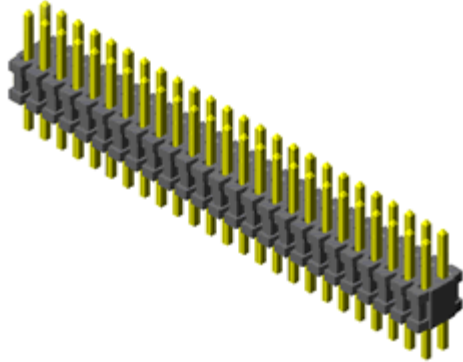
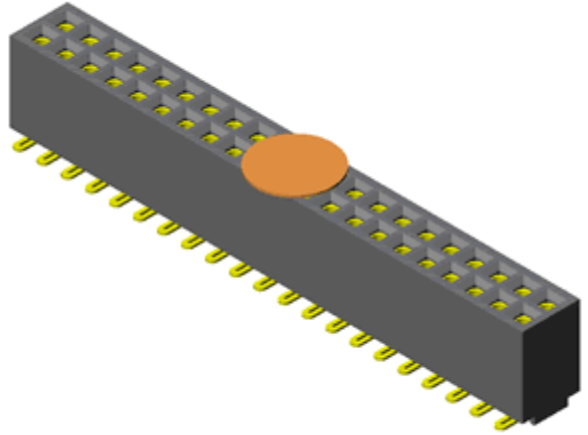




Project Number:		Tracking Code: TC0350--0335		
Requested by: Mark Shireman		Date: 12/12/2003	Product Rev: NA	
Part #: FTSH-140-04-L-D-RA, SFMC-140-L2-S-D, SFMC-140-02-S-D, SFMC-140-T2-S-D		Lot #: NA	Tech: T. C.	Eng: J. T.
Part description: FTSH-140-04-L-D-RA, SFMC-140-L2-S-D, SFMC-140-02-S-D, , SFMC-140-T2-S-D				Qty to test: 1
Test Start: 12/18/2003	Test Completed: 12/19/2003			



**FTSH Product Style**



**SFMC Product Style**

**Mating/Unmating - FTSH-140-04-L-D-RA**

- A) SFMC-140-L2-S-D (Low Insertion Force Contact)**
- B) SFMC-140-02-S-D (Standard Force Contact)**
- C) SFMC-140-T2-S-D (Tiger-Eye Lite Force Contact)**

## 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.

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**SCOPE:** To perform the following tests: mating and unmating the FTSH-140-04-L-D-RA/SFMC-140-X:

- Low insertion force contacts
- Standard Force Contacts
- Tiger-Eye Contacts

## 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) After soldering, the parts to be used for LLCR testing were cleaned according to TLWI-0001
- 4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used
- 5) The automated procedure is used with aqueous compatible soldering materials
- 6) The ultrasonic procedure can be used with either aqueous or non-aqueous soldering components and follows:
  - a) Sample test boards are to be ultrasonically cleaned after test lead attachment, preparation and/or soldering using the following process.
  - b) Sample test boards are immersed into Branson 3510 cleaner containing Kyzen Ionox HC1 (or equivalent) with the following conditions:
    - i) Temperature: -----55° C +/- 5° C
    - ii) Frequency:-----40 KHz
    - iii) Immersion Time: -----5 to 10 Minutes
    - iv) Sample test boards are removed and placed into the Branson 3510 cleaner containing deionized water with the following conditions:
      - v) Temperature:-----55° C +/- 5° C
      - vi) Frequency:-----40 KHz
      - vii) Immersion Time: -----5 to 10 Minutes
      - viii) Sample test boards are removed and placed in a beaker positioned on a hot plate with a magnetic stirrer containing deionized water warmed to 55° C +/- 5° C for 1/2 to 1 minute
  - c) Upon removal, the sample test boards are rinsed for 1/2 to 1 minute in room temperature free flowing deionized water.
  - d) After the final rinse, the sample test boards are dried in an air-circulating oven for 10 to 15 minutes at 50° C +/- 5° C
  - e) Sample test boards are then allowed to set and recover to room ambient condition prior to testing.
- 7) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
- 8) Any additional preparation will be noted in the individual test sequences.

