50038

TSG/ESD/TEB-038/72
28 April 1972

MEMORANDUM FOR: Chief, Research & Engineering Division, TSG

THROUGH : Chief, Engineering Support Division, TSG
Chief, Test & Evaluation Branch, ESD/TSG

SUBJECT : Memorandum Test Report - Acceptance Testing
X1 of the [redacted] 1540-4 Light Table

REFERENCE : TEB Report 027/72, "Acceptance Testing of
X1 the [redacted] 1540-4 Light Table - Preproduction
MODEL for DIA"

1. INTRODUCTION

X1 The [redacted] 1540-4 Light Table (DIA's) was first submitted to ESD/TEB for acceptance testing on 13 December 1971. Testing was stopped after one day when it became apparent that the motorized optics carriage was not operating sufficiently close to specified levels to warrent continuation of tests.

X1 [redacted] reworked the electrical system and resubmitted the table for tests on 17 January. The test program that followed revealed several specifications that were not met by the contractor; these were reported in reference (a). Subsequently, the contractor was notified that the light table was not acceptable.

Again the light table was reworked in-house by the contractor. On 10 March it was resubmitted for test and evaluation. This report describes the findings and compares them to earlier results.

2. SUMMARY OF RESULTS

2.1 The following conditions were corrected and now meet specifications:

- o The minimum illumination level is now 200 foot-lamberts.
- o Parallelism of the viewing surfaces to the microstereoscope mount is within 0.011 inch.
- o The focusing mechanism retains its locked "focused" positions.

2.2 The following specifications for the optics carriage motorized transport were not met:

- o Minimum operating speed - The permissible range is 0.0045 to 0.0055 in/sec. Average operating speeds varied from 0.0029 to 0.0052 in/sec. There is no significant improvement in the reworked light table.

- o Maximum operating speed - Requirement is for 0.250 in/sec or greater. Maximum speed achieved in the test was 0.234 in/sec. The condition is slightly worse than before.

- o Time to attain set speed - Requirement is for 1.0 second or less. The observed time varied from 0.40 to 4.19 seconds. There is no significant improvement in the reworked light table.

- o Time from release of control to stop - Requirement is for 0.1 second or less. Time required ranged from $<$ 0.02 to 0.26 seconds. There is no improvement in the reworked light table.

- o Speed of X travel vs. Y travel - Requirement is for X travel to be within 10 percent of Y travel. At minimum speed setting there was a 58 percent difference with the table horizontal and a 189 percent difference with the table tilted. There is no improvement in the reworked light table.

- o Uniformity of incremental velocities - Requirement is that any change in speed should not be greater than + 5 percent. In several cases the change exceeded 50 percent. There is no improvement in the reworked light table.

2.3 Additional specifications that were not met, all reported in reference (a), are as follows:

- o The sources flicker at low illumination level. There is no change in the reworked table.

- o The optics carriage will not translate over the entire Y direction of the viewing surface. There is no change in the reworked table.

- o A few of the instructions in the operation manual are incorrect. A revised manual was not provided.

3. TEST DETAILS

3.1 Listed below are specifications that were not met in the previous test program, past results and the results of the latest test program:

- Section 3.1.1.1 Illumination Level

  Specification ... "The minimum level of each of the sources shall be 200 foot lamberts."...

  Past Results - Left format - Minimum value was 250 foot lamberts.

  Latest Results - Meets specification - 200 foot lamberts.

- Section 3.1.1.4 Flicker

  Specification ... "such a level as not to be visibly objectionable to the sponsor's operators at any light intensity level"...

  Past Results - There is objectionable flicker when the illumination level is set for 400 foot lamberts.

  Latest Results - No change.

- Section 3.5.1.2 Translation

  Specification ... 'translation in the Y direction shall be adequate to cover the full 15 inch depth of the glass viewing surface"...

  Past Results - Length of tracks and obstructions caused by electrical cables hitting back members of the table, prevent the microstereoscope mount from translating over the rear 1 7/8 inches of the illuminated surface in the Y direction. Because of this condition future damage to electrical cables is highly probable.

  Latest Results - No change.

- Specification ... "and the viewing surfaces be parallel within 0.015 inches over the entire translation field of the microstereoscope mount"...

  Past Results - Between two specific points, one on each glass surface, a difference of 0.016 inches was measured.

  Latest Results - Meets specification - 0.011 inch.

o Section 3.5.1.5 Locks

Specification ... "The focusing mechanism shall be self locking"...

