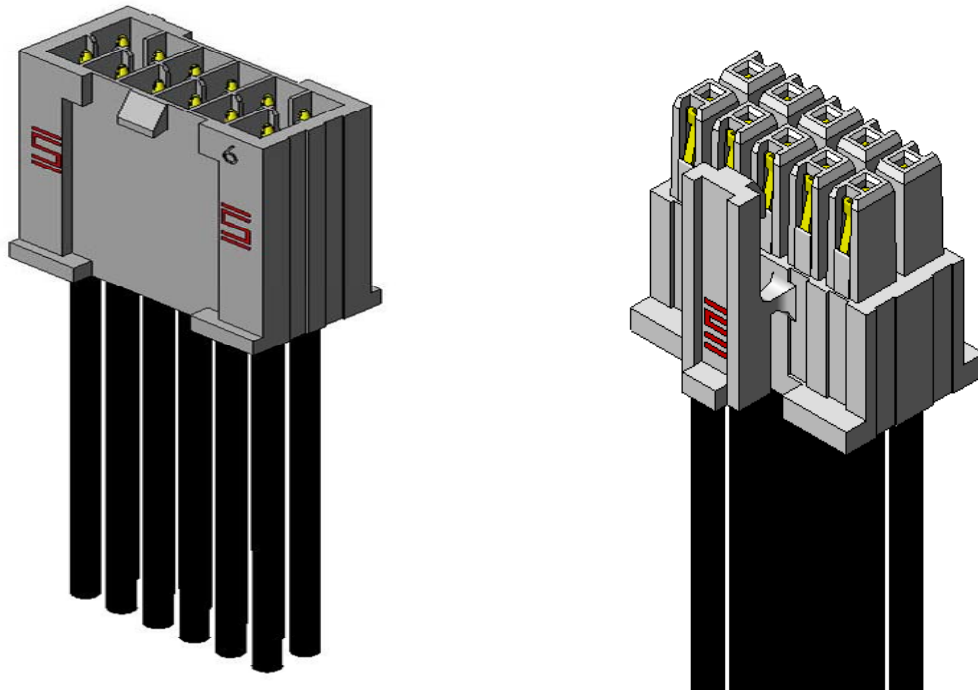




Project Number: Mating / Unmating Test Report		Tracking Code: TC1007—3189_Report_Rev_1	
Requested by: Erin Wright		Date: 6/4/2010	Product Rev: 3
Part #: MMSD-XX-20-S-06.00-S MMTD-XX-20-S-06.00-S		Lot #: 0	Tech: Roger Morris Tony Wagoner John Shearer Eng: Eric Mings
Part description: .100 Socket / Terminal Discrete Cable Assembly			Qty to test: 36
Test Start: 2/16/2010		Test Completed: 4/7/2010	



Mating / Unmating Test Report

Part Description:

MMTD-02-20-S-06.00-S / MMSD-02-20-S-06.00-S
MMTD-13-20-S-06.00-S / MMSD-13-20-S-06.00-S
MMTD-25-20-S-06.00-S / MMSD-25-20-S-06.00-S

CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to ISO 10012-1 and ANSI/NCSL 2540-1, as applicable.

All contents contained herein are the property of Samtec. No portion of this report, in part or in full shall be reproduced without prior written approval of Samtec.

SCOPE

To perform the following tests: Mating / Unmating, please see attached test plan

APPLICABLE DOCUMENTS

Standards: EIA Publication 364

TEST SAMPLES AND PREPARATION

- 1) All materials were manufactured in accordance with the applicable product specification.
- 2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
- 3) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
- 4) The automated procedure is used with aqueous compatible soldering materials.
- 5) Any additional preparation will be noted in the individual test sequences.

FLOWCHARTS**Mating/Unmating/Gaps**

TEST	GROUP A	GROUP B	GROUP C
STEP	10 Pieces MMTD-02-20-S-06.00-S & MMSD-02-20-S-06.00-S	10 Pieces MMTD-13-20-S-06.00-S & MMSD-13-20-S-06.00-S	10 Pieces MMTD-25-20-S-06.00-S & MMSD-25-20-S-06.00-S
01	Contact Gaps	Contact Gaps	Contact Gaps
02	25 Cycles	25 Cycles	25 Cycles
03	Clean w/Compressed Air	Clean w/Compressed Air	Clean w/Compressed Air
04	25 Cycles (50 Total)	25 Cycles (50 Total)	25 Cycles (50 Total)
05	Clean w/Compressed Air	Clean w/Compressed Air	Clean w/Compressed Air
06	25 Cycles (75 Total)	25 Cycles (75 Total)	25 Cycles (75 Total)
07	Clean w/Compressed Air	Clean w/Compressed Air	Clean w/Compressed Air
08	25 Cycles (100 Total)	25 Cycles (100 Total)	25 Cycles (100 Total)
09	Clean w/Compressed Air	Clean w/Compressed Air	Clean w/Compressed Air
10	Contact Gaps	Contact Gaps	Contact Gaps
11	Thermal Aging (Mated)	Thermal Aging (Mated)	Thermal Aging (Mated)
12	Contact Gaps	Contact Gaps	Contact Gaps
13	Cyclic Humidity (Mated)	Cyclic Humidity (Mated)	Cyclic Humidity (Mated)
14	Contact Gaps	Contact Gaps	Contact Gaps

Thermal A Time Condition 'B' (250 hours)

Humidity - and Method III (+25 °C to +65 °C @ 90%RH to 98% RH)

ambient pre-condition and delete steps 7a and 7b

Mating/Un-Mating Forces = EIA-364-13

Contact Gaps/Height - No standard method. Usually measured optically

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL:

- 1) EIA-364-17, *Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors*.
- 2) Test Condition 4 at 105° C.
- 3) Test Time Condition B for 250 hours.
- 4) All test samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

HUMIDITY:

- 1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors*.
- 2) Test Condition B, 240 Hours.
- 3) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
- 4) All samples are pre-conditioned at ambient.
- 5) All test samples are exposed to environmental stressing in the mated condition.

