To: G. P. Edmonds, Jr.
From: R. Erickson
Date: 6 April 1966
Subject: Block II and LEM Temperature Thermistor Resistance Values

The following represents the determination of resistance values for the Block II and LEM thermistors based on temperature range information from the MIT/IL thermal group. The expected ranges are:

<table>
<thead>
<tr>
<th></th>
<th>CSM</th>
<th>LEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC/LGC</td>
<td>45° - 130° F</td>
<td>Same</td>
</tr>
<tr>
<td>PSA</td>
<td>60° - 120° F</td>
<td>60° - 110° F</td>
</tr>
<tr>
<td>PEA/PTA</td>
<td>45° - 100° F</td>
<td>45° - 90° F</td>
</tr>
</tbody>
</table>

Fahrenheit to centigrade conversion results in

<table>
<thead>
<tr>
<th></th>
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<th>LEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC/LGC</td>
<td>7.2° - 54.5° C</td>
<td>Same</td>
</tr>
<tr>
<td>PSA</td>
<td>15.5° - 49° C</td>
<td>15.5° - 43.3° C</td>
</tr>
<tr>
<td>PEA/PTA</td>
<td>7.2° - 38° C</td>
<td>7.2° - 32.3° C</td>
</tr>
</tbody>
</table>

The thermistor part numbers are

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC/LGC</td>
<td>1006712-3</td>
</tr>
<tr>
<td>PSA, PEA/PTA</td>
<td>1008833</td>
</tr>
</tbody>
</table>

Using the nominal ratio table from drawing 1006712-3 and assuming linearity of ratio between 10 degree increments the following resistance values were interpolated and calculated by the equation:

\[ R = \left[ R_N \cdot LR - 0.1 \cdot (C - C_L) \cdot (LR - HR) \right] \]

where:

- \( R \) = thermistor resistance in K ohms at temperature C
- \( R_N = \) nominal thermistor resistance at 25°C = 5 K ohms
- \( LR \) = value from Table II, curve F, corresponding to the ratio given for the next lower temperature from the temperature point to be interpolated e.g., if the temperature point is 15°C LR would be the ratio for 10°C.
C = the temperature point given in °C.

\( C_L \) = the next lower temperature increment on Table II. e.g., if the temperature point is 15°C, \( C_L \) would be 10°C.

\( HR \) = the value from Table II, curve F corresponding to the ratio given for the next higher temperature from the temperature point to be interpolated. e.g., if the temperature point is 15°C, \( HR \) would be the ratio for 20°C.

Calculations:

\[
R \text{ for } 45^\circ\text{F (7.2°C)} = 5 \left[ 3.930 - 0.1 (7.2-0) (3.930-2.159) \right] = 13.25 \text{ Kohms}
\]

\[
R \text{ for } 130^\circ\text{F (54.5°C)} = 5 \left[ 0.3260-0.1 (54.5-50.) (0.326-.219) \right] = 1.39 \text{ Kohms}
\]

\[
R \text{ for } 60^\circ\text{F (15.5°C)} = 5 \left[ 2.159-0.1 (15.5-10.) (2.159-1.275) \right] = 8.37 \text{ Kohms}
\]

\[
R \text{ for } 120^\circ\text{F (49°C)} = 5 \left[ 0.5-0.1 (49-40) (.5-.326) \right] = 1.715 \text{ Kohms}
\]

\[
R \text{ for } 100^\circ\text{F (38°C)} = 5 \left[ 0.789-0.1 (38 - 30) (.789-.5) \right] = 2.8 \text{ Kohms}
\]

\[
R \text{ for } 90^\circ\text{F (32.3°C)} = 5 \left[ 0.789-0.1 (32.3-30) (.789 - .5) \right] = 3.65 \text{ Kohms}
\]

\[
R \text{ for } 110^\circ\text{F (43.3°C)} = 5 \left[ 0.5-0.1 (43.3-40) (.5-.326) \right] = 2.21 \text{ Kohms}
\]

Thermistor resistance ranges calculated from given temperature ranges are then:

<table>
<thead>
<tr>
<th></th>
<th>CSM</th>
<th>LEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>CGC/LGC</td>
<td>13.25K to 1.4K</td>
<td>Same</td>
</tr>
<tr>
<td>PSA</td>
<td>8.37K to 1.715K</td>
<td>8.37K to 2.21K</td>
</tr>
<tr>
<td>PEA/PTA</td>
<td>13.25K to 2.8K</td>
<td>13.25K to 3.65K</td>
</tr>
</tbody>
</table>
A 3 percent tolerance is allowable for measurement of those resistances which correspond to temperature below 100°F.

Robert Erickson
AC Resident Engineer

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Director, System Test Group
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