SAMTEC POWER CHARACTERIZATION

PART DESCRIPTION

SSM-140-L-DV/TSW-140-07-L-D
CERTIFICATION

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

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SCOPE
1. Temperature Rise/Current Carrying Capacity
   1.1. To determine the amount of current the device under test (DUT) can safely carry over the operating temperature range of the DUT.
   1.2. Contact loading will also be addressed in this document which will determine how much current can be carried as the number of energized contacts is varied.

2. Current Cycling
   2.1. To determine the performance of the device under test (DUT) when subjected to the power-on/power-off cycling that heats and cools the DUT in normal everyday use.
   2.2. Contact loading will set to 100% throughout the test.

APPLICABLE DOCUMENTS

   Standards: EIA Publication 364-70 Temperature Rise
             EIA Publication 364-06 Contact Resistance
             EIA Publication 364-55 Current Cycling
             TLPM-032 Current Carrying Capacity
             TLPM-084 Current Cycling

TEST SAMPLES AND PREPARATION

1) All materials shall be manufactured in accordance with the applicable product specification.
2) All test samples shall be identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used shall be cleaned according to TLWI-0001.
4) All samples shall be visually inspected and cleaned as necessary.
5) Any additional preparation shall be noted in the individual test sequences.
6) Solder Information: Lead Free
7) Re-Flow Time/Temp: See accompanying profile.
8) All products designed to operate mounted on a printed circuits board shall be tested mounted to test boards in accordance with EIA-364-70.
Figure 1: Example of thermocouple placement, actual part not depicted.

9) The following loading configurations shall be tested for Temperature Rise/Current Carrying Capacity testing of single row connector systems:
   a. One contact energized only
   b. Two contacts energized adjacent to each other
   c. Three contacts energized adjacent to each other
   d. Four contacts energized adjacent to each other
   e. All contacts energized

   ✦ Indicates energized contacts
   ✦ Indicates thermocouple monitored, energized contacts

   Test Condition as in 9.1 above

10) The following loading configurations shall be tested for Temperature Rise/Current Carrying Capacity testing of two row connector systems:
    a. Two by One contact energized
    b. Two by Two contacts energized adjacent to each other
    c. Two by Three contacts energized adjacent to each other
    d. Two by Four contacts energized adjacent to each other
    e. All contacts energized

    ✦ Indicates energized contacts
    ✦ Indicates thermocouple monitored, energized contacts

    Test Condition as in 10.1 above

11) For Current Cycling, only 100 % loading will be tested.
OVEN PROFILE (Soldering Parts to Test Boards)

Standard Solder Paste Reflow Profile for Kester Paste Containing Alloys: Sn63Pb37 or Sn62Pb36Ag02

- Preheat
- Soak
- Reflow
- Cool Down

Temperature (°C)

- Peak Temp.: 268 - 230°C
- Soaking Zone (2.0 min. max.): 60-90 sec. typical
- Reflow Zone (46-90 sec. max.): 60 sec. typical
- Pre-heating Zone (2.0-4.0 min. max.): <2.5 °C/Sec
FLOWCHARTS

**Current Carrying Capacity**

<table>
<thead>
<tr>
<th>TEST STEP</th>
<th>GROUP A</th>
<th>GROUP B</th>
<th>GROUP C</th>
<th>GROUP D</th>
<th>GROUP E</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>2 CONTACT POWERED</td>
<td>4 CONTACTS POWERED</td>
<td>6 CONTACTS POWERED</td>
<td>8 CONTACTS POWERED</td>
<td>ALL CONTACTS POWERED</td>
</tr>
<tr>
<td></td>
<td>CCC</td>
<td>CCC</td>
<td>CCC</td>
<td>CCC</td>
<td>CCC</td>
</tr>
</tbody>
</table>

