Device Statistics – Temperature

T13 Technical Proposal – e06183r8

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[This document is a proposal for the T13 to describe the Device Statistics for the device to report. The device temperature statistics is the information for the collected temperature information in the device. The statistics supported are optional, and only applicable to the applicable devices.]

A.5 Device Statistics (Log Address TBDh)

A.5.1 Overview

The Device Statistics log contains selected statistics about the device. This log shall be read-only, and shall only be accessed via the GPL feature set. This log is supported if there is a non-zero length for log address TBDh in the General Purpose Log Directory. The format of the data is defined in table TBD. If the Device Statistics log is supported, only the Structure Version field is required. Each statistic is composed of a 1-byte flag field and a value field. If the bit 7 of the flag field is set to one then the value field of that statistic is valid. Each statistic shall be a multiple of 8 bytes long. The number of log pages may be greater than one.

A.5.2 Device Temperature Statistics (Page TBD)

A.5.2.1 Overview

Device Statistics log page TBD contains general information about the device as described in table TBD. The value in the temperature field is a two's complement integer in degrees Celsius.

The summary of this temperature statistics is as followed:

a) Structure Version
b) Current Temperature
c) Average Temperature for the Past 24-Hours
d) Average Temperature for the Past 1008-Hours
e) Highest Temperature (Lifetime)
f) Lowest Temperature (Lifetime)
g) Lowest Device Temperature (Lifetime)
h) Lowest Short Term Average Temperature (Lifetime)
i) Highest Average Temperature (Lifetime)
j) Lowest Average 1008-Hour Temperature (Lifetime)

Table TBD – Temperature Statistics

Offset	Type	Content
0-7	QWord	Structure Version
		Bit **Meaning** 63:56 Reserved 55:48 Device Statistics Version Number = 0001h 47:16 Reserved 15:0 TBDh, Page Number
8-15	QWord	Current Temperature
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:32 Reserved 31:0 Current Temperature
16-23	QWord	Average Temperature for the Past 24-Hours
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 62 Reserved 7:0 Average Short Term Temperature

24-31	QWord	Average Temperature for the Past 1008-Hours
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Average Temperature
32-39	QWord	Highest Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Highest Temperature (Lifetime)
40-47	QWord	Lowest Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Lowest Temperature (Lifetime)
48-55	QWord	Lowest Device Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 61:56 Reserved for flags 55:8 Reserved 7:0 Lowest Device Temperature (Lifetime)
56-63	QWord	Lowest Short Term Average Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Lowest Short Term Average Temperature (Lifetime)
64-71	QWord	Highest Average Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Highest Average Temperature (Lifetime)
72-79	QWord	Lowest Average 1008-Hour Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:8 Reserved 7:0 Lowest Average 1008-Hour Temperature (Lifetime)
80-87	QWord	Time Over-Temperature (Lifetime)
		Bit **Meaning** 63:56 Device Statistics Flags, (See Table TBD) 55:32 Reserved 31:0 Time Over-Temperature (Lifetime)
96-511	Byte	Reserved

A.5.2.2 Structure Version

A.5.2.2.1 Description

Structure Version defines the version of the data structure arrangement for this statistics. The structure is defined by the T13 committee. When a new structure is defined the version number will be assigned.

Bit 56:48 is used for the revision number of the statistics structure. Bit 15:0 is used for the page number of the Log Page for this statistics.

A.5.2.2.2 Update Interval

Update interval is not applicable to the Structure Version field.

A.5.2.2.3 Measurement Unit

Measurement unit is not applicable to the Structure Version field.

A.5.2.2.4 Initialization

Structure Version shall be initialized to the corresponding number at the time of manufacture.

A.5.2.3 Current Temperature

A.5.2.3.1 Description

Current Temperature is a value that records current temperature measured by the device.

A.5.2.3.2 Update Interval

Current Temperature is measured and updated on the following events. When the device is operational the value is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.3.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.3.4 Initialization

Current Temperature reflects the current temperature of the device. There is no initialized value stored.

A.5.2.4 Average Short Term Temperature

A.5.2.4.1 Description

Average Short Term Temperature is a value that records the average lifetime device temperature samples at a mean interval of 10 minutes. The Average Short Term Temperature is calculated by averaging the last 144 temperature is only recorded when the device is in Active or Idle states.

A.5.2.4.2 Update Interval

Average Short Term Temperature is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.4.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.4.4 Initialization

Average Short Term Temperature is not initialized at the time of manufacture. Until the device takes 144 samples the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first sample is taken the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.5 Average Temperature

A.5.2.5.1 Description

Average Temperature is a value that records the average of the most recent 144 temperature. The Average Short Term Temperature is recorded on every 24 hours for 42 times. At the end of 24 hours a new Average Short Term Temperature value replaces the oldest one of the 42 data. The Average Temperature for the Past 1008-Hour is calculated by averaging the 42 data of the “Average Short Term Temperature” stored. Samples are only recorded when the device is in Active or Idle state.

