



# Test Report Product Validation

Braganca-Paulista Electrical Components Test Laboratory  
RUA AMPERE 304 Dist. Indl I BRAGANCA PAULISTA SAO PAULO BRAZIL 12929-570

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Report Title: MAXI FUSE BOX ASS'Y  
Report Number: RL140600  
Revision: 1  
Date Issued: 04 mar 2015

Execution: Diogo Rojas  
Phone: 11 3404-6278

Requestor: Marcos Ogawa  
Phone: 11 3404-6153  
Address: mrogawa@te.com

Disposition of Samples: Return to Customer  
Customer: FORD

List of Part Numbers: 2819045-1

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## Scope/Abstract and Conclusions

### Purpose

Validation test according to ADVP annex.

### Summary

Please see conclusion at each group test.

1. RESULTS

Test Sequence/Environment	Requirements	Results																																				
<b>Group 1</b>																																						
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.																																				
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Voltage drop	< 8mΩ (final measurements)	<p>Pass.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th rowspan="2"></th> <th colspan="3">Voltage drop [mV/A]</th> </tr> <tr> <th>Way 1</th> <th>Way 2</th> <th>Way 3</th> </tr> </thead> <tbody> <tr> <td>Minimum</td> <td>1,484</td> <td>2,276</td> <td>1,647</td> </tr> <tr> <td>Average</td> <td>1,634</td> <td>2,391</td> <td>1,759</td> </tr> <tr> <td>Maximum</td> <td>1,784</td> <td>2,505</td> <td>1,87</td> </tr> </tbody> </table>		Voltage drop [mV/A]			Way 1	Way 2	Way 3	Minimum	1,484	2,276	1,647	Average	1,634	2,391	1,759	Maximum	1,784	2,505	1,87																	
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Heating test	Informative.	<p>Only informative test. Please see results at item 4.14 of this test report.</p>																																				
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Informative.																																				

Test Sequence/Environment	Requirements	Results								
<b>Group 2</b>										
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.								
100% Continuity test	Proper continuity through each circuit	Pass.								
Dielectric test	Leakage current < 1mA	Pass. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Leakage current [mA]</th> </tr> </thead> <tbody> <tr> <td>Minimum</td> <td>0,005</td> </tr> <tr> <td>Average</td> <td>0,008</td> </tr> <tr> <td>Maximum</td> <td>0,010</td> </tr> </tbody> </table>	Leakage current [mA]		Minimum	0,005	Average	0,008	Maximum	0,010
Leakage current [mA]										
Minimum	0,005									
Average	0,008									
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Insulation resistance	>10MΩ	Pass. All samples >50GΩ.								
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.								

Test Sequence/Environment	Requirements	Results																				
<b>Group 3</b>																						
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.																				
Voltage drop	< 4mΩ (initial measurements)	Pass. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="4">Voltage drop [mV/A]</th> </tr> <tr> <th></th> <th>Way 1</th> <th>Way 2</th> <th>Way 3</th> </tr> </thead> <tbody> <tr> <td>Minimum</td> <td>1,22</td> <td>1,66</td> <td>1,38</td> </tr> <tr> <td>Average</td> <td>1,70</td> <td>2,07</td> <td>1,74</td> </tr> <tr> <td>Maximum</td> <td>2,80</td> <td>2,40</td> <td>2,47</td> </tr> </tbody> </table>	Voltage drop [mV/A]					Way 1	Way 2	Way 3	Minimum	1,22	1,66	1,38	Average	1,70	2,07	1,74	Maximum	2,80	2,40	2,47
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Remove and reinstall all components	There shall be no degradation in the design intended performance.	Pass.																				
Thermal shock	Samples must pass in items below.	Pass.																				
Flex flexible members 20 times	There shall be no degradation in the design intended performance.	Pass.																				

Test Sequence/Environment	Requirements	Results																				
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Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.																				

Test Sequence/Environment	Requirements	Results
<b>Group 4</b>		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.
Soak samples at -40°C for 72 hours	Samples must pass in items below.	Pass.
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.
Remove and reinstall all components	There shall be no degradation in the design intended performance.	Pass.
Flex flexible members 20 times	There shall be no degradation in the design intended performance.	Pass.
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.

Test Sequence/Environment	Requirements	Results
<b>Group 5</b>		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.
Soak samples at 125°C for 72 hours	Samples must pass in items below.	Pass.

Test Sequence/Environment	Requirements	Results
<b>Group 5</b>		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.
Remove and reinstall top cover 20 times after removing from hot chamber	There shall be no degradation in the design intended performance.	Pass.
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.

Test Sequence/Environment	Requirements	Results																
<b>Group 6</b>																		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.																
Component insertion/removal test	J-case Insertion force < 60N J-case extraction force > 6,8N	Pass. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Samples</th> <th>J-case insertion force [N]</th> </tr> </thead> <tbody> <tr> <td>Mínimum</td> <td>34,50</td> </tr> <tr> <td>Average</td> <td>41,11</td> </tr> <tr> <td>Maximum</td> <td>49,00</td> </tr> </tbody> </table> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Samples</th> <th>J-case extraction force [N]</th> </tr> </thead> <tbody> <tr> <td>Mínimum</td> <td>28,00</td> </tr> <tr> <td>Average</td> <td>34,61</td> </tr> <tr> <td>Maximum</td> <td>41,00</td> </tr> </tbody> </table>	Samples	J-case insertion force [N]	Mínimum	34,50	Average	41,11	Maximum	49,00	Samples	J-case extraction force [N]	Mínimum	28,00	Average	34,61	Maximum	41,00
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Average	34,61																	
Maximum	41,00																	

Test Sequence/Environment	Requirements	Results								
<b>Group 6</b>										
Top cover pull-out test	The maximum effort to remove the top cover from EDB shall be less than 90N.	<p>This item was approved by an agreement between FORD and TE engineering because this item is a carry over item and it was approved on Ford Program BV 226/BV 256 acc to specification S96FG-14A073-BA and ES-5L1T-14A067-AA item 2.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Top cover pull-out test [N]</th> </tr> </thead> <tbody> <tr> <td>Minimum</td> <td>57,0</td> </tr> <tr> <td>Average</td> <td>62,5</td> </tr> <tr> <td>Maximum</td> <td>68,0</td> </tr> </tbody> </table>	Top cover pull-out test [N]		Minimum	57,0	Average	62,5	Maximum	68,0
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Maximum	68,0									

Test Sequence/Environment	Requirements	Results
<b>Group 7</b>		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.
Drop test	There shall be no breakage or degradation in design-intended performance. Shake the EDB vigorously in 3 directions and there shall be no audible rattle, buzzes or squeaks.	Pass.
100% Continuity test	Proper continuity through each circuit	Pass.
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.

Test Sequence/Environment	Requirements	Results
<b>Group 8</b>		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Informative.
Acid battery spray	Samples must pass in items below.	Informative.

Test Sequence/Environment	Requirements	Results								
<b>Group 8</b>										
Dielectric test	Leakage current < 1mA	Pass. <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="2">Leakage current [mA]</th> </tr> </thead> <tbody> <tr> <td>Minimum</td> <td>0,004</td> </tr> <tr> <td>Average</td> <td>0,007</td> </tr> <tr> <td>Maximum</td> <td>0,011</td> </tr> </tbody> </table>	Leakage current [mA]		Minimum	0,004	Average	0,007	Maximum	0,011
Leakage current [mA]										
Minimum	0,004									
Average	0,007									
Maximum	0,011									
Flex flexible members 20 times	There shall be no degradation in the design intended performance.	Pass.								
Remove and reinstall all components 20 times	There shall be no degradation in the design intended performance.	Pass.								
Visual inspection	Plastic, labels and graphics must not crack, flake, bubble or deteriorate in any other way.	Informative. Please, see photos at item 3.8.								

Test Sequence/Environment	Requirements	Results
<b>Group 9</b>		
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.
Vibration test	There shall be no breakage or degradation in the design-intended performance. Shake the EDB vigorously in 3 directions and there shall be no audible rattle, buzzes or squeaks.	Pass.
100% Continuity test	Proper continuity through each circuit	Pass.
Visual inspection	There shall be no corrosion, discoloration, cracks, etc., which could affect the functionality of the part.	Pass.

## 2. SAMPLE & WIRE DESCRIPTION

The Certification of Conformance (C of C), submitted with the test request, lacked the necessary information to verify the samples tested. Therefore the Test Lab cannot verify that the samples have been produced, inspected, and accepted as conforming to product drawing requirements, and made using the same core manufacturing processes and technologies as production or parts.



### 2.1. Group / Samples

Group	Part Number	Rev.	Date Code	Sample Description	Quantity Tested
All groups	2819069-1	A1	N/A	Maxi Fuse Box Assy	40

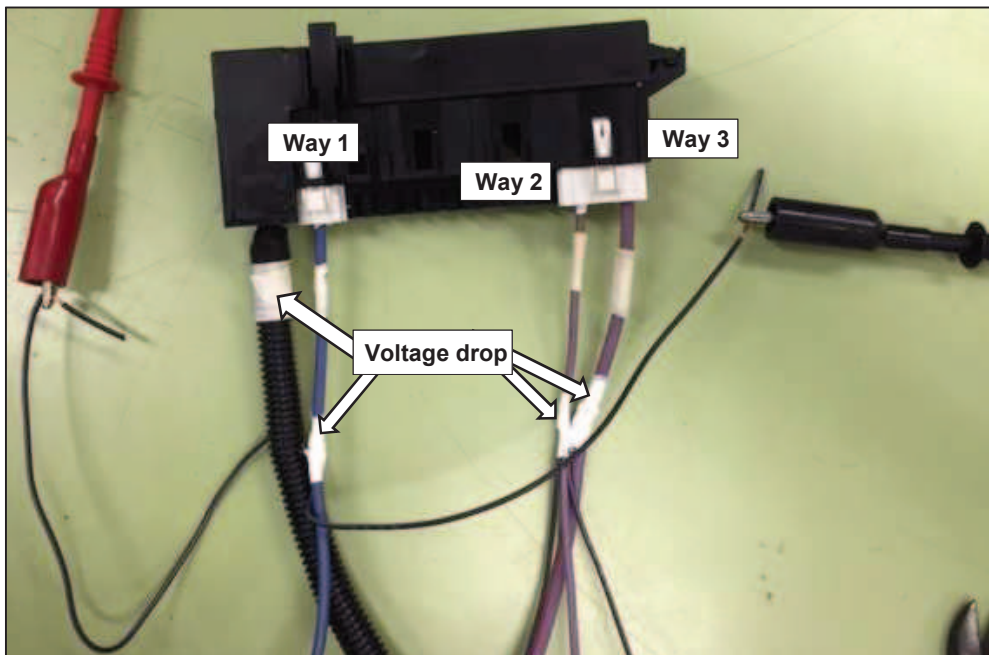
\* Information either unavailable or not provided by requestor.

### 2.2. Wire Information

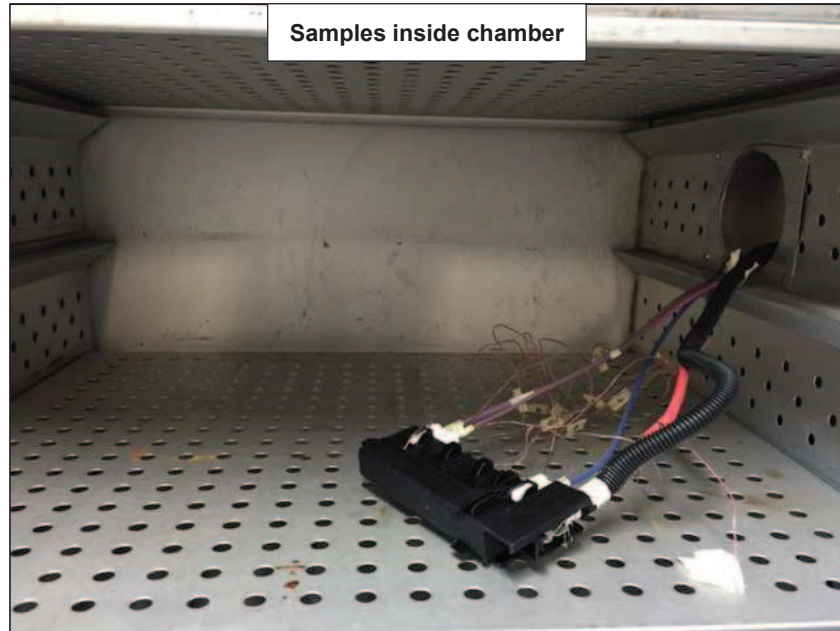
Group Number	Wire Gage	Overall Diameter	Strand Diameter	Number of Strands	Wire Length
All groups	6mm <sup>2</sup>	4,15mm	0,29mm	84	40cm
All groups	4mm <sup>2</sup>	3,49mm	0,31mm	54	40cm
All groups	10mm <sup>2</sup>	5,74mm	0,40mm	80	70cm
All groups	2,5mm <sup>2</sup>	2,77mm	0,39mm	19	40cm

