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I. PURPOSE

The purpose of the testing was to determine the effects of damaged or missing brush contact bristles on the performance of brush contact connectors.

II. CONCLUSIONS

1. The initial mating force for the connector pair containing the intentionally damaged bristles was 37 pounds, or averaged 3.9 ounces/contact pair. The high forces were anticipated because of the opposition that the bent bristles would create during wire bundle engagement. The initial high force was also due, in part, to the alignment method of rigidly mounted connectors. Unmating and mating forces are normally measured on mated connectors that have been fixture in a fully mated condition.

2. Reducing the number of bristles in motherboard contacts increased the contact resistance in a linear relationship having a slope of approximately .6 milliohms per strand.

3. Deliberately bending or damaging one bristle in either motherboard or daughterboard contacts produced a minimal change in contact resistance.

4. Contact resistance measurements were highest after the initial mating cycle. After 250 cycles, the values were reduced and remained stable throughout the balance of the 1000 cycles of durability.

5. After the first mating-unmating cycle, some skiving of the plastic in the motherboard contact cavities was observed.

6. Visual examination throughout the test sequence evidenced some deflection of the deliberately bent bristles.

7. The latter two conditions remained relatively unchanged throughout the 1000 durability cycles. Overall, the connectors maintained a good visual appearance during the entire test sequence.
III. RECOMMENDATIONS

It is recommended that the mating and unmating forces be considered with regard to the fact that two thirds of the contact mating pairs were physically modified. It should also be noted that the mating and unmating force measurements were not performed from the normally mated condition which establishes initial alignment. Both mating connector halves were rigidly mounted which would oppose the natural alignment of the connectors.

IV. ACTION TAKEN

None

V. DETAILED REPORT

A. Sample Preparation

The following components were submitted for assembly and evaluation:

- 2 pcs 10-502542-150 Motherboard (MB) Connector Moldings
- 2 pcs 10-502562-150 Daughterboard (DB) Connector Moldings
- 300 pcs 10-502402-31 Male Brush Wire Contacts (MB)
- 150 pcs 10-502400-121 Female Brush Wire Contacts (DB)
- 150 pcs 10-502400-221 Female Brush Wire Contacts (DB)

Prior to the installation of the contacts into their respective connector moldings, the contacts were modified as shown in Table I. To obtain 6 or 5 wires, one or two bristles were bent out from the bundle at the holder surface and flexed back and forth through an approximate arc of 90° until the strand fractured and broke off. Bent wires were bent through the bristle bunch as shown below.

After contact insertion and bending of the daughterboard tails was accomplished, circuit boards were soldered to each connector half.
TABLE I
CONDITION OF BRUSH WIRES IN SAMPLE CONNECTORS

<table>
<thead>
<tr>
<th>Sample Connector</th>
<th>A1-A25</th>
<th>A26-A50</th>
<th>A51-A75</th>
</tr>
</thead>
<tbody>
<tr>
<td>MB</td>
<td>5 Wires</td>
<td>6 Wires</td>
<td>7 Wires</td>
</tr>
<tr>
<td>DB</td>
<td>7 Wires</td>
<td>7 Wires</td>
<td>7 Wires</td>
</tr>
<tr>
<td>MB</td>
<td>7 Wires</td>
<td>7 Wires</td>
<td>7 Wires</td>
</tr>
<tr>
<td>DB</td>
<td>7 Wires</td>
<td>1 Bent</td>
<td>7 Wires</td>
</tr>
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</table>

B. Test Sequence

Photographs of the contacts displaying the intentional bristle damage were taken prior to the initial mating. These photographs are in Appendix B as Figures 1, 2, 3 and 4. Figures 1 and 2 are representative cavities of #2 motherboard connector, cavities A26-A50 and B26-B50. Figures 3 and 4 are representative cavities of #2 daughterboard connector, cavities A1-A25 and B1-B25.

