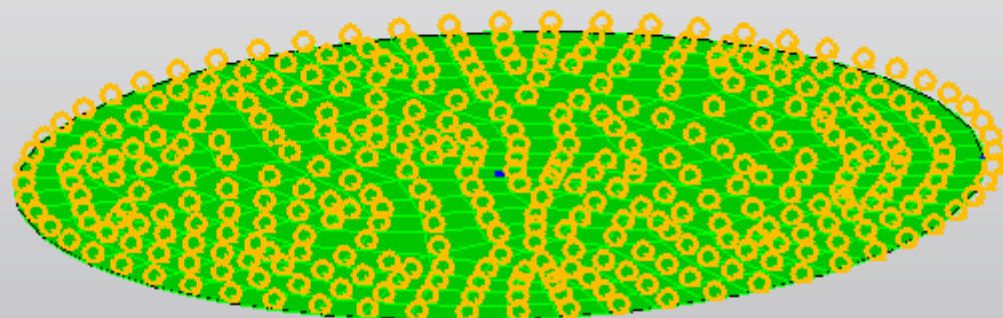


# Design Analysis

## Project Title Here

### Created by

Author:

Department:

Created Date: 10-02-2012

### Reviewed by

Reviewer:

Department:

Model Created 10-02-2012

Date:

Reviewer

Comments:

### Executive Summary

This is where to put your Executive summary. So, replace this text with your overall Project Description.

### Summary

*Model Information*

Analysis Type - Steady-State Heat Transfer

Units - Custom - (N, m, s, K, K, V, ohm, A, J)

Model location - E:\Thermal Analysis\10022012\2.fem

Design scenario description - Design Scenario # 1

## Analysis Parameters Information

### *Multiphysics Information*

|                                                      |    |
|------------------------------------------------------|----|
| Use electrostatic results to calculate Joule Effects | No |
| Include fluid convection effects                     | No |

### *Processor Information*

|                                             |                                                             |
|---------------------------------------------|-------------------------------------------------------------|
| Boundary Temperature Multiplier             | 1                                                           |
| Convection Multiplier                       | 1                                                           |
| Radiation Multiplier                        | 1                                                           |
| Heat Generation Multiplier                  | 1                                                           |
| Radiation Temperature Increment To Absolute | 510.761111111111 K                                          |
| Stefan-Boltzmann Constant                   | 5.66782254731658e-008 J/(s*m <sup>2</sup> *K <sup>4</sup> ) |

|                                               |                         |
|-----------------------------------------------|-------------------------|
| Default Nodal Temperature                     | 295 K                   |
| Type of Solver                                | Automatic               |
| Avoid Bandwidth Optimization                  | No                      |
| Stop After Stiffness Calculations             | No                      |
| Control of Heat Rate at Boundaries            | Temperature Controlled  |
| Nodal Temperature Data Results in Output File | Yes                     |
| Equation Numbers Data Results in Output File  | No                      |
| Avoid heat Flux Data Output                   | Yes                     |
| Element Input Data in Output File             | No                      |
| Nodal Input Data in Output File               | Yes                     |
| Perform Nonlinear Iterations                  | Yes                     |
| Criteria                                      | Stop When Relative Norm |
| Maximum Number of Iterations                  | 15                      |
| Corrective Tolerance                          | 0.001                   |
| Relaxation Tolerance                          | 0.001                   |
| Relaxation Parameter                          | 1                       |

## Part Information

| Part ID | Part Name | Element Type | Material Name |
|---------|-----------|--------------|---------------|
|---------|-----------|--------------|---------------|

|                   |                |               |                                            |
|-------------------|----------------|---------------|--------------------------------------------|
|                   |                |               |                                            |
| <a href="#">1</a> | Primary Mirror | Thermal Plate | <a href="#">[Customer Defined] (Part1)</a> |

## Element Information

Element Properties used for:

- Primary Mirror

|                       |                       |
|-----------------------|-----------------------|
| Element Type          | Thermal Plate         |
| Material Model        | Isotropic             |
| Heat Flow Calculation | Nonlinear Based On BC |
| Integration Order     | 2nd Order             |
| Thickness             | 20 m                  |

## Material Information

[\[Customer Defined\] \(Part1\) -Thermal Plate](#)

|                      |                     |
|----------------------|---------------------|
| Material Model       | Standard            |
| Material Source      | Not Applicable      |
| Material Source File |                     |
| Date Last Updated    | 2012/02/10-08:29:52 |

|                      |                                      |
|----------------------|--------------------------------------|
| Material Description | Customer defined material properties |
| Mass Density         | 2530 kg/m <sup>3</sup>               |
| Thermal Conductivity | 1.46 J/(s*m*K)                       |
| Specific Heat        | 820 J/(kg*K)                         |

## Loads

### FEA Object Group 2: Surface Heat Fluxes

#### Surface Heat Flux

| ID | Description | Part ID | Surface ID | Magnitude  | Multiplier Table Id | Applied Both Sides |
|----|-------------|---------|------------|------------|---------------------|--------------------|
| 2  | Unnamed     | 1       | 1          | 154.000000 | 0                   | No                 |

## Constraints

Constraint data was requested, but no constraints were detected.

## Rotating Frames of Reference

No RFR definitions found - not a fluid analysis.