## 3. SAMPLE PREPARATION

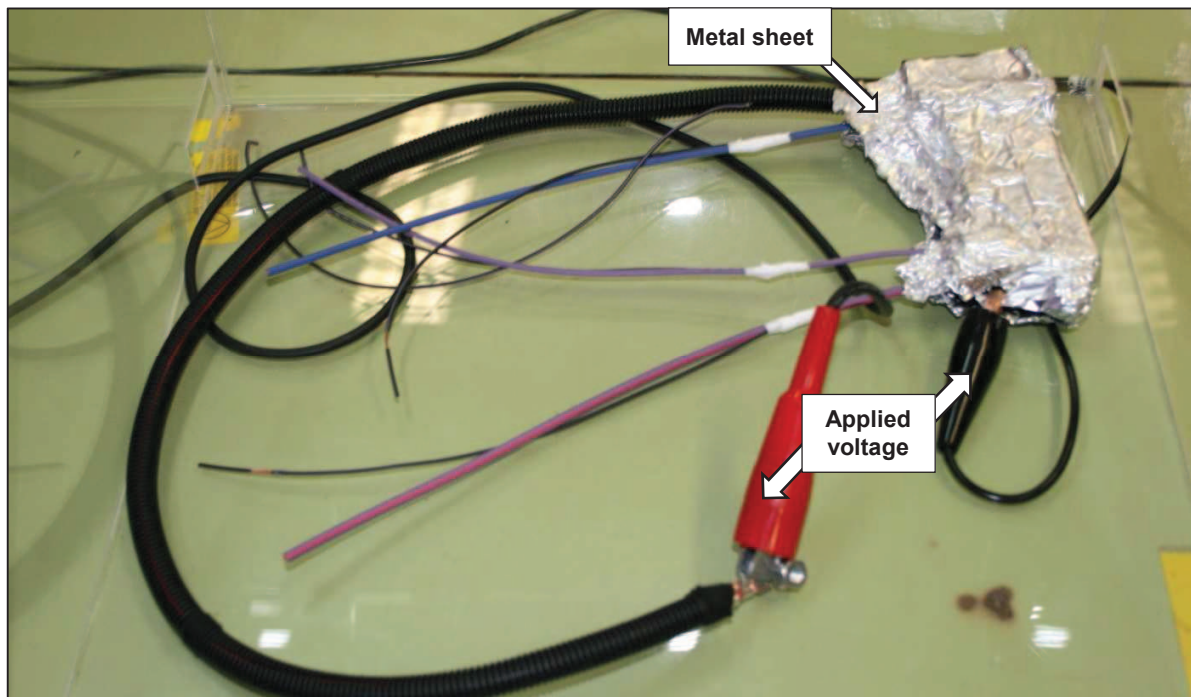
### 3.1. Voltage drop / 100% continuity test



### 3.2. Thermal mapping / Power dissipation / Heating test



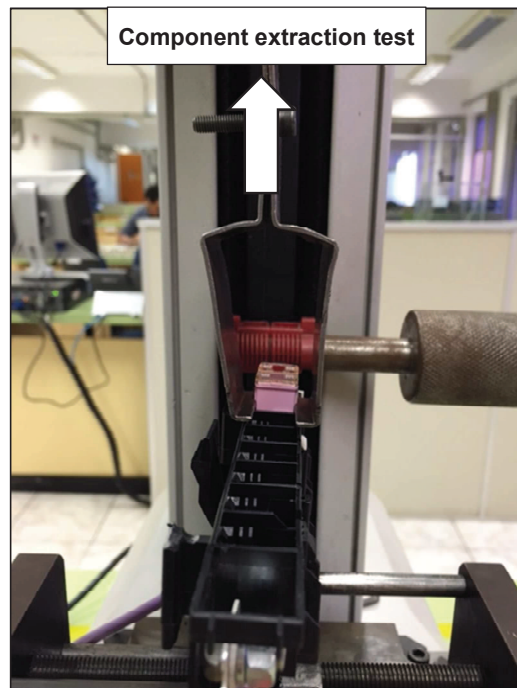
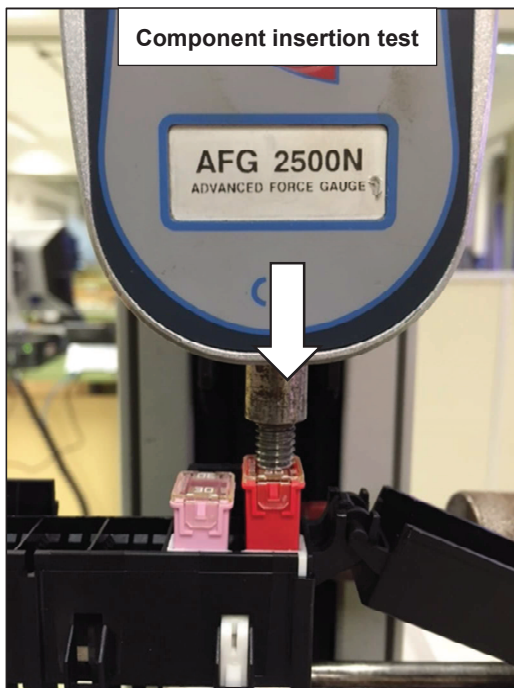
### 3.3. Dielectric test and Insulation resistance test



### 3.4. Thermal shock / Low and High temperature exposure test



### 3.5. Component insertion/removal test



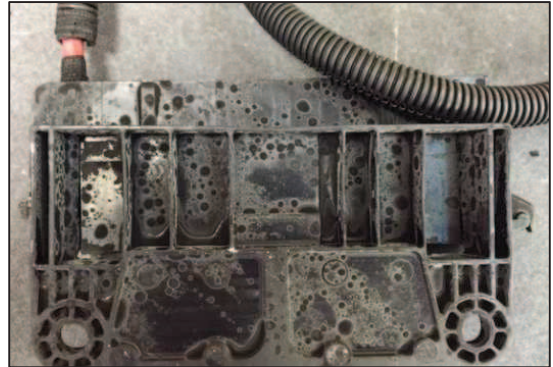
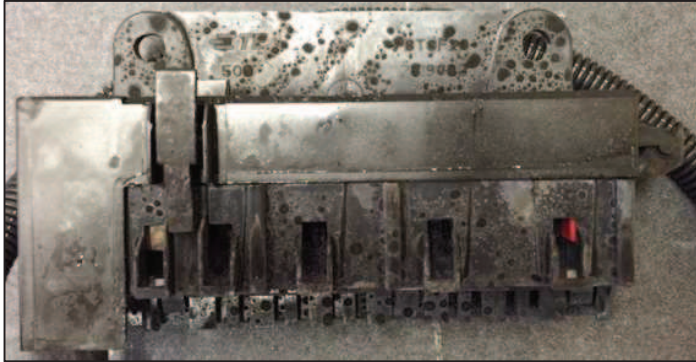
### 3.6. Top cover pull-off test



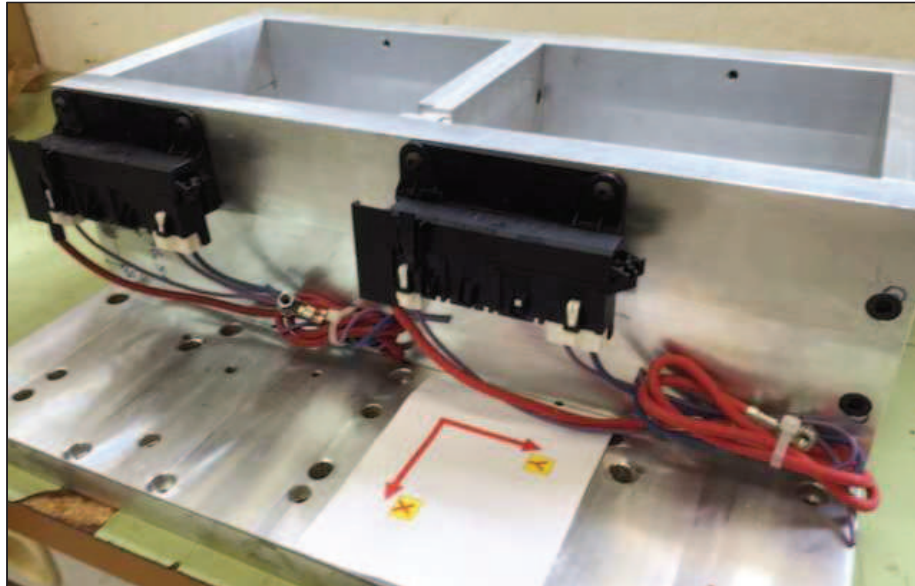
### 3.7. Drop test



### 3.8. Acid Battery spray



### 3.9. Vibration test



#### 4. TEST PROCEDURE

##### 4.1. Voltage drop

Measure the voltage drop between points described at item 3.1 by applying 1ADC to the circuit.

##### 4.2. Thermal mapping

Due to the max vehicle steady state load current uncertainty, it was performed 3 different tests and the results are just for customer information.

###### **Test 1 (82% of specified J-case current):**

Apply 82% of the max nominal J-case current to each input/output circuit simultaneously until stabilizes. Measure and record the temperature increase above ambient.

Applied current:

Way 1 = 24,5A<sub>dc</sub>; Way 7 = 24,5A<sub>dc</sub> and Way 8 = 40,3A<sub>dc</sub>.

###### **Test 2 (75% of specified J-case current):**

Apply 75% of the max nominal J-case current to each input/output circuit simultaneously until stabilizes. Measure and record the temperature increase above ambient.

Applied current:

Way 1 = 22,5A<sub>dc</sub>; Way 7 = 22,5A<sub>dc</sub> and Way 8 = 37,5A<sub>dc</sub>.

###### **Test 3 (Ford matrix specified current):**

Apply the currents specified at Ford matrix to each input/output circuit simultaneously until stabilizes. Measure and record the temperature increase above ambient.

Applied current:

Way 1 = 22,5A<sub>dc</sub>; Way 7 = 3,9A<sub>dc</sub> (1,2A nominal steady state op. current + 2,7A max. steady state op. current) and Way 8 = 6A<sub>dc</sub> (2A nominal steady state op. current + 4A max. steady state op. current).

##### 4.3. Power dissipation

Due to the max vehicle steady state load current uncertainty, it was performed 3 different tests and the results are just for customer information.

Remove and reinstall all components before tests.

###### **Test 1:**

Soak the samples at a temperature of 125°C, then after the stabilization apply 82% of the max nominal J-case current to each input/output circuit simultaneously until stabilizes.

Measure and record the temperature increase above ambient.

Applied current:

Way 1 = 24,5A<sub>dc</sub>; Way 7 = 24,5A<sub>dc</sub> and Way 8 = 40,3A<sub>dc</sub>.

###### **Test 2:**

Soak the samples at a temperature of 125°C, then after the stabilization apply 75% of the max nominal J-case current to each input/output circuit simultaneously until stabilizes.

Measure and record the temperature increase above ambient.

Applied current:

Way 1 = 22,5A<sub>dc</sub>; Way 7 = 22,5A<sub>dc</sub> and Way 8 = 37,5A<sub>dc</sub>.

**Test 3:**

Soak the samples at a temperature of 85°C, then after the stabilization apply 75% of the max nominal J-case current to each input/output circuit simultaneously until stabilizes.

Measure and record the temperature increase above ambient.

Applied current:

Way 1 = 22,5Adc; Way 7 = 22,5Adc and Way 8 = 37,5Adc

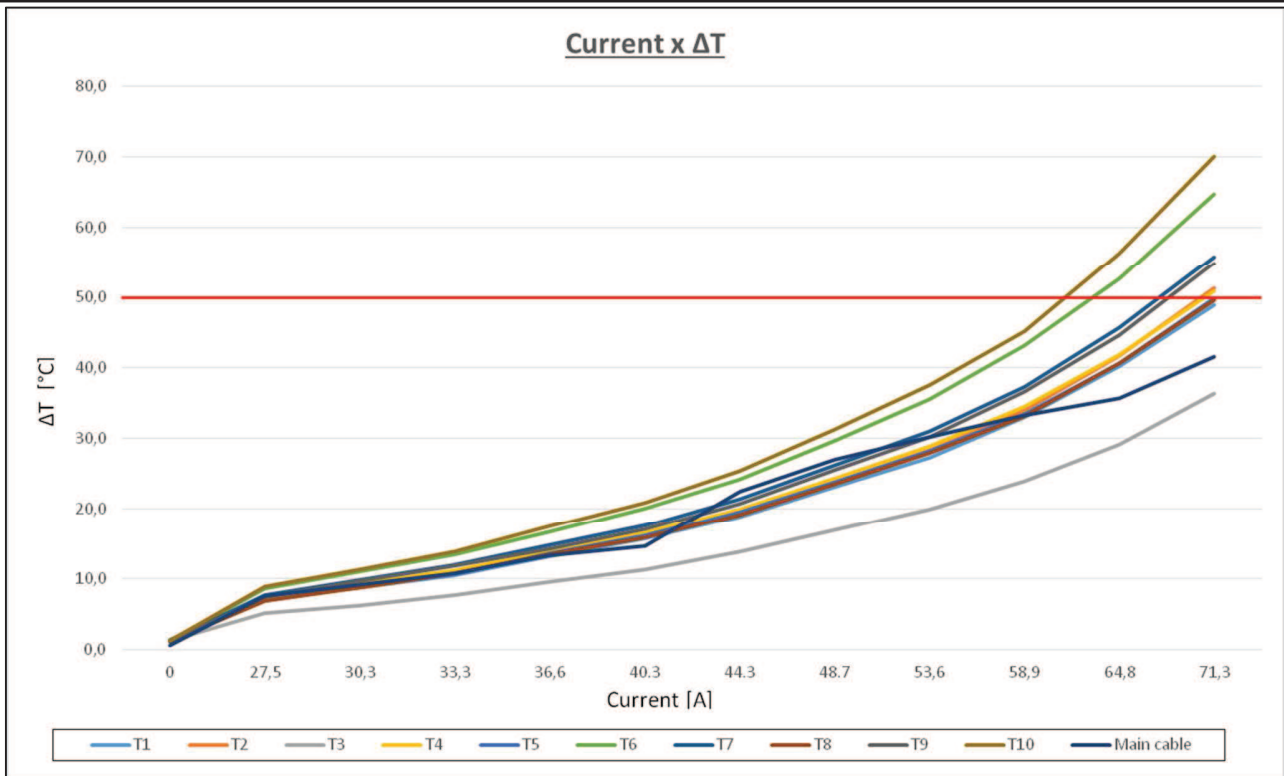
**4.4. Heating test**

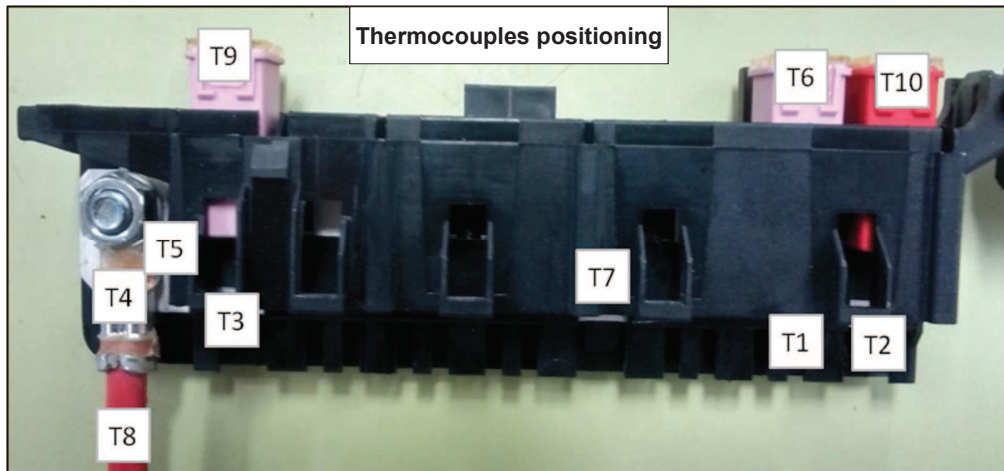
Test performed only for customer information.