1. Mating Force - The initial mating force measurement of each connector pair was performed on the Instron Model 1122 force tester. The special motherboard holding fixture was mounted on a ball bearing table attached to the load cell. The L-34119-58 parallel clamping fixture to hold daughterboard connectors was mounted to the crosshead. The connectors were positioned for mating and mated at a rate of 0.100 inch/minute. The mating was stopped when it was apparent that further mating would result in moldering interference. The initial mating forces were recorded on Data Sheet 1 of Appendix A. Normally, fixturing for this test is accomplished with the connectors in their fully mated condition. The force to completely separate the connectors is measured first and then the connectors are remated within 0.010 inch of the original fully mated condition.
2. **Contact Resistance** - Contact resistance measurements were performed on each mating pair of contacts in both mated connector pairs after the initial mating. The Keithly Model 503 Milliohmeter was used in conjunction with a voltage divider, digital voltmeter and a paper tape punch to record the data. The paper tape punch data was reduced and analyzed via the Hewlett-Packard (H-P) 9820 calculator, printed on tape and placed on data sheets 4, 5 and 6 of Appendix A. All values were less than 1.5 milliohms, except for six measurements in Sample #1, Row B 1-25. These six values were less than 13.6 milliohms.

3. **Unmating Forces** - Initial unmating forces were performed on the Instron 1122 using the same fixturing as for mating forces. The fully mated connectors were separated at a rate of 0.100 inch/minute. The unmating forces are recorded on Data Sheet 1 in Appendix A.

4. **Visual Examination** - Visual examination at 12X magnification after the initial unmating did not reveal any noticeable contact damage in addition to the deliberate simulated damage at the onset of the test. There was minor skiving of molding material in the contact retention cavities of the #2 motherboard connector. These conditions are specifically noted on Data Sheet 3 in Appendix A. Photographs of some of the representative cavities verify that there was no additional damage incurred. See Figures 4, 5, 6 and 7 in Appendix B.

5. **Durability (10 Cycles)** - Each connector pair was mated and unmated by hand an additional nine times. The daughterboard connector was rigidly mounted while the motherboard was mated with it.

6. **Unmating and Mating Forces** - After ten cycles of durability by hand, the unmating and mating force measurements were performed starting with the connectors in the mated condition to assure alignment. The same fixtures and rate application were used as initially. The values are recorded on Data Sheet 1 in Appendix A. The unmating force increased slightly from the initial, but the mating force was reduced approximately fifty percent.
7. **Visual Examination** - There were some compounded discrepancies noted after ten cycles of durability. The No. 2 Motherboard connector displayed bending of one bristle in three contacts that were deliberately damaged initially. The visual examination was performed at 12X magnification and the comments are recorded on Data Sheet 2 of Appendix A.

8. **Durability (250 Cycles)** - Each pair of connectors was mated and unmated a total of 250 cycles by hand. The mating and unmating was relatively easy, but it was more difficult with the #2 sample where two thirds of the mated contact population had some type of intentional bristle damage.

9. **Unmating and Mating Forces** - After 250 cycles of durability, the mated connectors were fixtured on the Instron and unmated mated at a rate of 0.100 inch/minute. The forces required to unmate and mate them increased from those recorded after 10 cycles of durability. Compare the forces recorded on Data Sheet 1 of Appendix A.

10. **Contact Resistance** - Contact resistance was performed as described in Paragraph No. 2 above, after the 250 cycles of durability conditioning. All values were less than 11.4 milliohms. Individual measurements and statistical analysis are recorded on Data Sheets 7, 8 and 9 in Appendix A. The average resistance of each contact pair-group displayed a decrease of 0.2 milliohm, except Row B control contacts (7 bristles) in #2 connector which increased 0.3 milliohm.

11. **Visual Examination** - A visual examination of the connectors at 12X magnification revealed no apparent change in either half of the No. 1 sample or the daughterboard half of Sample No. 2. No. 2 motherboard had three additional bristles that were bent to some degree and some minor skiving of the plastic was noted.

12. **Sequence Tests (500 Cycles)** - Each pair of connectors was mated and unmated by hand an additional 250 times for a total of 500 cycles of durability.

The unmating and mating forces were measured as described in Paragraph No. 9 above. The change in forces of the No. 1 sample were negligible. The forces for the No. 2 sample were reduced. The force values are recorded on Data Sheet 1 in Appendix A and may be compared with other force values.

The contact resistance of each mated contact pair in both connectors was measured and recorded as described in
Paragraph No. 2 above. The average resistance of two groups increased 0.1 milliohms, two were unchanged and eight had a decrease of 0.1 to 0.7 milliohms. The contact resistance values were all less than 11.4 milliohms after 500 cycles of durability and are recorded on Data Sheets 10, 11 and 12 in Appendix A.

A visual examination at 12X magnification revealed minor skiving of the plastic molding in two additional contact cavities in each motherboard connector, as noted on Data Sheet 2 in Appendix A.