(TIN PLATING) - Tabulate calculated current at RT, 65°C, 75°C and 95°C after derating 20% and based on 105°C
(GOLD PLATING) - Tabulate calculated current at RT, 85°C, 95°C and 115°C after derating 20% and based on 125°C
CCC, Temp rise = EIA-364-70

**Current Cycling**

<table>
<thead>
<tr>
<th>TEST STEP</th>
<th>GROUP A</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>8 MATED ASSEMBLIES ALL CONTACTS POWERED</td>
</tr>
</tbody>
</table>

Current Cycle, 500 cycles at 125% of Rated Current

Current Cycle = EIA 364-55, Condition "B", Method #4
Test at Current 125% of Rated Current
Measure at 45 minutes into ON time of cycle
Measure Voltage Drop on 5 random contacts
TEST PROCEDURES

<table>
<thead>
<tr>
<th>Part No.</th>
<th>SSM-140-L-DV</th>
<th>Mating Part No.</th>
<th>TSW-140-07-L-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>15</td>
<td>Technician</td>
<td>Tony Wagoner</td>
</tr>
<tr>
<td>Start Date</td>
<td>12/1/2008</td>
<td>Complete Date</td>
<td>12/2/2008</td>
</tr>
<tr>
<td>Room Ambient</td>
<td>24.8°C</td>
<td>Relative Humidity</td>
<td>25%</td>
</tr>
<tr>
<td>Equipment ID#</td>
<td>MO-04, PS-07, TC111307-(001 - 017)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) Thermocouples shall be calibrated in accordance with Samtec documents; TLWI 0003, Thermocouple Welding Procedure and TLWI 0005, Thermocouple Calibration
2) The thermocouples shall be placed at a location to sense the maximum temperature generated during testing.
3) Temperature stability shall be defined as the temperature at which three successive readings, 5 minutes apart, differ not more than 1°C (computer controlled data acquisition). This is the Temperature Rise that the Current Carrying Capacity and De-rating curves are based on.
4) The following loading configurations shall be tested (double for two row systems):
   a. One contact energized only
   b. Two contacts energized adjacent to each other
   c. Three contacts energized adjacent to each other
   d. Four contacts energized adjacent to each other
   e. All contacts energized
5) The following loading configurations shall be tested for Temperature Rise/Current Carrying Capacity testing of two row connector systems:
   a. Two by One contact energized
   b. Two by Two contacts energized adjacent to each other
   c. Two by Three contacts energized adjacent to each other
   d. Two by Four contacts energized adjacent to each other
   e. All contacts energized
6) Three samples shall be tested for each of the above configurations for a total of eighteen assemblies.
7) Temperature Rise measurements shall be made at 5 different current levels yielding temperature rises in the 10 to 70°C range.
8) The base curve for the Current Rating chart will be derived from the average (maximum) value of three test specimens in accordance with IEC 512-3, Test 5b.
CURRENT CYCLING

1. Samples shall be prepared and tested as above (paragraph 14.5).
2. Current Cycling shall be performed in accordance with EIA-364-55, Test Condition 3. Testing shall be as follows:
   3.1. Test Current: 2.8 (125% of 30°C Rating)
   3.2. “ON” Time: 45 Minutes
   3.3. “OFF” Time: 15 Minutes
   3.4. Number of Cycles: 500
   3.5. Measurements: 40 minutes into ON cycle
      3.5.1. Temperature
      3.5.2. Voltage Drop/Contact Resistance
4. Temperature vs. Number of Cycles and Voltage Drop vs. Number of Cycles shall be measured and recorded.
TEST RESULTS

CURRENT CARRYING CAPACITY (CCC) RESULTS

- There was no evidence of physical damage to the test samples as tested.
- The following is a summary of the observed data:

Temperature Rise, CCC at a 20% de-rating

- CCC for a 30°C Temperature Rise ----------------------- 5.2A per contact with 2 contacts (2 x 1) powered
- CCC for a 30°C Temperature Rise ----------------------- 4.4A per contact with 4 contacts (2 x 2) powered
- CCC for a 30°C Temperature Rise ----------------------- 3.5A per contact with 6 contacts (2 x 3) powered
- CCC for a 30°C Temperature Rise ----------------------- 3.2A per contact with 8 contacts (2 x 4) powered
- CCC for a 30°C Temperature Rise ----------------------- 2.2A per contact with all contacts (2 x 40) powered

CURRENT CYCLING RESULTS

Test Condition: 500 Cycles, 45 minutes ON and 15 minutes OFF

- Test Current ------------------------------------------ 2.8 Amps

- Contact Resistances, Measured 40 minutes into the FIRST and LAST ON cycle
  - Initial
    - Min --------------------------------------- 3.05 mOhms
    - Max--------------------------------------- 3.73 mOhms
  - Final
    - Min --------------------------------------- 2.95 mOhms
    - Max--------------------------------------- 3.59 mOhms

- Temperature Change, Measured 40 minutes into the FIRST and LAST ON cycle
  - Initial Temperature Change ---------------------- 32.9°C
  - Final Temperature Change ------------------------ 32.0°C
TEST DATA

CONTACT RESISTANCE @ RATED CURRENT

The following data represents the Voltage drop and Contact Resistance at Rated Current for the 100% energized samples:

![Graph showing Contact Resistance @ Rated Current](image)

<table>
<thead>
<tr>
<th>Current (Amps)</th>
<th>Resistance (mOhms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>6.0</td>
</tr>
<tr>
<td>2.0</td>
<td>5.5</td>
</tr>
<tr>
<td>2.5</td>
<td>5.0</td>
</tr>
<tr>
<td>3.0</td>
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<td>4.0</td>
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<tr>
<td>5.5</td>
<td>2.0</td>
</tr>
<tr>
<td>6.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>

CONTACT RESISTANCE DATA
ALL CONTACTS ENERGIZED
(mΩ)

<table>
<thead>
<tr>
<th>TEST CURRENT AMPS</th>
<th>1.57</th>
<th>2.22</th>
<th>2.72</th>
<th>3.14</th>
<th>3.52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>3.02</td>
<td>3.05</td>
<td>3.09</td>
<td>3.11</td>
<td>3.11</td>
</tr>
<tr>
<td>Max</td>
<td>3.56</td>
<td>3.62</td>
<td>3.65</td>
<td>3.68</td>
<td>3.68</td>
</tr>
<tr>
<td>Avg</td>
<td>3.29</td>
<td>3.34</td>
<td>3.36</td>
<td>3.38</td>
<td>3.37</td>
</tr>
</tbody>
</table>
TEST DATA

VOLTAGE DROP @ RATED CURRENT

The following data represents the Voltage drop at Rated Current for the 100% energized samples:

![Voltage Drop @ Rated Current Graph](image)

### VOLTAGE DROP DATA
**ALL CONTACTS ENERGIZED**
(mV)

<table>
<thead>
<tr>
<th>TEST CURRENT AMPS</th>
<th>1.57</th>
<th>2.22</th>
<th>2.72</th>
<th>3.14</th>
<th>3.52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>4.74</td>
<td>6.78</td>
<td>8.4</td>
<td>9.75</td>
<td>10.94</td>
</tr>
<tr>
<td>Max</td>
<td>5.59</td>
<td>8.03</td>
<td>9.94</td>
<td>11.55</td>
<td>12.95</td>
</tr>
<tr>
<td>Avg</td>
<td>5.13</td>
<td>7.34</td>
<td>9.07</td>
<td>10.5</td>
<td>11.74</td>
</tr>
</tbody>
</table>
### CURRENT CARRYING CAPACITY DATA

**TC0838--1978**

2 (2x1) Contacts in Linear series  
Part Numbers: SSM-140-L-DV and TSW-140-07-L-D