## Results Presentation Images

*Temperature*

Autodesk (R) Simulation Steady-State Heat Transfer  
Version 2012.01.00.0017-W64/X64 15-Jun-2011  
Copyright (c) 2011, Autodesk, Inc. All rights reserved.

DATE: FEBRUARY 10, 2012

TIME: 08:59 AM

Input Model: E:\Thermal Analysis\10022012\2.ds\_data\1\ds

PROGRAM VERSION: 201201000017

ALG.DLL VERSION: 201201000017

AlgConfig.DLL VERSION: 201201000017

Agsdb\_AR.DLL VERSION: 201201000017

AMGSolve.DLL VERSION: 201201000017

AlgSolve.DLL VERSION: 201201000017

\*\*\*\* Model Unit System Settings:

-----  
Unit System : Custom  
Force : lbf  
Length : in  
Time : s  
Temperature (Absolute) : deg F (R)  
Thermal Energy : in\*lbf  
Voltage : V  
Current : A  
Electrical Resistance : ohm  
Mass : lbf\*s^2/in  
-----

## Thermal

### \*\*\*\* CONTROL INFORMATION

|                             |   |     |
|-----------------------------|---|-----|
| number of node points       | = | 347 |
| number of element types     | = | 1   |
| analysis type code          | = | 10  |
| equations per block         | = | 0   |
| bandwidth minimization flag | = | 0   |

### \*\*\*\* PHYSICAL CONSTANTS USED WHEN APPLICABLE

|                                   |   |           |
|-----------------------------------|---|-----------|
| The Stefan-Boltzmann Constant     | = | 3.083E-11 |
| Temperature Increment to Absolute | = | 4.597E+02 |

### \*\*\*\* NON-LINEAR ITERATION CONTROL PARAMETERS

|                              |   |            |
|------------------------------|---|------------|
| Nonlinear control option     | = | ON         |
| Convergence criterion        | = | 2          |
| Maximum number of iterations | = | 15         |
| Interval for monitoring      | = | 5          |
| Corrective tolerance         | = | 1.0000E-03 |
| Relative tolerance           | = | 1.0000E-03 |
| Relaxation parameter         | = | 1.0000E+00 |

### \*\*\*\* NODAL DATA

| NODE | NODAL POINT COORDINATES |
|------|-------------------------|
|------|-------------------------|

| NO. | X | Y | Z | T |
|-----|---|---|---|---|
|-----|---|---|---|---|

-----

|    |            |            |           |           |
|----|------------|------------|-----------|-----------|
| 1  | 0.000E+00  | 6.496E+00  | 0.000E+00 | 7.133E+01 |
| 2  | -1.351E+00 | 6.354E+00  | 8.270E-17 | 7.133E+01 |
| 3  | -6.790E-01 | 6.460E+00  | 4.158E-17 | 7.133E+01 |
| 4  | -2.642E+00 | 5.934E+00  | 1.618E-16 | 7.133E+01 |
| 5  | -2.007E+00 | 6.178E+00  | 1.229E-16 | 7.133E+01 |
| 6  | -3.818E+00 | 5.255E+00  | 2.338E-16 | 7.133E+01 |
| 7  | -3.248E+00 | 5.626E+00  | 1.989E-16 | 7.133E+01 |
| 8  | -4.828E+00 | 4.347E+00  | 2.956E-16 | 7.133E+01 |
| 9  | -4.347E+00 | 4.828E+00  | 2.662E-16 | 7.133E+01 |
| 10 | -5.626E+00 | 3.248E+00  | 3.445E-16 | 7.133E+01 |
| 11 | -5.255E+00 | 3.818E+00  | 3.218E-16 | 7.133E+01 |
| 12 | -6.178E+00 | 2.007E+00  | 3.783E-16 | 7.133E+01 |
| 13 | -5.934E+00 | 2.642E+00  | 3.634E-16 | 7.133E+01 |
| 14 | -6.460E+00 | 6.790E-01  | 3.956E-16 | 7.133E+01 |
| 15 | -6.354E+00 | 1.351E+00  | 3.891E-16 | 7.133E+01 |
| 16 | -6.460E+00 | -6.790E-01 | 3.956E-16 | 7.133E+01 |
| 17 | -6.496E+00 | 4.904E-07  | 3.978E-16 | 7.133E+01 |
| 18 | -6.178E+00 | -2.007E+00 | 3.783E-16 | 7.133E+01 |
| 19 | -6.354E+00 | -1.351E+00 | 3.891E-16 | 7.133E+01 |
| 20 | -5.626E+00 | -3.248E+00 | 3.445E-16 | 7.133E+01 |
| 21 | -5.934E+00 | -2.642E+00 | 3.634E-16 | 7.133E+01 |
| 22 | -4.828E+00 | -4.347E+00 | 2.956E-16 | 7.133E+01 |
| 23 | -5.255E+00 | -3.818E+00 | 3.218E-16 | 7.133E+01 |
| 24 | -3.818E+00 | -5.255E+00 | 2.338E-16 | 7.133E+01 |
| 25 | -4.347E+00 | -4.828E+00 | 2.662E-16 | 7.133E+01 |

