



AISG Extension: Antenna Line Device Temperature Sensor

Temperature Sensor Extension to the Control Interface for Antenna Line Devices

Extension to AISG version 2.0

Revision History

DATE	ISSUE	NOTES
31 January 2013	2.1.0	First Release
15 March 2016	2.2.0	Inc CRs 515, 531, 539, 605



CONTENTS

1.	Foreword.....	3
2.	Scope.....	3
3.	References	3
4.	Abbreviations	4
5.	Terminology and Definitions	4
6.	LAYER 1	5
6.1.	DC supply	5
6.1.1.	ATS DC power consumption	5
6.1.2.	ATS Power-up characteristics	5
6.2.	Resumption of operation after interruption of supply	5
6.2.1.	ATSs	5
7.	LAYER 2	6
7.1.	Device Type.....	6
8.	Layer 7	7
8.1.	General Aspects	7
8.1.1.	Geometry and Numbering	7
8.1.2.	Parallel Procedure Handling for Time Consuming Procedures (TCPs).....	7
8.2.	Return and alarm codes	7
8.3.	Elementary Procedures for the ALD Temperature Sensor	8
8.4.	Device-Specific Elementary Procedures for ATS Subunits	9
8.4.1.	ATS Get Temperature	10
8.4.2.	ATS Set Temperature Thresholds	11
8.4.3.	ATS Get Temperature Thresholds.....	13
8.4.4.	ATS Get Supported Functions	14
8.4.5.	ATS DeleteTarget Thresholds	15
9.	Product identification	17
9.1.	Marking of conforming products with extensions	17



1. FOREWORD

The Antenna Interface Standards Group (AISG) published the AISG standard to facilitate the introduction of antenna line products with remote control and monitoring facilities. The purpose of that standard is to ensure basic interoperability of antennas and control infrastructure. The AISG standard covers two basic types of Antenna Line Devices: Actuators capable of altering the electrical downtilt of the antenna and tower mounted amplifiers.

It has become evident that commercial antenna line devices are evolving beyond this set of capabilities. The AISG has decided to publish extensions to the basic standard rather than adding all possible branches to the core specification. For purposes of compliance, users should note that this entire Extension Standard is *optional*. However, once a given Extension Standard is elected for inclusion in a device, the entire option becomes mandatory.

This extension to the AISG standard adds procedures for Antenna Line Devices that implement monitoring and reporting of temperature. These sensors may be placed within an Antenna Line Device to monitor the performance of certain components or to compensate for changes in ambient temperature. By providing the means of assigning temperature thresholds, this specification allows for alarming and reporting temperature characteristics which may negatively impact the performance of an Antenna Line Device.

2. SCOPE

This document contains extensions to layers 2 and 7 of AISG specification, version 2.0 [1], for Antenna Line Devices implementing Antenna Temperature Sensor (ATS).

3. REFERENCES

This AISG standard incorporates provisions from other publications. These are cited in the text and the referenced publications are listed below. Where references are dated, subsequent amendments or revisions of these publications apply only when specifically incorporated by amendment or revision of this AISG extension. For undated references the latest edition of the publication referred to applies.

- 1 AISG Version 2.0, "Control Interface for Antenna Line Devices"
- 2 3GPP TS25.460 UTRAN Iu-nt Interface General Aspects and Principles Release 6
- 3 3GPP TS25.461 UTRAN Iu-nt Interface Layer 1, Release 6
- 4 3GPP TS25.462 UTRAN Iu-nt Interface Signalling Transport, Release 6
- 5 [Not used]
- 6 3GPP TS25.463 UTRAN Iu-nt Interface: Application Part, Release 6
- 7 AISG-ES-ACS v2.1.1 AISG Extension Specification: ACS



Note the 3GPP references are to Release 6 unless otherwise indicated. These documents are referred to in AISG Version 2.0, although they may have been superseded.

4. ABBREVIATIONS

Where abbreviations or acronyms are used in this document they have the following meanings:

ATS	Antenna Temperature Sensor
TCP	Time Consuming Procedure

5. TERMINOLOGY AND DEFINITIONS

Where the following terms are used in this document, they have the meanings listed below.