At the beginning of test, It was applied a current of 25% of J-case capacity, then the current was increased by steps of 10% until the delta T reach 50°C.

Please see below a table with the applied current and the reached delta T.

J-case [A]			Total current [A]	Delta T [°C]										
30	30	50		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	Main cable
Individual applied current in each circuit [A]			0	1,38	1,23	1,21	1,14	1,22	1,19	1,22	1,13	1,03	1,18	0,58
7,5	7,5	12,5	27,5	7,01	7,38	5,06	7,13	6,87	8,51	7,61	6,83	7,36	8,85	7,51
8,3	8,3	13,8	30,3	8,64	8,71	6,15	9,25	8,82	10,99	9,79	8,72	9,57	11,24	9,13
9,1	9,1	15,1	33,3	10,48	10,73	7,61	11,10	10,61	13,40	11,88	10,65	11,70	13,74	10,74
10,0	10,0	16,6	36,6	13,12	13,41	9,50	13,77	13,51	16,54	14,73	13,32	14,21	17,42	13,26
11,0	11,0	18,3	40,3	15,62	15,90	11,16	16,40	16,00	19,97	17,54	15,76	16,90	20,86	14,57
12,1	12,1	20,1	44,3	18,81	19,24	13,83	19,89	19,46	24,14	21,36	19,09	20,70	25,32	22,39
13,3	13,3	22,1	48,7	23,15	23,72	16,88	24,33	23,81	29,67	26,18	23,53	25,46	31,23	26,96
14,6	14,6	24,4	53,6	27,24	28,24	19,86	28,82	28,11	35,49	31,00	27,85	30,21	37,50	30,21
<b>16,1</b>	<b>16,1</b>	<b>26,8</b>	<b>58,9</b>	<b>32,91</b>	<b>33,85</b>	<b>23,87</b>	<b>34,38</b>	<b>33,33</b>	<b>43,04</b>	<b>37,24</b>	<b>33,11</b>	<b>36,54</b>	<b>45,15</b>	<b>33,24</b>
17,7	17,7	29,5	64,8	40,09	41,62	29,14	41,76	40,59	52,60	45,59	40,54	44,62	56,26	35,64
19,5	19,5	32,4	71,3	48,78	51,16	36,25	50,84	49,81	64,66	55,72	49,47	54,82	70,00	41,55





**4.5. 100% Continuity test**

Measure the continuity between each EDB circuit.

**4.6. Dielectric test**

Apply 400VAC for 2 minutes between the conductive parts to the outside surfaces of the housing (Al metal sheet).

**4.7. Insulation resistance test**

Apply 500VDC for 1 minute between the conductive parts to the outside surfaces of the housing (Al metal sheet).

**4.8. Thermal shock**

Test performed at FACTI-CTI Renato Archer Technology and Information center.  
Please see details of test FACTI test report nr. DAPE 2k14/179 annex.

125 thermal shock, according to cycle described below:  
30 minutes at 125°C  
30 minutes at -40°C  
Transfer time: < 5 minutes.

**4.9. Low temperature exposure test**

Soak samples at -40°C for 72 hours.

**4.10. High temperature exposure test**

Soak samples at 125°C for 72 hours.

**4.11. Top cover pull-off test**

Apply a force to the top cover centered above each of the release latches one at a time (do not apply the force directly to the latch but as close as possible) at rate of 5cm/min.



**4.12. Drop test**

Drop the EDB a distance of 20cm onto a concrete surface. Repeat once for each opposite direction in all three perpendicular axis for a total of 6 drops.

**4.13. Battery acid resistance test**

- Spray the EDB's with battery acid (sulfuric acid with a density of 1,28g/cm<sup>3</sup>);
- Allow the EDB's to air dry at 25°C for 24 hours;
- Soak the EDB's at 125°C for 96 hours.

**4.14. Vibration test**

Test performed at LIT-INPE laboratory.  
Please see details of test at item 36 of FORD spec. ES-5L1T-14A067-AA and INPE test report nr. TYCO52-R01 annex.

**5. TEST EQUIPMENT**

All equipment containing a calibration number is calibrated and traceable through TE to the National Institute of Standards and Technology (NIST).

Instrument Description	Manufacturer	Model Number	Calibration Number	Purpose
Climatic Chamber	Weiss	WK1 340	92-339032-004	Low temperature exposure test
Data Acquisition	Agilent	34970A	93-339048-846	Thermal mapping / power dissipation and heating test
Dielectric Analyzer	Associated research, Inc.	HypotUltra III	93-339033-001	Insulation resistance and Dielectric test
Oven	Fanem	320	92-339032-010	High temperature exposure
Digital Multimeter	Agilent	34401A	93-339033-029	Voltage drop / Thermal mapping / power dissipation and heating test
DC Power Supply	Agilent	E3649A	03267	Voltage drop
Digital Dynamometer	Mecmesin	AFG-2500	92-339017-090	Top cover pull-off test / component insertion and removal

**6. APPROVALS**

Approvals are secured electronically through the corporate document repository routing and approval system.

Testing & Report By: Diogo Rojas, Laboratory Engineer

Reviewed & Approved By: Paulo Almeida, Laboratory Coordinator



Centro de  
Tecnologia da  
Informação  
Renato Archer

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## Technical Service Report

DAPE 2k14 / 179

Page 1 of 2

MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E INOVAÇÃO  
Centro de Tecnologia da Informação Renato Archer  
Divisão de Qualificação e Análise de Produtos Eletrônicos

Rodovia Dom Pedro I, Km 143,6, Campinas, SP  
CEP 13069-901, Tel: 19-3746-6059, Fax 19-3746-6051  
CNPJ: 04.822.500/0001-60 I.E.: Isento

<b>Analyst (s):</b> R. Medeiros	<b>Report Date:</b> December 9, 2014	<b>Reviser:</b> Sebastião Eleutério Filho	<b>Revision Date:</b> December 9, 2014
------------------------------------	---	--	---

<b>Customer:</b> Tyco Electronics do Brasil LTDA.	<b>Requester:</b> Mr. Diogo Biassetto Rojas		
<b>Address / Phone Number:</b> Rua Ampère - 304 - Campo da Penha, Bragança Paulista – SP. Phone Number: (55 11) 3404-6278			
<b>Product (s):</b> Connectors	<b>Model (s):</b> N.A.	<b>Quantity:</b> 6	<b>Date received:</b> November 27, 2014

### 1.Objective

Submit connectors to thermal cycling test.

### 2.Identification Of Product (See Attached Photographs)

Customer identification: 1 to 6.

### 3.Equipment (s)

Thermal Cycling Chamber Thermotron ATSS-130, temperature range -70°C to 200°C, uncertainty  $\pm 2.0^\circ\text{C}$ .

### 4. Methodology

Thermal cycling according to description below, see Table 1. Perform visual inspection before and after thermal cycling test.

<b>Reference Method</b>	IEC 60068-2-14
<b>Temperature cycling test conditions</b>	(125 $\pm$ 2)°C and (-40 $\pm$ 3) °C
<b>Exposure Time at each temperature</b>	30 minutes
<b>Transfer mode</b>	Test Na; less than 30 seconds
<b>Total number of cycles</b>	125

Table 1 – Conditions of thermal cycling test according to IEC 60068-2-14.

### 5.Test Execution

From: November 27, 2014 to December 3, 2014.

### 6.Conclusion

The thermal cycling was executed according to specifications of item 4. Visual inspection after test showed no damages.

### 7.Technical Manager

Rafael Cortês de Medeiros  
Manager Name and Signature

### 8.Annex:

### Photographs



Figure 1. Samples as delivered.



Figure 2. Sample 1 – Connector.



Figure 3. Sample 3 – Identification.



Figure 4. Thermal chamber used to test



Figure 5. Samples arranged into the chamber test.



Figure 6. Sample 1, no damages observed after test. The same was observed for all other samples

### 9. General Remarks

The results of this report apply only to the above identified samples.  
The reproduction of this report only can be total and depends on the CTI authorization.

### 10. End of Report



## RELATÓRIO DE ENSAIOS DE VIBRAÇÃO & CHOQUE

**SOLICITANTE:** TYCO Electronics Brasil Ltda.

**EQUIPAMENTO:** MAXI FUSE BOX & BRACKET

**MODELO:** N/A

**Nº DO RELATÓRIO:** TYCO52 - R01

**VERSÃO:** 1

**INPE/LIT.PM.118/14**



## RELATÓRIO DE ENSAIOS DE VIBRAÇÃO- RESUMO

➤ Documento No.	<b>TYCO52 - R01</b>
➤ Versão / Data de emissão	Versão 1 (Emitida em 27 de Outubro de 2014)
➤ No. total de páginas	21 páginas
➤ Solicitante	<b>TYCO Electronics Brasil Ltda.</b> At.: Sr. Diogo Biasetto Rojas
➤ Endereço	Rua Ampère, 304 - Penha (CEP: 12929-570) Bragança Paulista - SP - Brasil
➤ Espécime(s) / Produto(s)	<b>MAXI FUSE BOX &amp; BRACKET</b> P/N: <b>2819045-1</b> (Maxi Fuse Box) & <b>2819068-1</b> (Bracket)
➤ Quantidade	04 (quatro) Amostras identificadas com <b>#01, #02, #03 e #04</b>
➤ Especificação de ensaio(s)	Conforme condições de ensaio definidas pela Solicitante (Ref.: Especificação Ford PN: ES-5L1T-14A067-AA): - Ensaio de Vibração / Durabilidade (3 horas/eixo);
➤ Resultado(s) do(s) ensaio(s)	Vide páginas seguintes deste documento
➤ Data de início do(s) ensaio(s)	15 de Outubro de 2014
➤ Data de conclusão do(s) ensaio(s)	16 de Outubro de 2014
➤ Área do LIT No. / Laboratório	LIT02 / Laboratório de Ensaios Dinâmicos
➤ Processo LIT/PAC No.	ELIT.2183.14.PRO (Serviços #: 335523 )
➤ Ordens de Serviço Nos.	0153.14.LIT02

## CONTROLE DE VERSÕES

Página	Versão	Data	Referência de modificação
1 a 9; A1 a A3; B1 a B4; C1 a C5	1	27/10/2014	- Versão original



## SUMÁRIO

	Pág.
1. INTRODUÇÃO .....	5
2. OBJETIVO DOS ENSAIOS .....	5
3. PERÍODO DE REALIZAÇÃO DOS ENSAIOS.....	5
4. IDENTIFICAÇÃO DOS ESPÉCIMES .....	5
5. DOCUMENTOS APLICÁVEIS E DE REFERÊNCIA.....	6
5.1 DOCUMENTOS APLICÁVEIS.....	6
5.2 DOCUMENTOS DE REFERÊNCIA.....	6
6. REQUISITOS TÉCNICOS .....	6
6.1 ÁREA DE ENSAIOS.....	6
6.2 EQUIPE TÉCNICA ENVOLVIDA.....	6
6.3 MEIOS DE ENSAIOS.....	6
7. CONDIÇÕES DE ENSAIO.....	7
7.1 ESPECIFICAÇÃO DE ENSAIO .....	7
7.1.1. ENSAIOS DE VIBRAÇÃO.....	7
7.2 EIXOS DE REFERÊNCIA .....	7
7.3 INSTRUMENTAÇÃO DE CONTROLE .....	8
7.4 MONTAGEM DOS ESPÉCIMES PARA ENSAIOS.....	8
8. DESENVOLVIMENTO DOS ENSAIOS .....	9
9. RESULTADOS/COMENTÁRIOS.....	9
LISTA DE TABELAS.....	4
APÊNDICE A - CÓPIA DA SOLICITAÇÃO DE ENSAIO.....	A1
APÊNDICE B - REGISTROS OBTIDOS.....	B1
APÊNDICE C - FOTOGRAFIAS DA MONTAGEM DOS ESPÉCIMES SOBRE OS MEIOS DE ENSAIO E DA INSTRUMENTAÇÃO DE CONTROLE.....	C1



## LISTA DE TABELAS

Pág.

Tabela 6.3.1 - Lista de Equipamentos/Meios de Ensaios.....7

---

## LISTA DE FIGURAS

Pág.

Figura 7.2.1: MAXI FUSE BOX & BRACKET- Eixos de referência (X,Y,Z).....8



## ENSAIOS DE VIBRAÇÃO - MAXI FUSE BOX & BRACKET

### 1. INTRODUÇÃO

Atendendo à solicitação da empresa Tyco Electronics Brasil Ltda., o Laboratório de Integração e Testes - LIT, do INPE, realizou em suas instalações uma série de ensaios de vibração em quatro (4) amostras da Caixa de Fusíveis & Bracket, fornecidos pela Solicitante. Os ensaios não tiveram acompanhamento de representantes da Solicitante e as condições de realização e os resultados obtidos são apresentados a seguir.

A série prevista de ensaios foi realizada e completada, com sucesso, sem quaisquer ocorrências impactivas ao andamento dos ensaios ou à integridade física das amostras.