26 -2.642E+00 -5.934E+00 1.618E-16 7.133E+01  
27 -3.248E+00 -5.626E+00 1.989E-16 7.133E+01  
28 -1.351E+00 -6.354E+00 8.270E-17 7.133E+01  
29 -2.007E+00 -6.178E+00 1.229E-16 7.133E+01  
30 5.679E-07 -6.496E+00 -3.477E-23 7.133E+01  
31 -6.790E-01 -6.460E+00 4.158E-17 7.133E+01  
32 1.351E+00 -6.354E+00 -8.270E-17 7.133E+01  
33 6.790E-01 -6.460E+00 -4.158E-17 7.133E+01  
34 2.642E+00 -5.934E+00 -1.618E-16 7.133E+01  
35 2.007E+00 -6.178E+00 -1.229E-16 7.133E+01  
36 3.818E+00 -5.255E+00 -2.338E-16 7.133E+01  
37 3.248E+00 -5.626E+00 -1.989E-16 7.133E+01  
38 4.828E+00 -4.347E+00 -2.956E-16 7.133E+01  
39 4.347E+00 -4.828E+00 -2.662E-16 7.133E+01  
40 5.626E+00 -3.248E+00 -3.445E-16 7.133E+01  
41 5.255E+00 -3.818E+00 -3.218E-16 7.133E+01  
42 6.178E+00 -2.007E+00 -3.783E-16 7.133E+01  
43 5.934E+00 -2.642E+00 -3.634E-16 7.133E+01  
44 6.460E+00 -6.790E-01 -3.956E-16 7.133E+01  
45 6.354E+00 -1.351E+00 -3.891E-16 7.133E+01  
46 6.460E+00 6.790E-01 -3.956E-16 7.133E+01  
47 6.496E+00 7.746E-08 -3.978E-16 7.133E+01  
48 6.178E+00 2.007E+00 -3.783E-16 7.133E+01  
49 6.354E+00 1.351E+00 -3.891E-16 7.133E+01  
50 5.626E+00 3.248E+00 -3.445E-16 7.133E+01  
51 5.934E+00 2.642E+00 -3.634E-16 7.133E+01  
52 4.828E+00 4.347E+00 -2.956E-16 7.133E+01  
53 5.255E+00 3.818E+00 -3.218E-16 7.133E+01

54 3.818E+00 5.255E+00 -2.338E-16 7.133E+01  
55 4.347E+00 4.828E+00 -2.662E-16 7.133E+01  
56 2.642E+00 5.934E+00 -1.618E-16 7.133E+01  
57 3.248E+00 5.626E+00 -1.989E-16 7.133E+01  
58 1.351E+00 6.354E+00 -8.270E-17 7.133E+01  
59 2.007E+00 6.178E+00 -1.229E-16 7.133E+01  
60 6.790E-01 6.460E+00 -4.158E-17 7.133E+01  
61 9.758E-01 -5.128E+00 -5.975E-17 7.133E+01  
62 3.476E-02 -5.240E+00 -2.128E-18 7.133E+01  
63 2.026E+00 -4.632E+00 -1.241E-16 7.133E+01  
64 3.100E+00 -4.103E+00 -1.898E-16 7.133E+01  
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66 4.551E+00 -2.544E+00 -2.786E-16 7.133E+01  
67 4.961E+00 -1.634E+00 -3.038E-16 7.133E+01  
68 5.178E+00 -5.299E-01 -3.171E-16 7.133E+01  
69 5.145E+00 4.865E-01 -3.150E-16 7.133E+01  
70 4.854E+00 1.643E+00 -2.972E-16 7.133E+01  
71 4.402E+00 2.627E+00 -2.695E-16 7.133E+01  
72 3.701E+00 3.696E+00 -2.266E-16 7.133E+01  
73 3.285E+00 4.560E+00 -2.012E-16 7.133E+01  
74 2.316E+00 4.720E+00 -1.418E-16 7.133E+01  
75 1.109E+00 5.076E+00 -6.790E-17 7.133E+01  
76 6.978E-02 5.198E+00 -4.273E-18 7.133E+01  
77 -1.071E+00 5.075E+00 6.555E-17 7.133E+01  
78 -2.042E+00 4.730E+00 1.250E-16 7.133E+01  
79 -3.103E+00 4.094E+00 1.900E-16 7.133E+01  
80 -4.009E+00 3.671E+00 2.455E-16 7.133E+01  
81 -4.166E+00 2.412E+00 2.551E-16 7.133E+01

