REPORT MOCKUP

Acceptance Test Data Sheets

For

Skyryse Flight OS LEMA TPX 325

|  |  |
| --- | --- |
| LEMA Assembly Part Number | Serial Number |
|  | 12 |

6.1. **Visual Examination of the Product**

UUT conforms to the requirements of paragraph 6.1 Unhandled Type: Void

6.2 **Weight**

UUT weight should not exceed 10 lbs actual weight Unhandled Type: Void lbs

**6.3 Bonding**

Bonding resistance

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Expected** | **Tolerance** | **Simplex** | **Duplex** |
|  | (mOhms) | (mOhms) | (mOhms) | (mOhms) |
| Motor End Cap | 2.5 mOhms | 0.5 mOhms | 0 mOhms | 0 mOhms |
| Solenoid housing | 2.5 mOhms | 0.5 mOhms | 0 mOhms | 0 mOhms |
| Encoder cover | 2.5 mOhms | 0.5 mOhms | 0 mOhms | 0 mOhms |

6.4 Resistance and Inductance Test (motor and solenoid)

**Resistances:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Expected** | **Tolerance** | **Connector J1** | **Connector J2** | **Connector J3** |
| Pins | Resistance (Ohms) | Resistance (Ohms) | Resistance (Ohms) | Resistance (Ohms) | Resistance (Ohms) |
| E to F | 0.212 mOhms | 0.0212 mOhms | 0 mOhms | 0 mOhms | 0 mOhms |
| F to G | 0.212 mOhms | 0.0212 mOhms | 0 mOhms | 0 mOhms | 0 mOhms |
| G to E | 0.212 mOhms | 0.0212 mOhms | 0 mOhms | 0 mOhms | 0 mOhms |
| A to L | 6.55 mOhms | 0.44 mOhms | 0 mOhms | 0 mOhms | 0 mOhms |
| G,F,E,A,L tied together to chassis grounds. Apply 500VDC | 5E+6 mOhms | 0 mOhms | 0 mOhms | 0 mOhms | 0 mOhms |

**Inductances:**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Expected** | **Tolerance** | **Connector J1** | **Connector J2** | **Connector J3** |
|  |  |  | Inductance(mH) | Inductance(mH) | Inductance(mH) |
| E to F | 0.155 mH | 0.02325 mH | 0 mH | 0 mH | 0 mH |
| F to | 0.155 mH | 0.02325 mH | 0 mH | 0 mH | 0 mH |
| G to E | 0.155 mH | 0.02325 mH | 0 mH | 0 mH | 0 mH |
| A to L | 22 mH | 3.3 mH | 0 mH | 0 mH | 0 mH |

6.5 **Power ON UUT Checks**

Confirm all sensors are reporting nominal values and no faults reported

|  |  |  |
| --- | --- | --- |
| Sensor | Value | Pass/Fail |
| Motor 1 | 0 | Pass |
| Motor 2 | 0 | Pass |
| Motor 3 | 0 | Pass |
| M1 | -207 | Failed |
| M2 | -288 | Failed |
| M3 | -383 | Failed |
| Faults 1 | 0 | Failed |
| Faults 2 | 0 | Failed |
| Faults 3 | 0 | Failed |

6.7 **Functional Check Out**

6.7.1 **MCE1, MCE 2, MCE3 Power Up**

|  |  |  |  |
| --- | --- | --- | --- |
| Description | Ballnut position | Pass/Fail | |
| MCE 1 reports values for Ballnut position and motor current | 0 | Ballnut Position | Current |
| Pass | Unhandled Type: Void |
| (Simulated) FCC/reports values for M1(QPS) | -207 | Failed | Unhandled Type: Void |
| MCE 2 reports values for Ballnut position and motor current | 0 | Pass | Unhandled Type: Void |
| (Simulated) FCC/reports values for M2(QPS) | -288 | Failed | Unhandled Type: Void |
| MCE 3 reports values for Ballnut position and motor current | 0.0021 | Pass | Unhandled Type: Void |
| (Simulated) FCC/reports values for M3(QPS) | -383 | Failed | Unhandled Type: Void |

6.7.2 **N1 and N2 Extend Mechanical Stops and MCE Rigging**

**Step 6.7.2.1** **Extend using M1/N1**

|  |  |  |
| --- | --- | --- |
| Description | Value | Pass/Fail |
| N1 extend stop engaged (M1 current saturated) | 0 | Failed |
| MCE 1 Motor Current 4.5 +/- 0.15 Amps | 6.0113 Amps | Failed |
| Linear Encoder Value | 0.0275 | Pass |
| N1 is Rigged | 0 | Pass |

