generated if an attempt is made to cancel all available fault actions for a non-ignorable fault. At least one fault action must be specified.
111	Max PAU ON timeout is 15.0 sec	Entered value must be less than 15.0 seconds.
112	Invalid activation key	While attempting to activate an optional feature (e.g. Inertia Simulation or Road Load), an invalid activation key was entered.
113	Incorrect password	Password entered is not correct. Try again. If the password is lost or forgotten, contact Dyne Systems.
114	Password characters must be digits 0 to 9	Password must be numeric.

Error Code	Text	Description
115	Password length must be 4 to 10 digits	Password must be 4 to 10 digits in length.
116	0.02 < Speed Scaling < 50.0	When configuring a speed input (see Chapter 7 (section 1.0)), the "Speed Scaling" parameter must be in the range of 50:1 to 1:50. Speed scaling is described in Chapter 7 (section 1.6).
117	Max allowable PPR is 4096	The Inter-Loc V does not support speed transducers with a resolution greater than 4096 pulses-per-revolution. Contact DyneSystems if the resolution of your speed transducer exceeds this value.
118 - 129	UNDEFINED	

Calibration Errors (130 – 149)

These errors are displayed when the Inter-Loc V is in calibration mode and invalid parameter values are entered.

Error Code	Text	Description
130	Opposite signs not allowed	When calibrating Map, Vac, or Torque, the polarity of the entered span value is opposite the polarity of the current reading. This is not allowed. If the polarity of the current reading is incorrect, the configuration of the respective control variable should be changed in order to correct the polarity. Do not attempt to correct the polarity by entering span values of opposite sign.
131	Span count must be > 36000	When calibrating the actuator low and high limits, the actuator span count value (i.e. the difference between the encoder count value at 100% and the encoder count value at 0%) must be at least 36,000 counts. If a smaller range of travel is required, slide the throttle cable connection down the actuator arm (i.e. move it closer to the center of the actuator). NOTE: This error only applies to throttle actuators using digital encoder feedback
132	Span count must be < 57000	When calibrating the actuator low and high limits, the actuator span count value (i.e. the difference between the encoder count value at 100% and the encoder count value at 0%) must be less than 57,000 counts. If a larger range of travel is required, slide the throttle cable connection up the actuator arm (i.e. move it away from the center of the actuator). NOTE: This error only applies to throttle actuators using digital encoder feedback.
133	Span voltage must be > 2.0 volts	When calibrating the actuator low and high limits, the span voltage value (i.e. the difference between the position voltage at 100% and the position voltage at 0%) must be greater than 2 volts. NOTE: This error only applies to systems getting their actuator position feedback from a throttle position sensor or an analog actuator position potentiometer.
134	Gain correction truncated to MAX value	While calibrating a transducer, the computed gain correction value is too large and has been reduced to the maximum allowable value. See Chapter 7 (section 2.5.4) for more information.
135	Gain correction truncated to MIN value	While calibrating a transducer, the computed gain correction value is too small and has been increased to the minimum allowable value. See Chapter 7 (section 2.5.4) for more information.
136 - 149	UNDEFINED	

OCS Configuration Errors (150 – 159)

These errors are displayed when there are incorrect cable connections between the Inter-Loc V and one or more OCSs.

Error Code	Text	Description
150	An OCS is connected to the host COMPUTER port	All OCSs must be connected to one of the three OCS connectors on the back of the Inter-Loc V. Do not connect an OCS to the COMPUTER port.
151	Host COMPUTER is connected to an OCS port	A host computer must be connected to the COMPUTER connector on the back of the Inter-Loc V. Connecting a host computer to one of the OCS connectors is not allowed. The UART on the host computer may get damaged because pins 6 and 9 of each OCS connector are part of the hardware ESTOP chain and will present a DC voltage of 24 volts across these pins.
152 - 159	UNDEFINED	

OCS Communications Errors (160 – 169)

These errors are typically due to bad cabling, bad shielding, and/or severe electrical noise.

Error Code	Text	Description
160	Packet checksum error	Command packet is corrupt.
161 - 169	UNDEFINED	

Hardware Configuration Errors (170 – 179)

These errors are boot errors and must be corrected before the Inter-Loc V accepts controller commands.