(750 Cycles) Each mating pair of connectors was subjected to a total of 750 cycles of durability by hand. The unmating and mating forces were measured as described in Paragraph 9 above. The maximum increase in force from the measurements after 500 cycles of durability was 1.7 pounds. The values are recorded on Data Sheet 1 in Appendix A.

The contact resistance measurements were performed as before and are recorded on Data Sheets 13, 14, and 15 in Appendix A. The average resistance change for any of the twelve contact groups from 500 to 750 cycles of durability was 0.2 milliohms. Four groups were unchanged and the other eight groups varied 0.1 milliohms.

Visual examination at 12X magnification did not reveal any discrepancies in addition to those noted after 500 cycles of durability.

(1000 Cycles) The mating connector pairs were each mated and unmated by hand an additional 250 times for a total of 1000 cycles of durability. The unmating and mating forces were measured as described in Paragraph 9 above. The maximum change in force from 750 cycles of durability was the mating force of the No. 2 sample, an increase of 1.5 pounds. The other force value changes were negligible as noted on Data Sheet 1 in Appendix A.

The contact resistance test was performed as described in Paragraph 2 above and the values were recorded on Data Sheets 16, 17 and 18 in Appendix A. The maximum average resistance change as a result of an additional 250 cycles of durability for six contact groups was 0.2 milliohms. Six groups did not display a change. All values were 11.4 milliohms or less.
The visual examination was performed at 12X magnification. The results are recorded on Data Sheet 3 and may be compared with the initial discrepancy notations. The No. 1 mating halves did not display any significant physical changes. The No. 2 motherboard connector had four bristles that were conspicuously more bent over than when deliberately formed that way for the test. One other bristle in A49 was also bent, but the deliberately bent bristle did not display additional deflection.

Photographs of the No. 2 motherboard, Row A & B 1-25 and No. 2 daughterboard, Rows A & B 26-50 were made to document the changes in bristle bunch configuration and damage. These are represented in Figures 9, 10, 11 and 12 of Appendix B.

A summary of contact resistance mean values for each group throughout the test sequence appears in Table II.

VI. REFERENCES

EWCM G997
Contract #71366-A
CLT 4924
ECL0592-33 through -36
ECL0592A-35 through -51
### TABLE II
SUMMARY OF CONTACT RESISTANCE MEASUREMENTS
(MEAN VALUES, N = 23)

#### Connector #1, Row A

<table>
<thead>
<tr>
<th>No. of Bristles in MB Contacts</th>
<th>Initial</th>
<th>250</th>
<th>500</th>
<th>750</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>8.3</td>
<td>7.9</td>
<td>8.0</td>
<td>7.9</td>
<td>8.0</td>
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<td>6</td>
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<td>7.3</td>
<td>7.3</td>
<td>7.4</td>
<td>7.4</td>
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<tr>
<td>7</td>
<td>8.0</td>
<td>7.0</td>
<td>7.1</td>
<td>6.9</td>
<td>6.7</td>
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#### Connector #1, Row B

<table>
<thead>
<tr>
<th>No. of Bristles in MB Contacts</th>
<th>Initial</th>
<th>250</th>
<th>500</th>
<th>750</th>
<th>1000</th>
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</thead>
<tbody>
<tr>
<td>5</td>
<td>10.3</td>
<td>9.6</td>
<td>9.6</td>
<td>9.5</td>
<td>9.5</td>
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<tr>
<td>6</td>
<td>9.1</td>
<td>8.8</td>
<td>8.7</td>
<td>8.7</td>
<td>8.7</td>
</tr>
<tr>
<td>7</td>
<td>8.7</td>
<td>9.0</td>
<td>8.3</td>
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<td>8.1</td>
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#### Connector #2, Row A

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<tr>
<th>MB Contacts Damaged</th>
<th>Initial</th>
<th>250</th>
<th>500</th>
<th>750</th>
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</tr>
<tr>
<td>7.2</td>
<td>7.0</td>
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<td>7.1</td>
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#### Connector #2, Row B

<table>
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<tr>
<th>Control</th>
<th>Initial</th>
<th>250</th>
<th>500</th>
<th>750</th>
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<tr>
<td>8.6</td>
<td>8.4</td>
<td>8.3</td>
<td>8.4</td>
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</table>
APPENDIX A
Data Sheets
# LABORATORY DATA SHEET