Temperature	Temperature is reported in decimal degrees Celsius, to one decimal place of accuracy, and then multiplied by 10 so that it may be represented by an integer.
Calculated Temperature	A value representing the 'best estimate' of temperature. This value is the result of averaging historical data, or any other means of calculation deemed appropriate by the ATS vendor for producing a consistently accurate result.
Temperature Precision	A value that represents the standard deviation of values from their arithmetic mean in temperature. This value may be used to judge the credibility of calculated temperatures.
Lowest Calculated Temperature	A temperature value that represents the lowest Calculated Temperature since the ATS was last layer-7 reset..
Highest Calculated Temperature	A temperature value that represents the highest Calculated Temperature since the ATS was last layer-7 reset..
Overtemp Alarm Threshold	A value that represents the highest measurement permitted without triggering a temperature alarm condition. An Overtemp Alarm Threshold is given in decimal degrees Celsius to one decimal place of accuracy, and then multiplied by 10 so that it may be represented by an integer.
Undertemp Alarm Threshold	A value that represents the lowest measurement permitted without triggering a temperature alarm condition. An Undertemp Alarm Threshold is given in decimal degrees Celsius to one decimal place of accuracy, and then multiplied by 10 so that it may be represented by an integer.



6. LAYER 1

All definitions and specifications for RET devices in the reference [1], [2] and [3] regarding lant layer 1 apply to ATS devices complying with this Extension Standard unless otherwise stated by requirements in this document.

6.1. DC supply

6.1.1. ATS DC power consumption

Power consumption shall be given by the product data sheet.

6.1.2. ATS Power-up characteristics

Devices complying with this Extension Standard shall have a maximum power-up period of 3 seconds.

After the power-up period, the device shall be fully functional.

6.2. Resumption of operation after interruption of supply

Normal operation shall be resumed after restoration of the power supply after any interruption or arbitrary reduction of the voltage supplied (brown-out) in accordance with [3].

NOTE: Temperature information may not be immediately available.

6.2.1. ATSS

During loss of DC power, antennas with ATSS continue in normal RF operation but will lose temperature monitoring functionality.

The following data shall be retained:

- Upper Temperature Threshold
- Lower Temperature Threshold



7. LAYER 2

All definitions and specifications for RET devices in reference [4] regarding layer 2 shall be valid for all antenna line devices included in this Extension Standard regardless of whether the device implements RET functionality.

Extended specifications for layer 2 are defined in the following chapter.

7.1. Device Type

For the purposes of reverse compliance with [4], devices implementing this Extension Standard shall report the device type in compliance with provisions in [6].

The following table shows the additional device type for this Extension Standard:

Table 7.1.1: Device type

Device Type	1-octet hexadecimal code
Antenna Line Device Temperature Sensor	0x24



8. LAYER 7

The application layer includes the common elementary procedures as defined in [1] and [6] and is extended by AISG-specific procedures.

8.1. General Aspects

8.1.1. Geometry and Numbering

All ATS devices shall be defined as multiple subunit devices.

NOTE: Devices with single ATS units shall be implemented as multiple subunit devices with the number of subunits equal to 1.

8.1.2. Parallel Procedure Handling for Time Consuming Procedures (TCPs)

The ATS device does not define any TCPs. Parallel procedure handling is not supported by the ATS.

8.2. Return and alarm codes

A table of return and alarm codes is given in [6] and extended in Annex A of this document.



8.3. Elementary Procedures for the ALD Temperature Sensor

To avoid prematurely exhausting the available space in the command table through the proliferation of extensions, certain codes defined for other devices are reused by this extension. This process is called “overloading”.

For device compliant with this extension, the overloaded code shall refer to a member of the ATS procedure set defined herein, and not to the procedure assigned by the original specification.

This section defines those procedures that are defined by overloading existing procedure codes without any significant changes in the procedure initiation message, response message, and/or return code values. For clarity, only differences from the language of the referenced specification are elaborated for these procedures.

Table 8.3.1 Common elementary procedures

ATS Command	Overloads	Code Value	Requirement
ATSAAlarmIndication	TMAAlarmIndication [1]	0x76	Mandatory
ATSClearActiveAlarms	TMAClearActiveAlarms [1]	0x77	Mandatory
ATSGetAlarmStatus	TMAGetAlarmStatus [1]	0x78	Mandatory
ATSGetNumberOfSubunits	TMAGetNumberOfSubunits [1]	0x79	Mandatory

These commands shall be implemented as specified in the corresponding paragraphs of [1].