**Current Rating per Contact (30 Deg. Rise, 20% Derated)**  =  5.2 Amps

![Graph showing current carrying capacity data](image)

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>20</th>
<th>40</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>120</th>
<th>140</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current (Amps)</td>
<td>12.0</td>
<td>9.6</td>
<td>7.5</td>
<td>6.5</td>
<td>5.2</td>
<td>3.6</td>
<td>2.9</td>
</tr>
</tbody>
</table>

**Base Curve**  
**Derated 20%**  
**RT Peak Amp**  
**RT Derated Amp**  
**Measured Current**

### TEMPERATURE RISE DATA

**TWO CONTACT ENERGIZED**  
(Degrees Celsius above ambient)

<table>
<thead>
<tr>
<th>Test Current Amps</th>
<th>3.44</th>
<th>4.87</th>
<th>5.97</th>
<th>6.89</th>
<th>7.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>7.1</td>
<td>18.1</td>
<td>26.6</td>
<td>35.4</td>
<td>43.9</td>
</tr>
<tr>
<td>Sample 2</td>
<td>7.5</td>
<td>17.6</td>
<td>25.3</td>
<td>33.7</td>
<td>42.5</td>
</tr>
<tr>
<td>Sample 3</td>
<td>7.3</td>
<td>16.8</td>
<td>24.7</td>
<td>32.8</td>
<td>40.8</td>
</tr>
<tr>
<td>Min</td>
<td>7.1</td>
<td>16.8</td>
<td>24.7</td>
<td>32.8</td>
<td>40.8</td>
</tr>
<tr>
<td>Max</td>
<td>7.5</td>
<td>18.1</td>
<td>26.6</td>
<td>35.4</td>
<td>43.9</td>
</tr>
<tr>
<td>Avg</td>
<td>7.3</td>
<td>17.5</td>
<td>25.53</td>
<td>33.97</td>
<td>42.4</td>
</tr>
</tbody>
</table>

- Indicates energized contacts
- Indicates thermocouple monitored, energized contacts

**Double Row Configuration**

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11 of 21  
1/7/2009
TEMPERATURE RISE DATA
FOUR CONTACTS ENERGIZED
(Degrees Celsius above ambient)

<table>
<thead>
<tr>
<th>TEST CURRENT AMPS</th>
<th>3.44</th>
<th>4.87</th>
<th>5.97</th>
<th>6.89</th>
<th>7.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 4</td>
<td>9.4</td>
<td>23.5</td>
<td>34.8</td>
<td>45.8</td>
<td>56.5</td>
</tr>
<tr>
<td>Sample 5</td>
<td>11.3</td>
<td>25.3</td>
<td>37.1</td>
<td>48.6</td>
<td>59.8</td>
</tr>
<tr>
<td>Sample 6</td>
<td>10.8</td>
<td>24.6</td>
<td>36.2</td>
<td>47.2</td>
<td>58.4</td>
</tr>
<tr>
<td>Min</td>
<td>9.4</td>
<td>23.5</td>
<td>34.8</td>
<td>45.8</td>
<td>56.5</td>
</tr>
<tr>
<td>Max</td>
<td>11.3</td>
<td>25.3</td>
<td>37.1</td>
<td>48.6</td>
<td>59.8</td>
</tr>
<tr>
<td>Avg</td>
<td>10.5</td>
<td>24.47</td>
<td>36.03</td>
<td>47.2</td>
<td>58.23</td>
</tr>
</tbody>
</table>

- ✤ Indicates energized contacts
- ✧ Indicates thermocouple monitored, energized contacts
TEMPERATURE RISE DATA
SIX CONTACTS ENERGIZED
(Degrees Celsius above ambient)