CONTACT GAPS:

- 1) Gaps above the surrounding plastic surface were measured before and after stressing the contacts (e.g. thermal aging, mechanical cycling, etc.).
- 2) Typically, all contacts on the connector are measured.

MATING/UNMATING:

- 1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
- 2) The full insertion position was to within 0.003” to 0.004” of the plug bottoming out in the receptacle to prevent damage to the system under test.
- 3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

RESULTS

Contact Gaps

2 positions

- **Initial**
 - **Min**-----**0.0160 in**
 - **Max**-----**0.0174 in**
- **After 100 Cycles**
 - **Min**-----**0.0151 in**
 - **Max**-----**0.0179 in**
- **Thermal**
 - **Min**-----**0.0165 in**
 - **Max**-----**0.0197 in**

13 positions

- **Initial**
 - **Min**-----**0.0151 in**
 - **Max**-----**0.0178 in**
- **After 100 Cycles**
 - **Min**-----**0.0149 in**
 - **Max**-----**0.0180 in**
- **Thermal**
 - **Min**-----**0.0152 in**
 - **Max**-----**0.0225 in**
 -

25 positions

- **Initial**
 - **Min**-----**0.0146 in**
 - **Max**-----**0.0180 in**
- **After 100 Cycles**
 - **Min**-----**0.0152 in**
 - **Max**-----**0.0202 in**
- **Thermal**
 - **Min**-----**0.0169 in**
 - **Max**-----**0.0221 in**

Mating – Unmating Forces

2 positions

- **Initial**
 - **Mating**
 - **Min**-----0.31 Lbs
 - **Max**-----0.79 Lbs
 - **Unmating**
 - **Min**-----0.15 Lbs
 - **Max**-----0.30 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min**-----0.34 Lbs
 - **Max**-----0.83 Lbs
 - **Unmating**
 - **Min**-----0.14 Lbs
 - **Max**-----0.32 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min**-----0.33 Lbs
 - **Max**-----0.80 Lbs
 - **Unmating**
 - **Min**-----0.15 Lbs
 - **Max**-----0.31 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min**-----0.32 Lbs
 - **Max**-----0.78 Lbs
 - **Unmating**
 - **Min**-----0.15 Lbs
 - **Max**-----0.30 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min**-----0.34 Lbs
 - **Max**-----0.78 Lbs
 - **Unmating**
 - **Min**-----0.14 Lbs
 - **Max**-----0.29 Lbs
- **Thermal**
 - **Mating**
 - **Min**-----0.21 Lbs
 - **Max**-----0.41 Lbs
 - **Unmating**
 - **Min**-----0.10 Lbs
 - **Max**-----0.21 Lbs
- **Humidity**
 - **Mating**
 - **Min**-----0.18 Lbs
 - **Max**-----0.35 Lbs
 - **Unmating**
 - **Min**-----0.10 Lbs
 - **Max**-----0.21 Lbs

13 positions

- **Initial**
 - **Mating**
 - **Min** ----- 2.40 Lbs
 - **Max** ----- 3.84 Lbs
 - **Unmating**
 - **Min** ----- 1.37 Lbs
 - **Max** ----- 2.32 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 2.68 Lbs
 - **Max** ----- 3.96 Lbs
 - **Unmating**
 - **Min** ----- 1.63 Lbs
 - **Max** ----- 2.51 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 2.48 Lbs
 - **Max** ----- 3.93 Lbs
 - **Unmating**
 - **Min** ----- 1.59 Lbs
 - **Max** ----- 2.41 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 2.53 Lbs
 - **Max** ----- 3.90 Lbs
 - **Unmating**
 - **Min** ----- 1.52 Lbs
 - **Max** ----- 2.45 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 2.45 Lbs
 - **Max** ----- 3.94 Lbs
 - **Unmating**
 - **Min** ----- 1.62 Lbs
 - **Max** ----- 2.46 Lbs
- **Thermal**
 - **Mating**
 - **Min** ----- 1.60 Lbs
 - **Max** ----- 2.43 Lbs
 - **Unmating**
 - **Min** ----- 0.95 Lbs
 - **Max** ----- 1.58 Lbs
- **Humidity**
 - **Mating**
 - **Min** ----- 2.04 Lbs
 - **Max** ----- 2.71 Lbs
 - **Unmating**
 - **Min** ----- 1.23 Lbs
 - **Max** ----- 1.77 Lbs

25 positions

- **Initial**
 - **Mating**
 - **Min**----- 3.59 Lbs
 - **Max**----- 7.45 Lbs
 - **Unmating**
 - **Min**----- 2.07 Lbs
 - **Max**----- 4.12 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min**----- 3.89 Lbs
 - **Max**----- 6.89 Lbs
 - **Unmating**
 - **Min**----- 2.43 Lbs
 - **Max**----- 3.96 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min**----- 4.09 Lbs
 - **Max**----- 7.19 Lbs
 - **Unmating**
 - **Min**----- 2.40 Lbs
 - **Max**----- 4.24 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min**----- 4.08 Lbs
 - **Max**----- 7.21 Lbs
 - **Unmating**
 - **Min**----- 2.50 Lbs
 - **Max**----- 4.36 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min**----- 4.02 Lbs
 - **Max**----- 7.32 Lbs
 - **Unmating**
 - **Min**----- 2.37 Lbs
 - **Max**----- 4.42 Lbs
- **Thermal**
 - **Mating**
 - **Min**----- 2.49 Lbs
 - **Max**----- 3.62 Lbs
 - **Unmating**
 - **Min**----- 0.96 Lbs
 - **Max**----- 2.01 Lbs
- **Humidity**
 - **Mating**
 - **Min**----- 2.61 Lbs
 - **Max**----- 3.93 Lbs
 - **Unmating**
 - **Min**----- 1.03 Lbs
 - **Max**----- 2.09 Lbs

