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## Presentation of Specification to TSG or WG

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**Presentation to:** TSG RAN Meeting #25

**Documents for presentation:** TS 25.463: UTRAN Iuant Interface: RETAP Signalling  
Version 1.0.0

**Presented for:** Approval

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### Abstract of document:

At TSG-RAN#19 the "Work Item Description for Remote Control of Electrical Tilting Antennas" (RP-030193) was approved. The new Technical Specifications 25.463 specifies the *Remote Electrical Tilting Application Part (RETAP)* between the implementation specific O&M transport function and the RET Antenna Control unit function of the Node B. It defines the Iuant interface and its associated signalling procedures.

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### Changes since last presentation to TSG RAN Meeting #24:

- The open issues in the draft versions of the specifications were solved in RAN3
  - Technical Specification 25.463 for Iuant was prepared for approval at TSG-RAN#25
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### Outstanding Issues:

Some minor open issues were identified which can be handled via CRs during the next WG meetings:

- Change Requests for the TSs can be expected in the next RAN3 meetings to solve editorial mistakes.
  - The WI level of completion is 95%.
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### Contentious Issues:

No contentious issues are open.

# 3GPP TS 25.463 V1.0.0 (2004-09)

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*Technical Specification*

## **3rd Generation Partnership Project; Technical Specification Group Radio Access Network; UTRAN Iuant Interface: Remote Electrical Tilting (RET) Antennas Application Part (RETAP) Signalling (Release 6)**



The present document has been developed within the 3<sup>rd</sup> Generation Partnership Project (3GPP<sup>TM</sup>) and may be further elaborated for the purposes of 3GPP.

The present document has not been subject to any approval process by the 3GPP Organizational Partners and shall not be implemented. This Specification is provided for future development work within 3GPP only. The Organizational Partners accept no liability for any use of this Specification. Specifications and reports for implementation of the 3GPP<sup>TM</sup> system should be obtained via the 3GPP Organizational Partners' Publications Offices.

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## Foreword

This Technical Specification has been produced by the 3<sup>rd</sup> Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

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# 1 Scope

The present document specifies the *Remote Electrical Tilting Application Part (RETAP)* between the implementation specific O&M transport function and the RET Antenna Control unit function of the Node B. It defines the Iuant interface and its associated signaling procedures.

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# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

- [1] 3GPP TS 25.460: "UTRAN Iuant Interface: General Aspects and Principles".
- [2] ISO/IEC 13239 (2<sup>nd</sup> Edition, March 2000): Information Technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures.
- [3] 3GPP TS 25.462: "UTRAN Iuant Interface: Signalling Transport".

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# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

**ASCII character:** A character forming part of the International Reference Version of the 7-bit character set defined in ISO/IEC 646:1991

**Calibrate:** Exercise the antenna drive unit over its entire range of travel to ensure fault-free operation and synchronise the measured and actual beam tilt of the antenna

**Configuration data:** A stored table or function defining the relationship between the physical position of the drive and electrical beam-tilt

**Device type:** See section 4.7 in [3].

**Elementary Procedure:** The RETAP protocol consists of Elementary Procedures (EPs). An Elementary Procedure is a unit of interaction between the primary device (Node B) and the secondary devices (RET devices).

An EP consists of an initiating message and possibly a response message.

Two kinds of EPs are used:

- **Class 1:** Elementary Procedures with response (success or failure).
- **Class 2:** Elementary Procedures without response.

For **Class 1** EPs, the types of responses can be as follows:

Successful

- A signalling message explicitly indicates that the elementary procedure has been successfully completed with the receipt of the response.

Unsuccessful

- A signalling message explicitly indicates that the EP failed.

**Class 2 EPs** are considered always successful.

**Little-endian:** The order of transmission in which the least-significant octets of a multi-octet representation of a number are transmitted first. Little endian only applies to binary integer representations.

**Return code:** A 1-octet enumerated response message to an initiating message.

**Tilt (also downtilt, tilt angle, beamtilt):** The elevation angle between the direction orthogonal to the antenna element axis and the maximum of its main beam in the elevation plane. A positive electrical tilt angle means that the antenna beam is directed below the direction orthogonal to the antenna axis. An antenna has separate values for electrical and mechanical tilt. The mechanical tilt is fixed by the geometry of the installation. In this TS the tilt referred to is always the electrical tilt unless otherwise stated

## 3.2 Symbols

Void

## 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

EP	Elementary Procedure
HDLC	High-Level Data Link Control
RET	Remote Electrical Tilting

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# 4 General

## 4.1 Procedure Specification Principles

The principle for specifying the procedure logic is to specify the functional behaviour of the RET antenna Control unit exactly and completely. The Node B functional behaviour is left unspecified.