## FLOWCHART

TEST STEP	GROUP A	GROUP B	GROUP B
	Low Insertion Contact	Standard Contact	Tiger-Eye Lite Contact
<b>01</b>	Mating / Unmating	Mating / Unmating	Mating / Unmating
<b>02</b>	Data Review	Data Review	Data Review
<b>03</b>	5 Cycles	5 Cycles	5 Cycles
<b>04</b>	Mating / Unmating	Mating / Unmating	Mating / Unmating
<b>06</b>	Data Review	Data Review	Data Review
<b>07</b>	10 Cycles	10 Cycles	10 Cycles
<b>08</b>	Mating / Unmating	Mating / Unmating	Mating / Unmating

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

### **ATTRIBUTE DEFINITION**

Following is a brief, simplified description of attributes.

#### **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

### Mating – Unmating Forces

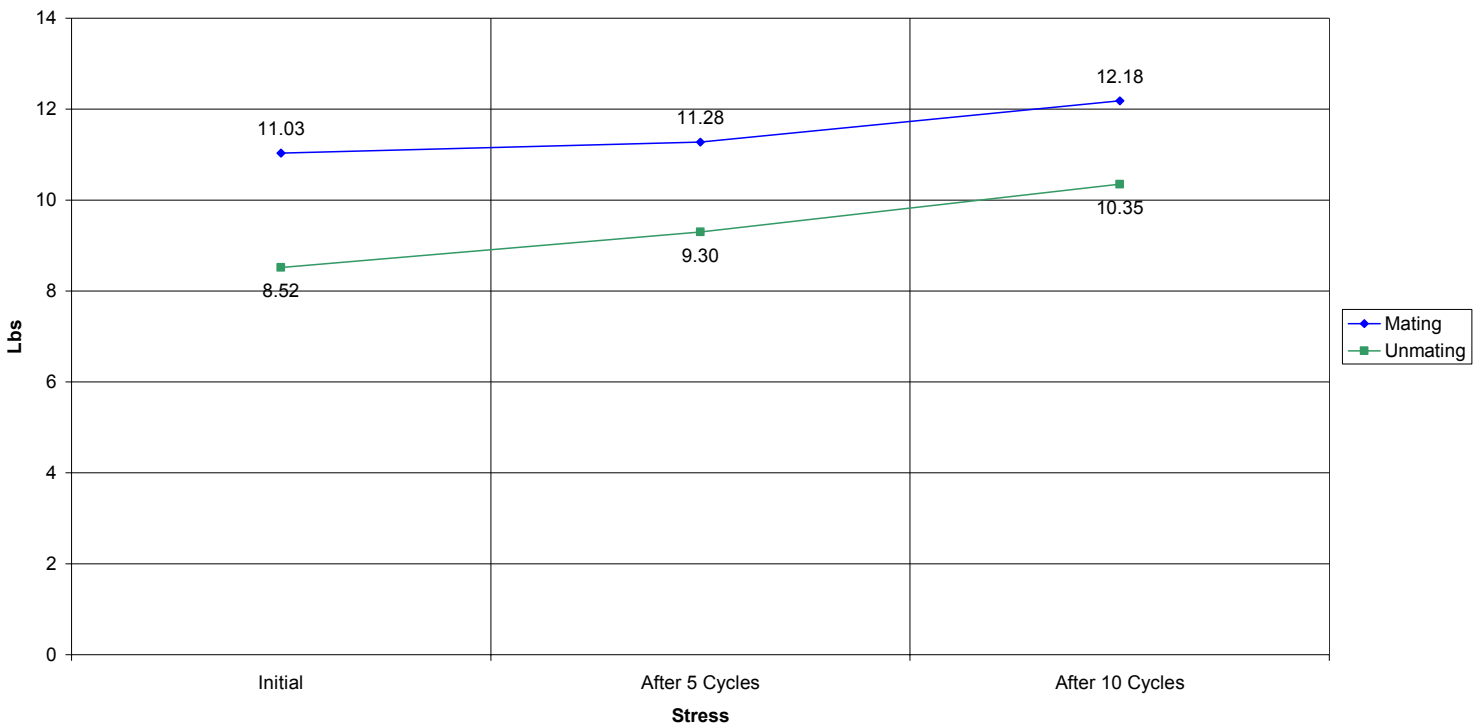
- **Initial**
  - **Mating - MIN**
    - **Low Insertion Contact**-----10.30 lbs.
    - **Standard Contact**-----18.23 lbs.
    - **Tiger-Eye Lite Contact**-----12.66 lbs.
  - **Mating - MAX**
    - **Low Insertion Contact**-----12.43 lbs.
    - **Standard Contact**-----19.87 lbs.
    - **Tiger-Eye Lite Contact**-----16.65 lbs.
  - **UN-Mating - MIN**
    - **Low Insertion Contact**----- 7.53 lbs.
    - **Standard Contact**-----15.02 lbs.
    - **Tiger-Eye Lite Contact**----- 9.54 lbs.
  - **UN-Mating - MAX**
    - **Low Insertion Contact**----- 9.76 lbs.
    - **Standard Contact**-----16.89 lbs.