DATA SUMMARIES**CONTACT GAPS:****2 positions**

Initial		After 100 Cycles		After Thermal	
Units:	inches	Units:	inches	Units:	inches
<i>Minimum</i>	0.0160	<i>Minimum</i>	0.0151	<i>Minimum</i>	0.0165
<i>Maximum</i>	0.0174	<i>Maximum</i>	0.0179	<i>Maximum</i>	0.0197
<i>Average</i>	0.0167	<i>Average</i>	0.0166	<i>Average</i>	0.0186
<i>St. Dev.</i>	0.0004	<i>St. Dev.</i>	0.0006	<i>St. Dev.</i>	0.0008
<i>Count</i>	20	<i>Count</i>	20	<i>Count</i>	20

13 positions

Initial		After 100 Cycles		After Thermal	
Units:	inches	Units:	inches	Units:	inches
<i>Minimum</i>	0.0151	<i>Minimum</i>	0.0149	<i>Minimum</i>	0.0152
<i>Maximum</i>	0.0178	<i>Maximum</i>	0.0180	<i>Maximum</i>	0.0225
<i>Average</i>	0.0165	<i>Average</i>	0.0167	<i>Average</i>	0.0188
<i>St. Dev.</i>	0.0005	<i>St. Dev.</i>	0.0005	<i>St. Dev.</i>	0.0010
<i>Count</i>	260	<i>Count</i>	260	<i>Count</i>	260

25 positions

Initial		After 100 Cycles		After Thermal	
Units:	inches	Units:	inches	Units:	inches
<i>Minimum</i>	0.0146	<i>Minimum</i>	0.0152	<i>Minimum</i>	0.0169
<i>Maximum</i>	0.0180	<i>Maximum</i>	0.0202	<i>Maximum</i>	0.0221
<i>Average</i>	0.0165	<i>Average</i>	0.0168	<i>Average</i>	0.0193
<i>St. Dev.</i>	0.0007	<i>St. Dev.</i>	0.0008	<i>St. Dev.</i>	0.0010
<i>Count</i>	250	<i>Count</i>	250	<i>Count</i>	250

MATING/UNMATING:**2 positions**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	1.37	0.31	0.67	0.15	1.51	0.34	0.64	0.14
Maximum	3.49	0.79	1.32	0.30	3.71	0.83	1.42	0.32
Average	1.87	0.42	0.90	0.20	2.04	0.46	1.04	0.23
St Dev	0.67	0.15	0.21	0.05	0.69	0.16	0.27	0.06
Count	10	10	10	10	10	10	10	10
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	1.49	0.33	0.66	0.15	1.43	0.32	0.65	0.15
Maximum	3.57	0.80	1.38	0.31	3.45	0.78	1.35	0.30
Average	2.06	0.46	1.04	0.23	2.01	0.45	1.00	0.22
St Dev	0.65	0.15	0.27	0.06	0.61	0.14	0.25	0.06
Count	10	10	10	10	10	10	10	10
	After 100 Cycles				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)	Newton's	Force (Lbs)
Minimum	1.49	0.34	0.62	0.14	0.91	0.21	0.44	0.10
Maximum	3.45	0.78	1.29	0.29	1.81	0.41	0.94	0.21
Average	2.00	0.45	0.95	0.21	1.35	0.30	0.76	0.17
St Dev	0.60	0.13	0.23	0.05	0.34	0.08	0.15	0.03
Count	10	10	10	10	10	10	10	10
	After Humidity							
	Mating		Unmating					
	Newton's	Force (Lbs)	Newton's	Force (Lbs)				
Minimum	0.80	0.18	0.44	0.10				
Maximum	1.57	0.35	0.92	0.21				
Average	1.15	0.26	0.59	0.13				
St Dev	0.23	0.05	0.16	0.04				
Count	10	10	10	10				

13 positions

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	10.68	2.40	6.09	1.37	11.90	2.68	7.25	1.63
Maximum	17.10	3.84	10.31	2.32	17.61	3.96	11.16	2.51
Average	12.72	2.86	8.15	1.83	14.07	3.16	9.17	2.06
St Dev	2.00	0.45	1.59	0.36	1.85	0.42	1.57	0.35
Count	10	10	10	10	10	10	10	10
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	11.02	2.48	7.07	1.59	11.24	2.53	6.76	1.52
Maximum	17.49	3.93	10.72	2.41	17.36	3.90	10.90	2.45
Average	13.87	3.12	8.95	2.01	13.60	3.06	8.52	1.92
St Dev	1.96	0.44	1.39	0.31	1.90	0.43	1.43	0.32
Count	10	10	10	10	10	10	10	10
	After 100 Cycles				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)	Newton	Force (Lbs)
Minimum	10.92	2.45	7.22	1.62	7.11	1.60	4.21	0.95
Maximum	17.54	3.94	10.94	2.46	10.82	2.43	7.04	1.58
Average	13.89	3.12	8.79	1.98	8.68	1.95	5.40	1.21
St Dev	1.98	0.44	1.34	0.30	1.28	0.29	1.10	0.25
Count	10	10	10	10	10	10	10	10
	After Humidity							
	Mating		Unmating					
	Newton	Force (Lbs)	Newton	Force (Lbs)				
Minimum	9.09	2.04	5.47	1.23				
Maximum	12.07	2.71	7.86	1.77				
Average	10.79	2.43	6.50	1.46				
St Dev	0.80	0.18	0.76	0.17				
Count	10	10	10	10				