**TEST SPECIMEN**
- 16-35234.2 - 150 MB (Anchor Rod)
- 16-50256.2 - 150-78 (Daughter Card)
- LT: 402.4

**TEST EQUIPMENT**
- Instron Model 112.3
- 236.13

**CAL DATE**
- 5/16/78

**DUE DATE**
- 2/18/79

**SPEC. LIMITS**

**TEST CONDITIONS**
- Room Ambient
- Crossing Speed: 0.100 in
- L-34119.58 Head Fixture

<table>
<thead>
<tr>
<th>Sample</th>
<th>Date</th>
<th>Temp RH Cycle</th>
<th>Matric Force</th>
<th>Unmatc Force</th>
<th>Remarks</th>
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<tbody>
<tr>
<td>1</td>
<td>10/13/78</td>
<td>73F 45% Initial</td>
<td>31 lbs</td>
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<tr>
<td>2</td>
<td>10/13/78</td>
<td>73F 45% Initial</td>
<td>37 lbs</td>
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<td></td>
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</table>

**NOTE:**
- 1. Connector mating and unmating forces
- 2. The parallel clamp was opened and the ends were separated at the RS R6 at the end and the opposite RS, 100 lbs, and the RS were not aligned. This resulted in the pull point to the desired, but only the left side, was pulled at the desired, but not the entire connector, at the desired, but not the entire connector.
LABORATORY DATA SHEET

TEST: VISUAL EXAMINATION

TEST SPECIMEN (3) 10-502-5042-150 MB (A/P STAGE BOARD)
10-502-5042-150 DB (DUTY BOARD)

TEST EQUIPMENT MODEL MB-37235
WELDING ELECTRIC 7-4722

DATE OF TESTS 11-1-78
REPORT NUMBER 2375

SPEC. 872
CAL DATE N/A
DUE DATE N/A

TEST CONDITIONS
ROOM AMBIENT. 12X MAGNIFICATION.

W/P 41%

Sample #1 After 10th Utility Cycle, only additional discrepancies.

Sample #2 MB After 10th Utility Cycle
A16 - wire bent over
B2 1 part by bent over

Sample #1 no change of either half after 250 cycles of durability.

Sample #2 MB - additional discrepancies after 250 cycles of durability.
A26 - skiving of cavity - minor
A49 - 2 bristles damaged - minor skiving of cavity
A45 - 1 bristle bent over

Sample #2 DB - no additional damage.

H-2.78 %28%

Sample #1 DB - no change after 500 cycles of durability.
MB - additional - A1 skiving, 374 skiving.

Sample #2 DB - no change after 500 cycles of durability.
MB - 235 & 249 minor skiving.

Sample #1 DB no change after 750 cycles of durability.

Sample #2 DB MB

ECL0592-35 &-36.

Electrical Components Division

Bendix

Tested by T.F. BAIRD
R.D. WAGHOUL

WITNESSED BY
LABORATORY DATA SHEET

TEST VISUAL EXAMINATION - INITIAL CYCLES SHEARING

TEST SPECIMEN 10-502562 - 150 MB (DADILL TERS)

TEST EQUIPMENT MODEL M5 - 37635

CAL DATE 5/10/72

DATE OF TESTS 11/4/71

REPORT NUMBER 3375

TOTAL # OF CYCLES 1000

SPEC LIMITS

SPEC.

PARAMETERS

12X MAGNIFICATION
R. EXAMINATION OF TABS VISUALIZED
AFTER 1000 CYCLES OF
DURABILITY BY HAND

TEST CONDITIONS ROOM AMBIENT

INITIAL SHEARING

SAMPLE #1 MB - 376 - ONE BRISTLE OUT TOWARD CAVITY WALL
A35 - TWO TIMES DISPLAYED SKIVING, ROLLING, MOLDING MATERIAL DOWN INTO CAVITY
B45 - HAD ONLY 5 BRISTLES INSTEAD OF PLANNED SIX, PREPARED 5/6 BRISTLE CONTACTS LOOKED GOOD

#1 DB - O.K.