### 2. OBJETIVO DOS ENSAIOS

Os ensaios tiveram por objetivo avaliar a resistência mecânica dos espécimes quando submetidos a ensaios de vibração nos três eixos principais de excitação, conforme condições definidas pela Solicitante e apresentadas no item 7.1 deste documento.

### 3. PERÍODO DE REALIZAÇÃO DOS ENSAIOS

Os ensaios foram realizados na área de Qualificação de Sistemas - Laboratório de Ensaios Dinâmicos, do LIT, no período de 15 a 16 de Outubro de 2014.

### 4. IDENTIFICAÇÃO DOS ESPÉCIMES

- *Denominação* ..... : **MAXI FUSE BOX & BRACKET;**
- *P/N* ..... : **2819045-1 (Maxi Fuse Box) & 2819068-1 (Bracket);**
- *Dimensões externas [mm]* ..... : não especificado;
- *Peso unitário* ..... : não especificado;
- *Quantidade* ..... : 04 (quatro).





## 5. DOCUMENTOS APLICÁVEIS E DE REFERÊNCIA

### 5.1 DOCUMENTOS APLICÁVEIS

- DA1: E-mail Tyco de 03/07/2014 (Solicitação de ensaios);
- DA2: Documento de especificação Ford PN: ES-5L1T-14A067-AA.

### 5.2 DOCUMENTOS DE REFERÊNCIA

- DR1: Manuais dos sistemas de vibração LDS V964LS;
- DR2: Manuais do Controlador/Analisador Spectral Dynamics SD2560.

## 6. REQUISITOS TÉCNICOS

### 6.1 ÁREA DE ENSAIOS

Os ensaios foram realizados na área de Qualificação de Sistemas do LIT ("Hall" de Testes), na área de Ensaio Dinâmico, que apresenta as seguintes condições ambientais controladas (somente pessoal autorizado tem acesso a esta área):

- *Classe de limpeza* ..... : 100.000 (ISO 8);
- *Temperatura*..... : 23°C +/- 2°C;
- *Umidade relativa do ar* ..... : 50% +/- 10%.

### 6.2 EQUIPE TÉCNICA ENVOLVIDA

Os ensaios foram realizados pela equipe do LIT com acompanhamento por um representante da Solicitante, conforme segue:

- Pelo LIT.....: Eng. Homero A. F. de Souza;  
Eng. André B. Aguiar;  
Téc. Flavio Alexandre;  
Téc. Carlos Eduardo Correa  
Téc. Gabriel Faria Silva

Todas as atividades relativas à instrumentação, montagem do adaptador de vibração sobre o meio de ensaio e realização dos ensaios foram de responsabilidade da equipe do INPE/LIT.

### 6.3 MEIOS DE ENSAIOS

Para realização dos ensaios foram utilizados os meios de ensaio e/ou facilidades listados na Tabela 6.3.1.

Tabela 6.3.1 - Lista de Equipamentos/Meios de Ensaios

Equipamento	Fabricante	Modelo	No. de Série	Data Calibração	Fornecedor
Vibrador eletrodinâmico	LDS	V964LS	--	(*)	LIT
Controlador de Vibração	Spectral Dynamics	SD2560 (#1)	--	03/04/2014	LIT
Acelerômetro	Endevco	2221D	10015	22/04/2014	LIT
Amplificador de Carga	Endevco	2721B	DK35	12/03/2014	LIT
Adaptador de Vibração	Tyco	--	--	--	Tyco
Interface LIT (disco)	Kimball	--	--	--	LIT

(\*) Meio de ensaio verificado com utilização de instrumentação calibrada.

## 7. CONDIÇÕES DE ENSAIO

### 7.1 ESPECIFICAÇÃO DE ENSAIO

Uma cópia da solicitação de ensaio (e-mail de 03/07/2014) está apresentada no Apêndice A deste Relatório. Um resumo da especificação de ensaios é apresentado a seguir.

#### 7.1.1. ENSAIOS DE VIBRAÇÃO

- *Norma de Referência*..... : Especificação **FORD** n° **ES-5L1T-14A067-AA**, item 36 Figura A e Tabela 1;
- *Método de ensaio*..... : Condicionamento de vida por vibração senoidal superposta com vibração aleatória ("sine-on-random");
- *Faixa de frequência*..... : 10 – 1000 Hz;
- *Nível de vibração senoidal*..... : 50 – 200 Hz // 8,5 g;  
200 – 650 Hz // 5 g;
- *Velocidade de Varredura senoidal*..... : 0,75 Hz/segundo;
- *Nível de vibração aleatória*..... : 10 Hz // 9,6 (m/s<sup>2</sup>)<sup>2</sup>/Hz;  
300 Hz // 0,327 (m/s<sup>2</sup>)<sup>2</sup>/Hz;  
1000 Hz // 0,0296 (m/s<sup>2</sup>)<sup>2</sup>/Hz;
- *Duração do ensaio*..... : 3 horas/eixo;
- *Eixos de ensaio*..... : 03 (X, Y & Z).
- *Condição das amostras*..... : *Desligadas*;
- *Outras informações*..... : Ensaios realizados à temperatura ambiente (23°C±2°C).

#### 7.2 EIXOS DE REFERÊNCIA

Os eixos principais dos espécimes foram definidos conforme especificado pelo Cliente (vide Figura 7.2.1):

- **X**: eixo transversal;
- **Y**: eixo longitudinal;
- **Z**: eixo vertical.



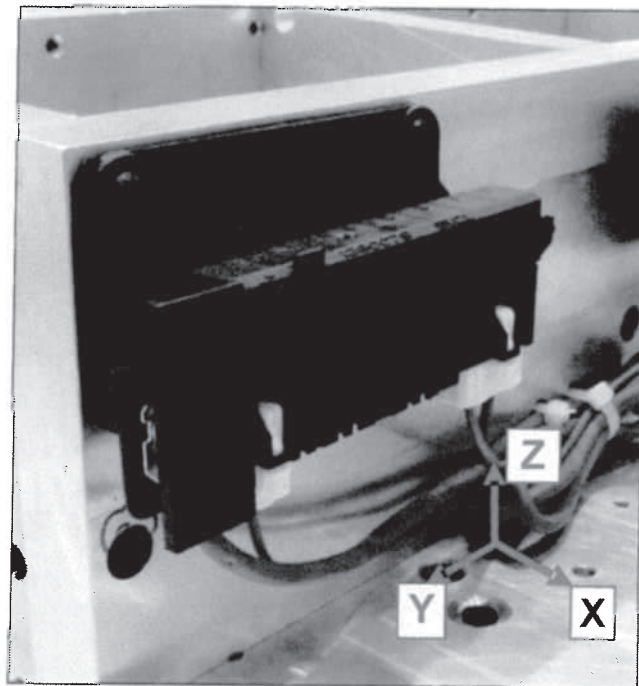


Figura 7.2.1: **MAXI FUSE BOX & BRACKET**- Eixos de referência (X,Y,Z)

### **7.3 INSTRUMENTAÇÃO DE CONTROLE**

O controle da vibração foi feito através do monitoramento do sinal proveniente de um acelerômetro (ACE01) instalado no dispositivo.

Apresenta-se no Apêndice B a ficha de instrumentação com a identificação do acelerômetro utilizado nos ensaios e suas respectivas características relevantes e, no Apêndice C, fotos ilustrativas da posição de montagem deste sensor.

### **7.4 MONTAGEM DOS ESPÉCIMES PARA ENSAIOS**

As amostras foram ensaiadas simultaneamente, fixadas às faces de um dispositivo em alumínio, fornecido pela Solicitante.

As amostras foram encaminhadas para o laboratório previamente fixadas através dos respectivos suportes (Brackets) às faces do dispositivo de vibração e, portanto, o conjunto foi manipulado como um bloco monolítico.

Para os ensaios no eixo vertical Z, o conjunto foi montado sobre a armadura do vibrador. Para os ensaios nos eixos lateral (X) e longitudinal (Y), o conjunto dispositivo mais amostras foi montado sobre a mesa transversal do sistema de vibração.

As fotos apresentadas no Apêndice C deste Relatório mostram o esquema de montagem utilizado na realização dos ensaios.





## 8. DESENVOLVIMENTO DOS ENSAIOS

Os ensaios de vibração foram realizados em três etapas, numeradas e identificadas cada uma como um ensaio particular, conforme está apresentado no Apêndice B deste documento. Os ensaios foram realizados na seguinte sequência de eixos: X, Y e Z. Todos os ensaios foram completados com sucesso sem quaisquer ocorrências impactivas ao andamento dos mesmos ou à integridade física das amostras.

As amostras foram inspecionadas visualmente antes, durante o transcorrer e ao final dos ensaios em cada eixo, constatando-se que não apresentavam sinais de danos mecânicos externos e/ou indícios de desprendimento das peças.

## 9. RESULTADOS/COMENTÁRIOS

Os ensaios foram realizados e completados com sucesso como descrito no item 8 deste relatório e foram aplicados em conformidade com as especificações apresentadas no item 7.

Os registros obtidos nos ensaios de vibração são apresentados no Apêndice B deste relatório e representam a Densidade Espectral de Aceleração [ $g^2/Hz$ ] do sinal de controle em função da frequência [Hz].

Através de inspeção visual externa realizada durante e após os ensaios, constatou-se que não haviam indícios de ocorrências de danos mecânicos externos e/ou partes soltas nas amostras ensaiadas.

Cabe observar que durante os ensaios foi observado ruído de choques entre partes devido à folga existente na fixação das amostras aos respectivos brackets. Tal ocorrência foi mais significativa no ensaio no eixo X (eixo transversal das amostras).

Os resultados apresentados neste documento são restritos às amostras relacionadas no item 4 e para as condições gerais de ensaios explicitadas no item 7.

Fotografias ilustrativas da instrumentação de controle, da montagem dos espécimes sobre os meios de ensaio estão apresentadas no Apêndice C deste Relatório.

Eng. responsável:  - 27 / 10 / 2014  
Homero A. Furquim de Souza





RELATÓRIO DE ENSAIO Nº: TYCO52-R01	
PÁGINA A1	VERSÃO 1

**APÊNDICE A**  
**CÓPIA DA SOLICITAÇÃO DE ENSAIOS**



**Assunto:** Vibração Maxi fuse box (Bracket)  
**De:** "Biassetto Rojas, Diogo" <diogo.rojas@te.com>  
**Data:** 03/07/2014 17:03  
**Para:** Homero <homero@lit.inpe.br>  
**CC:** "pac@lit.inpe.br" <pac@lit.inpe.br>

Boa tarde Homero,  
Conforme conversamos ontem, segue o perfil do teste que eu preciso fazer (será testado com sinal senoidal sobreposto, pois é no compartimento do motor).  
O dispositivo tem mais ou menos 15kg (4 peças) e deve-se usar o slip table.  
Segue anexo o desenho do produto e o perfil.

Qualquer dúvida eu estou à disposição.  
Obrigado.

Att.

**Diogo Biassetto Rojas**  
Laboratory Engineer  
Automotive Division  
Brazil  
+55 11 3404 6278 tel  
+55 11 3404 6045 fax  
[diogo.rojas@te.com](mailto:diogo.rojas@te.com)



[www.te.com](http://www.te.com)

—Vibração.jpg—

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### Engineering Specification

FRAME 27	OF 39	REV. A	PART NO. ES-5L1T-14A067-AA
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IV. TEST PROCEDURES AND REQUIREMENTS (continued)

D. Testing Procedures and Description (continued)

36. Vibration Test

Scope: This test evaluates the EDB's ability to endure vibration.

a. Procedure

1. Secure the EDB in vehicle position via production level bracket and hardware as defined by the responsible Design Engineer.
2. Ensure that each space in the EDB is filled with the appropriate components (fuse, relay, GEM, connector, ...etc).
3. The test shall be performed 3 hours in 3 perpendicular planes (vertical, horizontal and transverse) in sequence for a total of 9 hours.
4. For passenger and trunk compartment EDB's use the wide-band noise vibration profile shown in Appendix A, Figure 3 unless the actual vehicle vibration profile is available for the EDB's mounting location.
5. For engine compartment EDB's, superimpose a sine wave shown in Table 1, onto the wide-band noise vibration profile shown in figure A unless the actual vehicle vibration profile is available for the EDB's mounting location.

Table 1.

$f_1$ (Hz)	$a$ (g)
50-200	8.5
200-650	5
650-200	5
200-50	8.5

Sweep Rate= 0.75 hz/s  
 Effective of Acceleration= 20 m/s<sup>2</sup>

b. Requirement

1. There shall be no breakage or degradation in the design-intended performance.
2. Shake the EDB vigorously in 3 directions and there shall be no audible rattle, buzzes, or squeaks
3. Test proper continuity through each circuit per: III. D. 1. 100% Continuity Test.

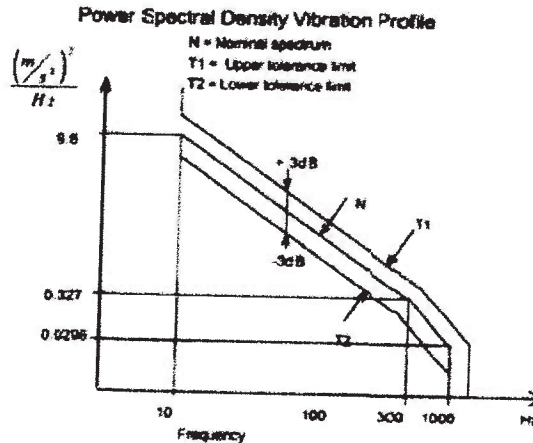


Figure A.

Reference: In particular with regard to the test specimen (natural frequency) and the selection of measuring and control points reference is made to DIN 40046, section 23.

May 1988 PD 3947-a2

FAP03-150

—Anexos:\_\_\_\_\_

Vibração.jpg

96,8KB

mfbbox-Instalacao duvidas.pdf

208KB



RELATÓRIO DE ENSAIO Nº: TYC052-R01	
PÁGINA B1	VERSÃO 1

**APÊNDICE B**  
**REGISTROS OBTIDOS**





## B1 - INTRODUÇÃO

Apresentam-se nas Tabelas B1.1 e B1.2, a sequência de execução de ensaios e a Ficha de Controle de acelerômetros, respectivamente e, em seguida, a lista dos registros gráficos obtidos nos ensaios aplicados nos espécimes em questão.

