

***NORTHROP GRUMMAN***

# Proposed Limit Increase

Raise the 1DPAMZT Planning, Caution, and Warning High Limits by 1° C.

## Present:

Warning High: +41.5° C  
Caution High: +39.5° C  
Planning Limit: + 37.5° C

## Proposed:

Warning High: +42.5° C  
Caution High: +40.5° C  
Planning Limit: + 38.5° C

The ACIS team carried out a detailed analysis and has approved these limit increases. Presented and approved by both the MPCWG and TWG.

**NOTE:** The +12°C. lower limit to reduce the range of thermal cycling must now be set to +13°C.

# 1DPAMZT Panel Temperature As A Proxy for BEP and FEP Temperatures

## 1DPAMZT DPA Minus Z Panel Temperature

External Thermistor located on the ACIS Digital Processor Assembly (DPA) which contains the Back End Processors (BEPs), and the Front End Processors (FEPs).

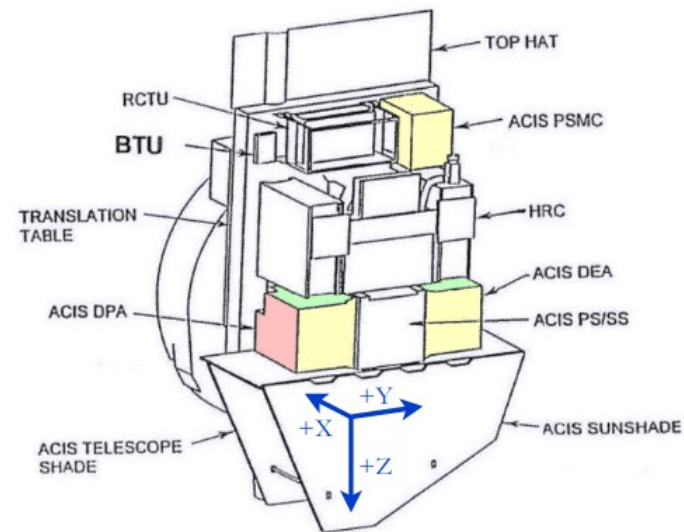
Thermistor measures temperature of the Minus Z Panel – the box.

Used as a proxy for the BEP and FEP Board temperatures because BEP/FEP temps appear in ACIS Housekeeping (science) data

- OCC has no insight into BEP/FEP Thermistor values

BEP/FEP Board temps are the KEY values.

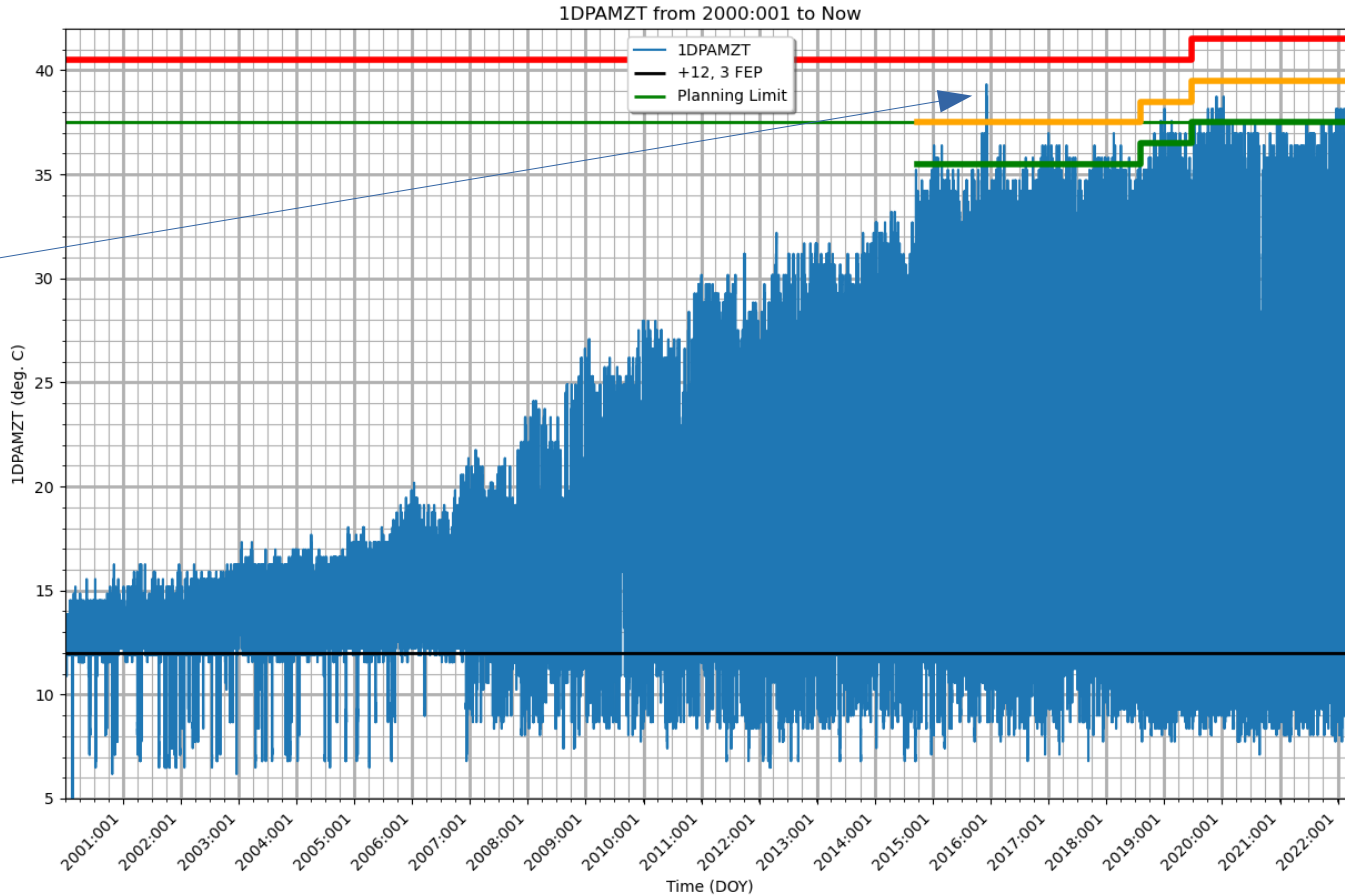
- Temp of aluminum box not of direct value.