A.5.2.5.2 Update Interval

Average Temperature is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.5.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.5.4 Initialization

Average Temperature is not initialized at the time of manufacture. Until the device takes 144 samples the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the 144 samples are taken the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.6 Highest Temperature (Lifetime)

A.5.2.6.1 Description

Highest Temperature (Lifetime) is a value that records the Highest Temperature after the device is manufactured. This data is calculated by comparing the “Current Temperature” sample taken at a mean interval of 10 minutes and the Highest Temperature (Lifetime) recorded.

A.5.2.6.2 Update Interval

Highest Temperature (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.6.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.6.4 Initialization

Highest Temperature (Lifetime) is not initialized at the time of manufacture. Until the device takes first sample the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first sample is taken the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.7 Lowest Temperature (Lifetime)

A.5.2.7.1 Description

Lowest Temperature (Lifetime) is a value that records the Lowest Temperature after the device is manufactured. This data is calculated by comparing the “Current Temperature” sample taken at a mean interval of 10 minutes and the Lowest Temperature (Lifetime) recorded.

A.5.2.7.2 Update Interval

Lowest Temperature (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.7.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.7.4 Initialization

Lowest Temperature (Lifetime) is not initialized at the time of manufacture. Until the device takes first sample the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first sample is taken the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.8 Lowest Device Temperature (Lifetime)

A.5.2.8.1 Description

Lowest Device Temperature (Lifetime) is a value that records the lowest device temperature after the device is manufactured. This data is calculated by comparing the current “Average Short Term Temperature” and the Lowest Device Temperature (Lifetime) recorded.

A.5.2.8.2 Update Interval

Lowest Device Temperature (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.8.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.8.4 Initialization

Lowest Device Temperature (Lifetime) is not initialized at the time of manufacture. Until the device takes first Average Short Term Temperature the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first Average Short Term Temperature is taken the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.9 Lowest Short Term Average Temperature (Lifetime)

A.5.2.9.1 Description

Lowest Short Term Average Temperature (Lifetime) is a value that records the lowest device short term average temperature after the device is manufactured. This data is calculated by comparing the current "Average Short Term Temperature" and the Lowest Short Term Average Temperature (Lifetime) recorded.

A.5.2.9.2 Update Interval

Lowest Short Term Average Temperature (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.9.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.9.4 Initialization

Lowest Short Term Average Temperature (Lifetime) is not initialized at the time of manufacture. Until the device records the first Average Short Term Temperature the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first Average Short Term Temperature is recorded and the Highest Short Term Average Temperature is calculated the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.10 Highest Average 1008-Hour Temperature (Lifetime)

A.5.2.10.1 Description

Highest Average Temperature (Lifetime) is a value that records the lowest device average temperature after the device is manufactured. This data is calculated by comparing the current "Average Temperature for the Past 1008-Hour" value and the Highest Average Temperature (Lifetime) recorded.

A.5.2.10.2 Update Interval

Highest Average Temperature (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour.

A.5.2.10.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.10.4 Initialization

Highest Average Temperature (Lifetime) is not initialized at the time of manufacture. Until the device records the first Average Temperature the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first Average Temperature is recorded and the Highest Short Term Average Temperature is calculated the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.11 Lowest Average 1008-Hour Temperature (Lifetime)

A.5.2.11.1 Description

Lowest Average 1008-Hour Temperature (Lifetime) is a value that records the Lowest device average 1008-hour temperature after the device is manufactured. This data is calculated by comparing the current "Average Temperature for the Past 1008-Hour" and the Lowest Average 1008-Hour Temperature (Lifetime) recorded.

A.5.2.11.2 Update Interval

Lowest Average 1008-Hour Temperature (Lifetime) is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at a minimum interval of one hour. Lowest Average 1008-Hour Temperature (Lifetime) is measured in the unit of degrees Celsius.

A.5.2.11.3 Measurement Unit

Measurement Unit: Degrees Celsius.

A.5.2.11.4 Initialization

Lowest Average 1008-Hour Temperature (Lifetime) is not initialized at the time of manufacture. Until the device records the first Average Temperature for the Past 1008-Hour the Value Valid bit (bit 62) is cleared to 0 and the data on bit 7:0 is not valid. After the first Average Temperature for the Past 1008-Hour is recorded and the Lowest Short Term Average Temperature is calculated the Value Valid bit is set to one and the temperature value on bit 7:0 is updated.

A.5.2.12 Time in Over-Temperature Condition (Lifetime)

A.5.2.12.1 Description

Time Over-Temperature (Lifetime) is a counter that records the amount of time that the device has been operational while the device temperature specification has been exceeded since the device was manufactured. The over-temperature time is sampled and recorded to a volatile counter with a minimum resolution ten minutes. This volatile counter is accumulated into a non-volatile location per the following update criteria. The reporting of time over-temperature is truncated to hour units. Time Over-Temperature (Lifetime) is incremented by one for each hour that the device has been operational while the device temperature specification has been exceeded.

A.5.2.12.2 Update Interval

Time Over-Temperature is updated on the following events. When the device is operational the counter is updated and stored in a non-volatile location at an interval of no greater that one hour

A.5.2.12.3 Measurement Unit

Measurement Unit: Hours.

A.5.2.12.4 Initialization

Time Over-Temperature (Lifetime) shall be initialized to zero at the time of manufacture.