25 positions

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	15.97	3.59	9.21	2.07	17.30	3.89	10.81	2.43
Maximum	33.13	7.45	18.33	4.12	30.63	6.89	17.63	3.96
Average	24.45	5.50	13.33	3.00	24.51	5.51	13.61	3.06
St Dev	4.76	1.07	2.67	0.60	3.84	0.86	2.01	0.45
Count	10	10	10	10	10	10	10	10
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	18.19	4.09	10.66	2.40	18.15	4.08	11.13	2.50
Maximum	31.97	7.19	18.87	4.24	32.07	7.21	19.40	4.36
Average	24.88	5.59	13.94	3.13	24.72	5.56	13.69	3.08
St Dev	3.91	0.88	2.21	0.50	3.87	0.87	2.29	0.51
Count	10	10	10	10	10	10	10	10
	After 100 Cycles				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	17.89	4.02	10.53	2.37	11.05	2.49	4.29	0.96
Maximum	32.54	7.32	19.68	4.42	16.08	3.62	8.92	2.01
Average	24.82	5.58	13.58	3.05	13.25	2.98	6.65	1.50
St Dev	4.04	0.91	2.49	0.56	1.48	0.33	1.51	0.34
Count	10	10	10	10	10	10	10	10
	After Humidity							
	Mating		Unmating					
	Newtons	Force (Lbs)	Newtons	Force (Lbs)				
Minimum	11.62	2.61	4.59	1.03				
Maximum	17.49	3.93	9.27	2.09				
Average	13.49	3.03	6.37	1.43				
St Dev	1.72	0.39	1.39	0.31				
Count	10	10	10	10				

DATA**CONTACT GAPS:****2 positions**

Initial										
Units: inches										
Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0167	0.0169	0.0169	0.0171	0.0170	0.0163	0.0170	0.0169	0.0169	0.0169
2	0.0168	0.0165	0.0161	0.0172	0.0164	0.0162	0.0161	0.0173	0.0172	0.0160
3	0.0163	0.0166	0.0160	0.0173	0.0166	0.0163	0.0161	0.0172	0.0165	0.0159
4	0.0164	0.0162	0.0172	0.0169	0.0174	0.0165	0.0169	0.0161	0.0161	0.0163
After 100 Cycles										
Units: inches										
Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0165	0.0151	0.0162	0.0163	0.0179	0.0169	0.0169	0.0160	0.0171	0.0170
2	0.0162	0.0174	0.0165	0.0161	0.0167	0.0163	0.0169	0.0178	0.0167	0.0168
3	0.0169	0.0157	0.0161	0.0169	0.0165	0.0167	0.0165	0.0169	0.0169	0.0161
4	0.0170	0.0165	0.0163	0.0166	0.0177	0.0161	0.0176	0.0172	0.0158	0.0172
After Thermal										
Units: inches										
Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0179	0.0181	0.0184	0.0194	0.0180	0.0194	0.0187	0.0185	0.0184	0.0184
2	0.0182	0.0192	0.0189	0.0196	0.0192	0.0183	0.0189	0.0193	0.0188	0.0190
3	0.0176	0.0184	0.0190	0.0192	0.0184	0.0175	0.0192	0.0171	0.0191	0.0187
4	0.0165	0.0195	0.0182	0.0184	0.0197	0.0190	0.0195	0.0172	0.0184	0.0199

13 positions

Initial										
Units: inches										
Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0169	0.0165	0.0174	0.0169	0.0153	0.0171	0.0159	0.0165	0.0158	0.0169
2	0.0176	0.0166	0.0172	0.0178	0.0156	0.0164	0.0163	0.0171	0.0161	0.0166
3	0.0166	0.0168	0.0169	0.0164	0.0158	0.0159	0.0164	0.0169	0.0164	0.0164
4	0.0167	0.0169	0.0167	0.0171	0.0168	0.0166	0.0161	0.0170	0.0165	0.0165
5	0.0167	0.0161	0.0169	0.0169	0.0165	0.0159	0.0165	0.0169	0.0168	0.0167
6	0.0170	0.0165	0.0171	0.0173	0.0158	0.0163	0.0158	0.0169	0.0162	0.0165
7	0.0172	0.0166	0.0169	0.0171	0.0157	0.0169	0.0156	0.0170	0.0171	0.0171
8	0.0170	0.0165	0.0172	0.0173	0.0154	0.0167	0.0165	0.0169	0.0173	0.0154
9	0.0165	0.0161	0.0168	0.0169	0.0158	0.0164	0.0161	0.0167	0.0172	0.0171
10	0.0165	0.0167	0.0167	0.0164	0.0159	0.0161	0.0154	0.0163	0.0155	0.0171
11	0.0161	0.0164	0.0165	0.0178	0.0156	0.0169	0.0165	0.0166	0.0152	0.0166
12	0.0173	0.0163	0.0158	0.0172	0.0164	0.0167	0.0161	0.0175	0.0161	0.0172
13	0.0178	0.0165	0.0165	0.0165	0.0167	0.0166	0.0158	0.0159	0.0169	0.0176
14	0.0166	0.0158	0.0172	0.0163	0.0163	0.0172	0.0175	0.0168	0.0161	0.0164
15	0.0161	0.0169	0.0162	0.0158	0.0161	0.0164	0.0159	0.0166	0.0165	0.0159
16	0.0161	0.0169	0.0165	0.0158	0.0169	0.0172	0.0172	0.0169	0.0171	0.0162
17	0.0168	0.0162	0.0157	0.0157	0.0162	0.0168	0.0162	0.0167	0.0158	0.0163
18	0.0165	0.0158	0.0165	0.0162	0.0159	0.0173	0.0163	0.0172	0.0160	0.0161
19	0.0161	0.0161	0.0156	0.0168	0.0169	0.0168	0.0167	0.0171	0.0164	0.0162
20	0.0165	0.0166	0.0154	0.0169	0.0161	0.0169	0.0169	0.0161	0.0171	0.0166
21	0.0165	0.0169	0.0176	0.0161	0.0164	0.0161	0.0162	0.0165	0.0155	0.0166
22	0.0167	0.0161	0.0165	0.0159	0.0160	0.0172	0.0168	0.0166	0.0174	0.0159
23	0.0151	0.0169	0.0165	0.0153	0.0155	0.0169	0.0161	0.0170	0.0156	0.0172
24	0.0161	0.0158	0.0158	0.0169	0.0161	0.0160	0.0160	0.0166	0.0164	0.0165
25	0.0169	0.0165	0.0161	0.0163	0.0165	0.0162	0.0161	0.0170	0.0166	0.0172
26	0.0170	0.0172	0.0169	0.0168	0.0169	0.0174	0.0167	0.0174	0.0166	0.0173
After 100 Cycles										
Units: inches										
Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0165	0.0164	0.0164	0.0170	0.0168	0.0172	0.0172	0.0168	0.0166	0.0171
2	0.0164	0.0162	0.0161	0.0168	0.0165	0.0166	0.0160	0.0165	0.0160	0.0169
3	0.0176	0.0170	0.0172	0.0173	0.0163	0.0172	0.0165	0.0168	0.0171	0.0176
4	0.0166	0.0159	0.0165	0.0168	0.0150	0.0170	0.0170	0.0163	0.0169	0.0168
5	0.0167	0.0165	0.0170	0.0170	0.0167	0.0169	0.0168	0.0170	0.0179	0.0174
6	0.0168	0.0155	0.0168	0.0171	0.0163	0.0169	0.0171	0.0171	0.0166	0.0165
7	0.0163	0.0165	0.0166	0.0154	0.0163	0.0166	0.0174	0.0165	0.0168	0.0164
8	0.0171	0.0167	0.0173	0.0170	0.0168	0.0165	0.0170	0.0173	0.0162	0.0166
9	0.0161	0.0168	0.0164	0.0165	0.0163	0.0165	0.0159	0.0169	0.0169	0.0161
10	0.0149	0.0167	0.0169	0.0159	0.0165	0.0163	0.0172	0.0173	0.0157	0.0171
11	0.0166	0.0163	0.0161	0.0176	0.0163	0.0169	0.0173	0.0172	0.0169	0.0162
12	0.0169	0.0166	0.0162	0.0169	0.0164	0.0162	0.0161	0.0162	0.0169	0.0168
13	0.0163	0.0179	0.0161	0.0168	0.0171	0.0173	0.0171	0.0163	0.0176	0.0165
14	0.0175	0.0180	0.0169	0.0168	0.0170	0.0179	0.0163	0.0161	0.0164	0.0170