**Step 6.7.2.2** **Extend using M2/N2**

|  |  |  |
| --- | --- | --- |
| Description | Value | Pass/Fail |
| N2 extend stop engaged (M2 current saturated) | 0 | Failed |
| MCE2 Motor Current 4.5 +/- 0.15 Amps | 5.9905 Amps | Failed |
| Linear Encoder Value | -0.0362 | Pass |
| N2 (Motor 2) is Rigged | Unhandled Type: Void | Unhandled Type: Void |
| N2 (Motor 3) is Rigged | 0 | Pass |

6.7.3 **N1 and N2 Stroke Check**

|  |  |  |  |
| --- | --- | --- | --- |
| Description | Actual Value N1 | Actual Value N2 | Pass/Fail |
| N1 and N2 at NULL |  |  |  |
| Pin to pin Length is 16.732 +/- TBD (ins) (c) | Pin to Pin Length | |  |
|  | |  |
| N2 at -0.575 ins from Null N1 at +1.725 ins from Null (using M2 and M1 motor) (e f) |  |  |  |
| N1 and N2 at NULL (using M1 and M2 motor) (g h) |  |  |  |
| N1 at -0.575 ins from Null N2 at +1.725 ins from NULL (using M1 and M2 motor) (I J) |  |  |  |
| N2 at Null (using M2 Motor) (K) |  |  |  |
| N2 at +1.725 from Null (using M3 motor) (r) |  |  |  |
| N2 at Null (using M3 motor) (S) |  |  |  |
| N1 at NULL and N2 at -0.575 ins (using M1 and M3 motors) (V W) |  |  |  |
| N1 and N2 at NULL (using M3 Motor) (x) |  |  |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Description | Expected | Tolerance | Motor 1 | Motor 2 | Motor 3 |
| Constant Velocity Extend | 0.2 |  | Unhandled Type: Void | 0.2006 | 0.199 |
| Constant Velocity Retract | -0.2 |  | Unhandled Type: Void | -0.2001 | -0.2009 |
| Delta between Motor Position and M position is less than +/- TDB |  |  |  |  |  |
| Standard Deviation | 0.2 |  |  |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Description | Expected Difference from Test rig encoder | Tolerance | Difference from Test rig encoder | Pass/Fail |
| Motor1 position + Motor 2 position = test rig truth encoder |  |  | Unhandled Type: Void | Unhandled Type: Void |
| Motor1 position + Motor 3 position = test rig truth encoder |  |  | Unhandled Type: Void | Unhandled Type: Void |
| M1 position + M2 position = test truth rig encoder |  |  | Unhandled Type: Void | Unhandled Type: Void |
| M1 position + M3 position = test truth rig encoder |  |  | Unhandled Type: Void | Unhandled Type: Void |
| Difference between Motor 2 position and Motor 3 position is < 0.01 ins |  |  | Unhandled Type: Void | <RESULTS> |
| Difference between M2 position and M3 position is < 0.01 ins |  |  | Unhandled Type: Void | Unhandled Type: Void |
| Difference between Motor 1 position and M1 position is < 0.01 ins |  |  | Unhandled Type: Void | Unhandled Type: Void |
| Difference between Motor 2 position and M2 position is < 0.01 ins |  |  | Unhandled Type: Void | Unhandled Type: Void |
| Difference between Motor 3 position and M3 position is < 0.01 ins |  |  | Unhandled Type: Void | Unhandled Type: Void |

**6.7.4 Brake Release Test**

**Step d –** LEMA reaches commanded position

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Description | Expected | Tolerance | Position | Pass/Fail |
| MCE1 /Motor 1 +/- TDB inches |  |  | <RESULTS> | <RESULTS> |
| MCE2 /Motor 2 |  |  | <RESULTS> | <RESULTS> |