Past Results - At the 4 7/8 inch height the pod drifted down 0.002 inch in one test and 0.005 inch in another.

Latest Results - Meets specification. There was no drift in 12 tests.

o Section 4.1 Instruction Manual

Specification ... "describing proper installation, operation, and maintenance"...

Past Observed - Paragraph 2.6.2(i) The word "counter-clockwise" should be changed to "clockwise."

Paragraph 2.6.2(k) The word "clockwise" should be changed to "counterclockwise."

Paragraph 2.6.3(i) The word "clockwise" should be changed to "counterclockwise."

Latest Observation - No change.

- OPTICS CARRIAGE MOTORIZED TRANSPORT -

o Specification 1. "X-Y minimum starting and operating speed 0.005 in/sec ± 10%." (Range 0.0045 to 0.0055 in/sec.)

Past Results - Average operating speeds varied from 0.0018 to 0.0053 in/sec. In 31 tests the specification was met 18 times.

Latest Results - Average operating speeds varied from 0.0029 to 0.0052 in/sec. In 16 tests the specification was met 9 times. (see Table 1)

o Specification 2. "X-Y maximum speed 0.250 in/sec."

Past Results - Specification was met.

Latest Results - Only one maximum speed test condition was run. With the table horizontal the carriage was preconditioned by moving to the rear. It was then restarted by moving forward. Under these conditions the maximum speed was 0.234 in/sec. The specification was not met.

o Specification 3. "Time to attain set speed 0.5 to 1.0 sec or less."

Past Results - From 32 tests, at minimum speed, 15 did not meet the specification, (range - 0.42 to 4.86 seconds).

Latest Results - From 16 tests at minimum speed, 10 did not meet the specification. The time to attain set speed ranged from 0.40 to 4.19 seconds. Tests were not made to determine the times at faster transport speed settings. (see Table 2)

o Specification 4. "Time from release of control to stop 0.1 sec or less."

Past Results - In 31 tests at minimum speed setting 18 did not meet the specification. Time required ranged from < 0.02 to 0.44 seconds.

Latest Results - In 16 tests at minimum speed setting 13 did not meet the specification. Time required range from < 0.02 to 0.26 seconds. (see Table 3)

o Specification 5. "Speed of X travel of bridge equal to speed of Y travel of bridge within 10%."

Past Results - At minimum speed setting

Horizontal table	58% difference
Tilted table	189% difference

Latest Results - No change.

o Specification 6. "For any setting of the speed control, that time for an increment equivalent to 0.2 seconds of motion at that nominal speed setting shall not vary from the time for the previous increment by more than ± 5%."

Past Results - At minimum speed setting 31 test runs were made. The specification was not met in any run. In several cases the percent change exceeded 50 percent.

Latest Results - The specification was never met in any of the 16 runs made. No improvement is evident.

SUBJECT: Memorandum Test Report - Acceptance Testing of
X1 the [redacted] 1540-4 Light Table

[redacted] 25X

Test Engineer
TEB/ESD

Distribution:
Original - Chrono
1 - Addressee
X1 1 - RED/TSG [redacted]
1 - RED/SA/TSG [redacted] 25X
1 - DI-8/Tech & Dev. Br. [redacted] 25X
1 - ESD/EPB
2 - ESD/TEB

TABLE 1

MINIMUM OPERATING SPEED

OPTICS CARRIAGE MOTORIZED TRANSPORT

SPECIFICATION 1. "X - Y MINIMUM STARTING AND OPERATING SPEED - 0.005 in/sec. ± 10%"

(RANGE 0.0045 TO 0.0055 in/sec.)

TEST CONDITIONS				COMPARISON DATA		PRESENT EVALUATION	
MINIMUM SPEED SETTING CARRIAGE OVER CENTER OF TABLE TOP				PRIOR EVALUATION (1st. TEST PROGRAM)		DATA FROM SECOND TEST PROGRAM (REWORKED TABLE)	
Test No.	Precondition Direction	Restart Direction	Table Orientation	Operating Speed in/sec.	Met Spec.	Operating Speed in/sec.	Met Spec.
1	Left	Left	Horizontal	0.0049	Yes	0.0049	Yes
2	Left	Right	Horizontal	0.0042	No	0.0042	No
3	Right	Right	Horizontal	0.0046	Yes	0.0049	Yes
4	Right	Left	Horizontal	0.0047	Yes	0.0043	No
5*	Left	Left	Tilted	0.0052	Yes	0.0047	Yes
6	Left	Right	Tilted	0.0043	No	0.0045	Yes
7	Right	Right	Tilted	0.0047	Yes	0.0049	Yes
8	Right	Left	Tilted	0.0049	Yes	0.0044	No
9	To Rear	To Rear	Horizontal	0.0052	Yes	0.0051	Yes
10	To Rear	To Front	Horizontal	0.0031	No	0.0035	No
11	To Front	To Front	Horizontal	0.0051	Yes	0.0052	Yes
12	To Front	To Rear	Horizontal	0.0042	No	0.0038	No
13	To Rear	To Rear	Tilted	0.0050	Yes	0.0050	Yes
14	To Rear	To Front	Tilted	0.0018	No	0.0031	No
15	To Front	To Front	Tilted	0.0049	Yes	0.0051	Yes
16	To Front	To Rear	Tilted	0.0023	No	0.0029	No