15	0.0170	0.0170	0.0167	0.0179	0.0165	0.0170	0.0165	0.0161	0.0167	0.0169
16	0.0165	0.0178	0.0172	0.0175	0.0169	0.0171	0.0164	0.0165	0.0169	0.0169
17	0.0165	0.0171	0.0167	0.0172	0.0170	0.0168	0.0159	0.0166	0.0165	0.0167
18	0.0163	0.0160	0.0169	0.0169	0.0169	0.0165	0.0164	0.0170	0.0172	0.0169
19	0.0172	0.0163	0.0169	0.0180	0.0169	0.0169	0.0161	0.0161	0.0164	0.0164
20	0.0170	0.0162	0.0166	0.0172	0.0159	0.0170	0.0162	0.0154	0.0168	0.0164
21	0.0167	0.0170	0.0163	0.0168	0.0167	0.0172	0.0163	0.0166	0.0172	0.0154
22	0.0165	0.0163	0.0167	0.0161	0.0165	0.0161	0.0161	0.0167	0.0165	0.0166
23	0.0168	0.0168	0.0165	0.0172	0.0161	0.0168	0.0161	0.0161	0.0168	0.0164
24	0.0165	0.0162	0.0163	0.0169	0.0169	0.0172	0.0157	0.0165	0.0174	0.0162
25	0.0171	0.0165	0.0165	0.0160	0.0172	0.0167	0.0161	0.0163	0.0170	0.0168
26	0.0171	0.0171	0.0164	0.0169	0.0166	0.0164	0.0161	0.0168	0.0171	0.0172

After Thermal

Units: inches

Pos.#	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
1	0.0206	0.0194	0.0187	0.0194	0.0191	0.0206	0.0184	0.0193	0.0180	0.0195
2	0.0198	0.0191	0.0183	0.0190	0.0184	0.0197	0.0181	0.0172	0.0192	0.0173
3	0.0184	0.0198	0.0193	0.0192	0.0186	0.0189	0.0178	0.0185	0.0184	0.0191
4	0.0182	0.0189	0.0183	0.0190	0.0183	0.0201	0.0187	0.0174	0.0177	0.0184
5	0.0185	0.0192	0.0193	0.0173	0.0195	0.0189	0.0184	0.0169	0.0184	0.0183
6	0.0192	0.0193	0.0195	0.0193	0.0180	0.0191	0.0172	0.0181	0.0190	0.0187
7	0.0191	0.0195	0.0184	0.0185	0.0181	0.0188	0.0180	0.0184	0.0192	0.0180
8	0.0191	0.0191	0.0191	0.0179	0.0191	0.0199	0.0187	0.0161	0.0191	0.0174
9	0.0183	0.0195	0.0193	0.0178	0.0191	0.0192	0.0191	0.0183	0.0195	0.0191
10	0.0188	0.0192	0.0190	0.0181	0.0195	0.0198	0.0183	0.0179	0.0186	0.0181
11	0.0195	0.0195	0.0201	0.0181	0.0191	0.0198	0.0195	0.0182	0.0180	0.0191
12	0.0191	0.0189	0.0182	0.0186	0.0194	0.0175	0.0193	0.0196	0.0184	0.0191
13	0.0202	0.0191	0.0203	0.0197	0.0213	0.0196	0.0194	0.0185	0.0186	0.0187
14	0.0225	0.0185	0.0184	0.0191	0.0195	0.0202	0.0196	0.0195	0.0187	0.0189
15	0.0193	0.0186	0.0183	0.0193	0.0187	0.0184	0.0186	0.0195	0.0172	0.0198
16	0.0199	0.0189	0.0187	0.0186	0.0178	0.0172	0.0152	0.0194	0.0179	0.0198
17	0.0191	0.0185	0.0189	0.0192	0.0169	0.0185	0.0185	0.0184	0.0183	0.0181
18	0.0186	0.0184	0.0181	0.0191	0.0204	0.0199	0.0187	0.0189	0.0162	0.0194
19	0.0186	0.0184	0.0219	0.0191	0.0203	0.0192	0.0180	0.0172	0.0175	0.0181
20	0.0184	0.0189	0.0197	0.0179	0.0192	0.0187	0.0163	0.0202	0.0176	0.0161
21	0.0184	0.0213	0.0203	0.0195	0.0195	0.0176	0.0165	0.0176	0.0183	0.0173
22	0.0190	0.0193	0.0184	0.0190	0.0185	0.0192	0.0179	0.0195	0.0169	0.0181
23	0.0180	0.0197	0.0183	0.0178	0.0187	0.0193	0.0193	0.0182	0.0169	0.0183
24	0.0184	0.0195	0.0173	0.0179	0.0191	0.0193	0.0190	0.0186	0.0185	0.0154
25	0.0203	0.0179	0.0187	0.0195	0.0195	0.0184	0.0177	0.0187	0.0180	0.0200
26	0.0195	0.0192	0.0193	0.0190	0.0186	0.0191	0.0194	0.0202	0.0198	0.0195