**6.7.5 Performance Test – unloaded operation (one channel operation)**

**6.7.5.1.1 MCE 1 - Step Response Test**

**The result for motor one is shown below:**

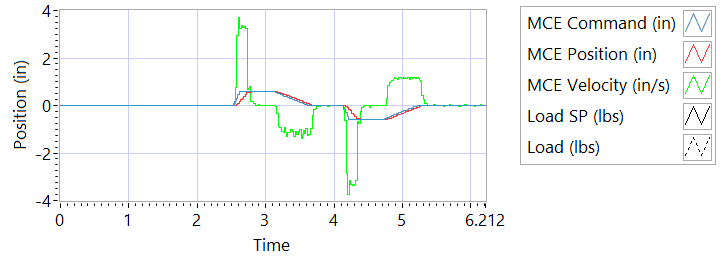
****

Figure - Results for Motor One

**Step d Extension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed / Time | Pass/Fail |
| No Load speed is 2.7 to 3.3 in/sec | 3.0142 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170+9/-9 ms seconds | 184 | Unhandled Type: Void |

**Step e Retraction**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed / Time | Pass/Fail |
| No Load speed is 2.7 to 3.3 in/sec | -0.0033 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170+9/-9 ms seconds | 687 | Failed |

**6.7.5.1.2 MCE 1 - Frequency Response**

**Step d**

**Frequency Response**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 Hz | 175.536 | -5 | True |
| 0.5 Hz | -174.374 | -10 | Failed |
| 1 Hz | 128.099 | -20 | True |
| 2 Hz | 3.57091 | -30 | True |
| 3 Hz | 72.1449 | -50 | True |
| 4 Hz | -134.516 | -60 | Failed |
| 5 Hz | -62.1163 | -70 | True |

6.7.5.2.1 **MCE 2 - Step Response Test**

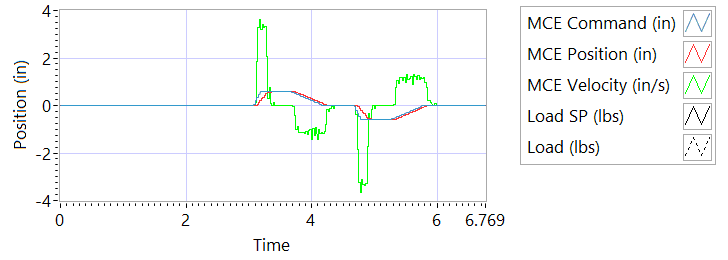
****

Figure - Results for Motor Two

**Step d Extension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed / Time | Pass/Fail |
| No Load speed is 2.7 to 3.3 in/sec | 3.1648 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170+9/-9 ms seconds | 188 | Failed |

**Step e Retraction**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed / Time | Pass/Fail |
| No Load speed is 2.7 to 3.3 in/sec | -0.0064 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170+9/-9 ms seconds | 719 | Failed |

6.7.5.2.2 **MCE 2 - Frequency Response Test**

**Step d**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 Hz | 178.529 | -5 | True |
| 0.5 Hz | -171.523 | -10 | Failed |
| 1 Hz | 136.89 | -20 | True |
| 2 Hz | 34.3418 | -30 | True |
| 3 Hz | 96.0725 | -50 | True |
| 4 Hz | -105.611 | -60 | Failed |
| 5 Hz | -53.6982 | -70 | True |

6.7.5.3.1 **MCE 3 – Step Response Test**

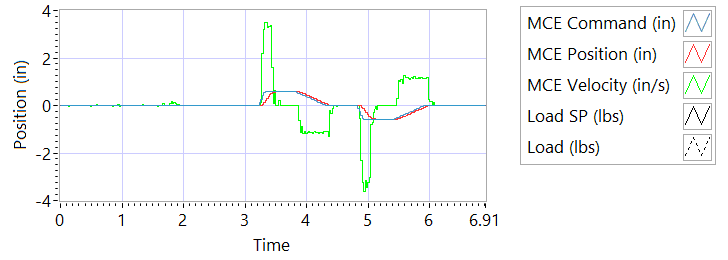
****

Figure - Results for Motor Three

**Step d Extension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed / Time | Pass/Fail |
| No Load speed is 2.7 to 3.3 in/sec | 3.2313 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170+9/-9 ms seconds | 188 | Failed |

**Step e Retraction**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed / Time | Pass/Fail |
| No Load speed is 2.7 to 3.3 in/sec | -0.0082 | Failed |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170+9/-9 ms seconds | 725 | RESULTS |

6.7.5.3.2 **MCE 3 Frequency Response Test**

**Step d**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 Hz | 178.29 | -5 | True |
| 0.5 Hz | -171.547 | -10 | Failed |
| 1 Hz | 136.338 | -20 | True |
| 2 Hz | 15.445 | -30 | True |
| 3 Hz | 112.065 | -50 | True |
| 4 Hz | -178.291 | -60 | Failed |
| 5 Hz | 157.312 | -70 | True |