**TABELA B1.1 - QUADRO-RESUMO DA SEQUÊNCIA DE ENSAIOS**

Ensaio #	Test ID	Eixo	Ensaio / Tipo	Observações
01	MFXR01	1	Durabilidade / Sine-on-Random	Ok (Completado!)
02	MFYR02	2		Ok (Completado!)
03	MFZR03	3		Ok (Completado!)

**TABELA B1.2 - FICHA DE CONTROLE DE INSTRUMENTAÇÃO**

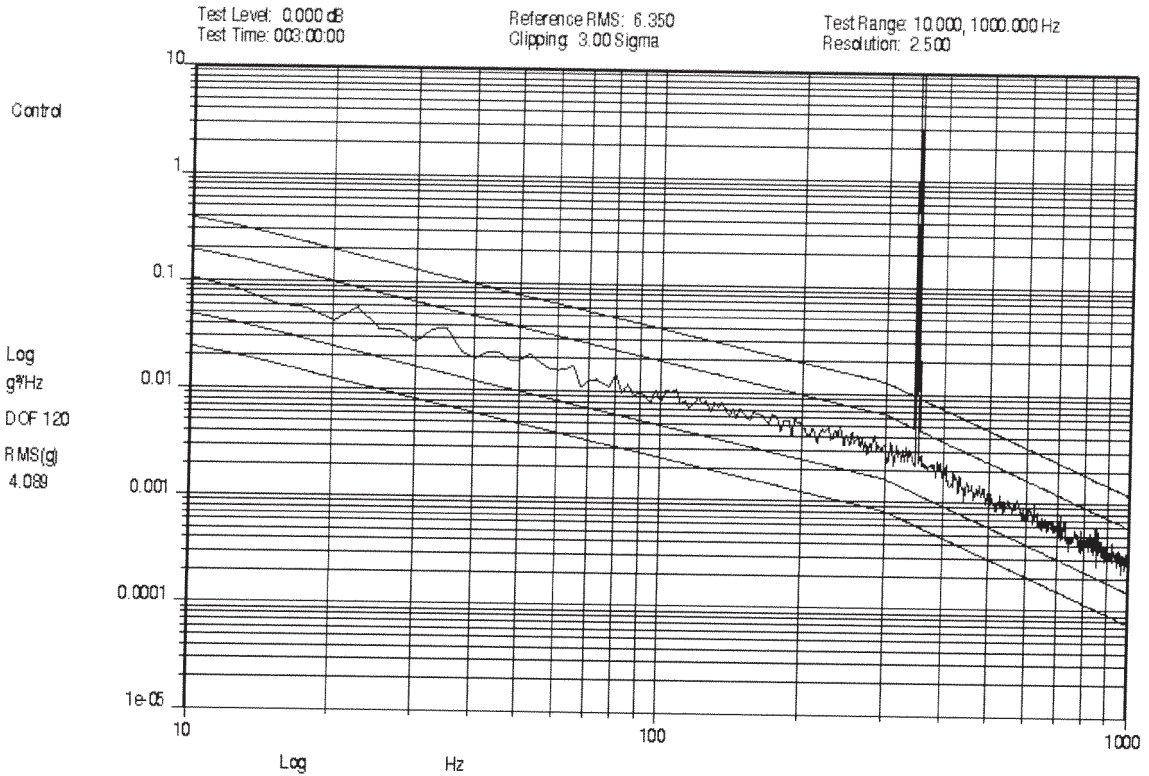
Nº	Modelo	N/S	Sensib. [pC/g]	Função	Certificado de Calibr. #	Data Calibr. [d/m/a]	Data Instal. [d/m/a]	Medida Isolação [GΩ]	Observ. (cabo #)
ACE01	2221D	10015	18,812	Ctrl	CC-1982	22/04/14	15/10/14	N.A.	Z577

NOTA: N.A. = Não Aplicável.

## B2 - LISTA DE FIGURAS

Figura Nº	Ensaio Ref. #	Eixo	Test ID	Gráfico do Sinal de Controle
B2.1	01	X	MFXR01	Ok // 3h (Durabilidade)
B2.2	02	Y	MFYR02	Ok // 3h (Durabilidade)
B2.3	03	Z	MFZR03	Ok // 3h (Durabilidade)

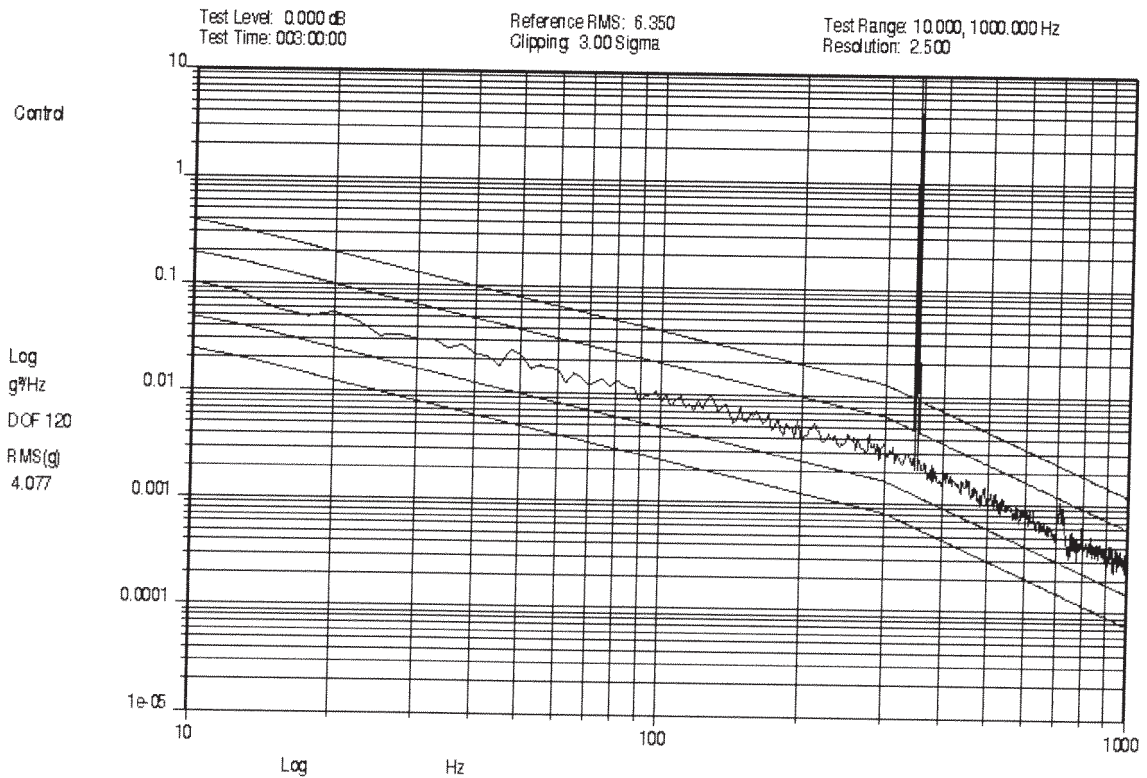
Nota 1: Ensaio realizado em duas etapas (Run1 e Run 2).



15:38:27  
15-Oct-2014

ENSAIO 01-Eixo X/Sine-On-Random/Durabilidade/3 Horas  
15OCT14-MFPR01-TYCO: Maxi Fuse Box & Bracket (Amostras: 1/2/3/4)

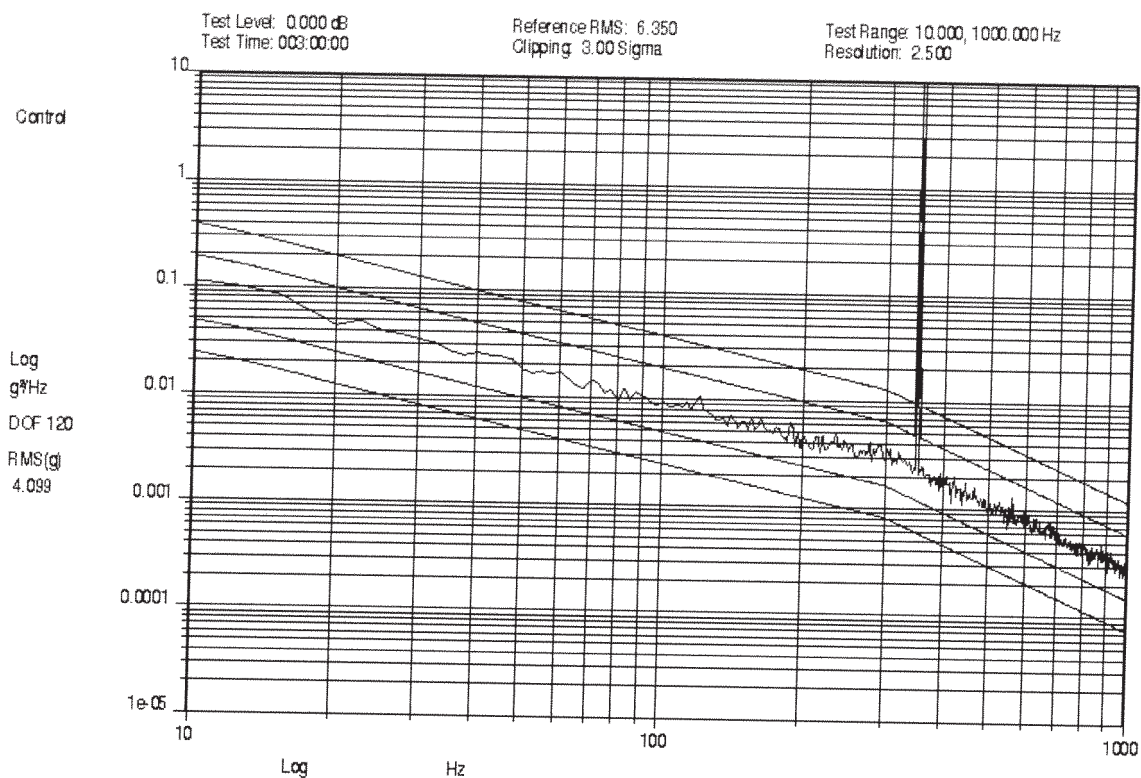
Fig. B2.1



19:06:56  
15-Oct-2014

ENSAIO 02-Eixo Y/Sine-On-Random/Durabilidade/3 Horas  
15OCT14-MFYR02-TYCO: Maxi Fuse Box & Bracket (Amostras: 1/2/3/4)

Fig. B2.2



11:47:00  
16-Oct-2014

ENSAIO 03-Eixo X/Sine-On-Random/Durabilidade/3 Horas  
16OCT14-MFXR03-TYCO: Maxi Fuse Box & Bracket (Amostras: 1/2/3/4)

**Fig. B2.3**



## APÊNDICE C

### FOTOGRAFIAS DA MONTAGEM DOS ESPÉCIMES SOBRE OS MEIOS DE ENSAIO E DA INSTRUMENTAÇÃO DE CONTROLE

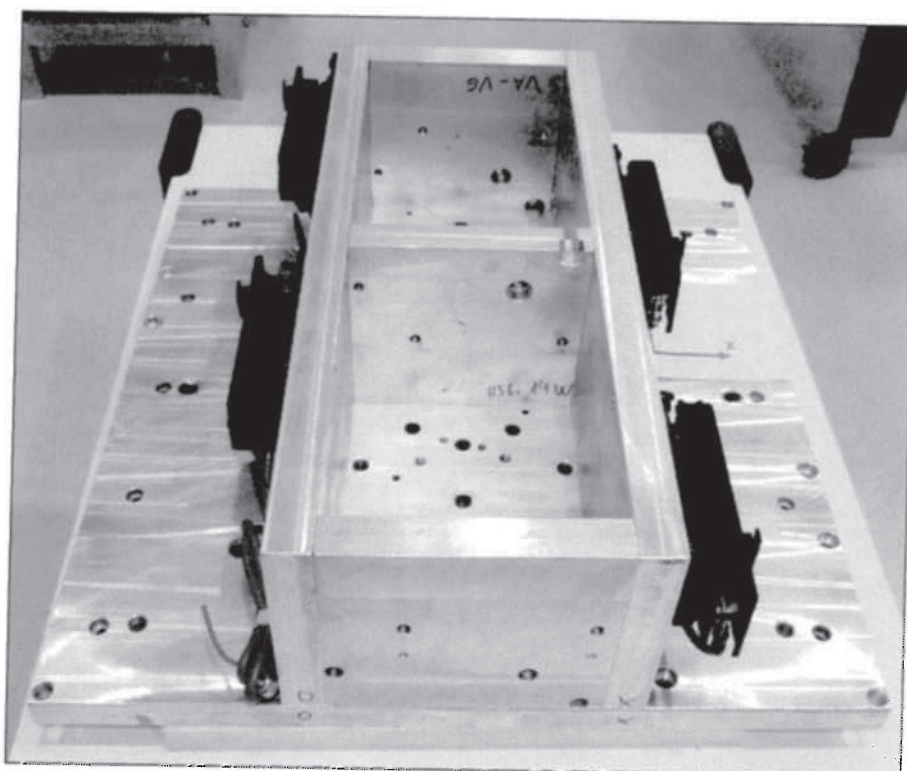


FOTO 01 – Vista geral com Amostras #01, #02, #03 e #04 montadas no adaptador de vibração.