Error Code	Text	Description
170	UNDEFINED	
171	Controller addressing problem	The Inter-Loc V has detected a controller card that is missing an address jumper and/or an interface cable. Check all installed controllers, repair as needed, and reboot the Inter-Loc V.
172	GPIO card RS-232 UART not found	The UART on the GPIO card (i.e. DS605 board) was not detected. The card is either missing or damaged. Repair and reboot the Inter-Loc V.

Error Code	Text	Description
173	Configuration version newer than firmware	<p>The version number of the Inter-Loc V parameters stored in non-volatile memory is newer than the version number of the program that is stored in non-volatile memory.</p> <p>This error is unique to Inter-Loc V controllers with main CPU boards based on FLASH technology for non-volatile memory storage. All configuration parameters are stored in one of the four FLASH chips. The other three FLASH chips contain the Inter-Loc V software. This error is most likely to occur if someone installs a configuration FLASH chip (created using the latest version of Inter-Loc V software) into an Inter-Loc V that contains older software. This is not allowed. The Inter-Loc V should be returned to Dyne Systems for a software upgrade.</p>
174	EEPROM version newer than firmware	<p>The version number of the Inter-Loc V parameters stored in EEPROM is newer than the version number of the program that is stored in non-volatile memory. This error is most likely to occur if someone installs a new GPIO card (i.e. DS605 board) that was initialized using the latest version of Inter-Loc V software into an Inter-Loc V that contains older software. This is not allowed. The Inter-Loc V should be returned to Dyne Systems for a software upgrade.</p>
175 - 179	UNDEFINED	

Hardware Errors (180 – 199)

These errors are caused by defective or failing hardware.

Error Code	Text	Description
180	Invalid configuration blocks in Flash	<p>The configuration FLASH chip contains an invalid data block. The FLASH part must be replaced and/or erased. The Inter-Loc V should be returned to Dyne Systems for repair.</p>
181	Flash erase failed	<p>A data block in the configuration FLASH chip failed to erase. Press the save button again to see if the erase failure is intermittent. If the problem persists, the Inter-Loc V should be returned to Dyne Systems for repair.</p>
182	Flash write failure	<p>A write error occurred while saving configuration data to FLASH. Press the save button again to see if the write failure is intermittent. If the problem persists, the Inter-Loc V should be returned to Dyne Systems for repair.</p>
183	EEPROM is damaged	<p>The contents of the EEPROM are invalid. The Inter-Loc V will automatically try to erase and re-initialize the EEPROM. All master ramp rate values for all controllers and the currently selected parameter set for all controllers will be reset to factory default values. If the problem persists, the Inter-Loc V should be returned to Dyne Systems for repair.</p>

Error Code	Text	Description
184	EEPROM contents have been initialized	This message is sent as a reminder that the contents of the EEPROM have been initialized. All master ramp rate values for all controllers and the currently selected parameter set for all controllers have been reset to factory default values and need to be re-entered.
185 - 189	UNDEFINED	
190	File open error	Unable to locate the configuration data file in the DiskOnChip™ device. The device may be damaged. Contact Dyne Systems.
191	File write error	A write error occurred while saving configuration data to the DiskOnChip™ device. Press the save button again to see if the write failure is intermittent. If the problem persists, the Inter-Loc V should be returned to Dyne Systems for repair.
192	File read error	A read error occurred while accessing configuration data in the DiskOnChip™ device. Cycle power to the Inter-Loc V to see if the read failure is intermittent. If the problem persists, the Inter-Loc V should be returned to Dyne Systems for repair.
193 - 199	UNDEFINED	

Internal Software Errors (200 – 249)

Internal software errors are generally due to programming errors in the Inter-Loc V. They are also due to programming errors in one of the connected OCS's. They are intended to catch programming errors that occur during product development; they should never occur in the final release of this product.

None of these errors are documented in this manual; instead, Dyne Systems should be contacted if an error code in this range is detected.

4.0 Connector Summary

All connectors on all Inter-Loc V back panel boards are described in this section.

The **Type** column indicates the type and direction of many of the signals. The last column specifies which common (i.e. power supply low-side return path) the specified common signal is connected to. The symbols used (e.g. Pi, Ai, etc.) are schematic references. Schematics are only available to factory personnel.

The following notational conventions are used in the connector pinout lists.