82 -5.004E+00 1.383E+00 3.064E-16 7.133E+01  
83 -5.498E+00 5.671E-01 3.367E-16 7.133E+01  
84 -4.961E+00 -5.740E-01 3.038E-16 7.133E+01  
85 -5.284E+00 -1.753E+00 3.236E-16 7.133E+01  
86 -4.649E+00 -2.490E+00 2.847E-16 7.133E+01  
87 -3.904E+00 -3.430E+00 2.390E-16 7.133E+01  
88 -3.106E+00 -4.099E+00 1.902E-16 7.133E+01  
89 -2.042E+00 -4.662E+00 1.251E-16 7.133E+01  
90 -1.057E+00 -5.020E+00 6.473E-17 7.133E+01  
91 4.711E-01 3.963E+00 -2.885E-17 7.133E+01  
92 2.204E+00 3.208E+00 -1.349E-16 7.133E+01  
93 2.768E+00 -2.870E+00 -1.695E-16 7.133E+01  
94 3.974E+00 -9.707E-02 -2.433E-16 7.133E+01  
95 3.408E+00 1.628E+00 -2.087E-16 7.133E+01  
96 -3.775E+00 -1.623E+00 2.311E-16 7.133E+01  
97 -1.007E+00 -3.476E+00 6.166E-17 7.133E+01  
98 -3.757E+00 7.203E-01 2.300E-16 7.133E+01  
99 -2.388E+00 2.673E+00 1.462E-16 7.133E+01  
100 3.669E-01 -4.283E+00 -2.246E-17 7.133E+01  
101 -1.073E+00 3.792E+00 6.572E-17 7.133E+01  
102 -2.793E+00 -2.798E+00 1.710E-16 7.133E+01  
103 3.731E+00 -1.593E+00 -2.284E-16 7.133E+01  
104 2.412E+00 -6.540E-01 -1.477E-16 7.133E+01  
105 -6.625E-02 2.455E+00 4.056E-18 7.133E+01  
106 -2.166E+00 -1.693E+00 1.326E-16 7.133E+01  
107 -2.757E+00 -7.215E-01 1.688E-16 7.133E+01  
108 -1.361E+00 -4.022E-02 8.332E-17 7.133E+01  
109 -2.243E+00 1.249E+00 1.374E-16 7.133E+01

110 -8.143E-01 9.690E-01 4.986E-17 7.133E+01  
111 7.372E-02 -1.800E-01 -4.514E-18 7.133E+01  
112 1.479E-01 9.897E-01 -9.059E-18 7.133E+01  
113 -1.090E+00 -1.633E+00 6.673E-17 7.133E+01  
114 1.111E+00 -3.674E-01 -6.802E-17 7.133E+01  
115 1.644E+00 8.205E-01 -1.007E-16 7.133E+01  
116 1.282E+00 2.163E+00 -7.850E-17 7.133E+01  
117 1.730E+00 -2.004E+00 -1.059E-16 7.133E+01  
118 4.122E-01 -1.415E+00 -2.524E-17 7.133E+01  
119 3.020E-01 -2.691E+00 -1.849E-17 7.133E+01  
120 -1.321E+00 1.785E+00 8.087E-17 7.133E+01  
121 1.357E+00 -3.297E+00 -8.310E-17 7.133E+01  
122 8.670E-03 -5.830E+00 -5.309E-19 7.133E+01  
123 5.151E-01 -5.265E+00 -3.154E-17 7.133E+01  
124 1.166E+00 -5.701E+00 -7.137E-17 7.133E+01  
125 5.921E-01 -5.814E+00 -3.626E-17 7.133E+01  
126 1.483E+00 -4.904E+00 -9.078E-17 7.133E+01  
127 2.327E+00 -5.263E+00 -1.425E-16 7.133E+01  
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133 4.330E+00 -3.873E+00 -2.652E-16 7.133E+01  
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139 5.542E+00 -1.804E+00 -3.393E-16 7.133E+01  
140 5.339E+00 -2.363E+00 -3.269E-16 7.133E+01  
141 5.081E+00 -1.086E+00 -3.111E-16 7.133E+01  
142 5.788E+00 -6.074E-01 -3.544E-16 7.133E+01  
143 5.691E+00 -1.212E+00 -3.485E-16 7.133E+01  
144 5.238E+00 -2.253E-02 -3.207E-16 7.133E+01  
145 5.770E+00 5.896E-01 -3.533E-16 7.133E+01  
146 5.823E+00 -1.008E-02 -3.566E-16 7.133E+01  
147 5.004E+00 1.061E+00 -3.064E-16 7.133E+01  
148 5.491E+00 1.810E+00 -3.362E-16 7.133E+01  
149 5.655E+00 1.203E+00 -3.463E-16 7.133E+01  
150 4.700E+00 2.161E+00 -2.878E-16 7.133E+01  
151 4.985E+00 2.934E+00 -3.053E-16 7.133E+01  
152 5.278E+00 2.387E+00 -3.232E-16 7.133E+01  
153 4.045E+00 3.153E+00 -2.477E-16 7.133E+01  
154 4.262E+00 3.995E+00 -2.610E-16 7.133E+01  
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156 3.439E+00 4.196E+00 -2.106E-16 7.133E+01  
157 3.498E+00 4.841E+00 -2.142E-16 7.133E+01  
158 3.886E+00 4.465E+00 -2.380E-16 7.133E+01  
159 2.876E+00 4.611E+00 -1.761E-16 7.133E+01  
160 2.456E+00 5.317E+00 -1.504E-16 7.133E+01  
161 3.020E+00 5.099E+00 -1.849E-16 7.133E+01  
162 1.703E+00 4.894E+00 -1.043E-16 7.133E+01  
163 1.235E+00 5.685E+00 -7.562E-17 7.133E+01  
164 1.850E+00 5.519E+00 -1.133E-16 7.133E+01  
165 5.918E-01 5.212E+00 -3.624E-17 7.133E+01