6.7.6 **Performance Test – Loaded Operation**

**Step j – 225 lbf tension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | 3.2955 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170 +9/-9 ms | 178 | True |

**Step k – 225 lbf tension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | -0.0019 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170 +9/-9 ms | 705 | Failed |

**Step n – 225 lbf compression**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | 3.0499 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170 +9/-9 ms | 185 | Failed |

**Step o – 225 lbf compression**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | -0.0032 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170 +9/-9 ms | 708 | Failed |

6.7.6.1.2 **MCE 1 – Frequency Response Test**

**Step d – 225 lbf Tension**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 HZ | 178.076 | -5 | True |
| 0.5 HZ | -166.24 | -10 | Failed |
| 1 HZ | 136.942 | -20 | True |
| 2 HZ | 119.505 | -30 | True |
| 3 HZ | 97.5694 | -50 | True |
| 4 HZ | -93.2539 | -60 | Failed |
| 5 HZ | -69.1827 | -70 | True |

**Step h – 225 lbf Compression**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 HZ | 170.97 | -5 | True |
| 0.5 HZ | -159.565 | -10 | Failed |
| 1 HZ | 125.939 | -20 | True |
| 2 HZ | 104.171 | -30 | True |
| 3 HZ | 83.6784 | -50 | True |
| 4 HZ | -111.367 | -60 | Failed |
| 5 HZ | -153.586 | -70 | Failed |

6.7.6.1.3 **MCE 2 – Step Response Test**

Chart, line chart

Description automatically generated

Figure 1- Results for Motor Two Loaded

**Step j – 225 lbf tension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | 3.1798 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170 +9/-9 ms | 197 | Failed |

**Step k – 225 lbf tension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | -0.0058 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170 +9/-9 ms | 698 | Failed |

**Step n – 225 lbf compression**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | 2.938 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170 +9/-9 ms | 204 | Failed |

**Step o – 225 lbf compression**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | -0.0019 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170 +9/-9 ms | 681 | Failed |

6.7.6.1.4 **MCE 2 – Frequency response Test**

**Step d – 225 lbf Tension**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 HZ | 178.028 | -5 | True |
| 0.5 HZ | -165.848 | -10 | Failed |
| 1 HZ | 136.815 | -20 | True |
| 2 HZ | 112.7 | -30 | True |
| 3 HZ | -56.3433 | -50 | Failed |
| 4 HZ | -31.7655 | -60 | True |
| 5 HZ | -60.181 | -70 | True |

**Step h – 225 lbf Compression**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 HZ | 168.893 | -5 | True |
| 0.5 HZ | -176.856 | -10 | Failed |
| 1 HZ | 132.687 | -20 | True |
| 2 HZ | 107.796 | -30 | True |
| 3 HZ | 67.2694 | -50 | True |
| 4 HZ | -22.9843 | -60 | True |
| 5 HZ | -152.876 | -70 | Failed |

6.7.6.1.5 **MCE 3 – Step Response Test**

Chart, line chart

Description automatically generated

Figure 2- Results for Motor Three

**Step j – 225 lbf tension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | 3.2019 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170 +9/-9 ms | 174 | True |

**Step k – 225 lbf tension**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | -0.009 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170 +9/-9 ms | 728 | Failed |

**Step n – 225 lbf compression**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | 2.799 | True |
| Time to achieve 80% of the specified stroke (+ 0.575 ins) is 170 +9/-9 ms | 218 | Failed |

**Step o – 225 lbf compression**

|  |  |  |
| --- | --- | --- |
| Description | Actual Speed | Pass/Fail |
| speed between 2.07 and 2.53 in/sec | -0.0034 | Failed |
| Time to achieve 80% of the specified stroke (- 0.575 ins) is 170 +9/-9 ms | 704 | Failed |

6.7.6.1.6 **MCE 3 – Frequency Response Test**

**Step d – 225 lbf Tension**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 HZ | 177.922 | -5 | True |
| 0.5 HZ | -165.641 | -10 | Failed |
| 1 HZ | 140.227 | -20 | True |
| 2 HZ | 103.94 | -30 | True |
| 3 HZ | 91.7217 | -50 | True |
| 4 HZ | -103.205 | -60 | Failed |
| 5 HZ | -48.668 | -70 | True |