Symbol	Description
n/c	not connected
I	Input
O	Output
I - PLC	PLC-style input (Chapter 14 (section 5.5))
O - PLC	PLC-style output (Chapter 14 (section 5.4))
O - Relay	Dry contact relay output
Pi	Isolated PLC common
Ai	Isolated Analog Common
Di	Isolated Digital Common
De	Encoder Excitation Common

4.1 Dynamometer Controller Back Panel

The pin descriptions of each connector on the back of a dynamometer controller back panel board (DS603 board) are described in the sections that follow.

4.1.1 SPEED

Type: DB-15 female.

Signal	Type	Pin	Description	
Common		1	Encoder Excitation Common	De
Common		9	Encoder Excitation Common	De
+12 volts	O	2	Encoder Excitation (900 ma available for all encoders)	
+12 or +5 volts	O	10	See notes 1 and 2.	
A	I	3	Differential Clock A (+) or Single-ended TTL Clock A	
A*	I	11	Differential Clock A (-)	
B	I	4	Differential Clock B (+) or Single-ended TTL Clock B	
B*	I	12	Differential Clock B (-)	
Index	I	5	Differential Index pulse (+) or Single-ended TTL Index	
Index*	I	13	Differential Index pulse (-)	
MAGPU	I	6	Differential MAG Pickup (+)	
MAGPU*	I	14	Differential MAG Pickup (-)	
MAGPU Shield		7	MAG Pickup shield connection	Ai
Shield		15	Additional shield connection	De
Shield		8	Additional shield connection	De

NOTES:

- 1) Pin 10 provides +12 volts (same as pin 2) on DS603 boards Rev B (or earlier). Pin optionally provides +5 volts on Rev C boards (or later).
- 2) The +5 volt regulator is optionally installed at the factory as needed.

4.1.2 TORQUE

Type: DB-25 male.

Signal	Type	Pin	Description	
IN-	I	1	±50 mV differential load cell input (-)	
IN+	I	14	±50 mV differential load cell input (+)	
Shield		2	Differential load cell input signal shield	Ai
n/c		15		
Amplified Load Cell Signal	O	3	250x differential load cell input	
-EXC/Common		16	Load cell excitation (-)	Ai
+EXC	O	4	+10 volt load cell excitation (+)	
-EXC/Common		17	Load cell excitation (-)	Ai
+EXC	O	5	+10 volt load cell excitation (+)	
SENSE -	I	18	Sense line for +10 volt excitation regulator (-)	
SENSE +	I	6	Sense line for +10 volt excitation regulator (+)	
n/c		19		
n/c		7		
n/c		20		
n/c		8		
Shunt CAL Enable Common		21		Pi
n/c		9		
Shunt CAL Enable Common		22		Pi
External Shunt CAL (-) Enable	O-PLC	10	Enable external shunt calibration resistor (-)	
Shunt CAL Enable Common		23		Pi
External Shunt CAL (+) Enable	O-PLC	11	Enable external shunt calibration resistor (+)	
n/c		24		
Shield		12	Torque sensor input shield	Ai
TS Common		25	Torque sensor common	Ai
TS Input	I	13	±10 volt torque sensor input	

NOTES:

- 1) For 4-wire load cell connections, connect pin 5 to pin 6. Also connect pin 17 to pin 18.
- 2) Connect pin 3 to pin 13 to measure load cell voltages.

4.1.3 ANALOG I/O

Type: DB-15 female (VGA).

Signal	Type	Pin			Description	
Programmable Analog Output 1	O	1			±10 volt output	
Common			6			Ai
Shield				11		Ai
Programmable Analog Output 2	O	2			±10 volt output	
n/c			7			
n/c				12		
Programmable Analog Output 3	O	3			±10 volt output	
Common			8			Ai
Shield				13		Ai
Analog Input 1	I	4			±10 volt input	
+15 volts with 5K series resistor			9		See notes 1 and 2.	
+15 volts with 5K series resistor				14	See notes 1 and 2.	
Analog Input 2	I	5			±10 volt input	
Common			10			Ai
Shield				15		Ai

NOTES:

- 1) Available only on Rev C (or later) of the DS603 board. Pins are n/c on earlier board versions.
- 2) Connect a 10K to 25K potentiometer (to Common) to create a unipolar adjustable voltage that can be used to drive an analog input. Due to the input impedance of each analog input, the maximum voltage available depends on the value of the potentiometer. Several examples are listed below. Analog input functions for dyno controllers are discussed in Chapter 4 (section 2.10).