* NOTE: Tests 1 - 8 ARE FOR TRAVEL IN X DIRECTION
Tests 9 - 16 ARE FOR TRAVEL IN Y DIRECTION

TABLE 2

TIME TO ATTAIN SET SPEED

OPTICS CARRIAGE MOTORIZED TRANSPORT

SPECIFICATION 3. "TIME TO ATTAIN SET SPEED 0.5 to 1.0 SECONDS OR LESS"

TEST CONDITIONS				COMPARISON DATA		PRESENT EVALUATION	
MINIMUM SPEED SETTING CARRIAGE OVER CENTER OF TABLE TOP				PRIOR EVALUATION (1st. TEST PROGRAM)		DATA FROM SECOND TEST PROGRAM (REWORKED TABLE)	
Test No.	Precondition Direction	Restart Direction	Table Orientation	TIME - SECONDS -	Met Spec.	TIME - SECONDS -	Met Spec.
1	Left	Left	Horizontal	0.72	Yes	0.46	Yes
2	Left	Right	Horizontal	1.19	No	2.98	No
3	Right	Right	Horizontal	0.45	Yes	0.76	Yes
4	Right	Left	Horizontal	1.75	No	2.15	No
5	Left	Left	Tilted	0.60	Yes	0.42	Yes
6	Left	Right	Tilted	0.78	Yes	2.15	No
7	Right	Right	Tilted	0.47	Yes	1.64	No
8	Right	Left	Tilted	2.89	No	2.16	No
9	To Rear	To Rear	Horizontal	0.51	Yes	0.60	Yes
10	To Rear	To Front	Horizontal	1.84	No	3.71	No
11	To Front	To Front	Horizontal	0.48	Yes	0.40	Yes
12	To Front	To Rear	Horizontal	2.77	No	2.60	No
13	To Rear	To Rear	Tilted	0.63	Yes	1.12	No
14	To Rear	To Front	Tilted	4.86	No	3.97	No
15	To Front	To Front	Tilted	0.63	Yes	0.41	Yes
16	To Front	To Rear	Tilted	4.20	No	4.19	No

* NOTE: TESTS 1 - 8 ARE FOR TRAVEL IN X DIRECTION
TESTS 9 - 16 ARE FOR TRAVEL IN Y DIRECTION

TABLE 3

TIME TO STOP CARRIAGE

OPTICS CARRIAGE MOTORIZED TRANSPORT

SPECIFICATION 4. "TIME FROM RELEASE OF CONTROL TO STOP 0.1 SECOND OR LESS"

TEST CONDITIONS				COMPARISON DATA		PRESENT EVALUATION	
MINIMUM SPEED SETTING CARRIAGE OVER CENTER OF TABLE TOP				PRIOR EVALUATION (1st. TEST PROGRAM)		DATA FROM SECOND TEST PROGRAM (REWORKED TABLE)	
Test No.	Precondition Direction	Restart Direction	Table Orientation	TIME - SECONDS -	Met Spec.	TIME - SECONDS -	Met Spec.
1	Left	Left	Horizontal	0.02	Yes	0.26	No
2	Left	Right	Horizontal	< 0.03	Yes	0.10	Yes
3	Right	Right	Horizontal	0.02	Yes	< 0.04	Yes
4	Right	Left	Horizontal	0.12	No	0.24	No
5	Left	Left	Tilted	0.06	Yes	< 0.02	Yes
6	Left	Right	Tilted	< 0.02	Yes	0.18	No
7	Right	Right	Tilted	0.03	Yes	0.20	No
8	Right	Left	Tilted	0.33	No	0.11	No
9	To Rear	To Rear	Horizontal	0.29	No	0.18	No
10	To Rear	To Front	Horizontal	0.44	No	0.24	No
11	To Front	To Front	Horizontal	0.05	Yes	0.26	No
12	To Front	To Rear	Horizontal	0.05	Yes	0.25	No
13	To Rear	To Rear	Tilted	0.40	No	0.20	No
14	To Rear	To Front	Tilted	0.16	No	0.22	No
15	To Front	To Front	Tilted	0.05	Yes	0.22	No
16	To Front	To Rear	Tilted	0.39	No	0.17	No