166 2.816E-02 5.816E+00 -1.724E-18 7.133E+01  
167 6.335E-01 5.793E+00 -3.879E-17 7.133E+01  
168 -5.004E-01 5.148E+00 3.064E-17 7.133E+01  
169 -1.198E+00 5.685E+00 7.337E-17 7.133E+01  
170 -5.874E-01 5.777E+00 3.597E-17 7.133E+01  
171 -1.579E+00 4.976E+00 9.669E-17 7.133E+01  
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183 -4.699E+00 1.894E+00 2.877E-16 7.133E+01  
184 -5.558E+00 1.699E+00 3.403E-16 7.133E+01  
185 -5.281E+00 2.270E+00 3.234E-16 7.133E+01  
186 -5.275E+00 8.959E-01 3.230E-16 7.133E+01  
187 -5.892E+00 5.957E-01 3.608E-16 7.133E+01  
188 -5.770E+00 1.135E+00 3.533E-16 7.133E+01  
189 -5.286E+00 1.290E-01 3.237E-16 7.133E+01  
190 -5.750E+00 -6.269E-01 3.521E-16 7.133E+01  
191 -5.856E+00 2.445E-02 3.586E-16 7.133E+01  
192 -5.153E+00 -1.304E+00 3.156E-16 7.133E+01  
193 -5.647E+00 -1.842E+00 3.458E-16 7.133E+01

194 -5.726E+00 -1.281E+00 3.506E-16 7.133E+01  
195 -5.000E+00 -2.051E+00 3.061E-16 7.133E+01  
196 -5.111E+00 -2.866E+00 3.129E-16 7.133E+01  
197 -5.423E+00 -2.350E+00 3.321E-16 7.133E+01  
198 -4.277E+00 -2.967E+00 2.619E-16 7.133E+01  
199 -4.349E+00 -3.862E+00 2.663E-16 7.133E+01  
200 -4.748E+00 -3.378E+00 2.907E-16 7.133E+01  
201 -3.553E+00 -3.825E+00 2.176E-16 7.133E+01  
202 -3.436E+00 -4.658E+00 2.104E-16 7.133E+01  
203 -3.921E+00 -4.293E+00 2.401E-16 7.133E+01  
204 -2.580E+00 -4.380E+00 1.580E-16 7.133E+01  
205 -2.341E+00 -5.271E+00 1.433E-16 7.133E+01  
206 -2.901E+00 -4.984E+00 1.776E-16 7.133E+01  
207 -1.571E+00 -4.911E+00 9.617E-17 7.133E+01  
208 -1.194E+00 -5.663E+00 7.313E-17 7.133E+01  
209 -1.778E+00 -5.506E+00 1.089E-16 7.133E+01  
210 -4.993E-01 -5.143E+00 3.058E-17 7.133E+01  
211 -5.910E-01 -5.774E+00 3.619E-17 7.133E+01  
212 1.715E-01 4.622E+00 -1.050E-17 7.133E+01  
213 9.184E-01 4.521E+00 -5.624E-17 7.133E+01  
214 5.479E-01 4.790E+00 -3.355E-17 7.133E+01  
215 2.240E+00 4.068E+00 -1.371E-16 7.133E+01  
216 3.062E+00 3.449E+00 -1.875E-16 7.133E+01  
217 2.904E+00 4.081E+00 -1.778E-16 7.133E+01  
218 3.411E+00 -3.111E+00 -2.088E-16 7.133E+01  
219 2.862E+00 -3.560E+00 -1.752E-16 7.133E+01  
220 3.262E+00 -3.497E+00 -1.997E-16 7.133E+01  
221 4.572E+00 3.158E-01 -2.799E-16 7.133E+01

222 4.613E+00 -4.084E-01 -2.825E-16 7.133E+01  
223 4.802E+00 -4.303E-02 -2.940E-16 7.133E+01  
224 3.880E+00 2.264E+00 -2.376E-16 7.133E+01  
225 4.223E+00 1.542E+00 -2.586E-16 7.133E+01  
226 4.272E+00 1.975E+00 -2.616E-16 7.133E+01  
227 -9.631E-01 -4.373E+00 5.897E-17 7.133E+01  
228 -1.681E+00 -4.093E+00 1.029E-16 7.133E+01  
229 -1.394E+00 -4.444E+00 8.534E-17 7.133E+01  
230 -2.780E+00 3.464E+00 1.702E-16 7.133E+01  
231 -3.278E+00 2.523E+00 2.007E-16 7.133E+01  
232 -3.439E+00 3.252E+00 2.106E-16 7.133E+01  
233 7.462E-01 -4.660E+00 -4.569E-17 7.133E+01  
234 1.191E-01 -4.736E+00 -7.295E-18 7.133E+01  
235 4.632E-01 -4.878E+00 -2.836E-17 7.133E+01  
236 -1.681E+00 4.232E+00 1.029E-16 7.133E+01  
237 -9.941E-01 4.494E+00 6.087E-17 7.133E+01  
238 -1.417E+00 4.560E+00 8.678E-17 7.133E+01  
239 -1.718E+00 3.242E+00 1.052E-16 7.133E+01  
240 -2.184E+00 3.839E+00 1.337E-16 7.133E+01  
241 -2.863E+00 -3.537E+00 1.753E-16 7.133E+01  
242 -3.448E+00 -3.068E+00 2.111E-16 7.133E+01  
243 -3.283E+00 -3.478E+00 2.010E-16 7.133E+01  
244 -4.487E+00 1.034E+00 2.748E-16 7.133E+01  
245 -3.846E+00 1.599E+00 2.355E-16 7.133E+01  
246 -4.338E+00 1.494E+00 2.656E-16 7.133E+01  
247 -4.295E+00 -1.100E+00 2.630E-16 7.133E+01  
248 -4.225E+00 -2.078E+00 2.587E-16 7.133E+01  
249 -4.668E+00 -1.633E+00 2.858E-16 7.133E+01