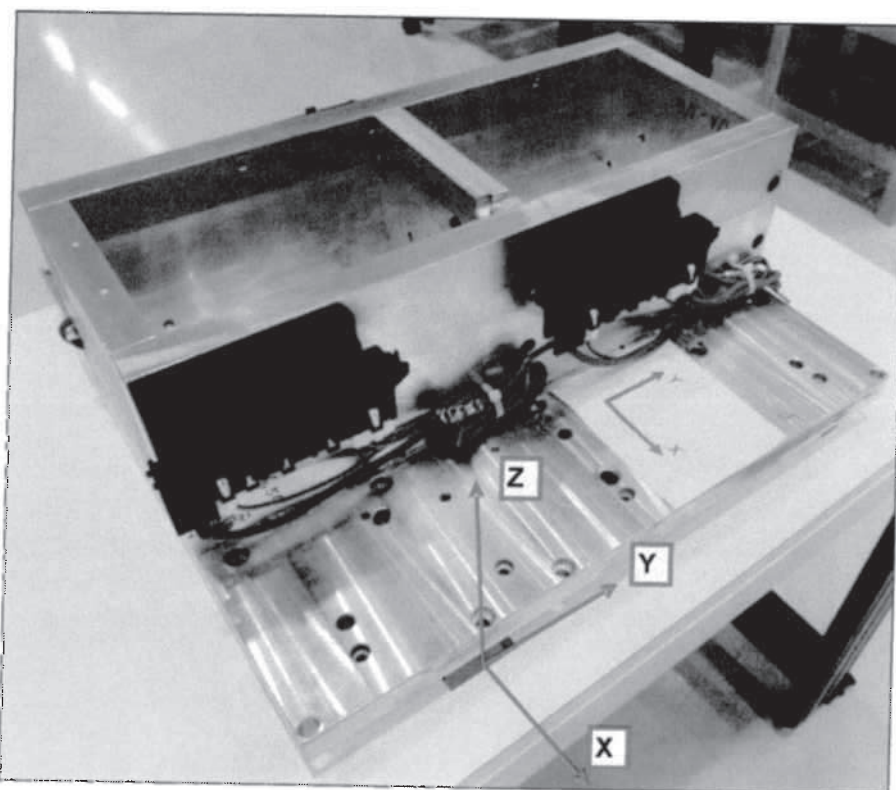


FOTO 02 – Detalhe do triedro de referência (X,Y,Z) utilizado na realização dos ensaios.



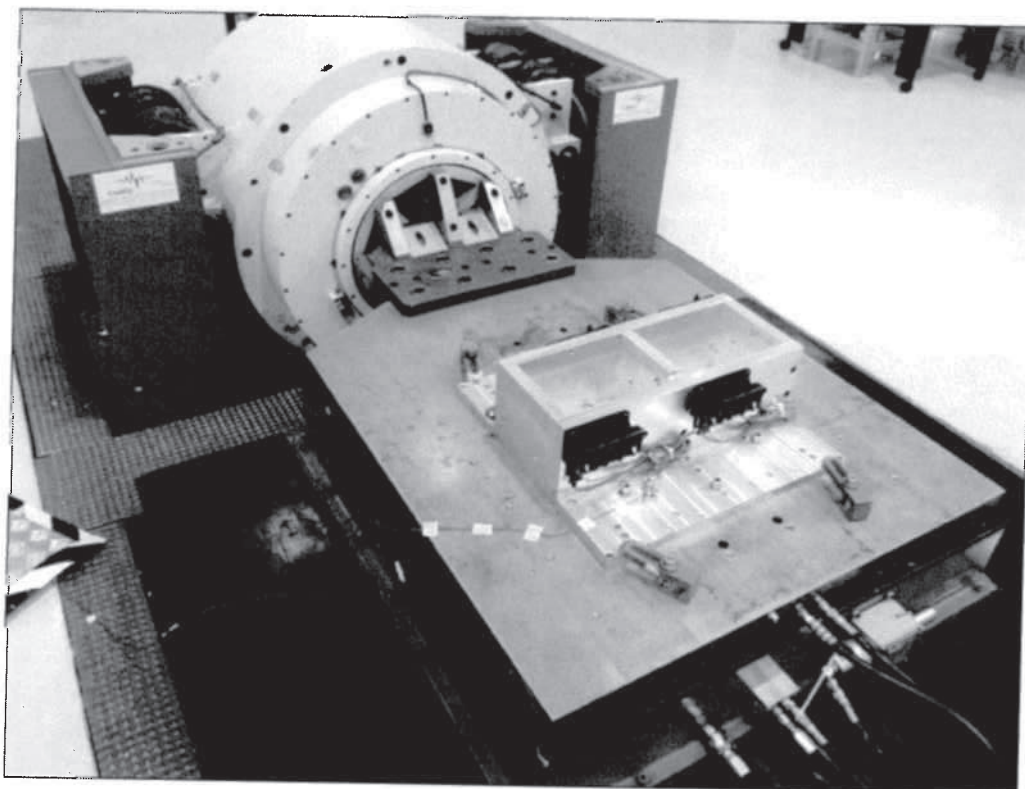


FOTO 03 – Vista geral do ensaio de vibração/durabilidade aplicado no eixo X.

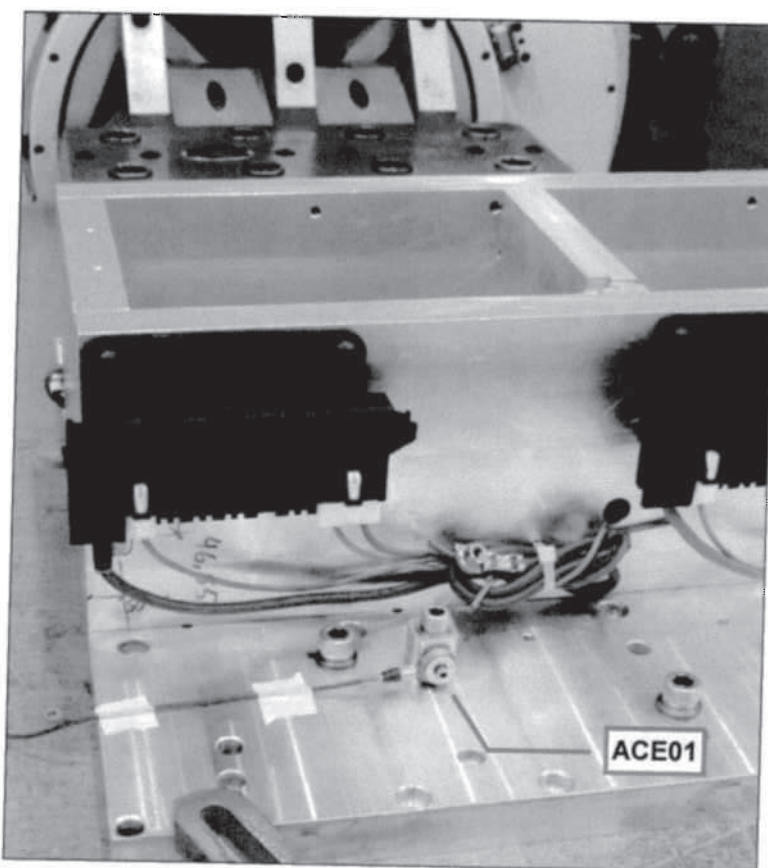


FOTO 04 – Detalhe da localização do acelerômetro de controle ACE01 para o ensaio no eixo X.



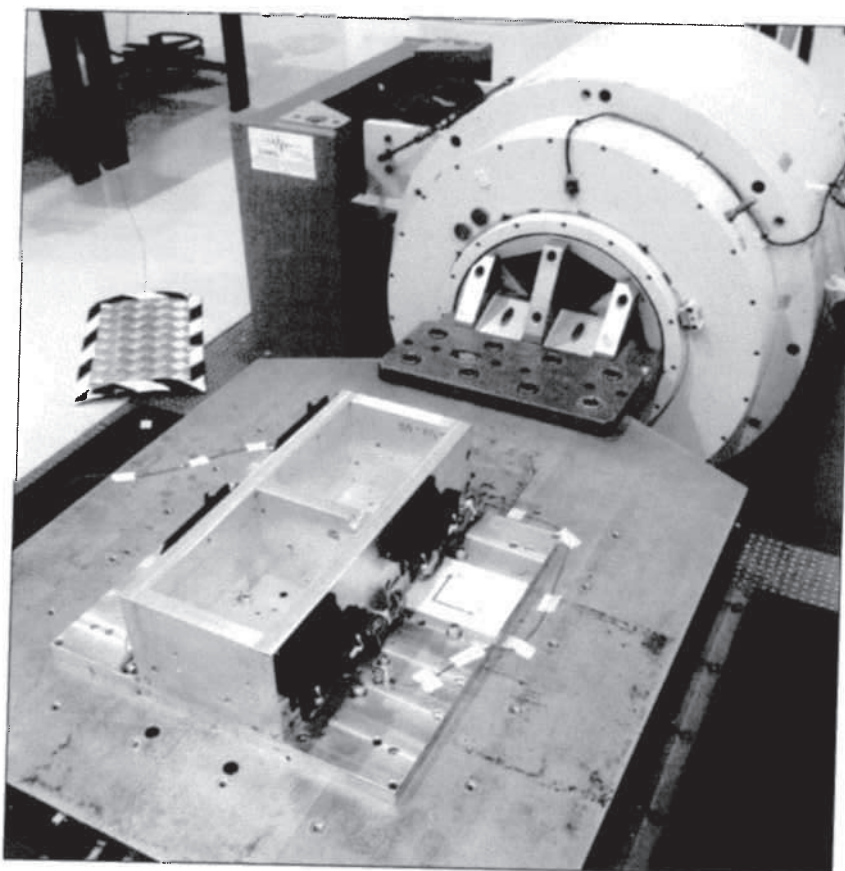


FOTO 05 – Vista geral do ensaio de vibração/durabilidade aplicado no eixo Y.

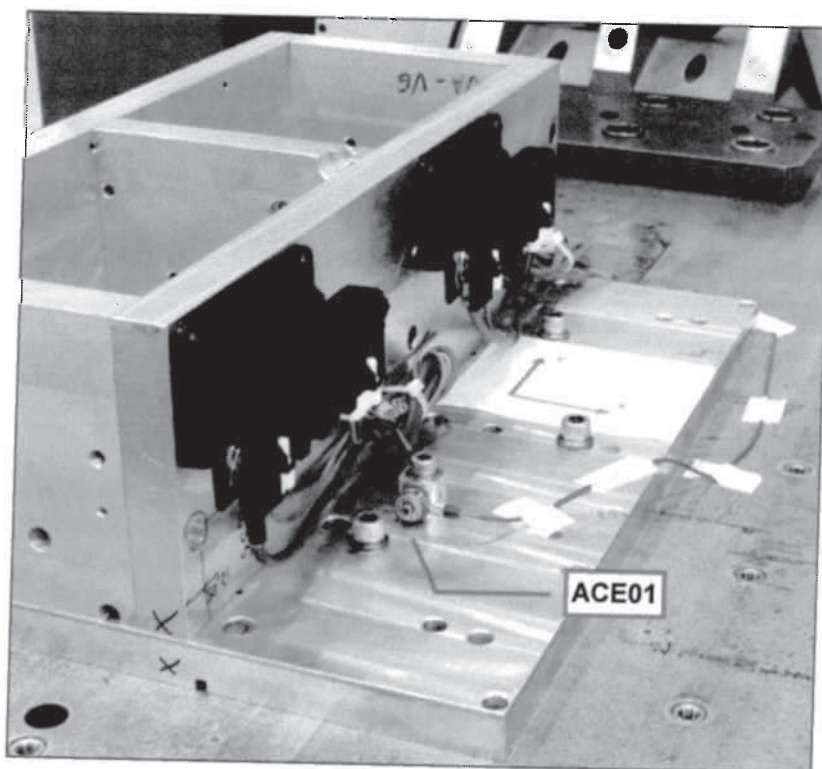
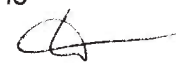
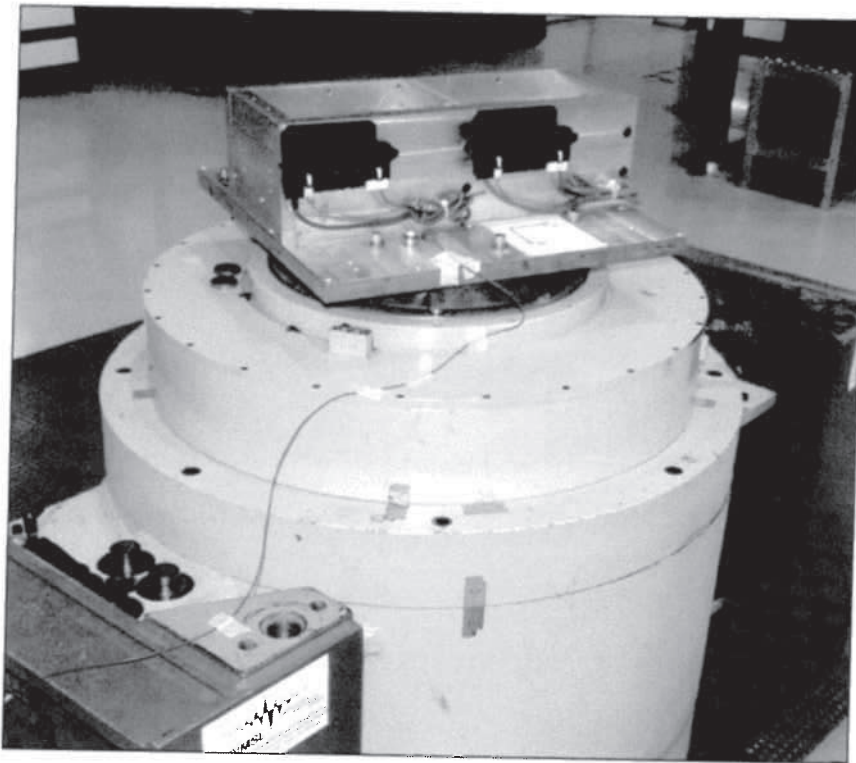
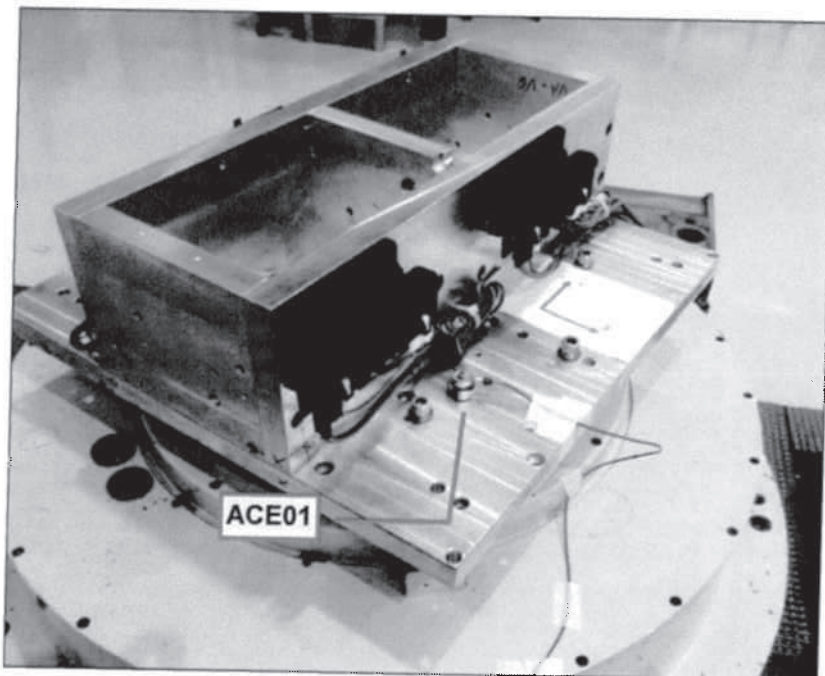


FOTO 06 – Detalhe da localização do acelerômetro de controle ACE01 para o ensaio no eixo Y.