* NOTE: Tests 1 - 8 ARE FOR TRAVEL IN X DIRECTION
Tests 9 - 16 ARE FOR TRAVEL IN Y DIRECTION

19 April 1972

TEST NO. R 1

TOTAL TIME	TOTAL DISTANCE	Incremental VELOCITY
0.0000	0.0000	0.0000
0.1900	0.0000	0.0022
0.3700	0.0004	0.0050
0.5500	0.0013	0.0047
0.7400	0.0022	0.0044
0.9200	0.0030	0.0056
1.1000	0.0040	0.0053
1.2900	0.0050	0.0056
1.4700	0.0060	0.0039
1.6500	0.0067	0.0042
1.8400	0.0075	0.0050
2.0200	0.0084	0.0047
2.1900	0.0092	0.0045
2.3900	0.0101	0.0050
2.5700	0.0110	0.0056
2.7500	0.0120	0.0059
2.9200	0.0130	0.0047
3.0900	0.0138	0.0047
3.2500	0.0146	0.0047
3.4300	0.0154	0.0047
3.6000	0.0162	0.0044
3.7800	0.0170	0.0053
3.9500	0.0179	0.0053
4.1200	0.0188	0.0041
4.2900	0.0195	0.0047
4.4600	0.0203	0.0041
4.6300	0.0210	0.0059
4.8000	0.0220	0.0050
4.9800	0.0229	0.0053
5.1500	0.0238	0.0047
5.3200	0.0246	0.0053
5.4900	0.0255	0.0035
5.6600	0.0261	0.0053
5.8300	0.0270	0.0059
6.0000	0.0280	0.0047
6.1700	0.0288	0.0041
6.3400	0.0295	0.0050
6.5200	0.0304	0.0035
6.6900	0.0310	0.0059
6.8600	0.0320	0.0059
7.0300	0.0330	0.0065
7.2000	0.0341	0.0033
7.3500	0.0346	0.0047
7.5200	0.0354	0.0047
7.6900	0.0362	0.0050
7.8700	0.0371	0.0053
8.0400	0.0380	0.0047
8.2100	0.0388	0.0053
8.3800	0.0397	0.0047
8.5500	0.0405	

AVERAGE VELOCITY 0.0049 TIME INTERVAL 0.92 TO 8.04

-0148 / 3.06 = -.00484

8.21
5.15
3.06

-.0053
-.0047
.0006

-.0006 / 3.06

196

.0386
.0238
.0148

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TEST NO. R 11

TOTAL TIME	TOTAL DISTANCE	VELOCITY
0.0000	0.0000	
0.1600	0.0002	0.0013
0.3200	0.0004	0.0013
0.4800	0.0013	0.0056
0.6400	0.0021	0.0050
0.8000	0.0031	0.0062
0.9600	0.0040	0.0056
1.1200	0.0049	0.0056
1.2800	0.0058	0.0056
1.4400	0.0065	0.0044
1.6000	0.0074	0.0056
1.7700	0.0081	0.0041
1.9400	0.0090	0.0053
2.1000	0.0100	0.0062
2.2700	0.0110	0.0059
2.4400	0.0119	0.0053
2.6000	0.0129	0.0062
2.7700	0.0138	0.0053
2.9600	0.0149	0.0058
3.1300	0.0158	0.0053
3.3000	0.0166	0.0047
3.4700	0.0174	0.0047
3.6400	0.0184	0.0059
3.8300	0.0194	0.0053
4.0000	0.0202	0.0047
4.1700	0.0212	0.0059
4.3400	0.0221	0.0053
4.5100	0.0230	0.0053
4.6900	0.0240	0.0056
4.8600	0.0250	0.0059
5.0300	0.0260	0.0059
5.2000	0.0269	0.0053
5.3800	0.0278	0.0050
5.5500	0.0285	0.0041
5.7200	0.0295	0.0059
5.9000	0.0302	0.0039
6.0700	0.0311	0.0053
6.2400	0.0320	0.0053
6.4200	0.0330	0.0056
6.5900	0.0340	0.0059
6.7600	0.0347	0.0041
6.9300	0.0355	0.0047
7.1000	0.0364	0.0053
7.2700	0.0370	0.0035
7.4500	0.0380	0.0056
7.6200	0.0390	0.0059
7.8000	0.0400	0.0056
7.9800	0.0407	0.0039