POT Value	Voltage Range
10K	0 to +9.660 volts
12K	0 to +10.207 volts
15K	0 to +10.819 volts
20K	0 to +11.509 volts
25K	0 to +11.968 volts

4.1.4 DYNO CONTROL

Type: DB-25 female.

Signal	Type	Pin	Description	
Dyno Error Output	O	1	Error signal that controls the dyno	
Dyno Error Common		14		Ai
Shield		2	Error signal shield	Ai
Reset	O-PLC	15		
Dyne ON	O-PLC	3		
ESTOP*	O-PLC	16	From hardware ESTOP circuit	
Dyne ON	O-PLC	4		
Supply Common		17		Pi
Supply Common		5		Pi
Coolant Interlock	I-PLC	18	Delay allowed	
PAU ON	I-PLC	6	Delay allowed	
PAU OK	I-PLC	19	Delay NOT allowed	
Shield		7		Ai
Current Feedback Common		20		Ai
Current Feedback Input	I	8	±10 volt analog input	
Programmable Output 1	O-PLC	21		
Programmable Output 2	O-PLC	9		
Programmable Output 3	O-PLC	22		
Programmable Output 4	O-PLC	10		
Supply Common		23		Pi
+24 volt supply	I	11	1 of 3 pins. At least one must supply power.	
Supply Common		24		Pi
+24 volt supply	I	12	1 of 3 pins. At least one must supply power.	
Supply Common		25		Pi
+24 volt supply	I	13	1 of 3 pins. At least one must supply power.	

4.2 Throttle Controller Back Panel

The pin descriptions of each connector on the back of a throttle controller back panel board (DS604 board) are described in the sections that follow.

4.2.1 SPEED

Type: DB-15 female.

Signal	Type	Pin		Description	
Common		1		Encoder Excitation Common	De
Common			9	Encoder Excitation Common	De
+12 volts	O	2		Encoder Excitation (900 ma available for all encoders)	
+12 or +5 volts	O		10	See notes 1 and 2.	
A	I	3		Differential Clock A (+) or Single-ended TTL Clock A	
A*	I		11	Differential Clock A (-)	
B	I	4		Differential Clock B (+) or Single-ended TTL Clock B	
B*	I		12	Differential Clock B (-)	
Index	I	5		Differential Index pulse (+) or Single-ended TTL Index	
Index*	I		13	Differential Index pulse (-)	
MAGPU	I	6		Differential MAG Pickup (+)	
MAGPU*	I		14	Differential MAG Pickup (-)	
MAGPU Shield		7		MAG Pickup shield connection	Ai
Shield			15	Additional shield connection	De
Shield		8		Additional shield connection	De

NOTES:

- 1) Pin 10 provides +12 volts (same as pin 2) on DS604 boards Rev B (or earlier). Pin optionally provides +5 volts on Rev C boards (or later).
- 2) The +5 volt regulator is optionally installed at the factory as needed.

4.2.2 TORQUE

Type: DB-25 male.

Signal	Type	Pin	Description	
IN-	I	1	±50 mV differential load cell input (-)	
IN+	I	14	±50 mV differential load cell input (+)	
Shield		2	Differential load cell input signal shield	Ai
n/c		15		
Amplified Load Cell Signal	O	3	250x differential load cell input	
-EXC/Common		16	Load cell excitation (-)	Ai
+EXC	O	4	+10 volt load cell excitation (+)	
-EXC/Common		17	Load cell excitation (-)	Ai
+EXC	O	5	+10 volt load cell excitation (+)	
SENSE -	I	18	Sense line for +10 volt excitation regulator (-)	
SENSE +	I	6	Sense line for +10 volt excitation regulator (+)	
n/c		19		
n/c		7		
n/c		20		
n/c		8		
Shunt CAL Enable Common		21		Pi
n/c		9		
Shunt CAL Enable Common		22		Pi
External Shunt CAL (-) Enable	O-PLC	10	Enable external shunt calibration resistor (-)	
Shunt CAL Enable Common		23		Pi
External Shunt CAL (+) Enable	O-PLC	11	Enable external shunt calibration resistor (+)	
n/c		24		
Shield		12	Torque sensor input shield	Ai
TS Common		25	Torque sensor common	Ai
TS Input	I	13	±10 volt torque sensor input	

NOTES:

- 1) For 4-wire load cell connections, connect pin 5 to pin 6. Also connect pin 17 to pin 18.
- 2) Connect pin 3 to pin 13 to measure load cell voltages.