<table>
<thead>
<tr>
<th>TEST CURRENT AMPS</th>
<th>2.5</th>
<th>3.53</th>
<th>4.33</th>
<th>5</th>
<th>5.59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 7</td>
<td>15.1</td>
<td>18.4</td>
<td>26.6</td>
<td>35</td>
<td>42.4</td>
</tr>
<tr>
<td>Sample 8</td>
<td>15.4</td>
<td>19.3</td>
<td>28.4</td>
<td>37.5</td>
<td>45.8</td>
</tr>
<tr>
<td>Sample 9</td>
<td>17.7</td>
<td>22</td>
<td>32.1</td>
<td>42</td>
<td>51.2</td>
</tr>
<tr>
<td>Min</td>
<td>15.1</td>
<td>18.4</td>
<td>26.6</td>
<td>35</td>
<td>42.4</td>
</tr>
<tr>
<td>Max</td>
<td>17.7</td>
<td>22</td>
<td>32.1</td>
<td>42</td>
<td>51.2</td>
</tr>
<tr>
<td>Avg</td>
<td>16.07</td>
<td>19.9</td>
<td>29.03</td>
<td>38.17</td>
<td>46.47</td>
</tr>
</tbody>
</table>

- Indicates energized contacts
- Indicates thermocouple monitored, energized contacts
TC0838--1978
8 (2x4) Contacts in Linear series
Part Numbers: SSM-140-L-DV and TSW-140-07-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 3.2 Amps

TEMPERATURE RISE DATA
EIGHT CONTACTS ENERGIZED
(Degrees Celsius above ambient)

<table>
<thead>
<tr>
<th>TEST CURRENT AMPS</th>
<th>2.5</th>
<th>3.53</th>
<th>4.33</th>
<th>5</th>
<th>5.59</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 10</td>
<td>18.3</td>
<td>22.6</td>
<td>33.1</td>
<td>43.2</td>
<td>52.6</td>
</tr>
<tr>
<td>Sample 11</td>
<td>19.8</td>
<td>25</td>
<td>36.2</td>
<td>47.2</td>
<td>57.5</td>
</tr>
<tr>
<td>Sample 12</td>
<td>19</td>
<td>24</td>
<td>34.9</td>
<td>46.3</td>
<td>56.7</td>
</tr>
<tr>
<td>Min</td>
<td>18.3</td>
<td>22.6</td>
<td>33.1</td>
<td>43.2</td>
<td>52.6</td>
</tr>
<tr>
<td>Max</td>
<td>19.8</td>
<td>25</td>
<td>36.2</td>
<td>47.2</td>
<td>57.5</td>
</tr>
<tr>
<td>Avg</td>
<td>19.03</td>
<td>23.87</td>
<td>34.73</td>
<td>45.57</td>
<td>55.6</td>
</tr>
</tbody>
</table>

 관한 액체 점검.

* Indicates energized contacts
* Indicates thermocouple monitored, energized contacts
TC0838-1978

All power 100 contacts in linear series
Part Numbers: SSM-140-L-DV and TSW-140-07-L-D

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 2.2 Amps

TEMPEATURE RISE DATA
All contacts energized
(Degrees Celsius above ambient)

<table>
<thead>
<tr>
<th>TEST CURRENT AMPS</th>
<th>1.57</th>
<th>2.22</th>
<th>2.72</th>
<th>3.14</th>
<th>3.52</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 13</td>
<td>11.2</td>
<td>21</td>
<td>30.4</td>
<td>38.9</td>
<td>47</td>
</tr>
<tr>
<td>Sample 14</td>
<td>10.8</td>
<td>20.2</td>
<td>28.9</td>
<td>37</td>
<td>44.4</td>
</tr>
<tr>
<td>Sample 15</td>
<td>10.7</td>
<td>20</td>
<td>28.8</td>
<td>36.9</td>
<td>44.4</td>
</tr>
<tr>
<td>Min</td>
<td>10.7</td>
<td>20</td>
<td>28.8</td>
<td>36.9</td>
<td>44.4</td>
</tr>
<tr>
<td>Max</td>
<td>11.2</td>
<td>21</td>
<td>30.4</td>
<td>38.9</td>
<td>47</td>
</tr>
<tr>
<td>Avg</td>
<td>10.9</td>
<td>20.4</td>
<td>29.37</td>
<td>37.6</td>
<td>45.27</td>
</tr>
</tbody>
</table>