250 -4.335E+00 2.431E-02 2.655E-16 7.133E+01  
251 -4.846E+00 5.209E-01 2.967E-16 7.133E+01  
252 4.408E+00 -1.534E+00 -2.699E-16 7.133E+01  
253 4.116E+00 -2.175E+00 -2.520E-16 7.133E+01  
254 4.445E+00 -1.944E+00 -2.722E-16 7.133E+01  
255 -1.866E-01 -3.927E+00 1.142E-17 7.133E+01  
256 -3.825E-01 -4.545E+00 2.342E-17 7.133E+01  
257 1.720E+00 -4.011E+00 -1.053E-16 7.133E+01  
258 2.096E+00 -3.155E+00 -1.284E-16 7.133E+01  
259 2.315E+00 -3.774E+00 -1.418E-16 7.133E+01  
260 1.301E+00 3.583E+00 -7.966E-17 7.133E+01  
261 1.540E+00 4.267E+00 -9.432E-17 7.133E+01  
262 -3.307E+00 -2.168E+00 2.025E-16 7.133E+01  
263 -3.814E+00 -2.570E+00 2.335E-16 7.133E+01  
264 -1.964E+00 -3.095E+00 1.202E-16 7.133E+01  
265 -2.272E+00 -3.776E+00 1.391E-16 7.133E+01  
266 3.889E+00 -8.579E-01 -2.381E-16 7.133E+01  
267 4.498E+00 -9.717E-01 -2.754E-16 7.133E+01  
268 3.220E+00 -2.217E+00 -1.971E-16 7.133E+01  
269 3.741E+00 -2.627E+00 -2.291E-16 7.133E+01  
270 3.652E+00 7.235E-01 -2.237E-16 7.133E+01  
271 4.363E+00 9.106E-01 -2.671E-16 7.133E+01  
272 -3.097E-01 3.922E+00 1.896E-17 7.133E+01  
273 -4.082E-01 4.547E+00 2.499E-17 7.133E+01  
274 3.152E+00 -2.677E-01 -1.930E-16 7.133E+01  
275 3.035E+00 -1.200E+00 -1.859E-16 7.133E+01  
276 3.361E+00 -7.837E-01 -2.058E-16 7.133E+01  
277 2.157E+00 1.343E-01 -1.321E-16 7.133E+01

278 2.503E+00 1.213E+00 -1.533E-16 7.133E+01  
279 2.866E+00 4.507E-01 -1.755E-16 7.133E+01  
280 -6.465E-01 3.076E+00 3.959E-17 7.133E+01  
281 2.930E-01 3.176E+00 -1.794E-17 7.133E+01  
282 -2.374E-01 3.393E+00 1.454E-17 7.133E+01  
283 -3.290E+00 -1.150E+00 2.015E-16 7.133E+01  
284 -2.413E+00 -1.291E+00 1.478E-16 7.133E+01  
285 -2.401E+00 -2.128E+00 1.470E-16 7.133E+01  
286 -2.853E+00 -1.684E+00 1.747E-16 7.133E+01  
287 -1.889E+00 6.267E-01 1.157E-16 7.133E+01  
288 -2.130E+00 -3.815E-01 1.304E-16 7.133E+01  
289 -3.207E+00 -6.930E-02 1.963E-16 7.133E+01  
290 -2.913E+00 1.005E+00 1.784E-16 7.133E+01  
291 -2.535E+00 2.952E-01 1.552E-16 7.133E+01  
292 -1.018E+00 5.946E-01 6.235E-17 7.133E+01  
293 -1.737E+00 1.477E+00 1.064E-16 7.133E+01  
294 -1.025E+00 1.315E+00 6.278E-17 7.133E+01  
295 -1.417E+00 1.003E+00 8.679E-17 7.133E+01  
296 -4.216E-01 9.788E-01 2.581E-17 7.133E+01  
297 1.150E-01 3.977E-01 -7.043E-18 7.133E+01  
298 -5.655E-01 -1.499E-01 3.463E-17 7.133E+01  
299 -4.726E-01 4.553E-01 2.894E-17 7.133E+01  
300 -1.205E+00 -8.918E-01 7.380E-17 7.133E+01  
301 1.304E-01 -7.612E-01 -7.983E-18 7.133E+01  
302 -3.770E-01 -1.539E+00 2.309E-17 7.133E+01  
303 -5.043E-01 -8.355E-01 3.088E-17 7.133E+01  
304 -1.730E+00 -1.681E+00 1.059E-16 7.133E+01  
305 -1.870E+00 -1.061E+00 1.145E-16 7.133E+01