4.2.3 MAP/VAC

Type: DB-9 female.

Signal	Type	Pin	Description	
Vin	I	1	±10 volt Map/Vac sensor input	
Signal Common		6		Ai
Shield		2	Input signal shield	Ai
n/c		7		
n/c		3		
n/c		8		
n/c		4		
Power Common		9		Ai
+15 volts	O	5	Excitation for Map/Vac sensor	

4.2.4 TPS

Type: DB-9 male.

Signal	Type	Pin	Description	
Vin	I	1	±10 volt Throttle Position Sensor input	
Signal Common		6		Ai
Shield		2	Input signal shield	Ai
n/c		7		
n/c		3		
n/c		8		
n/c		4		
Power Common		9		Ai
+10 volts	O	5	Excitation for Throttle Position Sensor	

4.2.5 ANALOG I/O

Type: DB-15 female (VGA).

Signal	Type	Pin			Description	
Programmable Analog Output 1	O	1			±10 volt output	
Common			6			Ai
Shield				11		Ai
Programmable Analog Output 2	O	2			±10 volt output	
n/c			7			
n/c				12		
Programmable Analog Output 3	O	3			±10 volt output	
Common			8			Ai
Shield				13		Ai
n/c		4				
+15 volts with 5K series resistor			9		See notes 1 and 2.	
+15 volts with 5K series resistor				14	See notes 1 and 2.	
n/c		5				
Common			10			Ai
Shield				15		Ai

NOTES:

- 1) Available only on Rev C (or later) of the DS604 board. Pins are n/c on earlier board versions.
- 2) Connect a 10K to 25K potentiometer (to Common) to create a unipolar adjustable voltage that can be used to drive an analog input. Due to the input impedance of each analog input, the maximum voltage available depends on the value of the potentiometer. Several examples are listed below. Analog input functions for throttle controllers are discussed in Chapter 4 (section 3.8).

POT Value	Voltage Range
10K	0 to +9.660 volts
12K	0 to +10.207 volts
15K	0 to +10.819 volts
20K	0 to +11.509 volts
25K	0 to +11.968 volts

4.2.6 THROTTLE CONTROL

Type: DB-37 male.

Signal	Type	Pin	Description	
Error Output	O	1	Error signal that controls actuator motor	
Error Common		20		Ai
Shield		2	Error signal shield	Ai
Reset	O-PLC	21		
ACT ON	O-PLC	3		
ESTOP*	O-PLC	22	From hardware ESTOP circuit	
Common		4		Pi
PFAIL*	I-PLC	23	PFAIL state from Throttle PAU	
Common		5		Pi
PAU OK	I-PLC	24		
+24 volt supply	I	6	1 of 2 pins. At least one must supply power.	
+24 volt supply	I	25	1 of 2 pins. At least one must supply power.	
n/c		7		
n/c		26		
Analog Actuator Input	I	8	Analog actuator position feedback signal	
Analog Actuator Common		27		Ai
Shield		9	Analog actuator feedback shield	Ai
n/c		28		
n/c		10		
Common		29		Pi
Common		11		Pi
Button - Up	I-PLC	30	Remote OCS button input	
Lamp - Lower Limit	O-PLC	12	Remote OCS lamp output	
Button - Down	I-PLC	31	Remote OCS button input	
Lamp - Upper Limit	O-PLC	13	Remote OCS lamp output	
Button - Enter	I-PLC	32	Remote OCS button input	
Lamp - Accept	O-PLC	14	Remote OCS lamp output	
Button - Soft Shutdown	I-PLC	33	Remote OCS button input	
Lamp - Stalled	O-PLC	15	Remote OCS lamp output	
+5 volts	O	34	Actuator encoder excitation.	
Shield		16		De
Common		35		De
ILK	I	17	Actuator encoder interlock input.	
A*	I	36	Actuator encoder clock A (-)	
A	I	18	Actuator encoder clock A (+)	
B*	I	37	Actuator encoder clock B (-)	
B	I	19	Actuator encoder clock B (+)	

4.3 General Purpose I/O Back Panel

The pin descriptions of each connector on the back of the General Purpose I/O back panel board (DS602 board) are described in the sections that follow

4.3.1 COMPUTER

Type: DB-9 female.