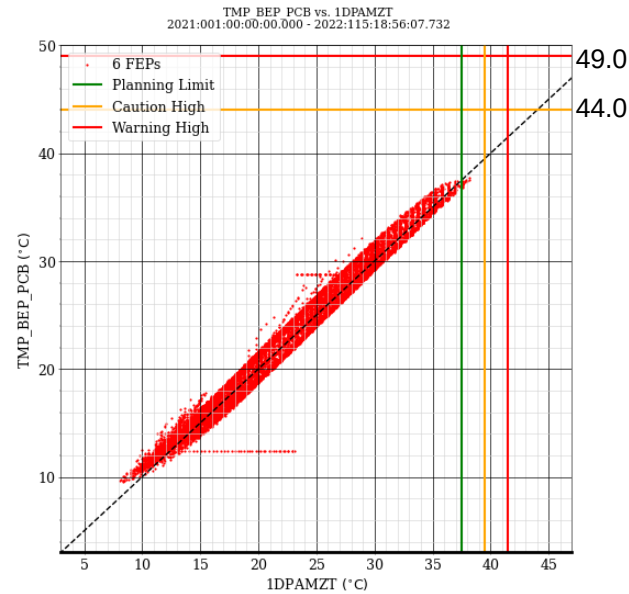
# 1DPAMZT Mission Thermal History

Max 1DPAMZT Temp  
To date: 39.3267  
Dec. 05, 2015

- Prior to high off  
Nominal roll model  
update



## 1DPAMZT as a Proxy for BEP and FEP Temperatures (cont'd).



- BEP PCB is the internal temperature closest to its Warning high limit, tracks 1DPAMZT box temperature within  $\pm 2^{\circ}\text{C}$
- 1DPAMZT temperature of  $40.5^{\circ}\text{C}$  (planning limit + model error) Results in a worst case BEP PCB temperature of  $42.5^{\circ}\text{C}$
- BEP PCB Warning High =  $49^{\circ}\text{C}$
- Model accuracy is  $\pm 2^{\circ}\text{C}$  at the hot end; accuracy preserved via model updates as necessary.
- Current DPA model has prevented all DPA caution high limit violations within the prior 6 years
- ACIS Ops monitors the temperature trends of all relevant ACIS locations from a health and safety perspective on a weekly basis

## It Is Safe To increase the 1DPAMZT Planning, Caution High and Warning High Limits

ACIS Team studied the thermal risks to the DPA P.C. boards by raising the 1DPAMZT Red High Warning Limit and believes the risk is minimal:

- Margin available with the BEP/FEP temperatures. Worst case scenarios of the hottest boards show that Red High Warning Limit violations on BEP/FEP boards not likely to occur.

Maintaining the 2°C limits spacing and Thermal Model 2°C accuracy, FOT MP can build plans which avoid Yellow Caution Violations.

Experience shows we can adequately predict and manage the temperatures.

This must be done in conjunction with a 1DEAMZT limits increase as well as the 1 degree C increase in the 1DPAMZT lower limit from +12C to +13C whenever 0 FEPs are on.

# 1DPAMZT Limit Rationale and Budget

Limit	New Values	Budget ( $\Delta T$ to Next Threshold)	Rationale
Warning High	<b>42.5° C</b>		Sufficient margin between the BEP/FEP temps we are seeing and the C/W limits. Worst case 1DPAMZT scenario is still safe. Maintain 2° C Spacing on all limits
Caution High	<b>40.5° C</b>	2.0° C	Limit provides warning before the Warning High limit is reached; ensures that BEP/FEP board temps are below their limits if this limit were to be reached. ACIS Instrument team confirms 2° C pad is sufficient.
Planning Limit	<b>38.5° C</b>	2.0° C	Model error of less than 2 degrees indicates a 2° C pad between the P.L and Caution High is sufficient with a well-calibrated thermal model

## Recommendation

The ACIS Team recommends approval the 1°C increase in the 1DPAMZT Planning, Caution High, and Warning High limits.  
- TWG and MPCWG approved

### Follow Up Actions:

Safe Safing Actions SOP update

Xija model spec updates to include limits

In work, waiting for FDB approval of guideline updates before seeking final FSDS approval for these model changes

FSW K-constant patch update