8.4. Device-Specific Elementary Procedures for ATS Subunits

This section defines procedures that are defined by overloading existing procedures in [1] that include significant changes in the procedure message initiation, response, and/or return code values or formats. No requirements from the corresponding procedure clauses in [1] shall be inferred unless re-stated in this Extension Standard.

Table 8.4.1 Antenna Line Device Temperature Sensor elementary procedures for all supported functions

The following elementary procedures shall be included by all ATS implementations, regardless of supported functions.

ATS Command	Overloaded command	Code Value	Requirement
ATSGetSupportedFunctions	TMAGetSupportedFunctions [1]	0x7A	Mandatory
ATSGetTemperature		0xA5	Mandatory

Table 8.4.2 ATS Temperature Compare to Threshold function specific elementary procedures

If the Temperature Compare to Threshold function flag is set, the following elementary procedures must be supported.

ATS Command	Overloaded command	Code Value	Requirement
ATSSetTemperatureThresholds		0xA6	Mandatory
ATSGetTemperatureThresholds		0xA7	Mandatory
ATSDeleteTargetThresholds		0x9E	Mandatory



8.4.1. ATS Get Temperature

Table 8.4.1.1: Elementary procedure ATSGetTemperature

Name: ATSGetTemperature				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
0xA5	Primary device	1	No	Low

Table 8.4.1.2: Initiating message parameters and format for ATSGetTemperature

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number

Table 8.4.1.3: Response message parameters and format for ATSGetTemperature

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK
3	2 octets	Signed integer	Calculated temperature
4	2 octets	Unsigned integer	Temperature precision
5	2 octets	Signed integer	Lowest calculated temperature
6	2 octets	Signed integer	Highest calculated temperature



Table 8.4.1.4: Return codes for ATSGetTemperature

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing UnsupportedProcedure OffScale NotConfigured NotReady	See [1] Temperature is beyond the capability of the sensor. Prerequisite data has not been set. Unable to calculate result and fulfill request. The ATS has been correctly configured, but the requested measurement is currently unavailable. The ATS is busy collecting the required data or performing calculations on collected data.

8.4.2. ATS Set Temperature Thresholds

On receipt of the initiating message the secondary device shall first set the addressed ATS subunit Major and Minor Overtemp and Major and Minor Undertemp Thresholds to the respective values passed in the message parameters, and then return the response message.

OutOfRange shall be returned for temperature thresholds which are beyond the range of values supported by the subunit, as reported by ATSGetSupportedFunctions.

FormatError shall be returned when $MinorATSOvertempAlarm > MajorATSOvertempAlarm$ or when $MinorATSUndertempAlarm < MajorATSUndertempAlarm$.

When both Minor and Major thresholds are set to the same value, a Major Alarm shall be returned if an alarm is detected.

NOTE: Care should be taken to prevent excessive alarm state transitions. Mechanisms which require both a minimum timeframe and minimum change in temperature to be met before allowing alarm state transitions are highly recommended.



Table 8.4.2.1: Elementary procedure ATSSetTemperatureThresholds

Name: ATSSetTemperatureThresholds				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
0xA6	Primary device	1	No	Low

Table 8.4.2.2: Initiating message parameters and format for ATSSetTemperatureThresholds

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	2 octets	Signed integer	Minor overtemp alarm threshold
3	2 octets	Signed integer	Major overtemp alarm threshold
4	2 octets	Signed integer	Minor undertemp alarm threshold
5	2 octets	Signed integer	Major undertemp alarm threshold

Table 8.4.2.3: Response message parameters and format for ATSSetTemperatureThresholds

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK

Table 8.4.2.4: Return codes for ATSSetTemperatureThresholds

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing UnsupportedProcedure OutOfRange	See [1]



8.4.3. ATS Get Temperature Thresholds

Table 8.4.3.1: Elementary procedure ATSGetTemperatureThresholds

Name: ATSGetTemperatureThresholds				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
0xA7	Primary device	1	No	Low

Table 8.4.3.2: Initiating message parameters and format for ATSGetTemperatureThresholds

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number

Table 8.4.3.3: Response message parameters and format for ATSGetTemperatureThresholds

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK
3	2 octets	Signed integer	Minor overtemp alarm threshold
4	2 octets	Signed integer	Major overtemp alarm threshold
5	2 octets	Signed integer	Minor undertemp alarm threshold
6	2 octets	Signed integer	Major undertemp alarm threshold

Table 8.4.3.4: Return codes for ATSGetTemperatureThresholds

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing UnsupportedProcedure NotConfigured	See [1] Prerequisite data has not been set. Unable to calculate result and fulfill request.