Signal	Type	Pin	Description	
n/c		1		
n/c		6		
TX data	O	2	Transmit data output	
CTS	I	7	Clear-To-Send handshaking input	
RX data	I	3	Receive data input	
RTS	O	8	Ready-To-Send output	
n/c		4		
n/c		9		
Ground		5		Di

4.3.2 OCS 1, OCS 2, and OCS 3

Type: DB-9 male.

Signal	Type	Pin	Description	
n/c		1		
ESTOP chain		6		
RX data	I	2	Receive data input	
RTS	O	7	Ready-To-Send output	
TX data	O	3	Transmit data output	
CTS	I	8	Clear-To-Send handshaking input	
n/c		4		
ESTOP chain		9		
Ground		5		Di

4.3.3 24 VAC

Type: 3-pin power connector

Signal	Type	Pin	Description	
24 VAC	I	2	24 vac input	
Ground		1		
24 VAC	I	3	24 vac input	

4.3.4 GENERAL PURPOSE I/O

Type: DB-37 female.

Signal	Type	Pin		Description	
Programmable Output 1	O-PLC	1		Output power from pins 18 and/or 19	
Programmable Output 2	O-PLC		20	" " " " " " " "	
Programmable Output 3	O-PLC	2		" " " " " " " "	
Common			21		Pi
Programmable Output 4	O-PLC	3		Output power from pins 18 and/or 19	
Programmable Output 5	O-PLC		22	" " " " " " " "	
Programmable Output 6	O-PLC	4		" " " " " " " "	
Common			23		Pi
Common		5			Pi
ESTOP*	O-PLC		24	Output power from pins 18 and/or 19	
Programmable Output 7	O-PLC	6		" " " " " " " "	
Common			25		Pi
Programmable Output 8	O-PLC	7		Output power from pins 36 and/or 37	
Programmable Output 9	O-PLC		26	" " " " " " " "	
Programmable Output 10	O-PLC	8		" " " " " " " "	
Programmable Output 11	O-PLC		27	" " " " " " " "	
Common		9			Pi
Programmable Output 12	O-PLC		28	Output power from pins 36 and/or 37	
Programmable Output 13	O-PLC	10		" " " " " " " "	
Programmable Output 14	O-PLC		29	" " " " " " " "	
Programmable Output 15	O-PLC	11		" " " " " " " "	
Common			30		Pi
Common		12			Pi
Programmable Input 1	I-PLC		31		
Programmable Input 2	I-PLC	13			
Programmable Input 3	I-PLC		32		
Programmable Input 4	I-PLC	14			
Programmable Input 5	I-PLC		33		
Power Common		15			Pi
Power Common			34		Pi
Master Enable	I-PLC	16			
Reset	I-PLC		35	External reset input	
ESTOP*	I-PLC	17		External ESTOP command input	
+24 volt supply #1	I		36	1 of 2 pins. At least one must supply power.	
+24 volt supply #2	I	18		1 of 2 pins. At least one must supply power.	
+24 volt supply #1	I		37	1 of 2 pins. At least one must supply power.	
+24 volt supply #2	I	19		1 of 2 pins. At least one must supply power.	

4.4 Digital Control Back Panel

The pin descriptions of each connector on the back of the Digital Control back panel board (DS607 board) are described in the sections that follow. The functions of each input and output (as a complete set) are configurable based on the type of device providing the digital control. The Digital Control feature is described in Chapter 13.

Note: The Digital Control feature is a purchased option; therefore, this board is NOT installed in a typical Inter-Loc V.

4.4.1 DIGITAL CONTROL

Type: DB-25 male.

Signal	Type	Pin	Description
Input 1 (+)	I-PLC	1	
Input 2 (+)	I-PLC	14	Function of Inputs 1 - 8 are configurable (as a set)
Input 3 (+)	I-PLC	2	as described in Chapter 13.
Input 4 (+)	I-PLC	15	Pins 5, 6, and 18 provide a COMMON for all inputs.
Input 5 (+)	I-PLC	3	
Input 6 (+)	I-PLC	16	
Input 7 (+)	I-PLC	4	
Input 8 (+)	I-PLC	17	
Input Common (-)		5	Common for all inputs.
Input Common (-)		18	" " " "
Input Common (-)		6	" " " "
Loopback - IN		19	Loopback for "cable off" detection by host.
Loopback - OUT		7	Loopback for "cable off" detection by host.
Output 1	O-Relay	20	
Output 2	O-Relay	8	Function of Outputs 1 - 8 are configurable (as a set)
Output 3	O-Relay	21	as described in Chapter 13.
Output 4	O-Relay	9	Outputs are dry contact relay outputs.
Output 5	O-Relay	22	Pins 13 and 25 provide a COMMON for all outputs.
Output 6	O-Relay	10	
Output 7	O-Relay	23	
Output 8	O-Relay	11	
n/c		24	
n/c		12	
Output Common		25	Common for all relay outputs.
Output Common		13	" " " " "