**FOTO 07** – Vista geral das amostras montadas, estando em configuração para o ensaio de vibração/durabilidade aplicado no eixo Z.



**FOTO 08** – Detalhe da localização do acelerômetro de controle ACE01 para o ensaio no eixo Z.





**Ford Cargo AMT Fuse Box  
DVP & R - Track System**

System (CPSC)		18.00.00		Electrical		Champion		Raúl Suzuki		Date		22/09/2014		Ford Cargo AMT Fuse Box		Pending RQMT's to DVP		65								
Sub-System (CPFSC)		18.01.07		Terminal		File Name		C:\Users\13015214\Documents\A\PS\SPRS\899214_M99_PC		< LR >		< CC >		Pending RQMT's		65										
TEST DESCRIPTION CETP / DVM	ACCEPTANCE CRITERIA	PART NUMBER	DESIGN LEVEL	REQUIREMENTS	SUB SYSTEM	LEADER	BENCH VEHICLE, BUCK	VEHICLE	QTY	DURATION	DATES		TEST	PHASE	FAIL	PASS	TEST RESULTS	RISK	YES	NO	% DONE	ROUTE CAUSE	ROAD MAP TO PASS	DATE TO CLOSE	GENERAL COMMENTS	FROM (if Calculate of Transfer)
											PREDICTED	ACTUAL														
<b>100% Continuity Test - Test 1:</b> This test is to check each circuit from input to output individually in the EDB. This also verifies the presence of functioning components.	Proper continuity through each circuit	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-14M067-AA[Test 1]-100% CONTINUITY TEST_0	Maxi Fuse Box	Maccoso-Ozama	BUCK	KA 2007	See Rqmt detail	3 Months			CP													
<b>Thermal Mapping - Test 2:</b> This test provides information as to where the most critical thermal areas of the EDB may be. It also gives the necessary information where to place thermo-couples for the tests that require thermal data.	The temperature of the EDB shall not increase above the ambient temperature by more than 50°C max. and/or the EDB temperature shall never exceed its material deflection temperature at 460 kPa (66 psi)	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-14M067-AA[Test 2]-THERMAL MAP TEST_0	Maxi Fuse Box	Maccoso-Ozama	BUCK	KA 2007	2	3 Months			CP													
<b>Power Dissipation Test - Test 3:</b> This test provides information about the EDB's ability to dissipate and manage heat.	1. The voltage drop before the test shall be less than or equal to: (number of crimps x 0.5 mV/Amp) + (number of terminal interfaces x 1.0 mV/Amp); 2. The voltage drop after test completion shall be less than or equal to: (number of crimps x 1.0 mV/Amp) + (number of terminal interfaces x 2.0 mV/Amp); 3. The temperature of the EDB shall not increase above the ambient temperature by more than 50° max and the EDB temperature shall never exceed its material deflection temperature at 460kPa (66 psi); 4. The temperature of the EDB shall not increase at any terminal interface to a temperature that exceeds the terminal's temperature rating. Circuits connected to the coil terminals of any relay should be designed to tolerate the heat generated by that relay; 5. There shall be no visible distortion in the assemblies or in the parts of assembly. There shall be no discoloration of PCB traces, terminals, or components that are a result of overheating.	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-14M067-AA[Test 3]-POWER DISSIPATION TEST_0	Maxi Fuse Box	Maccoso-Ozama	BUCK	Ford Cargo AMT Fuse Box	2	3 Months			CP													
<b>135% Short Circuit Test - Test 4:</b> This test ensure that every circuit in the EDB is protected in the event of a Short or System malfunction.	There shall be no plastic flow or terminal fusing.	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-14M067-AA[Test 4]-135% SHORT CIRCUIT TEST_0	Maxi Fuse Box	Maccoso-Ozama	BUCK	Ford Cargo AMT Fuse Box	6	2 weeks	N/A	N/A	N/A													

The components used in our proposal, is the same used for Amazon project where this characteristic was approved.

*Handwritten signature and date: 22/09/2014*

**Ford Cargo AMT Fuse Box  
D.V.P & R - Track System**

System ( CPSC )		18.00.00		Electrical		Champion		Raul Suzuki		Date		21/01/2014		Ford Cargo AMT Fuse Box		RQM's to DVP		66		
Sub-System ( CPSC )		18.01.07		Terminal		File Name		C:\Users\SA19013218\Documents\VFSTARTS_89214_MEB_PC		< CC >		< LR >		Pending RQM'S		66		From (if Cascade or Transfer)		
TEST DESCRIPTION CETP / DVM	ACCEPTANCE CRITERIA	PART NUMBER	DESIGN LEVEL	REQUIREMENTS ( CPSC )	SUB SYSTEM	LEADER	BENCH VEHICLE	VEHICLE	DURATION	DATES		PHASE	TEST	TEST RESULTS	RISK %	ROUTE CAUSE	ROAD MAP TO PASS	DATE TO CLOSE	GENERAL COMMENTS	From (if Cascade or Transfer)
										START	END									
<b>135% Fuse Load Test - Test 5:</b> This test ensures that every circuit in the EDB is protected in the event of a short or system malfunction.	There shall be no plastic flow or terminal fusing.	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4067-AA (Test 5)_135% FUSE CIRCUIT BREAKER LOAD TEST_0	Maxi Fuse Box	BALCO208-0230068	BUCK	Ford Cargo AMT Fuse Box	2 weeks	N/A	N/A	CP	NOT APPLICABLE	NOT APPLICABLE					The components used in our proposal is the same used for Amazon project where this characteristic was approved.	
<b>Dielectric Test - Test 6:</b> This test ensures that any circuit is sufficiently isolated from adjacent circuits.	The leakage current shall not exceed 1mA.	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4067-AA (Test 6)_DIELECTRIC TEST_0	Maxi Fuse Box	BALCO208-0230068	BUCK	Ford Cargo AMT Fuse Box	2 weeks	N/A	CP	CP							A MEB tem apenas um polo e não é possível medir a rigidez dielétrica entre cavidades. Será embutido a MEB em papel alumínio e medir a rigidez dielétrica entre o condutor e a folha de alumínio, procurando por eventuais fugas.	
<b>Insulation Resistance - Test 7:</b> This test ensures that the material used for the housing is sufficient for insulating the current in the EDB with any surrounding part.	The insulation resistance shall not be less than 10 Mohm.	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4067-AA (Test 7)_INSULATION RESISTANCE TEST_0	Maxi Fuse Box	BALCO208-0230068	BUCK	Ford Cargo AMT Fuse Box	2 weeks			CP								
<b>Key Life Test - Test 8:</b> This accelerated test replicates na 10 year/150K mile life expectancy for the EDB for the worst case 90th percentile customer usage.	1. The mv/Amp before the test shall be less than or equal to: (number of crimps x 0.5 mv/Amp) + (number of terminal interfaces x 1.0 mv/Amp) 2. The mv/Amp after test completion shall be less than or equal to: (number of crimps x 1.0 mv/Amp) + (number of terminal interfaces x 2.0 mv/Amp). 3. Temp. rise not to exceed 50°C over ambient or exceed the HDT @ 460 KPa. 4. There shall be no discontinuities greater than 7 ohms for more than 10 microseconds. 5. There shall be no breakage or degradation in the design intended for the test. 6. Shake the EDB vigorously (by hand) and there shall be no rattle. 7. All threaded fasteners shall retain the minimum specified torque.	Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4067-AA (Test 8)_KEY LIFE TEST_0	Maxi Fuse Box	BALCO208-0230068	BUCK	Ford Cargo AMT Fuse Box	3 Months	NA	NA	NA	NOT APPLICABLE	NOT APPLICABLE					This test was approved for the KA project using 4 fuse 60A, 1 fuse 40A and 1 fuse 20A. For Cargo Project, Ford will use only 1 fuse 30 A and 1 fuse 30A.	

11/01/2014  
17/01/2014  
CP

**Ford Cargo AMT Fuse Box  
D.V.P & B - Track System**

System ( CPSC )	18.00.00	PMT / PAT	Electrical	Champion	Raul Suzuki	Date	21/01/2014	Ford Cargo AMT Fuse Box	< CC >	ROMT's to DVP	65									
Sub-System ( CPSC )	18.01.07	Sub-Sub-system ( CPSC )	Terminal	File Name	C:\Users\13014218\Documents\SPS\RCSS\899434_VBA_PC	DATES	ACTUAL	TEST	< LRP >	General Comments	From (if Cascade or Transfer)									
TEST DESCRIPTION / DVM	CEP	Acceptance Criteria	DESIGN LEVEL	REQUIREMENTS	SUB SYSTEM	LEADER	VEHICLE	VEHICLE	OTTY	DURATION	PHASE	TEST	TEST RESULTS	RISK YES NO	% DONE	Route Cause	Road Map to Pass	DATE TO CLOSE		
<b>Thermal Shock Resistance Test - Test 9:</b> This test evaluates the EDB's material resistance to extreme thermal cycling.		1. The voltage drop before the test shall be less than or equal to: number of crimps x 0.5 mV/Amp + number of terminal interfaces x 1.0 mV/Amp; 2. The voltage drop after test completion shall be less than or equal to: (number of crimps x 1.0 mV/Amp) + (number of terminal interfaces x 2.0 mV/Amp); 3. There shall be no visible cracks or distortion in the assemblies; 4. Remove and reinstall the top cover 20 times. There shall be no degradation in the design intended performance; 5. Flex 6 of each type of flexible members to the maximum allowable travel 20 times. There shall be no degradation in the design intended performance; 6. Remove and reinstall all the mating connectors 20 times. There shall be no degradation in the design intended performance; 7. The residual torque of all threaded fasteners should be equal to or greater than the minimum specified assembly torque.	CP	ES-SLIT-14-AM97-AA Test 9 - THERMAL SHOCK RESISTANCE TEST 9	Maxi Fuse Box	Maxicool 52aaa	BUCK	Ford Cargo AMT Fuse Box	6	1 month	CP									
<b>Low Temperature Exposure Test - Test 10:</b> This test evaluates the EDB's material resistance to low temperature.		1. There shall be no visible cracks or distortion in the assemblies; 2. Remove and reinstall the top cover 20 times. There shall be no degradation in the design intended performance; 3. Flex 6 of each type of flexible members to the maximum allowable travel 20 times immediately after removing the EDB from the cold chamber. There shall be no degradation in the design intended performance; 4. Remove and reinstall all the mating connectors 20 times immediately after removing the EDB from the cold chamber. There shall be no degradation in the design intended performance;	CP	ES-SLIT-14-AM97-AA Test 10 - LOW TEMPERATURE EXPOSURE TEST 10	Maxi Fuse Box	Maxicool 52aaa	BUCK	Ford Cargo AMT Fuse Box	6	1 month	CP									
<b>High Temperature Exposure Test - Test 11:</b> This test evaluates the EDB's material resistance to high temperature.		1. Remove and reinstall the top cover 20 times immediately after removing the EDB from the hot chamber. There shall be no degradation in the design intended performance; 2. Remove and reinstall all the mating connectors 20 times immediately after removing the EDB from the hot chamber. There shall be no degradation in the design intended performance;	CP	ES-SLIT-14-AM97-AA Test 11 - HIGH TEMPERATURE EXPOSURE TEST 11	Maxi Fuse Box	Maxicool 52aaa	BUCK	Ford Cargo AMT Fuse Box	6	1 month	CP									