306 8.183E-01 9.406E-01 -5.011E-17 7.133E+01  
307 1.293E+00 1.745E-01 -7.916E-17 7.133E+01  
308 6.084E-01 -2.092E-01 -3.725E-17 7.133E+01  
309 7.086E-01 3.259E-01 -4.339E-17 7.133E+01  
310 1.446E+00 1.638E+00 -8.855E-17 7.133E+01  
311 7.815E-02 1.645E+00 -4.785E-18 7.133E+01  
312 7.431E-01 2.284E+00 -4.550E-17 7.133E+01  
313 7.714E-01 1.627E+00 -4.724E-17 7.133E+01  
314 1.664E+00 -5.599E-01 -1.019E-16 7.133E+01  
315 1.694E+00 -9.382E-02 -1.037E-16 7.133E+01  
316 2.272E+00 -2.335E+00 -1.391E-16 7.133E+01  
317 2.053E+00 -1.394E+00 -1.257E-16 7.133E+01  
318 2.645E+00 -1.786E+00 -1.620E-16 7.133E+01  
319 1.118E+00 -1.727E+00 -6.846E-17 7.133E+01  
320 8.721E-01 -8.838E-01 -5.340E-17 7.133E+01  
321 1.427E+00 -1.141E+00 -8.736E-17 7.133E+01  
322 5.404E-01 -6.090E-01 -3.309E-17 7.133E+01  
323 3.152E-01 -2.182E+00 -1.930E-17 7.133E+01  
324 -1.961E-01 -2.962E+00 1.201E-17 7.133E+01  
325 -1.052E+00 -2.429E+00 6.443E-17 7.133E+01  
326 -3.276E-01 -2.278E+00 2.006E-17 7.133E+01  
327 -1.724E+00 2.249E+00 1.056E-16 7.133E+01  
328 -2.429E+00 1.886E+00 1.487E-16 7.133E+01  
329 -1.953E+00 1.874E+00 1.196E-16 7.133E+01  
330  
-7.873E-01 2.104E+00 4.821E-17 7.133E+01  
331 -1.219E+00 2.668E+00 7.463E-17 7.133E+01  
332 -5.390E-01 1.511E+00 3.300E-17 7.133E+01

|     |            |            |            |           |
|-----|------------|------------|------------|-----------|
| 333 | -1.787E+00 | -2.333E+00 | 1.094E-16  | 7.133E+01 |
| 334 | -3.782E+00 | -5.737E-01 | 2.316E-16  | 7.133E+01 |
| 335 | 1.485E+00  | -2.584E+00 | -9.090E-17 | 7.133E+01 |
| 336 | 1.949E+00  | -2.687E+00 | -1.193E-16 | 7.133E+01 |
| 337 | 7.026E-01  | -2.936E+00 | -4.302E-17 | 7.133E+01 |
| 338 | 9.051E-01  | -2.357E+00 | -5.542E-17 | 7.133E+01 |
| 339 | 7.962E-01  | -3.834E+00 | -4.876E-17 | 7.133E+01 |
| 340 | 1.186E+00  | -4.352E+00 | -7.263E-17 | 7.133E+01 |
| 341 | 2.790E-01  | -3.415E+00 | -1.709E-17 | 7.133E+01 |
| 342 | 1.641E+00  | 2.553E+00  | -1.005E-16 | 7.133E+01 |
| 343 | 9.946E-01  | 2.899E+00  | -6.090E-17 | 7.133E+01 |
| 344 | 2.787E+00  | 2.400E+00  | -1.706E-16 | 7.133E+01 |
| 345 | 2.094E+00  | 1.951E+00  | -1.282E-16 | 7.133E+01 |
| 346 | -3.116E+00 | 1.753E+00  | 1.908E-16  | 7.133E+01 |
| 347 | 3.443E+00  | 2.817E+00  | -2.108E-16 | 7.133E+01 |

\*\*\*\* PRINT OF EQUATION NUMBERS SUPPRESSED

\*\*\*\* FLUID FLOW CONVECTION IS NOT INCLUDED IN THIS MODEL.

\*\*\*\* HARD DISK FILE SIZE INFORMATION FOR PROCESSOR:

Available hard disk space on E drive = 404326.180 megabytes

\*\*\*\* LOAD CASE MULTIPLIERS

|                                 |       |
|---------------------------------|-------|
| Boundary temperature multiplier | 1.000 |
|---------------------------------|-------|

|                            |       |
|----------------------------|-------|
| Convection multiplier      | 1.000 |
| Radiation multiplier       | 1.000 |
| Heat generation multiplier | 1.000 |

\*\*\*\*

\*\*\*\* Invoking BCSLIB-EXT Sparse Solver ...