5.0 Electrical Specifications

5.1 Input Power

The Inter-Loc V requires 24 VAC. An appropriate step-down transformer is provided with the unit at the time of purchase. The nominal input voltage to this transformer is 115 VAC. The allowable input voltage range is 110 to 120 VAC.

5.2 Analog Inputs

Each controller has four analog ± 10 volt inputs. All have dedicated functions or are reserved for future applications.

5.3 Analog Outputs

Each controller (dyno or throttle) has four analog ± 10 volt outputs. One output provides the controller error signal. The other three are available on the ANALOG I/O connector of each controller; the function of these three analog outputs is programmable (see Chapter 4 (section 1.8)).

5.4 PLC-Style Digital Outputs

All digital outputs on all connectors are +24 vdc sourcing PLC-style outputs. A schematic diagram of the PLC output circuit is shown in section 9.0. Each individual output can source up to 1A.

All PLC outputs are fused in groups of 7 or 8 outputs per fuse; thus, the total output current for each group of outputs is further limited by the value of the fuse. The total available current for all PLC outputs on the DYNO CONTROL connector is limited by the value of F1 (see Chapter 4 (section 2.20)). The total available current for all PLC outputs on the THROTTLE CONTROL connector is limited by the value of F1 (see Chapter 4 (section 3.13)).

The PLC outputs on the GENERAL PURPOSE I/O connector exist as two groups. The total available current for all PLC outputs in each group is limited by the values of F1 and F2 respectively (see Chapter 8 (section 10.0)).

5.5 PLC-Style Digital Inputs

All digital inputs on all connectors are sinking PLC-style inputs. A schematic diagram of the PLC input is shown in section 9.0. A logic 1 input requires $V_{in} > +12$ volts; conversely, a logic 0 input requires $V_{in} < 5$ volts.

5.6 Transducer Excitation

Transducer	Connector	Voltage (VDC)	Notes
Encoder	SPEED	+12	0.9 amps available for all encoders
Load Cell	TORQUE	+10	
MAP/VAC Sensor	MAP/VAC	+15	Throttle controller only
TPS Sensor	TPS	+10	Throttle controller only

6.0 Version Tracking

The Inter-Loc V and the Operator Control Station (OCS) provide several hardware and software components that contain version numbers. These version numbers are critical to the tracking of software fixes, hardware modifications, addition of new features, etc. This section provides information on how to view these numbers in the event they are requested of the customer by Dyne Systems service personnel.

6.1 Main Inter-Loc V Firmware

The version number of the Inter-Loc V firmware is located in the root folder of the property tree.

Path: \\Inter-Loc V\

ID	Parameter	Values
0	Firmware Version	x.xxx

6.2 Operator Control Station (OCS) Firmware

The version number of the OCS firmware is displayed on the Inter-Loc V OCS setup page as described in Chapter 2 (section 3.2.1).

6.3 Hardware Information

Information regarding various Inter-Loc V hardware components is listed in the following folder. This information is mainly used by DyneSystems service technicians.

Path: \\Inter-Loc V\System\Hardware\

ID	Parameter	Values
0	CPU Type	See section 6.3.1.
1	EPLD Version (Slot 1) (DS606 board)	See section 6.3.2.
2	EPLD Version (Slot 2) (DS606 board)	See section 6.3.2.
3	EPLD Version (Slot 3) (DS606 board)	See section 6.3.2.
4	EPLD Version (Slot 4) (DS605 board)	See section 6.3.2.

6.3.1 CPU Type

To date, several types of main CPU boards have been used in the Inter-Loc V. The CPU type determines the software update method and the format of the required data file whenever the Inter-Loc V firmware requires upgrading (usually in the field). This parameter simplifies the determination of the CPU type (i.e. the Inter-Loc V does not need to be removed and/or opened).