SAMPLE #2 MB - CAVITIES A26, A29, A45, B27, B37, B41 AND B45 DISPLAYED MINOR SKIVING OF MOLDING AT BASE OF RETENTION TINES, NO CHANCE APPARENT OF THE PREPARED BENT WIRES (BISTLES)

#2 DB - O.K. - NO CHANCE APPARENT OF THE PREPARED BENT WIRES

AFTER 1000 CYCLES OF DURABILITY

SAMPLE #1 MB - A35 SKIVING OF TWO TIMES
A 1 " (MINOR)
B 74 " (MINOR)
PREPARED 5/6 BRISTLE CONTACTS, NO CHANCE, LOOK GOOD

DB - O.K., NO DAMAGE, NO APPARENT CHANGE

SAMPLE #2 MB - CAVITIES DISPLAYED SKIVING IN VARYING DEGREES
A26, A29, A33, A44, A45, B27, B37, B41, B45, B42
A46 WIRE BRISTLE BENT OVER
A49 ONE BRISTLE BENT OVER
A26 " " " " " "
A49 TWO " (3) " "
A45 ONE " " "

DB - O.K., NO DAMAGE, NO APPARENT CHANGE EVEN OF PREPARED BENT WIRES
LABORATORY DATA SHEET

TEST CONTACT RESISTANCE - INITIAL (p/n mating)

TEST SPECIMEN ISI 10-602342 - 13MU, 10-262552-150 DE

DATE OF TESTS 10-19-78
REPT NUMBER 2375

TEMP 72°F 15% RH

ECL 6592A-35

SPEC
PARA

TEST EQUIPMENT KEITHLEY 593 MILLIAMMETER

CAL DATE 2-12-78

DUE DATE 5-8-79

TEST CONDITIONS ROOM AMBIENT

#3 MILLIAMS FULL SCALE K = 2.292

#1 Row A
1-25
MB 5 Wires

#1 Row B
1-25
MB 5 Wires

#1 Row A
26-50
MB 4 Wires

#1 Row B
26-50
MB 6 Wires

NO. OF SAMPLES:
25
25
25
25

MINIMUM:
10.0
11.0
10.0
10.0

MAXIMUM:
11.5
11.5
9.1
9.1

MEAN:
10.8
11.0
9.3
9.3

R. D. WAGNER

T R SHARP

APPROVED BY

WITNESSED BY

72-354-2
#2 Row A
1-25
DB 1 BENT WIRE

#2 Row B
1-25
DB 1 BENT WIRE

#2 Row A
26-50
MB 1 BENT WIRE

#2 Row B
26-50
MB 1 BENT WIRE

No. of samples: 10
Max. = 10.4
Min. = 9.7
Mean = 9.4

No. of samples: 10
Max. = 10.3
Min. = 9.7
Mean = 9.9

No. of samples: 10
Max. = 10.1
Min. = 9.7
Mean = 9.9

EWD 0302
E040592-25

Bendix Corporation
Electrical Components Division

72-354-2
# LABORATORY DATA SHEET

**TEST**

**CONTACT RESISTANCE - INITIAL (1ST MATING)**

**TEST SPECIMENS**

- 10-502.542-150 MB, 10-502.542-150 DB

**CAL DATE**

- F-462: 2-22-78

**DUE DATE**

- 3-8-79

**TEST EQUIPMENT**

- KEITHLEY 503 MILLIONOMETER: F-462
- H.P. 3489A DIGITAL VOLTOMETER: F-0392
- H.P. 3489A DATA FUSHER: F-2103

**DATE OF TESTS**

- 10-19-78

**SPEC. LIMITS**

- SPEC.

**TEST CONDITIONS**

- ROOM AMBIENT
- 30 MILLIONMS FULL SCALE
- K = 2.292

<table>
<thead>
<tr>
<th>Sample</th>
<th>Date</th>
<th>Value</th>
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<tbody>
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<td>#1 Row A</td>
<td>10-19-78</td>
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<tr>
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<td>10-19-78</td>
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<td>10-20-78</td>
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<td>10-20-78</td>
<td>51.75</td>
<td>7 wires</td>
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</tbody>
</table>

**WITNESSED BY**

- R. D. WAGMAN

**APPROVED BY**

- T. E. BOYD

---

**Bendix**

**Electrical Components Division**

**EWD G997**

**ECL0592-35**

---

**72-354-2**
#2 Row A 1-25
DB 1 BENT WIRE

#2 Row B 1-25
DB 1 BENT WIRE

#2 Row A 2-50
MB 1 BENT WIRE

#2 Row B 2-50
MB 1 BENT WIRE

---

**LABORATORY DATA SHEET**

**TEST** CONTACT RESISTANCE - AFTER 250 CYCLES OF DURABILITY

**TEST SPECIMEN** 1A-502652-150M8, 1B-502652-150M8

**DATE OF TESTS** 11-1-76

**REPORT NUMBER** 2375

**TEMP 73°F**

**CAL.** 13296

**SPECIAL** 1C025092-39

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**TEST EQUIPMENT**

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<th>Model</th>
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**SPEC LIMITS**