    - **Tiger-Eye Lite Contact**-----11.87 lbs.
- **5 Cycles**
  - **Mating - MIN**
    - **Low Insertion Contact**-----10.51 lbs.
    - **Standard Contact**-----19.91 lbs.
    - **Tiger-Eye Lite Contact**-----13.44 lbs.
  - **Mating - MAX**
    - **Low Insertion Contact**-----12.92 lbs.
    - **Standard Contact**-----21.23 lbs.
    - **Tiger-Eye Lite Contact**-----17.02 lbs.
  - **UN-Mating - MIN**
    - **Low Insertion Contact**----- 7.40 lbs.
    - **Standard Contact**-----15.99 lbs.
    - **Tiger-Eye Lite Contact**-----10.65 lbs.
  - **UN-Mating - MAX**
    - **Low Insertion Contact**-----10.73 lbs.
    - **Standard Contact**-----17.19 lbs.
    - **Tiger-Eye Lite Contact**-----14.34 lbs.
- **10 Cycles**
  - **Mating - MIN**
    - **Low Insertion Contact**-----11.81 lbs.
    - **Standard Contact**-----21.03 lbs.
    - **Tiger-Eye Lite Contact**-----14.36 lbs.
  - **Mating - MAX**
    - **Low Insertion Contact**-----12.81 lbs.
    - **Standard Contact**-----22.38 lbs.
    - **Tiger-Eye Lite Contact**-----19.62 lbs.
  - **UN-Mating - MIN**
    - **Low Insertion Contact**----- 9.48 lbs.
    - **Standard Contact**-----16.34 lbs.
    - **Tiger-Eye Lite Contact**-----11.20 lbs.
  - **UN-Mating - MAX**
    - **Low Insertion Contact**-----11.34 lbs.
    - **Standard Contact**-----17.67 lbs.
    - **Tiger-Eye Lite Contact**-----15.07 lbs.