6.3.2 Electronically Programmable Logic Devices

The hardware circuitry for each controller and the GPIO board contain several Electronically Programmable Logic Devices (EPLD's). The hardware version of these devices is located in the "Hardware" folder shown previously in section 6.3.

If the specified board does not exist, the version number will display "Not installed". Earlier versions of the circuit boards did not contain version information; in this case, the version number will display "????". Finally, if the circuit board is installed and the EPLD does contain version information, the version number (i.e. an integer number) will be displayed.

7.0 Constants and Conversions

The following constants and conversion factors are used in the Inter-Loc V software.

7.1 Constants

Value	Units	Description
9.80665	m / sec ²	Gravitational acceleration (metric)
32.17404856	ft / sec ²	Gravitational acceleration
3.14159265		PI

7.2 Conversion Factors

Value	Units	Type
12	in / ft	length
5280	ft / mi	length
2.54	cm / in	length
25.4	mm / in	length
1.609344	km / mi	length
60	sec / min	time
60	min / hr	time
16	oz / lb	weight or force
0.22480894	lb / N	weight or force
0.73756214	lb-ft / N-m	torque
14.59390205	kg / slug	mass
1.355817866	kg-m ² / slug-ft ²	rotational inertia
32.17404856	lb-ft ² / slug-ft ² (i.e. G)	rotational inertia
0.145038	kpa / psi	pressure
0.491159	in-Hg / psi	pressure
0.0193368	mm-Hg / psi	pressure

8.0 Acronyms

Acronym	Definition
A/D	Analog-to-Digital Converter
BSTOP	Brake Stop
CV	Control Variable
D/A	Digital-to-Analog Converter
EC	Eddy-Current
EC PAU	Eddy-Current Power Amplifier Unit
ESTOP	Emergency Stop
GPIO	General Purpose Input/Output
ILK	Interlock
LOSF	Loss of Speed Feedback
LPF	Low Pass Filter
MAG PU	Magnetic Pickup
MAP	Manifold Absolute Pressure
OCS	Operator Control Station
PAU	Power Amplifier Unit
PID	Proportional – Integral – Derivative
PLC	Programmable Logic Controller
PPR	Pulses-Per-Revolution
RTZ	Return to Zero
THR PAU	Throttle Power Amplifier Unit
TPS	Throttle Position Sensor
VAC	Vacuum

9.0 Figures, Drawings, and Schematics

The following A-size (8½ x 11 in) drawings are included at the end of this manual (printed version only) or in the file IL5_Drawings_SizeA.pdf (included on CD).

Drawing No.	Description
DWG-ILV-MAN-001	Encoder – Single Ended
DWG-ILV-MAN-002	Encoder – Differential
DWG-ILV-MAN-003	Magnetic Pickup
DWG-ILV-MAN-050	Load Cell – 4 Wire
DWG-ILV-MAN-051	Load Cell – 6 Wire
DWG-ILV-MAN-052	Torque Sensor
DWG-ILV-MAN-100	MAP or VAC Sensor
DWG-ILV-MAN-101	TPS Sensor
DWG-ILV-MAN-102	Analog Actuator Position Feedback (NOT INCLUDED at this time)
DWG-ILV-MAN-250	Inter-Loc V to OCS Serial Cable
DWG-ILV-MAN-251	Inter-Loc V to Host Computer Serial Cable
DWG-ILV-MAN-252	Inter-Loc V to Remote PLC Serial Cable
DWG-ILV-MAN-260	PLC Output Schematic
DWG-ILV-MAN-261	PLC Input Schematic

The following B-size (11 x 17 in) drawings are included at the end of this manual (printed version only) or in the file IL5_Drawings_SizeB.pdf (included on CD).

Drawing No.	Description
DWG-ILV-MAN-300	Dynamometer Controller Block Diagram
DWG-ILV-MAN-301	Throttle Controller Block Diagram
DWG-ILV-MAN-302	Throttle "By-Wire" Position Control Block Diagram (ECM)
DWG-ILV-MAN-303	Throttle "By-Wire" Speed Control Block Diagram (ECM)
DWG-ILV-MAN-304	Throttle "By-Wire" Speed Control Block Diagram (Motor)
DWG-ILV-MAN-310	Dyno Error Signals
DWG-ILV-MAN-400	Actuator Mechanical Mounting (sheet 1 of 2)
DWG-ILV-MAN-401	Actuator Mechanical Mounting (sheet 2 of 2)