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<tbody>
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<td>DB 1 BENT WIRE</td>
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**#2 Row B**

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<td>DB 1 BENT WIRE</td>
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**#2 Row A**

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<td>MB 1 BENT WIRE</td>
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**#2 Row B**

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<th>NO. OF SAMPLE</th>
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**CALCULATIONS**

<table>
<thead>
<tr>
<th>MEAN</th>
<th>MINIMUM</th>
<th>MAXIMUM</th>
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<tbody>
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<td>10.1</td>
<td>8.3</td>
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</tr>
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<td>8.3</td>
<td>6.5</td>
<td>10.7</td>
</tr>
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<td>6.5</td>
<td>5.0</td>
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**U.C.L.**

<table>
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<tr>
<th>10.1</th>
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</table>

**L.C.L.**

<table>
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---

**EWOM G397**

**ECL0592-35**

---

**Electrical**

**Components**

**Division**

**72-354-2**
LABORATORY DATA SHEET

<table>
<thead>
<tr>
<th>TEST</th>
<th>CONTACT RESISTANCE - AFTER 250 CYCLES OF DURABILITY</th>
</tr>
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<tbody>
<tr>
<td>DATE OF TESTS</td>
<td>11-1-78</td>
</tr>
<tr>
<td>TEST SPECIMENS</td>
<td>10-5025-72 - 150 MIG 10-502582 - 150 DX</td>
</tr>
<tr>
<td>TEMP</td>
<td>110°F</td>
</tr>
<tr>
<td>PERM</td>
<td></td>
</tr>
<tr>
<td>IN</td>
<td>12</td>
</tr>
<tr>
<td>OUT</td>
<td>22-78</td>
</tr>
<tr>
<td>SPEC TIMES</td>
<td>12-4-78</td>
</tr>
<tr>
<td>TEST CONDITIONS</td>
<td>3.5-4.3</td>
</tr>
<tr>
<td>TEST EQUIPMENT</td>
<td>A. M. D. Voltmeter</td>
</tr>
<tr>
<td>H-P 3490 A DIGITAL VOLTMETER</td>
<td>3.5-4.3</td>
</tr>
<tr>
<td>H-P 3489 A DATA HAVING</td>
<td>3.5-4.3</td>
</tr>
<tr>
<td>#1 Row A</td>
<td>51-75</td>
</tr>
<tr>
<td>7 WIRES</td>
<td>N/A</td>
</tr>
<tr>
<td>#1 Row B</td>
<td>51-75</td>
</tr>
<tr>
<td>7 WIRES</td>
<td>N/A</td>
</tr>
<tr>
<td>#2 Row A</td>
<td>51-75</td>
</tr>
<tr>
<td>7 WIRES</td>
<td>N/A</td>
</tr>
<tr>
<td>#2 Row B</td>
<td>51-75</td>
</tr>
<tr>
<td>7 WIRES</td>
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</table>

NO. OF SAMPLES | NO. OF SAMPLES |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>15</td>
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MINIMUM | 8.4 |
|---------|-----|