8.4.4. ATS Get Supported Functions

Table 8.4.4.1: Elementary procedure ATSGetSupportedFunctions

Name: ATSGetSupportedFunctions				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
0x7A	Primary device	1	No	Low

Table 8.4.4.2: Initiating message parameters and format for ATSGetSupportedFunctions

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number

Table 8.4.4.3: Response message parameters and format for ATSGetSupported Functions

On receipt of the initiating message, the ATS shall respond with the function flags and parameters indicating the supported functionality of the addressed ATS subunit.

The minimum and maximum measureable temperature parameters indicate the range of supported temperatures that will be returned by ATSGetTemperature and accepted by ATSSetTemperatureThresholds. Min > Max is disallowed.

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK
3	1 octet	Unsigned integer	Function Flags
4	2 octets	Signed integer	Minimum measureable temperature
5	2 octets	Signed integer	Maximum measureable temperature



Table 8.4.4.4: Return codes for ATSGetSupportedFunctions

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing	See [1]

Table 8.4.4.5: Function Flags for ATSGetSupportedFunctions

Bit	7 to 1	0
Function	Spare	Temperature Compare to Threshold

Bits are numbered from 0...7, bit number 0 set to 1 represents the value 0x01
 Bit value 0 represents function is not supported
 Bit value 1 represents function is supported
 Spare bits shall be set to zero

8.4.5. ATS DeleteTarget Thresholds

On receipt of the initiating message, the secondary device shall reset the thresholds for the temperature values and shall set the corresponding values to not configured. This procedure shall disable the corresponding alarms.

Table 8.4.5.1: Elementary procedure ATSDeleteTargetThresholds to reset thresholds to unconfigured state

Name: ATSDeleteTargetThresholds				
Code:	Issued by:	Procedure class:	DownloadMode state:	Power mode:
0x9E	Primary device	1	No	Low

Table 8.4.5.2: Initiating message parameters and format for CPMDeleteTargetThresholds

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number



Table 8.4.5.3: Response message parameters and format for ATSDeleteTargetThresholds

Field	Length	Type	Description
1	1 octet	Unsigned integer	Subunit number
2	1 octet	Return code	Return code: OK

Table 8.4.5.4: Return codes for ATSDeleteTargetThresholds

OK	FAIL	Comment
	FormatError HardwareError WorkingSoftwareMissing UnsupportedProcedure	See [1]



9. PRODUCT IDENTIFICATION

9.1. Marking of conforming products with extensions

In order to allow users to identify products which conform with the requirements of this extension standard, member companies are encouraged to use the AISG logo on conforming products and on any brochures, advertisements or product literature associated with them. In addition, the legends 'AISG 2.0 (Antenna Line Device Temperature Sensor Extension)' or 'Conforms with interface standard AISG 2.0 with Antenna Line Device Temperature Sensor Extension ' may be used on such products and associated literature.



Annex A: Return Codes for ATS devices (Normative)

The return codes listed in [1] ,[6, Annex A] and the return code “NotReady” defined in [7] can be used by AISG ATS. The following return codes can also be used by ATS.

Table A.1: Assigned return codes and alarms of the ATS

Code	Meaning		Alarm	Download Mode State
0x33	MinorATSOvertempAlarm	Minor temperature threshold is exceeded	X	
0x34	MajorATSOvertempAlarm	Major temperature threshold is exceeded	X	
0x35	MinorATSUndertempAlarm	Minor temperature is below the threshold	X	
0x36	MajorATSUndertempAlarm	Major temperature is below the threshold	X	
0x37	OffScale	Temperature is beyond the capability of the sensor.		