AVERAGE VELOCITY 0.0052 TIME INTERVAL 0.95 TO 7.98

19 April 1972

TEST NO. R 16

TOTAL TIME	TOTAL DISTANCE	VELOCITY
0.0000	0.0000	0.0000
0.1700	0.0000	0.0000
0.3400	0.0000	0.0000
0.5100	0.0000	0.0000
0.6800	0.0000	0.0000
0.8400	0.0000	0.0000
1.0100	0.0000	0.0000
1.1700	0.0000	0.0000
1.3400	0.0000	0.0000
1.5100	0.0000	0.0000
1.6800	0.0000	0.0000
1.8500	0.0000	0.0011
2.0300	0.0002	0.0006
2.2000	0.0003	0.0012
2.3700	0.0005	0.0006
2.5500	0.0006	0.0006
2.7200	0.0007	0.0012
2.8900	0.0009	0.0006
3.0600	0.0010	0.0000
3.2400	0.0010	0.0018
3.4100	0.0013	0.0018
3.5800	0.0016	0.0022
3.7600	0.0020	0.0018
3.9300	0.0023	0.0028
4.1100	0.0028	0.0035
4.2800	0.0034	0.0035
4.4500	0.0040	0.0028
4.6300	0.0045	0.0035
4.8000	0.0051	0.0035
4.9700	0.0057	0.0039
5.1500	0.0064	0.0035
5.3200	0.0070	0.0056
5.5000	0.0080	0.0041
5.6700	0.0087	0.0050
5.8500	0.0096	0.0050
6.0300	0.0105	0.0053
6.2000	0.0114	0.0044
6.3800	0.0122	0.0050
6.5600	0.0131	0.0050
6.7400	0.0140	0.0056
6.9200	0.0150	0.0044
7.1000	0.0158	0.0039
7.2800	0.0165	0.0050
7.4600	0.0174	0.0041
7.6300	0.0181	0.0044
7.8100	0.0189	0.0061
7.9900	0.0200	0.0056
8.1700	0.0210	0.0056
8.3500	0.0220	

AVERAGE VELOCITY 0.0029 TIME INTERVAL 1.01 TO 7.99

TABLE 1

MINIMUM OPERATING SPEED

OPTICS CARRIAGE MOTORIZED TRANSPORT

SPECIFICATION 1. "X - Y MINIMUM STARTING AND OPERATING SPEED - 0.005 in/sec. ± 10%"

(RANGE 0.0045 TO 0.0055 in/sec.)

TEST CONDITIONS				COMPARISON DATA		PRESENT EVALUATION	
MINIMUM SPEED SETTING CARRIAGE OVER CENTER OF TABLE TOP				PRIOR EVALUATION (1st. TEST PROGRAM)		DATA FROM SECOND TEST PROGRAM (REWORKED TABLE)	
Test No.	Precondition Direction	Restart Direction	Table Orientation	Operating Speed in/sec.	Met Spec.	Operating Speed in/sec.	Met Spec.
1	Left	Left	Horizontal	0.0049	Yes	0.0049	Yes
2	Left	Right	Horizontal	0.0042	No	0.0042	No
3	Right	Right	Horizontal	0.0046	Yes	0.0049	Yes
4	Right	Left	Horizontal	0.0047	Yes	0.0043	No
5	Left	Left	Tilted	0.0052	Yes	0.0047	Yes
6	Left	Right	Tilted	0.0043	No	0.0045	Yes
7	Right	Right	Tilted	0.0047	Yes	0.0049	Yes
8	Right	Left	Tilted	0.0049	Yes	0.0044	No
9	To Rear	To Rear	Horizontal	0.0052	Yes	0.0051	Yes
10	To Rear	To Front	Horizontal	0.0031	No	0.0035	No
11	To Front	To Front	Horizontal	0.0051	Yes	0.0052	Yes
12	To Front	To Rear	Horizontal	0.0042	No	0.0038	No
13	To Rear	To Rear	Tilted	0.0050	Yes	0.0050	Yes
14	To Rear	To Front	Tilted	0.0018	No	0.0031	No
15	To Front	To Front	Tilted	0.0049	Yes	0.0051	Yes
16	To Front	To Rear	Tilted	0.0023	No	0.0029	No