### DATA SUMMARIES

#### MATING/UNMATING Low Insertion Force Contact:

Initial - Low Insertion Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	164.8	10.30	120.5	7.53
Maximum	198.9	12.43	156.2	9.76
<b>Average</b>	<b>176.5</b>	<b>11.03</b>	<b>136.3</b>	<b>8.52</b>
After 5 Cycles - Low Insertion Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	168.2	10.51	118.4	7.40
Maximum	206.7	12.92	171.7	10.73
<b>Average</b>	<b>180.4</b>	<b>11.28</b>	<b>148.8</b>	<b>9.30</b>
After 10 Cycles - Low Insertion Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	189.0	11.81	151.7	9.48
Maximum	205.0	12.81	181.4	11.34
<b>Average</b>	<b>194.9</b>	<b>12.18</b>	<b>165.6</b>	<b>10.35</b>

**Mating & Unmating Averages**  
**TC0350-0335**  
**FTSH-140-04-L-DV / SFMC-140-L2-S-D**  
**(Low Insertion Force Contact)**

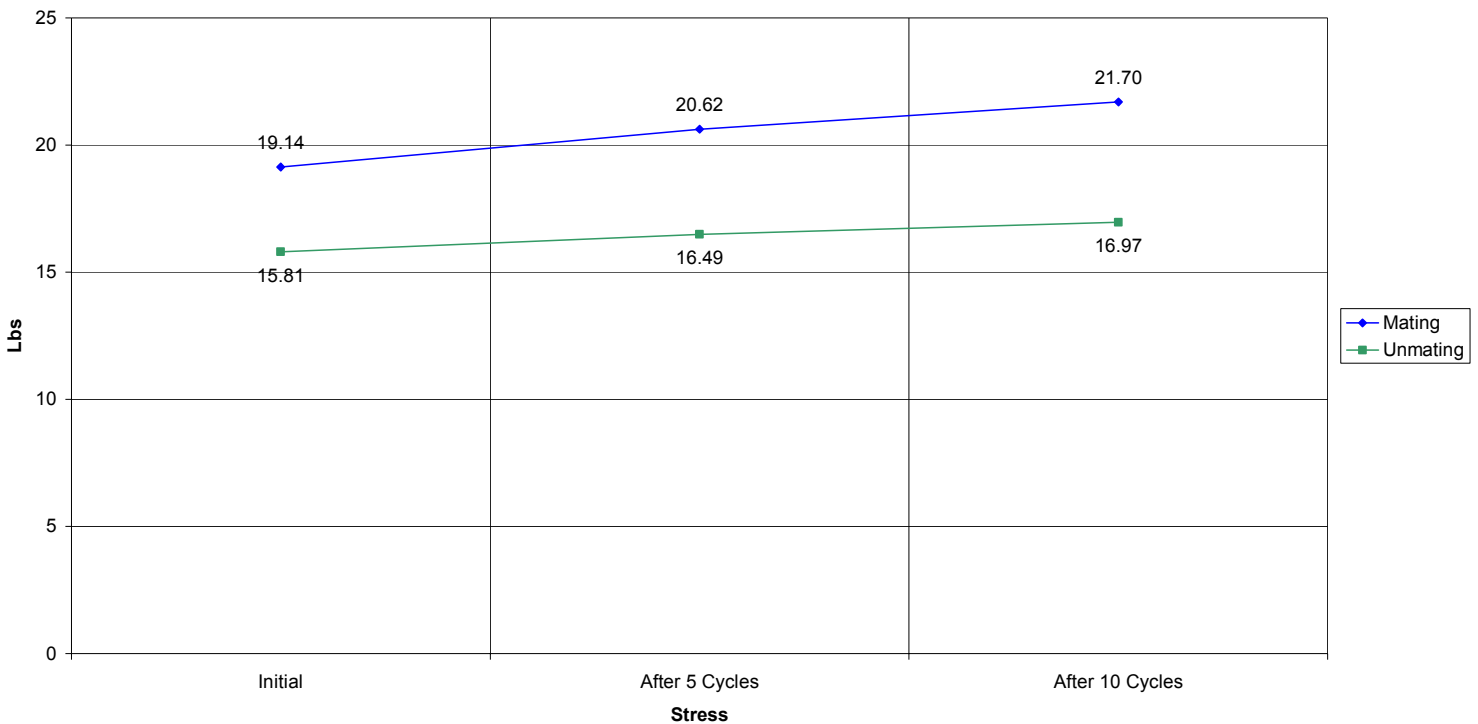


### DATA SUMMARIES Continued

#### MATING/UNMATING STD Force Contact:

Initial - STD Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	291.7	18.23	240.3	15.02
Maximum	317.9	19.87	270.2	16.89
Average	306.2	19.14	252.9	15.81
After 5 Cycles - STD Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	318.6	19.91	255.8	15.99
Maximum	339.7	21.23	275.0	17.19
Average	329.9	20.62	263.9	16.49
After 10 Cycles - STD Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	336.5	21.03	261.4	16.34
Maximum	358.1	22.38	282.7	17.67
Average	347.2	21.70	271.4	16.97