25 positions

Initial					
Units: inches					
Pos.#	B1	B2	B3	B4	B5
1	0.0176	0.0159	0.0170	0.0163	0.0173
2	0.0170	0.0161	0.0158	0.0172	0.0176
3	0.0169	0.0157	0.0168	0.0178	0.0172
4	0.0168	0.0165	0.0167	0.0177	0.0165
5	0.0160	0.0176	0.0162	0.0173	0.0177
6	0.0163	0.0159	0.0165	0.0172	0.0165
7	0.0163	0.0170	0.0154	0.0180	0.0172
8	0.0169	0.0166	0.0162	0.0174	0.0162
9	0.0165	0.0165	0.0179	0.0180	0.0161
10	0.0176	0.0161	0.0161	0.0169	0.0153
11	0.0168	0.0169	0.0161	0.0167	0.0167
12	0.0170	0.0172	0.0167	0.0156	0.0169
13	0.0171	0.0165	0.0165	0.0163	0.0160
14	0.0178	0.0162	0.0161	0.0154	0.0177
15	0.0162	0.0170	0.0173	0.0161	0.0167
16	0.0164	0.0164	0.0165	0.0149	0.0165
17	0.0176	0.0157	0.0168	0.0157	0.0172
18	0.0176	0.0176	0.0153	0.0153	0.0161
19	0.0176	0.0168	0.0158	0.0162	0.0170
20	0.0170	0.0164	0.0146	0.0161	0.0175
21	0.0179	0.0173	0.0163	0.0161	0.0162
22	0.0178	0.0176	0.0164	0.0163	0.0154
23	0.0169	0.0169	0.0163	0.0157	0.0175
24	0.0169	0.0161	0.0169	0.0172	0.0161
25	0.0168	0.0162	0.0169	0.0170	0.0170
26	0.0179	0.0166	0.0170	0.0161	0.0180
27	0.0168	0.0169	0.0157	0.0158	0.0170
28	0.0173	0.0163	0.0160	0.0168	0.0154
29	0.0176	0.0165	0.0156	0.0166	0.0176
30	0.0172	0.0169	0.0151	0.0166	0.0156
31	0.0177	0.0164	0.0172	0.0170	0.0154
32	0.0175	0.0161	0.0161	0.0156	0.0169
33	0.0160	0.0165	0.0156	0.0157	0.0157
34	0.0166	0.0157	0.0167	0.0161	0.0160
35	0.0165	0.0169	0.0157	0.0159	0.0163
36	0.0157	0.0157	0.0153	0.0155	0.0164
37	0.0175	0.0176	0.0158	0.0154	0.0165
38	0.0171	0.0164	0.0165	0.0150	0.0159

39	0.0168	0.0161	0.0167	0.0163	0.0155
40	0.0165	0.0158	0.0161	0.0163	0.0164
41	0.0165	0.0174	0.0163	0.0152	0.0165
42	0.0165	0.0159	0.0163	0.0155	0.0167
43	0.0159	0.0169	0.0154	0.0167	0.0164
44	0.0167	0.0160	0.0172	0.0160	0.0174
45	0.0169	0.0167	0.0169	0.0172	0.0170
46	0.0157	0.0163	0.0153	0.0174	0.0172
47	0.0166	0.0167	0.0161	0.0169	0.0165
48	0.0165	0.0154	0.0152	0.0166	0.0160
49	0.0166	0.0179	0.0166	0.0156	0.0167
50	0.0166	0.0173	0.0169	0.0162	0.0172