 Indicates energized contacts

 Indicates thermocouple monitored, energized contacts
CURRENT CYCLING VS. TEMPERATURE RISE

TEMPERATURE RISE DATA
ALL CONTACTS ENERGIZED
(Degrees Celsius above ambient)

<table>
<thead>
<tr>
<th></th>
<th>INITIAL</th>
<th>50 CYCLES</th>
<th>100 CYCLES</th>
<th>200 CYCLES</th>
<th>500 CYCLES</th>
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</thead>
<tbody>
<tr>
<td>Min</td>
<td>31.3</td>
<td>30.9</td>
<td>30.7</td>
<td>30.5</td>
<td>30.1</td>
</tr>
<tr>
<td>Max</td>
<td>35.7</td>
<td>35.3</td>
<td>35</td>
<td>34.8</td>
<td>34.5</td>
</tr>
<tr>
<td>Avg</td>
<td>32.9</td>
<td>32.6</td>
<td>32.4</td>
<td>32.2</td>
<td>32</td>
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</tbody>
</table>
CURRENT CYCLING VS. CONTACT RESISTANCE

CONTACT RESISTANCE DATA
ALL CONTACTS ENERGIZED
(mΩ)

<table>
<thead>
<tr>
<th></th>
<th>INITIAL</th>
<th>50 CYCLES</th>
<th>100 CYCLES</th>
<th>200 CYCLES</th>
<th>500 CYCLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Min</td>
<td>3.05</td>
<td>2.99</td>
<td>2.98</td>
<td>2.97</td>
<td>2.95</td>
</tr>
<tr>
<td>Max</td>
<td>3.73</td>
<td>3.62</td>
<td>3.61</td>
<td>3.6</td>
<td>3.59</td>
</tr>
<tr>
<td>Avg</td>
<td>3.29</td>
<td>3.22</td>
<td>3.2</td>
<td>3.19</td>
<td>3.18</td>
</tr>
</tbody>
</table>
CURRENT CYCLING VS. VOLTAGE DROP

VOLTAGE DROP DATA
ALL CONTACTS ENERGIZED
(MV)

<table>
<thead>
<tr>
<th></th>
<th>INITIAL</th>
<th>50 CYCLES</th>
<th>100 CYCLES</th>
<th>200 CYCLES</th>
<th>500 CYCLES</th>
</tr>
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<tbody>
<tr>
<td>Min</td>
<td>8.55</td>
<td>8.37</td>
<td>8.34</td>
<td>8.31</td>
<td>8.26</td>
</tr>
<tr>
<td>Max</td>
<td>10.45</td>
<td>10.15</td>
<td>10.11</td>
<td>10.09</td>
<td>10.05</td>
</tr>
<tr>
<td>Avg</td>
<td>9.21</td>
<td>9</td>
<td>8.97</td>
<td>8.94</td>
<td>8.89</td>
</tr>
</tbody>
</table>
EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: PS-01
Description: System Power Supply
Manufacturer: Hewlett Packard
Model: HP 6033A
Serial #: (HP) 3329A-07330
Accuracy: See Manual
… Last Cal: 06/22/07, Next Cal: 06/22/08

Equipment #: PS-02
Description: System Power Supply, 0 - 20V/ 0 - 30 amp, 200 Watts
Manufacturer: Hewlett Packard
Model: 6033A
Serial #: (HP) 2847A-04167
Accuracy: See Manual
… Last Cal: 03/08/2007, Next Cal: 03/08/2008