\*\*\*\*

BCSLIB-EXT solver memory status:

|                                   |         |
|-----------------------------------|---------|
| in-core memory requirement (MB) = | 0.15    |
| minimum memory requirement (MB) = | 0.10    |
| user specified memory (MB) =      | 4990.98 |
| available physical memory (MB) =  | 4990.98 |
| available virtual memory (MB) =   | 7305.71 |
| memory currently allocated (MB) = | 8.00    |

BCSLIB-EXT solver memory status:

|                                   |         |
|-----------------------------------|---------|
| in-core memory requirement (MB) = | 0.15    |
| minimum memory requirement (MB) = | 0.10    |
| user specified memory (MB) =      | 4990.32 |
| available physical memory (MB) =  | 4990.32 |
| available virtual memory (MB) =   | 7307.09 |
| memory currently allocated (MB) = | 8.00    |

\*\*\*\* CONVERGED SOLUTION OBTAINED

\*\*\*\* THERMAL ANALYSIS

|             |   |
|-------------|---|
| LOAD CASE = | 1 |
|-------------|---|

## TEMPERATURES OF NODES

NODE  
NUMBER TEMPERATURE

|    |            |
|----|------------|
| 1  | 1.5431D+14 |
| 2  | 1.5431D+14 |
| 3  | 1.5431D+14 |
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347 1.5431D+14

\*\*\*\* TEMPORARY FILE STORAGE (MEGABYTES)

-----  
UNIT NO. 7 : 0.003  
UNIT NO. 8 : 0.057  
UNIT NO. 9 : 0.040  
UNIT NO. 10 : 0.040  
UNIT NO. 11 : 0.394  
UNIT NO. 12 : 0.000  
UNIT NO. 13 : 0.040  
UNIT NO. 14 : 0.000  
UNIT NO. 15 : 0.040

UNIT NO. 18 : 0.040  
UNIT NO. 65 : 0.003  
UNIT NO. 67 : 0.038

TOTAL : 0.696

\*\*\*\* End of File \*\*\*\*

### *Analysis Logs*

Autodesk (R) Simulation Steady-State Heat Transfer  
Version 2012.01.00.0017-W64/X64 15-Jun-2011  
Copyright (c) 2011, Autodesk, Inc. All rights reserved.

\*\*\*\* Memory Dynamically Allocated = 4172236 KB

\*\*\*\* Steady-State Heat Transfer Analysis

---

DATE: FEBRUARY 10, 2012

TIME: 08:59 AM

Input Model: E:\Thermal Analysis\10022012\2.ds\_data\1\ds

PROGRAM VERSION: 201201000017  
ALG.DLL VERSION: 201201000017  
AlgConfig.DLL VERSION: 201201000017  
Agsdb\_AR.DLL VERSION: 201201000017  
AMGSolve.DLL VERSION: 201201000017  
AlgSolve.DLL VERSION: 201201000017

---

Options executed are:

NOMIN  
SUPNOD  
SUPSTR

processing ...

\*\*\*\* Model Unit System Settings:

---

Unit System : Custom  
Force : lbf  
Length : in  
Time : s  
Temperature (Absolute) : deg F (R)  
Thermal Energy : in\*lbf  
Voltage : V

Current : A  
Electrical Resistance : ohm  
Mass : lbf\*s^2/in

---

\*\*\*\* OPENING TEMPORARY FILES

NDYN = 10

\*\*\*\* BEGIN NODAL DATA INPUT

Node number= 347

Equation number= 347

\*\*\*\* END NODAL DATA INPUT

\*\*\*\* HARD DISK FILE SIZE INFORMATION FOR PROCESSOR:

Available hard disk space on E drive = 404326.180 megabytes

\*\*\*\* BEGIN NODAL HEAT FLOW INPUT

\*\*\*\* END NODAL HEAT FLOW INPUT

\*\*\*\*

\*\*\*\* Invoking BCSLIB-EXT Sparse Solver ...

\*\*\*\*

\*\*\*\* BEGIN NON-LINEAR ITERATIONS

Nonlin Iter. Incr. Norm(T) Rel. Norm(T)

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|   |           |           |
|---|-----------|-----------|
| 1 | 1.543E+14 | 1.000E+00 |
|---|-----------|-----------|

2 0.000E+00 0.000E+00

\*\*\*\* END NON-LINEAR ITERATIONS

\*\*\*\* CONVERGED SOLUTION OBTAINED

\*\*\*\* BEGIN TYPE-36 HEAT FLUX OUTPUT  
316 ELEMENTS ...

\*\*\*\* END TYPE-36 HEAT FLUX OUTPUT

\*\*\*\* Table for actual hard disk space used:

|          |                   |
|----------|-------------------|
| ds.t7 =  | 2.719 kilobytes   |
| ds.t8 =  | 58.125 kilobytes  |
| ds.t9 =  | 41.250 kilobytes  |
| ds.t10 = | 41.250 kilobytes  |
| ds.t11 = | 403.695 kilobytes |
| ds.t12 = | 0.000 kilobytes   |
| ds.t13 = | 41.250 kilobytes  |
| ds.t14 = | 0.062 kilobytes   |
| ds.t15 = | 41.250 kilobytes  |
| ds.t18 = | 41.250 kilobytes  |
| ds.t65 = | 2.719 kilobytes   |
| ds.t67 = | 39.105 kilobytes  |

total temporary disk storage (megabytes) = 0.6960

\*\*\*\* BEGIN DELETING TEMPORARY FILES

\*\*\*\* TEMPORARY FILES DELETED

\*\*\*\* END OF SUCCESSFUL EXECUTION

Processing completed for model E:\Thermal Analysis\10022012\2.ds\_data\1\ds

ds.l10 = 30.593 kilobytes

ds.to = 16.312 kilobytes

ds.hfo = 9.922 kilobytes

Total actual hard disk space used = 0.761 megabytes

Total elapsed time = 0.029 minutes

### *Meshing Log*

**No Meshing Logs Found.**