**Mating & Unmating Averages**  
**TC0350-0335**  
**FTSH-140-04-L-DV / SFMC-140-02-S-D**  
**(Standard Force Contact)**

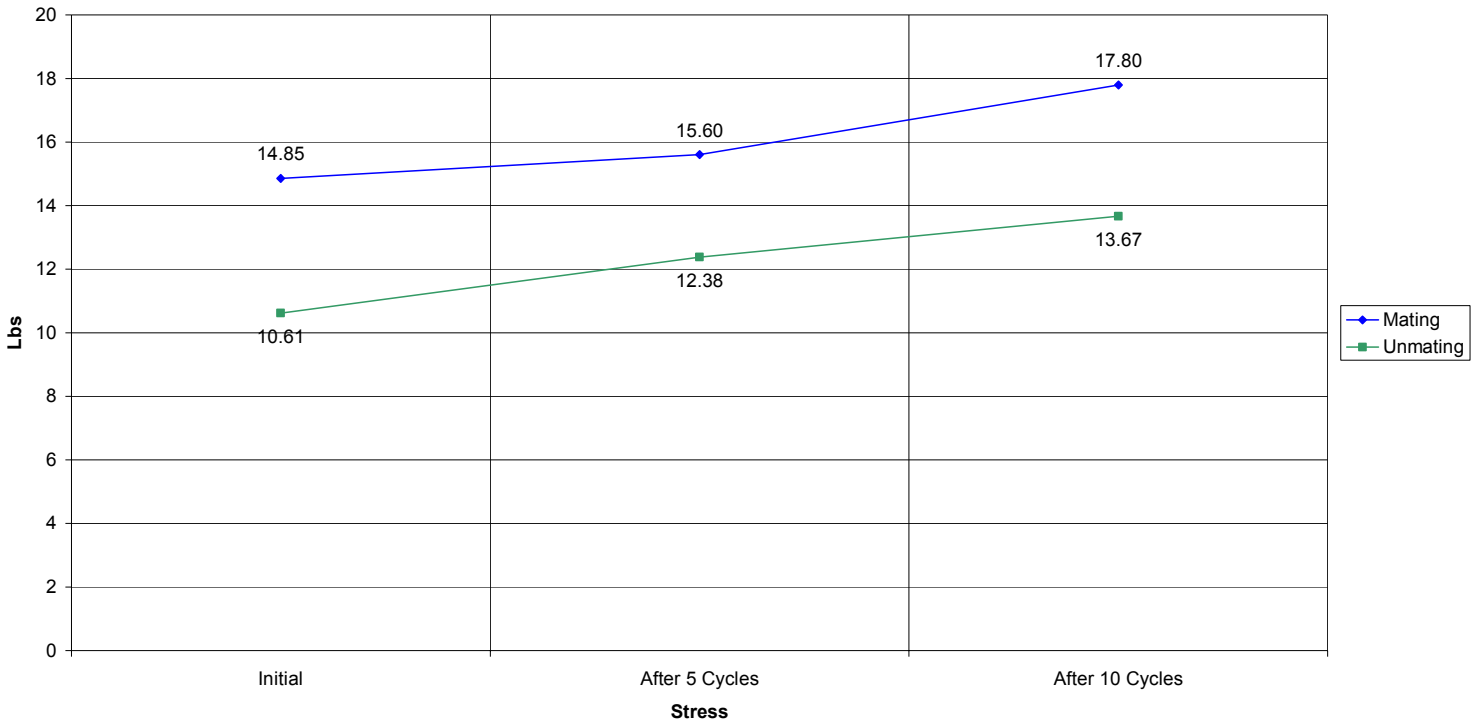


### DATA SUMMARIES Continued

#### MATING/UNMATING Tiger Eye Lite Contact:

Initial - Tiger Eye Lite Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	202.6	12.66	152.6	9.54
Maximum	266.4	16.65	189.9	11.87
Average	237.6	14.85	169.8	10.61
After 5 Cycles - Tiger Eye Lite Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	215.0	13.44	170.4	10.65
Maximum	272.3	17.02	229.4	14.34
Average	249.6	15.60	198.1	12.38
After 10 Cycles - Tiger Eye Lite Force Contact				
	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
Minimum	229.8	14.36	179.2	11.20
Maximum	313.9	19.62	241.1	15.07
Average	284.7	17.80	218.7	13.67

**Mating & Unmating Averages**  
**TC0350-0335**  
**FTSH-140-04-L-DV / SFMC-140-T2-S-D**  
**(Tiger Eye Lite Contact)**



**DATA**

**MATING/UNMATING Low Insertion Force contact:**

<b>Test Date:</b>	12/19/2003
<b>Operator:</b>	Troy Cook
<b>Temperature (C):</b>	22
<b>Humidity (RH):</b>	28%
<b>Equipment ID:</b>	TCT-03
<b>Load Cell ID:</b>	LC-2500N(icell)
<b>Terminal Part #</b>	FTSH-140-04-L-DV
<b>Socket Part #</b>	SFMC-140-L2-S-D

Initial - Low Insertion Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	176.0	11.00	151.2	9.45
2	172.0	10.75	135.7	8.48
3	164.8	10.30	120.5	7.53
4	172.8	10.80	131.0	8.19
5	174.4	10.90	123.2	7.70
6	198.9	12.43	156.2	9.76

After 5 Cycles - Low Insertion Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	179.5	11.22	168.0	10.50
2	175.7	10.98	153.4	9.59
3	168.2	10.51	118.4	7.40
4	176.8	11.05	142.6	8.91
5	175.5	10.97	138.7	8.67
6	206.7	12.92	171.7	10.73