* NOTE: Tests 1 - 8 | ARE FOR TRAVEL IN X DIRECTION
Tests 9 - 16 | ARE FOR TRAVEL IN Y DIRECTION

TABLE 2

TIME TO ATTAIN SET SPEED

OPTICS CARRIAGE MOTORIZED TRANSPORT

SPECIFICATION 3. "TIME TO ATTAIN SET SPEED 0.5 to 1.0 SECONDS OR LESS"

TEST CONDITIONS				COMPARISON DATA		PRESENT EVALUATION	
MINIMUM SPEED SETTING CARRIAGE OVER CENTER OF TABLE TOP				PRIOR EVALUATION (1st. TEST PROGRAM)		DATA FROM SECOND TEST PROGRAM (REWORKED TABLE)	
Test No.	Precondition Direction	Restart Direction	Table Orientation	TIME - SECONDS -	Met Spec.	TIME - SECONDS -	Met Spec.
1	Left	Left	Horizontal	0.72	Yes	0.46	Yes
2	Left	Right	Horizontal	1.19	No	2.98	No
3	Right	Right	Horizontal	0.45	Yes	0.76	Yes
4	Right	Left	Horizontal	1.75	No	2.15	No
5	Left	Left	Tilted	0.60	Yes	0.42	Yes
6	Left	Right	Tilted	0.78	Yes	2.15	No
7	Right	Right	Tilted	0.47	Yes	1.64	No
8	Right	Left	Tilted	2.89	No	2.16	No
9	To Rear	To Rear	Horizontal	0.51	Yes	0.60	Yes
10	To Rear	To Front	Horizontal	1.84	No	3.71	No
11	To Front	To Front	Horizontal	0.48	Yes	0.40	Yes
12	To Front	To Rear	Horizontal	2.77	No	2.60	No
13	To Rear	To Rear	Tilted	0.63	Yes	1.12	No
14	To Rear	To Front	Tilted	4.86	No	3.97	No
15	To Front	To Front	Tilted	0.63	Yes	0.41	Yes
16	To Front	To Rear	Tilted	4.20	No	4.19	No

* NOTE: TESTS 1 - 8 ARE FOR TRAVEL IN X DIRECTION
TESTS 9 - 16 ARE FOR TRAVEL IN Y DIRECTION

TABLE 3

TIME TO STOP CARRIAGE

OPTICS CARRIAGE MOTORIZED TRANSPORT

SPECIFICATION 4. "TIME FROM RELEASE OF CONTROL TO STOP 0.1 SECOND OR LESS"

TEST CONDITIONS				COMPARISON DATA		PRESENT EVALUATION	
MINIMUM SPEED SETTING CARRIAGE OVER CENTER OF TABLE TOP				PRIOR EVALUATION (1st. TEST PROGRAM)		DATA FROM SECOND TEST PROGRAM (REWORKED TABLE)	
Test No.	Precondition Direction	Restart Direction	Table Orientation	TIME - SECONDS -	Met Spec.	TIME - SECONDS -	Met Spec.
1	Left	Left	Horizontal	0.02	Yes	0.26	No
2	Left	Right	Horizontal	< 0.03	Yes	0.10	Yes
3	Right	Right	Horizontal	0.02	Yes	< 0.04	Yes
4	Right	Left	Horizontal	0.12	No	0.24	No
5	Left	Left	Tilted	0.06	Yes	< 0.02	Yes
6	Left	Right	Tilted	< 0.02	Yes	0.18	No
7	Right	Right	Tilted	0.03	Yes	0.20	No
8	Right	Left	Tilted	0.33	No	0.11	No
9	To Rear	To Rear	Horizontal	0.29	No	0.18	No
10	To Rear	To Front	Horizontal	0.44	No	0.24	No
11	To Front	To Front	Horizontal	0.05	Yes	0.26	No
12	To Front	To Rear	Horizontal	0.05	Yes	0.25	No
13	To Rear	To Rear	Tilted	0.40	No	0.20	No
14	To Rear	To Front	Tilted	0.16	No	0.22	No
15	To Front	To Front	Tilted	0.05	Yes	0.22	No
16	To Front	To Rear	Tilted	0.39	No	0.17	No

* NOTE: Tests 1 - 8 ARE FOR TRAVEL IN X DIRECTION
Tests 9 - 16 ARE FOR TRAVEL IN Y DIRECTION