The following specification principles have been applied for the procedure text in section 6:

- The procedure text discriminates between:
  - 1) Functionality which "shall" be executed

The procedure text indicates that the receiving node "shall" perform a certain function Y under a certain condition. If the receiving node supports procedure X but cannot perform functionality Y requested in the REQUEST message of a Class 1 EP, the receiving node shall respond with the message used to report unsuccessful outcome for this procedure, containing an appropriate cause value.

- 2) Functionality which "shall, if supported" be executed

The procedure text indicates that the receiving node "shall, if supported," perform a certain function Y under a certain condition. If the receiving node supports procedure X, but does not support functionality Y, the receiving node shall proceed with the execution of the EP, possibly informing the requesting node about the not supported functionality.



## 4.2 Forwards and Backwards Compatibility

The forwards and backwards compatibility of all versions of the protocol shall be assured by a mechanism in which all current and further messages will not be changed in the future. These parts can always be decoded regardless of the standard version.

## 4.3 Multi-Antenna Units

The RETAP elementary procedures are split into a single-antenna oriented part, a multi-antenna oriented part and a common part for both device types in order to support RET units controlling single- or multi-antenna devices. The RET unit responds, upon request, the number of antennas it controls. All multi-antenna oriented elementary procedures include a parameter stating which antenna the elementary procedure addresses.

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# 5 Services Expected from Signalling Transport

RETAP requires an assured in-sequence delivery service from the signalling transport and notification if the assured in-sequence delivery service is no longer available.

## 5.1 Elementary Procedure Format

Layer 2 provides a full-duplex link for the transmission of RETAP messages.

There are two types of RETAP elementary procedures:

**Class 1:** Initiating messages are sent either from the primary to a secondary device, or from a secondary to the primary device, in order to initiate some action within the receiving device. The other device sends a response message completing the procedure.

**Class 2:** Initiating messages are sent either from the primary to a secondary device, or from a secondary to the primary device. No response message is expected.

All RETAP messages use the same basic format:

**Table 5.1.1: Basic Format for all RETAP Messages**

Elementary Procedure	Number of data octets	Data
1 octet	2 octets	78 octets

NOTE: The default frame length of 78 octets is used unless another frame length is negotiated during the Address Assignment procedure (see [3]).

### 5.1.1 Initiating Message

The data part of an initiating message may contain parameters as specified in section 6 of this TS.

### 5.1.2 Response Message

If the elementary procedure requested by the initiating message was successfully executed, the response message data part from a single-antenna device shall be <OK>. Additional information may follow in the data part. The response message data part from a multi-antenna device starts with the antenna number followed by <OK> and optional additional information.

If the elementary procedure requested by the initiating message was not successfully executed, the response message data part from a single-antenna device shall within a default period of 1 second unless otherwise specified, be <FAIL>

The following octets may contain additional return codes which describe why the execution of the requested procedure failed. The response message data part from a multi-antenna device starts with the antenna number followed by <OK> and optional additional return codes which describe why the execution of the requested procedure failed.

Return codes marked with an X in the Alarm column of annex A in this TS are used to report operating conditions in alarm procedures (see sections 6.6.5 and 6.7.6 for details).

In some situations an initiating message can cause a change of operating conditions, for instance a SetTilt procedure might cause a RET device to discover that an adjuster is jammed or that a previously jammed adjuster works normally again. In these cases an alarm procedure reporting the change of operating conditions shall be used in addition to the regular <OK> or <FAIL> response message.

A complete annotated table of all return codes with their corresponding hexadecimal numbers is provided in annex A of this TS.

## 6 Control Elementary Procedures

### 6.1 State Model

The state model describing the secondary device is FFS.

**Figure 6.1: State Model for Secondary Device**

### 6.2 General Procedure Handling

All procedures are blocking i.e. no new initiation messages will have to be executed before a response message has been delivered as result of the previously initiated procedure.

The Reset Software procedure shall always be handled in all states and never be blocked.

### 6.3 Overview of Elementary Procedures

The set of elementary procedures for RET antenna control provides procedure-oriented instructions. An overview of the procedures is given in annex D. Table 6.3.1 lists all common elementary procedures described in section 6.5. Table 6.3.2 lists all elementary procedures specific for single-antenna device types described in section 6.6. Table 6.3.3 lists all elementary procedures specific for multi-antenna device types described in section 6.7. Section 6.4 describes how to interpret the elementary procedure definitions in sections 6.5 to 6.7.

Some elementary procedures shall be performed in sequence as described in Annex C for the software download.