**Step h – 225 lbf Compression**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency** | **Phase** | **Max phase** | **Pass/Fail** |
| 0.1 HZ | 168.887 | -5 | True |
| 0.5 HZ | -175.807 | -10 | Failed |
| 1 HZ | 133.607 | -20 | True |
| 2 HZ | 103.458 | -30 | True |
| 3 HZ | 106.159 | -50 | True |
| 4 HZ | -104.091 | -60 | Failed |
| 5 HZ | -110.249 | -70 | Failed |

**6.7.7 Holding Load Test**

6.7.7.1 Brake OFF, LEMA Output Locked

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| MCE | Expected Output force, lbf | Actual Output force, lbf | Output force, Pass/Fail | Position feedback signals (all sensors) Pass/Fail |
| MCE 1, 6.7.8.1.1 step i – extend 0.2 in |  | FORCE | RESULTS | RESULTS |
| MCE 1, 6.7.8.1.1 step k - retract 0.2 in |  | FORCE | RESULTS | RESULTS |
| MCE 2, m step i – extend 0.2 in |  | FORCE | RESULTS | RESULTS |
| MCE 2, m step k - retract 0.2 in |  | FORCE | RESULTS | RESULTS |
| MCE 3 m step i – extend 0.2 in |  | FORCE | RESULTS | RESULTS |
| MCE 3 m step k - retract 0.2 in |  | FORCE | RESULTS | RESULTS |

**6.7.7.2 Brake ON, LEMA Output Free**

|  |  |  |
| --- | --- | --- |
| MCE | 12.6 +/- TBD Amps for 3-5 sec | Position feedback signals (all sensors) |
| MCE 1, 6.7.8.2.1 step I – extend 0.2 in | RESULTS | RESULTS |
| MCE 1, 6.7.8.2.1 step k - retract 0.2 in | RESULTS | RESULTS |
| MCE 2, 6.7.8.2.2 6.7.8.2.3 step i – extend 0.2 in | RESULTS | RESULTS |
| MCE 2, m step k - retract 0.2 in | RESULTS | RESULTS |
| MCE 3 m step i– extend 0.2 in | RESULTS | RESULTS |
| MCE 3 m step k - retract 0.2 in | RESULTS | RESULTS |

**6.7.7.3 Brake Release test**

**Step d –** LEMA reaches commanded position

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Expected | Tolerance | Actual Position | Pass/Fail |
| MCE1 /Motor 1 |  |  |  | RESULTS |
| MCE2 /Motor 2 |  |  |  | RESULTS |

6.7.8 **Backlash**

6.7.8.1 **Simplex Brake 1 – ON; Duplex brake 2 – OFF**

|  |  |  |
| --- | --- | --- |
| Load (lbf) | Backlash (ins) | Pass/Fail |
| Step e +/- 100 lbf (motor 2 and motor 3 ZERO position) | INCHES | RESULTS |
| Step h, Total backlash | INCHES | RESULTS |
| Step f 322 lbf tension followed by 322 lbf compression | INCHES | RESULTS |
| All channels feedback signals (Motor 1, Motor 2, Motor 3, M1, M2 and M3 remain within allowable limits | INCHES | RESULTS |

6.7.8.2 **Simplex Brake 1 – OFF; Duplex Brake 2 – ON**

|  |  |  |
| --- | --- | --- |
| Load (lbf) | Backlash (ins) | Pass/Fail |
| Step e +/- 100 lbf (motor 1 holding ZERO position) | INCHES | RESULTS |
| Step h, Total backlash | INCHES | RESULTS |
| Step f, 322 lbf tension followed by 322 lbf compression | INCHES | RESULTS |
| All channels feedback signals (Motor 1, Motor 2, Motor 3, M1, M2 and M3 remain within allowable limits | INCHES | RESULTS |

6.7.8.3 **Both Brakes OFF**

|  |  |  |
| --- | --- | --- |
| Load (lbf) | Backlash (ins) | Pass/Fail |
| Step e +/- 100 lbf (both motors holding ZERO position) | INCHES | RESULTS |
| Step h, Total backlash | INCHES | RESULTS |
| Step f 322 lbf tension followed by 322 lbf compression | INCHES | RESULTS |
| All channels feedback signals (Motor 1, Motor 2, Motor 3, M1, M2 and M3 remain within allowable limits | INCHES | RESULTS |