After 100 Cycles

Units: inches

Pos.#	B1	B2	B3	B4	B5
1	0.0180	0.0173	0.0169	0.0158	0.0163
2	0.0173	0.0161	0.0165	0.0168	0.0176
3	0.0169	0.0171	0.0159	0.0166	0.0176
4	0.0169	0.0162	0.0157	0.0159	0.0169
5	0.0162	0.0166	0.0157	0.0167	0.0174
6	0.0161	0.0172	0.0172	0.0158	0.0166
7	0.0161	0.0157	0.0162	0.0160	0.0169
8	0.0164	0.0168	0.0164	0.0170	0.0165
9	0.0168	0.0160	0.0164	0.0168	0.0174
10	0.0166	0.0161	0.0161	0.0170	0.0178
11	0.0169	0.0161	0.0165	0.0164	0.0176
12	0.0169	0.0175	0.0156	0.0165	0.0170
13	0.0179	0.0162	0.0169	0.0164	0.0170
14	0.0176	0.0164	0.0163	0.0163	0.0163
15	0.0162	0.0159	0.0156	0.0167	0.0165
16	0.0176	0.0174	0.0161	0.0172	0.0165
17	0.0169	0.0155	0.0156	0.0165	0.0176
18	0.0161	0.0165	0.0163	0.0162	0.0170
19	0.0170	0.0163	0.0157	0.0176	0.0167
20	0.0170	0.0165	0.0164	0.0172	0.0172
21	0.0176	0.0157	0.0158	0.0177	0.0169
22	0.0191	0.0163	0.0157	0.0176	0.0169
23	0.0202	0.0159	0.0159	0.0171	0.0169
24	0.0192	0.0176	0.0164	0.0157	0.0164
25	0.0159	0.0175	0.0180	0.0176	0.0168
26	0.0180	0.0165	0.0176	0.0175	0.0172
27	0.0180	0.0173	0.0164	0.0170	0.0175
28	0.0179	0.0175	0.0172	0.0174	0.0169
29	0.0194	0.0166	0.0163	0.0174	0.0166

30	0.0194	0.0169	0.0176	0.0176	0.0178
31	0.0183	0.0155	0.0164	0.0174	0.0167
32	0.0184	0.0176	0.0165	0.0170	0.0172
33	0.0174	0.0165	0.0171	0.0167	0.0176
34	0.0184	0.0176	0.0175	0.0177	0.0169
35	0.0191	0.0167	0.0166	0.0169	0.0170
36	0.0172	0.0170	0.0165	0.0166	0.0174
37	0.0172	0.0165	0.0165	0.0165	0.0175
38	0.0176	0.0171	0.0153	0.0157	0.0173
39	0.0176	0.0172	0.0158	0.0157	0.0174
40	0.0172	0.0164	0.0171	0.0161	0.0169
41	0.0170	0.0165	0.0163	0.0162	0.0164
42	0.0169	0.0168	0.0169	0.0156	0.0167
43	0.0169	0.0173	0.0157	0.0160	0.0178
44	0.0166	0.0176	0.0169	0.0153	0.0169
45	0.0179	0.0161	0.0152	0.0154	0.0173
46	0.0169	0.0172	0.0158	0.0165	0.0169
47	0.0165	0.0169	0.0162	0.0161	0.0169
48	0.0175	0.0177	0.0163	0.0166	0.0172
49	0.0165	0.0166	0.0171	0.0164	0.0162
50	0.0172	0.0163	0.0165	0.0165	0.0179

After Thermal

Units: inches

Pos.#	B1	B2	B3	B4	B5
1	0.0213	0.0199	0.0191	0.0189	0.0197
2	0.0198	0.0201	0.0184	0.0184	0.0176
3	0.0217	0.0192	0.0182	0.0184	0.0199
4	0.0219	0.0189	0.0193	0.0191	0.0187
5	0.0211	0.0194	0.0201	0.0193	0.0193
6	0.0187	0.0203	0.0177	0.0182	0.0190
7	0.0215	0.0192	0.0202	0.0191	0.0194
8	0.0206	0.0200	0.0184	0.0185	0.0192
9	0.0209	0.0189	0.0187	0.0187	0.0193
10	0.0209	0.0195	0.0184	0.0191	0.0205
11	0.0197	0.0193	0.0190	0.0190	0.0188
12	0.0182	0.0198	0.0186	0.0191	0.0195
13	0.0190	0.0200	0.0195	0.0202	0.0192
14	0.0208	0.0195	0.0188	0.0191	0.0195
15	0.0199	0.0197	0.0186	0.0191	0.0185
16	0.0175	0.0202	0.0190	0.0195	0.0197
17	0.0186	0.0200	0.0180	0.0191	0.0193
18	0.0193	0.0193	0.0193	0.0206	0.0193
19	0.0169	0.0199	0.0189	0.0199	0.0186
20	0.0193	0.0191	0.0190	0.0213	0.0195

21	0.0171	0.0196	0.0191	0.0192	0.0201
22	0.0191	0.0198	0.0195	0.0207	0.0193
23	0.0204	0.0198	0.0191	0.0212	0.0195
24	0.0197	0.0213	0.0201	0.0180	0.0194
25	0.0187	0.0220	0.0194	0.0197	0.0185
26	0.0216	0.0219	0.0202	0.0198	0.0206
27	0.0195	0.0219	0.0191	0.0191	0.0213
28	0.0186	0.0207	0.0193	0.0189	0.0210
29	0.0176	0.0191	0.0212	0.0195	0.0210
30	0.0191	0.0207	0.0189	0.0195	0.0194
31	0.0191	0.0191	0.0191	0.0191	0.0205
32	0.0188	0.0197	0.0187	0.0196	0.0191
33	0.0184	0.0184	0.0192	0.0182	0.0194
34	0.0198	0.0185	0.0178	0.0194	0.0192
35	0.0201	0.0197	0.0196	0.0195	0.0195
36	0.0199	0.0188	0.0186	0.0190	0.0194
37	0.0194	0.0195	0.0191	0.0212	0.0172
38	0.0200	0.0194	0.0191	0.0198	0.0185
39	0.0190	0.0187	0.0199	0.0187	0.0192
40	0.0180	0.0177	0.0189	0.0199	0.0188
41	0.0188	0.0181	0.0187	0.0186	0.0188
42	0.0207	0.0185	0.0187	0.0179	0.0195
43	0.0178	0.0191	0.0198	0.0182	0.0196
44	0.0191	0.0184	0.0194	0.0184	0.0180
45	0.0221	0.0176	0.0181	0.0187	0.0192
46	0.0196	0.0182	0.0190	0.0187	0.0187
47	0.0190	0.0169	0.0181	0.0210	0.0192
48	0.0202	0.0173	0.0184	0.0195	0.0191
49	0.0206	0.0184	0.0188	0.0198	0.0192
50	0.0207	0.0195	0.0189	0.0203	0.0191