MAXIMUM | 28.5 |
|---------|------|

MEAN | 14.4 |
|------|------|

MINIMUM | 8.4 |
|---------|-----|

MAXIMUM | 28.5 |
|---------|------|

STANDARD DEVIATION | 5.0 |
|--------------------|-----|

U.C.L. | 25.7 |
|-------|-----|

L.C.L. | 7.2 |
|-------|-----|

REFERENCES | G997 |
|------------|-----|

ECL0592-35

Bendix

Electrical Components Division

72-354-2
<table>
<thead>
<tr>
<th>TEST</th>
<th>CONTACT RESISTANCE - AFTER 500 CYCLES OF DURABILITY</th>
<th>DATE OF TESTS</th>
<th>REPORT NUMBER</th>
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<tbody>
<tr>
<td>SPEC</td>
<td>1.0-502.542 - 150 MB; 1.0-502.542 - 150 DE</td>
<td>11-2-78</td>
<td>2375</td>
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<table>
<thead>
<tr>
<th>TEST EQUIPMENT</th>
<th>E-3244</th>
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<th>CM</th>
<th>28%</th>
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<tr>
<td>SPEC LIMITS</td>
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<td>SPEC</td>
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<th>TEST CONDITIONS</th>
<th>ROOM ENVIRONMENT</th>
<th>SPEC LIMITS</th>
<th>TEMP</th>
<th>74°F</th>
<th>CM</th>
<th>28%</th>
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<tbody>
<tr>
<td>SPEC</td>
<td>PARA</td>
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<tr>
<th>HP 3489A DIGITAL VOLTMETER</th>
<th>C-0332</th>
<th>9-16-78</th>
<th>3.6-79</th>
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<tr>
<td>HP 3489A DATA ACQUISITION</td>
<td>E-2103</td>
<td>N/A</td>
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<th>TEST CONDITIONS</th>
<th>ROOM ENVIRONMENT</th>
<th>SPEC LIMITS</th>
<th>TEMP</th>
<th>74°F</th>
<th>CM</th>
<th>28%</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEC</td>
<td>PARA</td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>#1 Row A</th>
<th>1-25</th>
<th>MB 6 Wires</th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>#1 Row B</td>
<td>1-25</td>
<td>MB 5 Wires</td>
<td></td>
<td></td>
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<td></td>
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<table>
<thead>
<tr>
<th>#1 Row A</th>
<th>26-50</th>
<th>MB 6 Wires</th>
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<tbody>
<tr>
<td>#1 Row B</td>
<td>26-50</td>
<td>MB 6 Wires</td>
<td></td>
<td></td>
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</tbody>
</table>

**EWON G397.**
ECLO532-36.

Bendix

Electrical Components Division

72-354-2
LABORATORY DATA SHEET

TEST: CONTACT RESISTANCE - AFTER 500 CYCLES OF DURABILITY

TEST SPECIMEN: 10-502562-150 M5, 10-502562-130 DB

TEST EQUIPMENT:
- KILEY MODEL 503 MILLIONMETERS
- DATE: FEB 4, 1976
- SPEC: N/A
- T-227
- SPEC LIMITS
- TEST CONDITIONS: ROOM AMBIENT
- 30 MILLIONMS FULL SCALE
- 

#2 ROW A
1-25
DB 1 BENT WIRES

#2 ROW B
1-25
DB 1 BENT WIRES

#2 ROW A
26-50
MB 1 BENT WIRES

#2 ROW B
26-50
MB 1 BENT WIRES

22-354-2
#1 Row A
1-25
MB 5 Wires

#1 Row B
1-25
MB 5 Wires

#1 Row A
26-50
MB 6 Wires

#1 Row B
26-50
MB 6 Wires
LABORATORY DATA SHEET

TEST: CONTACT RESISTANCE - AFTER 750 CYCLES OF DURABILITY

TEST SPECIMENS: 10-5025-2-150 MB, 10-5025-2-150 DB

DATE OF TESTS: 11-2-78
REPORT NUMBER: 2375

TEMP: 87°F
R.H.: 25%
ECLD592A-46

TEST EQUIPMENT:
- HP 3478A 30 MHz Oscilloscope

SPEC. LIMITS:
- N/A

TEST CONDITIONS:
- Room Ambient
- 30 MILLIONMS FULL SCALE

K=2.292

#2 Row A
- 1-25
- DB 1 BENT WIRE

#2 Row B
- 1-25
- DB 1 BENT WIRE

#2 Row A
- 26-50
- MB 1 BENT WIRE

#2 Row B
- 26-50
- MB 1 BENT WIRE

NO. OF SAMPLES:
- 25

MINIMUM:
- 6.1

MAXIMUM:
- 10.1

MEAN:
- 7.1

STDEV.:
- 2.1

EWDN G997.
ECLD592-36.

Electrical Components
Division

72-354-2
**LABORATORY DATA SHEET**

**TEST**  | **CONTACT RESISTANCE - AFTER 750 CYCLES OF DURABILITY**
--- | ---
**DATE OF TESTS** | 11-2-78
**TEMP** | 23°C
**RH** | 25%
**REPORT NUMBER** | 2395