After 10 Cycles - Low Insertion Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	199.5	12.47	181.4	11.34
2	191.7	11.98	167.8	10.49
3	189.0	11.81	158.4	9.90
4	192.3	12.02	153.0	9.56
5	192.0	12.00	151.7	9.48
6	205.0	12.81	181.4	11.34

**DATA Continued**

**MATING/UNMATING STD Force Contact:**

<b>Test Date:</b>	12/19/2003
<b>Operator:</b>	Troy Cook
<b>Temperature (C):</b>	22
<b>Humidity (RH):</b>	28%
<b>Equipment ID:</b>	TCT-03
<b>Load Cell ID:</b>	LC-2500N(icell)
<b>Terminal Part #</b>	FTSH-140-04-L-DV
<b>Socket Part #</b>	SFMC-140-02-S-D

Initial - STD Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	310.4	19.40	255.7	15.98
2	298.2	18.64	254.4	15.90
3	310.7	19.42	270.2	16.89
4	291.7	18.23	244.6	15.29
5	308.3	19.27	252.0	15.75
6	317.9	19.87	240.3	15.02
After 5 Cycles - STD Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	328.6	20.54	265.6	16.60
2	323.0	20.19	261.1	16.32
3	331.5	20.72	275.0	17.19
4	318.6	19.91	263.4	16.46
5	339.7	21.23	262.2	16.39
6	338.1	21.13	255.8	15.99
After 10 Cycles - STD Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	345.4	21.59	269.0	16.81
2	336.5	21.03	272.5	17.03
3	345.3	21.58	282.7	17.67
4	345.1	21.57	277.1	17.32
5	352.6	22.04	265.9	16.62
6	358.1	22.38	261.4	16.34

**DATA Continued**

**MATING/UNMATING Tiger Eye Lite Force Contact:**

<b>Test Date:</b>	12/19/2003
<b>Operator:</b>	Troy Cook
<b>Temperature (C):</b>	22
<b>Humidity (RH):</b>	28%
<b>Equipment ID:</b>	TCT-03
<b>Load Cell ID:</b>	LC-2500N(icell)
<b>Terminal Part #</b>	FTSH-140-04-L-DV
<b>Socket Part #</b>	SFMC-140-T2-S-D

Initial - Tiger Eye Lite Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	234.4	14.65	152.6	9.54
2	227.5	14.22	177.6	11.10
3	247.5	15.47	173.6	10.85
4	266.4	16.65	168.5	10.53
5	202.6	12.66	156.6	9.79
6	247.4	15.46	189.9	11.87
After 5 Cycles - Tiger Eye Lite Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	251.0	15.69	183.5	11.47
2	254.6	15.91	196.3	12.27
3	257.3	16.08	207.7	12.98
4	272.3	17.02	201.0	12.56
5	215.0	13.44	170.4	10.65
6	247.5	15.47	229.4	14.34
After 10 Cycles - Tiger Eye Lite Force Contact				
Sample#	Mating		Unmating	
	Force (Oz)	Force (Lbs)	Force (Oz)	Force (Lbs)
1	288.0	18.00	203.8	12.74
2	297.6	18.60	225.8	14.11
3	290.6	18.16	230.7	14.42
4	313.9	19.62	231.8	14.49
5	229.8	14.36	179.2	11.20
6	288.5	18.03	241.1	15.07

Tracking Code: TC0350--0335	Part #: FTSH-140-04-L-D-RA, SFMC-140-L2-S-D, SFMC-140-02-S-D, SFMC-140-T2-S-D
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Part description: FTSH-140-04-L-D-RA, SFMC-140-L2-S-D, SFMC-140-02-S-D, SFMC-140-T2-S-D
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## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** THL-01

**Description:** Temperature/Humidity Chart Recorder

**Manufacturer:** Dickson

**Model:** THDX

**Serial #:** 9316255

**Accuracy:** Temp: +/- 1C; Humidity: +/-2% RH (0 - 60%) +/- 3% RH (61 - 95%).

... Last Cal: 7/15/02, Next Cal: 7/15/03

**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: 6/12/03, Next Cal: 6/12/04

**Equipment #:** LC-2500N(icell)

**Description:** 2500 N Load Cell for Dillon Quantrol

**Manufacturer:** Dillon Quantrol

**Model:** icell

**Serial #:** 01-0132-01

**Accuracy:** .10% of capacity

... Last Cal: 3/27/03, Next Cal: 3/27/04