11/10/22  
4/10/2014  
CFL



Ford Cargo AMT Fuse Box  
D.V.P.&B - Track System

System ( CPSC )		18.00.00		PMT / PAT		Electrical		Champion		Ford Cargo AMT Fuse Box		ROMT's to DVP		65			
Sub-System ( CPSC )		18.01.07		Sub-Sub-system ( CPSC )		Terminal		File Name		Date		Route Cause		66			
TEST DESCRIPTION / DVM	CETP	PART NUMBER	DESIGN LEVEL	REQUIREMENTS	SUB SYSTEM	LEADER	BENCH VEHICLE /BUCK	VEHICLE	Duration	DATES		TEST PHASE	TEST FAIL / PASS	Test Results	RISK YES / NO	% DONE	
										START	END						START
<b>Humidity - Temperature Cycle Test - Test 17:</b> This test evaluates the EDB's ability to endure various combinations of temperature and humidity.		Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4M67-AA (Test 17)_HUMIDITY TEST_0	Maxi Fuse Box	Mazcoso Quana	BUCK	Ford Cargo AMT Fuse Box	1	N/A	N/A	N/A	NOT APPLICABLE	NOT APPLICABLE			Test already done for connectors of Amazon Maxi Fuse Box. For new proposal, will not be changed the connectors and terminals
<b>Perform Dust Test - Test 18:</b> This test evaluates the EDB's ability to function during exposure to dust.		Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4M67-AA (Test 18)_DUST TEST_0	Maxi Fuse Box	Mazcoso Quana	BUCK	Ford Cargo AMT Fuse Box	1	N/A	N/A	N/A	NOT APPLICABLE	NOT APPLICABLE			Maxi Fuse Box is not sealed. There is no problem in field for current version.
<b>Perform Drop Test - Test 19:</b> This test evaluates the EDB's ability to endure impact.		Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4M67-AA (Test 19)_DROP TEST_0	Maxi Fuse Box	Mazcoso Quana	BUCK	Ford Cargo AMT Fuse Box	6	1 week		CP					
<b>Top Cover Pull-Off Test - Test 20:</b> This test evaluates the EDB's ability to retain its top cover.		Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4M67-AA (Test 20)_TOP COVER PULL TEST_0	Maxi Fuse Box	Mazcoso Quana	BUCK	Ford Cargo AMT Fuse Box	6			CP					
<b>Bottom Cover Pull-off Test - Test 21:</b> This test evaluates the EDB's ability to retain its bottom cover.		Tyco PN: 2013-LE10-0479-01	CP	ES-SLIT-H4M67-AA (Test 21)_BOTTOM COVER PULL TEST_0	Maxi Fuse Box	Mazcoso Quana	BUCK	Ford Cargo AMT Fuse Box	6								

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**Ford Cargo AMT Fuse Box  
D.V.P. & B. - Track System**

System (CPSC)	18.00.00	PMT / PAT	Electrical	Champion	Raul Suzuki	Date	21/01/2014	Ford Cargo AMT Fuse Box	< CC >	ROMT's to DVP	65				
Sub-System (CPSC)	18.01.07	Sub-Sub-system (CPSC)	Terminal	File Name	CP Users\13017218 Document\6 PFS\ PFS_899214_PFS.FC	DATES	ACTUAL	TEST	ROUTE CAUSE	DATE TO CLOSE	From (if Check or Transfer)				
TEST DESCRIPTION / DVM	CP	DESIGN LEVEL	REQUIREMENTS	SUB SYSTEM	LEADER	BENCH VEHICLE	VEHICLE	OTTY	DURATION	TEST PHASE	TEST RESULTS	RISK YES NO	% DONE	ROAD MAP TO PASS	General Comments
<b>Component Rocking Test - Test 22:</b> This test evaluates the EDB's ability to allow insertion of components at various angles and maintain adequate normal force between the EDB's terminal and the component.	Tyco PN: 2013-LEI0-0479-01	CP	ES-SLIT-14A067-AA (Test 22)-COMPONENT ROCKING TEST 0	Maxi Fuse Box	Marcelo Quassa	BUCK	Ford Cargo AMT Fuse Box	1	1	N/A	NOT APPLICABLE	YES	100%		The MFB doesn't have receptacle terminals, only Tabs.
<b>Oil Resistance Test - Test 23:</b> This test evaluates the EDB's ability to function during exposure to oil.	Tyco PN: 2013-LEI0-0479-01	CP	ES-SLIT-14A067-AA (Test 23)-OIL RESISTANCE TEST 0	Maxi Fuse Box	Marcelo Quassa	BUCK	Ford Cargo AMT Fuse Box	1	1	N/A		NO	0%		Test not applicable - MFB will not be exposed to this fluid
<b>Gasoline Resistance Test - Test 24:</b> This test evaluates the EDB's ability to function during exposure to gasoline.	Tyco PN: 2013-LEI0-0479-01	CP	ES-SLIT-14A067-AA (Test 24)-GAS RESISTANCE TEST 0	Maxi Fuse Box	Marcelo Quassa	BUCK	Ford Cargo AMT Fuse Box	1	1	N/A		NO	0%		Test not applicable - MFB will not be exposed to this fluid
<b>Anti-Freeze Resistance Test - Test 25:</b> This test evaluates the EDB's ability to function during exposure to anti-freeze.	Tyco PN: 2013-LEI0-0479-01	CP	ES-SLIT-14A067-AA (Test 25)-ANTI-FREEZE TEST 0	Maxi Fuse Box	Marcelo Quassa	BUCK	Ford Cargo AMT Fuse Box	1	1	N/A		NO	0%		Test not applicable - MFB will not be exposed to this fluid

*OK!*  
*21/01/14*  
*Raul Suzuki*

Ford Cargo AMT Fuse Box  
DVP & R - Track System

System (CPSC)	18.00.00	Electrical	Champion	Raul Suzuki	Date	21/01/2014	Ford Cargo AMT Fuse Box	< CC >	ROMT's to DVP	65										
Sub-System (CPSC)	18.01.07	Terminal	File Name	C:\Users\110012218\Documents\APRS\APRS_8992314_4981.PV	Actual	START	END	< LIR >	Pending ROMT's	66										
TEST DESCRIPTION / DVM	CPET	DESIGN LEVEL	REQUIREMENTS	SUB SYSTEM	LEADER	BENCH VEHICLE	VEHICLE	ALLO	Duration	TEST PHASE	TEST FAIL	TEST PASS	RISK YES	% DONE	Route Cause	Road Map to Pass	DATE TO CLOSE	General Comments	From (if Cascade or Transfer)	
<b>Brake Fluid Resistance Test - Test 26:</b> This test evaluates the EDB's ability to function during exposure to brake fluid.	CP	CP	ES-SLIT-144M67-AA (Test 26). BRAKE FLUID TEST (1)	Maxi Fuse Box	BRACOR - Gamma	BUCK	Ford Cargo AMT Fuse Box	2	1	N/A	N/A	N/A	N/A	N/A				Test not applicable - MFB will not be exposed to this fluid		
<b>Steering Fluid Resistance Test - Test 27:</b> This test evaluates the EDB's ability to function during exposure to steering fluid.	CP	CP	ES-SLIT-144M67-AA (Test 27). STEERING FLUID TEST (1)	Maxi Fuse Box	BRACOR - Gamma	BUCK	Ford Cargo AMT Fuse Box	2	1	N/A	N/A	N/A	N/A	N/A				Test not applicable - MFB will not be exposed to this fluid		
<b>Battery Acid Test - Test 28:</b> This test evaluates the EDB's ability to function during exposure to battery acid.	CP	CP	ES-SLIT-144M67-AA (Test 28). BATTERY ACID TEST (1)	Maxi Fuse Box	BRACOR - Gamma	BUCK	Ford Cargo AMT Fuse Box	2	1											
<b>Wind Shield Fluid Test - Test 29:</b> This test evaluates the EDB's ability to function during exposure to windshield washer fluid.	CP	CP	ES-SLIT-144M67-AA (Test 29). WIND SHIELD FLUID TEST (1)	Maxi Fuse Box	BRACOR - Gamma	BUCK	Ford Cargo AMT Fuse Box	2	1											

OK  
22/10/14

**Ford Cargo AMT Fuse Box  
DVP & R - Track System**

System (CPSC)		18.00.00		Electrical		Champion		Raul Suzuki		Date		21/01/2014		Ford Cargo AMT Fuse Box		RCMT's to DVP		65		
Sub-System (CPSC)		18.01.07		Terminal		File Name		Duration		ACTUAL		START		END		Route Cause		From (if Cascade or Transfer)		
TEST DESCRIPTION / DVM / CETP		Acceptance Criteria		DESIGN LEVEL		REQUIREMENTS		SUB SYSTEM		LEADER		BENCH VEHICLE, BUCK		VEHICLE		RISK		General Comments		
				CP		ES-SLIT-14A067-AA (Test 30), SALT SPRAY TEST, 0		Maxi Fuse Box		Maxi Fuse Box		BUCK		Ford Cargo AMT Fuse Box		RISK YES NO		General Comments		
				CP		ES-SLIT-14A067-AA (Test 31), WATER TEST, 0		Maxi Fuse Box		Maxi Fuse Box		BUCK		Ford Cargo AMT Fuse Box		RISK YES NO		General Comments		
				CP		ES-SLIT-14A067-AA (Test 32), Bolt-on Attachment Torque, 0		Maxi Fuse Box		Maxi Fuse Box		BUCK		Ford Cargo AMT Fuse Box		RISK YES NO		General Comments		
				CP		ES-SLIT-14A067-AA (Test 33), TERMINAL PROTECTION SCOPED TEST, 0		Maxi Fuse Box		Maxi Fuse Box		BUCK		Ford Cargo AMT Fuse Box		RISK YES NO		General Comments		
<b>Salt spray Test - Test 30:</b> This test evaluates the EDB's ability to function during exposure to salt	1. The voltage drop before the test shall be less than or equal to: (number of crimps x 0.5 mV/Amp) + (number of terminal interfaces x 1.0 mV/Amp); 2. The voltage drop after test completion shall be less than or equal to: (number of crimps x 1.0 mV/Amp) + (number of terminal interfaces x 2.0 mV/Amp); 3. The maximum allowable leak current shall be 1mA per ILLD; 4. Dielectric Test and 1mA at vehicle voltage immediately following the test; 5. The maximum allowable leak current shall be 1mA per ILLD.6; 6. Dielectric Test at 24 hours after test completion																			Test not applicable because the MFB proposed is not sealed.
<b>Water Test - Test 31:</b> This test evaluates the EDB's ability to function during exposure to water.	1. The maximum allowable leak current shall be 1mA per ILLD. 2. Dielectric Test and 1mA at vehicle voltage immediately following the test; The Ford Responsible engineer and the FSS shall determine the circuits that are to be checked for dielectric; 3. The maximum allowable leak current shall be 1mA per ILLD.6; 4. Dielectric Test at 24 hours after test completion																			Test not applicable because the MFB proposed is not sealed.
<b>Battery/Alternator Bolt-on Attachment Torque Test - Test 32:</b> This test evaluates the EDB's ability to endure maximum torque to its bolt-in attachments.	At worst case mis-insertion angle, a 1.0mm gap must be maintained between the connector housing assembly and the mating connector terminals.																			The MFB proposed does't have any eyelet for service center.
<b>Terminal Protection (Scop) Test - Test 33:</b> This test evaluates the EDB's ability to allow insertion of connectors at various angles.	At worst case mis-insertion angle, a 1.0mm gap must be maintained between the connector housing assembly and the mating connector terminals.																			The terminals and connectors used in MFB proposed were approved according USCAR spec.
<b>Threaded Insert Retention Test - Test 34:</b> This test evaluates the EDB's ability to securely retain its threaded inserts.	1. During procedure #2 and #4, the threaded insert must withstand a minimum force prior to deformation or degradation in design intended performance of the threaded insert or the surrounding plastic molding. This minimum force, dependent on bolt size, shall be: -> 6mm bolt: 7.0KN -> 4mm bolt: 4.5KN																			There is no threaded insert at the Maxi Fuse Box proposed.



**Ford Cargo AMT Fuse Box  
DVP & R - Track System**

System (CPSC)	18.00.00	PMT / PAT	Electrical	Champion	Raul Suzuki	Date	22/08/2014	Ford Cargo AMT Fuse Box	< CC >	ROMT's to DVP	65									
Sub-System (CPSC)	18.01.07	Sub-Sub-system (CPSC)	Terminal	File Name	C:\Users\110112118\Documents\CPSC\WPS_893214_WPS.FC				< LR >		66									
TEST DESCRIPTION	CE/TP	DESIGN LEVEL	REQUIREMENTS	SUB SYSTEM	LEADER	BENCH VEHICLE BUCK	VEHICLE	DURATION	DATES	PHASE	TEST	TEST RESULTS	RISK	% DONE	ROUTE	ROUTE CLAUSE	READ MAP TO PASS	DATE TO CLOSE	GENERAL COMMENTS	FROM (if Cascade or Transfer)
/ DVM	Acceptance Criteria	PART NUMBER							START	END	START	END	YES	NO						
<b>Over Torque Capability Test- Test 35:</b> This test evaluates the EDB's ability to securely retain its threaded inserts.	1. No EDB using a 4mm nut insert must withstand a torque of 3.0Nm minimum, and no EDB using a 6mm nut insert must withstand a torque of 7.0 Nm minimum. No visual damage is allowed beyond a 0.25 mm movement of the brass bushing and a slight buckling of the tower (less than 5% of the tower diameter). 2. EDB's using bolt-in wire connector. The threaded insert shall not spin or dislodge from the EDB when subjected to two times the assembly drive torque.	Typo PN: 2013-LE104479-01	ES-SLT-14067-AA (Test 35) OVER TORQUE CAPABILITY TEST 0	Maxi Fuse Box	Maxwell 022008	BUCK	Ford Cargo AMT Fuse Box	1	N/A	N/A	N/A	NOT APPLICABLE							The MEB proposed doesn't have bolt-in connectors.	
<b>Vibration Test - Test 36:</b> This test evaluates the EDB's ability to endure vibration.	1. There shall be no breakage or degradation in the design-intended performance. 2. Shake the EDB vigorously in 3 directions and there shall be no audible rattle, buzzes, or squeaks. 3. Test proper continuity through each circuit per: D.L. 100% Continuity Test.	Typo PN: 2013-LE104479-01	ES-SLT-14067-AA (Test 36) VIBRATION TEST 0	Maxi Fuse Box	Maxwell 022008	BUCK	Ford Cargo AMT Fuse Box	1			CP									
<b>Alternator and Battery Attachment Fail Safe Test - Test 37:</b> This test evaluates the EDB's ability to endure misapplication of the P+ attachment.	1. The EDB and surrounding components shall not flame. Mechanical damage shall be confined to the EDB only. 2. Battery and Alternator attachments shall fail safe (i.e. Discharged Battery or open circuit).	Typo PN: 2013-LE104479-01	ES-SLT-14067-AA (Test 37) ATTACHMENT FAIL SAFE TEST 0	Maxi Fuse Box	Maxwell 022008	BUCK	Ford Cargo AMT Fuse Box	1	N/A	N/A	N/A	NOT APPLICABLE							It is necessary to complete vehicle. This test must be done by FORD.	

*Handwritten signature and date: 22/08/14*