Mating / Unmating**2 positions**

Sample#	Initial		After 25 Cycles		After 50 Cycles		After 75 Cycles		After 100 Cycles		After Thermals		After Humidity	
	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	0.37	0.16	0.39	0.14	0.38	0.15	0.39	0.15	0.38	0.14	0.27	0.15	0.28	0.16
2	0.31	0.16	0.34	0.17	0.34	0.18	0.35	0.19	0.36	0.17	0.34	0.21	0.18	0.11
3	0.79	0.30	0.83	0.32	0.80	0.31	0.78	0.30	0.78	0.24	0.21	0.20	0.23	0.10
4	0.31	0.15	0.35	0.19	0.33	0.18	0.32	0.16	0.34	0.16	0.21	0.10	0.22	0.11
5	0.52	0.25	0.55	0.25	0.58	0.25	0.50	0.21	0.52	0.22	0.23	0.14	0.29	0.13
6	0.33	0.21	0.39	0.26	0.41	0.29	0.39	0.25	0.39	0.27	0.36	0.19	0.35	0.21
7	0.35	0.23	0.40	0.30	0.42	0.29	0.41	0.28	0.42	0.27	0.27	0.16	0.21	0.10
8	0.35	0.18	0.35	0.19	0.38	0.18	0.39	0.20	0.35	0.18	0.40	0.19	0.31	0.16
9	0.54	0.22	0.58	0.30	0.57	0.30	0.58	0.30	0.55	0.29	0.41	0.20	0.27	0.16
10	0.36	0.18	0.41	0.22	0.41	0.21	0.41	0.21	0.41	0.20	0.34	0.19	0.25	0.11

13 positions

Sample#	Initial		After 25 Cycles		After 50 Cycles		After 75 Cycles		After 100 Cycles		After Thermals		After Humidity	
	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	2.41	1.37	2.68	1.66	2.48	1.75	2.53	1.76	2.45	1.68	2.06	1.58	2.52	1.43
2	2.50	1.45	2.69	1.63	2.71	1.59	2.78	1.60	2.77	1.62	1.74	1.00	2.37	1.32
3	3.84	2.32	3.96	2.39	3.93	2.36	3.90	2.30	3.94	2.28	1.88	1.29	2.31	1.34
4	3.19	1.97	3.44	2.10	3.42	2.01	3.33	1.95	3.42	1.99	1.66	1.00	2.43	1.43
5	3.02	1.87	3.31	2.19	3.36	2.16	3.35	2.06	3.33	2.05	1.74	0.95	2.04	1.23
6	2.73	2.07	3.19	2.51	3.13	2.37	3.22	2.45	3.25	2.46	1.99	1.20	2.33	1.38
7	3.13	2.12	3.52	2.51	3.46	2.41	3.24	2.15	3.47	2.29	1.60	0.95	2.55	1.44
8	2.78	2.20	3.17	2.17	3.13	2.07	2.89	1.80	3.05	2.03	2.04	1.16	2.71	1.69
9	2.61	1.46	2.93	1.66	2.86	1.65	2.77	1.57	2.85	1.70	2.43	1.54	2.47	1.77
10	2.40	1.49	2.74	1.79	2.70	1.76	2.57	1.52	2.69	1.67	2.39	1.47	2.53	1.59

25 positions

Sample#	Initial		After 25 Cycles		After 50 Cycles		After 75 Cycles		After 100 Cycles		After Thermals		After Humidity	
	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating	Mating	Unmating
1	3.59	2.07	3.89	2.72	4.09	2.91	4.08	2.85	4.02	2.69	2.90	1.63	3.01	1.42
2	4.37	2.42	4.56	2.43	4.53	2.40	4.60	2.50	4.62	2.37	3.11	1.57	3.04	1.41
3	5.89	3.25	5.93	3.16	6.02	3.20	5.94	3.13	5.97	3.09	2.97	1.35	3.12	1.57
4	4.82	2.39	4.88	2.51	5.05	2.62	4.97	2.54	5.03	2.65	3.00	1.50	2.84	1.32
5	5.30	3.15	5.46	3.24	5.39	3.11	5.31	2.99	5.46	3.02	3.10	1.61	3.10	1.73
6	5.86	3.56	6.01	3.43	6.09	3.49	5.91	3.28	6.03	3.29	2.49	0.96	3.28	1.47
7	5.43	2.88	5.62	3.03	5.74	3.11	5.67	2.98	5.39	2.74	2.54	1.07	2.61	1.03
8	6.19	3.05	6.14	3.16	5.95	3.19	5.99	3.14	6.09	3.22	3.27	2.01	2.72	1.13
9	7.45	4.12	6.89	3.96	7.19	4.24	7.21	4.36	7.32	4.42	3.62	1.97	3.93	2.09
10	6.07	3.07	5.74	2.96	5.90	3.08	5.91	3.01	5.88	3.04	2.79	1.28	2.66	1.14

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: TCT-03

Description: Dillon Quantrol TC2 Test Stand

Manufacturer: Dillon Quantrol

Model: TC2

Serial #: 02-1033-03

Accuracy: Speed Accuracy: +/- 5% of indicated speed; Displacement: +/- 5 micrometers.

... Last Cal: 05/07/2009, Next Cal: 05/07/2010

Equipment #: MV-05

Description: 6" x 6" Video Measuring Machine

Manufacturer: Micro-Vu

Model: M3010838

Serial #: V9344

Accuracy: See Manual

... Last Cal: 01/12/2010, Next Cal: 01/12/2011