**TEST SPECIMEN**  | 10-802,592-150 MBI-10=02532-150-28
**SPEL** | PFA
**SpEC LImItS** | 

| **TEST EQUIPMENT** | **Model 508 Milliommeter** |
--- | ---
**CAL DATE** | 2-22-78
**OCE DATE** | 3-6-78

| **H-P 3480A DIGITAL VOLTMETER** | **H-P 3489A DATA MCHN** |
--- | ---
**F-2392** | **F-6103**
**N/A** | **N/A**

**TEST CONDITIONS** | **Room Ambient**
**S/N MILLIONMS FULL SCALE** | **10**
**K=2.292**

| **#1 Row A** | **#1 Row B** | **#2 Row A** | **#2 Row B** |
--- | --- | --- | ---
**WIRE** | **WIRE** | **WIRE** | **WIRE** |
**S1-75** | **S1-75** | **S1-75** | **S1-75** |
**7 WIREs** | **7 WIREs** | **7 WIREs** | **7 WIREs** |

**NO. OF SAMPLES**  | **NO. OF SAMPLES**  | **NO. OF SAMPLES**  | **NO. OF SAMPLES**  |
--- | --- | --- | ---
**25** | **25** | **25** | **25**

**MINIMUM**  | **MINIMUM**  | **MINIMUM**  | **MINIMUM**  |
--- | --- | --- | ---
**7.5** | **7.5** | **7.5** | **7.5**

**MAXIMUM**  | **MAXIMUM**  | **MAXIMUM**  | **MAXIMUM**  |
--- | --- | --- | ---
**9.7** | **9.7** | **9.7** | **9.7**

**MEAN**  | **MEAN**  | **MEAN**  | **MEAN**  |
--- | --- | --- | ---
**8.4** | **8.4** | **8.4** | **8.4**

**ST. DEVIATION**  | **ST. DEVIATION**  | **ST. DEVIATION**  | **ST. DEVIATION**  |
--- | --- | --- | ---
**7.0** | **7.0** | **7.0** | **7.0**

---

**Bendix**
**Electrical Components Division**

**EWOM G397**
**ECL0592-36**

**TESTED BY**  | **R. J. ZIRKLE**
**APPROVED BY**  | **R. D. WAGNOR**
**WITNESSED BY**

---

72-354-2

15
<table>
<thead>
<tr>
<th>TEST SPECIMEN</th>
<th>10-502592 - 150 MΩ, 10-502592 - 150 MΩ</th>
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<tbody>
<tr>
<td>TEST EQUIMENT</td>
<td>Keithley Model 593 Milliammeter</td>
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<tr>
<td>TEST CONDITIONS</td>
<td>Ambient 30 Millions Full Scale</td>
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</table>

<table>
<thead>
<tr>
<th>NO. OF SAMPLE</th>
<th>1# OF SAMPLE</th>
<th>NO. OF SAMPLE</th>
<th>NO. OF SAMPLE</th>
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<tbody>
<tr>
<td>MEAN</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
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<tr>
<td>MIN</td>
<td>0.0</td>
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<tr>
<td>MAX</td>
<td>0.2</td>
<td>0.2</td>
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**Ref:** EWDM G397

**ECL0592-36**
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<th>Contract Resistance - After 1000 cycles of surgeability</th>
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<tr>
<td>Test Specimens</td>
<td>10-502592-150MB, 10-502592-150DB</td>
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<td>Temp</td>
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<tr>
<td>Spec</td>
<td>3A-24</td>
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<tr>
<td>Test Equipment</td>
<td>Keithley Model 593 Millivoltmeter</td>
</tr>
<tr>
<td>Cal Date</td>
<td>12-22-78</td>
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<tr>
<td>Due Date</td>
<td>3-8-79</td>
</tr>
<tr>
<td>Test Conditions</td>
<td>Room Ambient</td>
</tr>
<tr>
<td></td>
<td>30 Millivolts Full Scale</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>#2 Row A</th>
<th>#2 Row B</th>
<th>#2 Row A</th>
<th>#2 Row B</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-25 DB 1 Bent Wire</td>
<td>1-25 DB 1 Bent Wire</td>
<td>26-50 MB 1 Bent Wire</td>
<td>26-50 MB 1 Bent Wire</td>
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</tbody>
</table>

No. of Samples: 25

New WW 6997.
ECL0552-36.
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<th>Date</th>
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<tbody>
<tr>
<td></td>
<td>#1 Ros A</td>
<td>7</td>
<td>31-75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#2 Ros A</td>
<td>7</td>
<td>51-75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#1 Ros B</td>
<td>7</td>
<td>31-75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#2 Ros B</td>
<td>7</td>
<td>51-75</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The image contains a table with test conditions and wire numbers. The table is not fully visible due to the angle and quality of the photo. The data presented includes sample identification, wire counts, and test numbers.
APPENDIX B
Photographs