Equipment #: PS-03
Description: Power Supply, 50 amp
Manufacturer: HP/Agilent
Model: 0-60V / 0 - 50 amps / 1000 Watts
Serial #: 2723A-02144
Accuracy: See Manual
… Last Cal: 06/22/2007, Next Cal: 06/22/08

Equipment #: PS-04
Description: 60 V, 50 A DC Power Supply - AutoRanging SO
Manufacturer: Hewlett Packard / Agilent
Model: AT-6032A
Serial #: MY41001186
Accuracy: See Manual Current Cycle Chamber 2 - Lower Shelf
… Last Cal: 12/04/2007, Next Cal: 12/04/2008

Equipment #: PS-05
Description: 60 V, 50 A DC Power Supply - AutoRanging SO
Manufacturer: Hewlett Packard / Agilent
Model: AT-6032A
Serial #: MY41001158
Accuracy: See Manual Current Cycle Chamber 2 - Lower Shelf
… Last Cal: 12/04/2007, Next Cal: 12/04/2008
<table>
<thead>
<tr>
<th>Equipment #</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Model</th>
<th>Serial #</th>
<th>Accuracy</th>
<th>Last Cal</th>
<th>Next Cal</th>
</tr>
</thead>
<tbody>
<tr>
<td>PS-06</td>
<td>60 V, 50 A DC Power Supply - AutoRanging SO</td>
<td>Hewlett Packard / Agilent</td>
<td>AT-6032A</td>
<td>US3542827</td>
<td>See Manual Current Cycle Chamber 3 (This chamber only has 1 shelf)</td>
<td>10/25/2007</td>
<td>10/25/2008</td>
</tr>
<tr>
<td>MO-02</td>
<td>Multimeter /Data Acquisition System</td>
<td>Keithley</td>
<td>2700</td>
<td>0780546</td>
<td>See Manual</td>
<td>06/22/07</td>
<td>06/22/08</td>
</tr>
</tbody>
</table>

Equipment #: MO-08
Description: Model 2750 Multimeter/Switch System (Integra Series)
Manufacturer: Keithley
Model: 2750
Serial #: (HP) 3329A-07330
Accuracy: See Manual
Equipment #: MO-09  
Description: Model 2750 Multimeter/Switch System (Integra Series)  
Manufacturer: Keithley  
Model: 2750  
Serial #: WDC-874817  
Accuracy: See Manual  
… Last Cal: 10/22/2007, Next Cal: 10/22/2008

Equipment #: TC111307-(001 - 017)  
Description: CCC Chamber Thermocouples  
Manufacturer: Samtec  
Model:  
Serial #: TC111307-(001 - 017)  
Accuracy: +/- 1 Deg.  
… Last Cal: 11/03/2007, Next Cal: 11/03/2008

Equipment #: TC111307-(041 - 059)  
Description: Current Cycling Chamber #1 Thermocouples  
Manufacturer: Samtec  
Model:  
Serial #: TC111307-(041 - 059)  
Accuracy: +/- 1 Deg.  
… Last Cal: 11/03/2007, Next Cal: 11/03/2008

Equipment #: TC010908-(060 - 077)  
Description: Current Cycling Chamber # 2 Thermocouples  
Manufacturer: Samtec  
Model:  
Serial #: TC010908-(060-077)  
Accuracy: +/- 1 Deg.  
… Last Cal: 11/03/2007, Next Cal: 11/03/2008

Equipment #: TC111307-(118 - 136)  
Description: Current Cycling Chamber # 3 Thermocouples  
Manufacturer: Samtec  
Model:  
Serial #: TC111307-(118 - 136)  
Accuracy: +/- 1 Deg.  
… Last Cal: 11/03/2007, Next Cal: 11/03/2008

Equipment #: TC120607-(101C - 109C), 110807-140  
Description: Current Cycling Chamber # 4 Thermocouples  
Manufacturer: Samtec  
Model:  
Serial #: TC120607-(101C - 109C), 110807-140  
Accuracy: +/- 1 Deg.  