**Table 6.3.1: Common Elementary Procedure Set for All Device Types**

Command	Requirement	Comment
Reset Software	mandatory	
Get Error Status	mandatory	
Get Information	mandatory	
Clear Active Alarms	mandatory	
Alarm Subscribe	mandatory	
Read User Data	mandatory	

Write User Data	mandatory	
Self Test	mandatory	
Set Device Data	mandatory	
Get Device Data	mandatory	
Boot Mode Start	optional	This procedure is mandatory if the software download feature is supported.
Download Application	optional	This procedure is mandatory if the software download feature is supported.
Download End	optional	This procedure is mandatory if the software download feature is supported.

**Table 6.3.2: Elementary Procedure Set for Single-Antenna Device Type**

Command	Requirement	Comment
Calibrate	mandatory	
Send Configuration Data	mandatory	
Set Tilt	mandatory	
Get Tilt	mandatory	
Alarm	mandatory	

**Table 6.3.3: Elementary Procedure Set for Multiple-Antenna Device Type**

Command	Requirement	Comment
Antenna Calibrate	mandatory	
Antenna Set Tilt	mandatory	
Antenna Get Tilt	mandatory	
Antenna Set Data	mandatory	
Antenna Get Data	mandatory	
Antenna Alarm	mandatory	
Antenna Clear Active Alarms	mandatory	
Antenna Get Error Status	mandatory	
Antenna Get Number Of Antennas	mandatory	

## 6.4 Description of Elementary Procedures

**Table 6.4.1: Description of Elementary Procedures**

<b>Name:</b> The name used to refer to the elementary procedure				
<b>Code:</b> The code is defined here. All other code references are informative	<b>Issued by:</b> Primary device or secondary device	<b>Procedure class:</b> Class 1 or Class 2	<b>Download operation:</b> FFS	<b>Download boot mode:</b> Defines whether the procedure shall be supported when the secondary device is

				in the download boot mode state
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**Table 6.4.2: Initiating Message Parameters**

Number	Length	Type	Description

**Description:**

Describes the purpose of the elementary procedure.

**Initiating message data format:**

Describes the initiating message parameter order.

**Response message data format:**

Describes the response message data parameter order in case of procedure success.

**Response message data format upon error:**

Describes the response message data parameter order in case of procedure failure.

**Applicable return codes:**

Lists all allowed return codes for the procedure.

## 6.5 Common Elementary Procedures

### 6.5.1 Reset Software

**Table 6.5.1.1: Elementary Procedure Reset Software**

Name: <b>ResetSoftware</b>				
Code: <b>0x03</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>Yes</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.1.2: Initiating Message Parameters for Reset Software**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

On the receipt of the initiating message the secondary device shall set the HDLC address to the No-station address and place the device in the *No Address* state.

The device shall not execute the reset procedure before transport layer acknowledgement through sequence number update is received for the response. (See annex C in [2]).

The secondary device shall not fail to reset for any reason.

**Initiating message data format:**

No data carried in the message.

**Response message data format:**

<OK>

**Response message data format upon error:**

No error accepted.

**Applicable return codes:**

<OK>

## 6.5.2 Get Error Status

**Table 6.5.2.1: Elementary Procedure Get Error Status**

Name: <b>GetErrorStatus</b>				
Code: <b>0x04</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.2.2: Initiating Message Parameters for Get Error Status**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

On receipt of the initiating message the secondary device reports back the return codes corresponding to the active errors in the secondary device to the primary device.

**Initiating message data format:**

No data carried.

**Response message data format:**

<OK><ReturnCode1>...<ReturnCodeN>

**Response message data format upon error:**

<FAIL><ReturnCode1><ReturnCode2>...<ReturnCodeN>

**Applicable return codes:**

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, EEPROMError, FlashEraseError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTError, Busy, DataError, DeviceDisabled, UnknownParameter, WorkingSoftwareMissing, DownloadInProgress

NOTE1: ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, EEPROMError, FlashEraseError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTError WorkingSoftwareMissing may be part of OK response message

NOTE2: Busy, DataError, DeviceDisabled, UnknownParameter, OtherHardwareError, OtherSoftwareError, FlashError, RAMError, UARTError, DownloadInProgress may be part of FAIL response message.

## 6.5.3 Get Information

**Table 6.5.3.1: Elementary Procedure Get Information**

Name: <b>GetInformation</b>				
Code: <b>0x05</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.3.2: Initiating Message Parameters for Get Information**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

### Description:

On receipt of the initiating message the secondary device shall return the product number ProdNr and the serial number SerNr of the secondary device. If known, also the hardware version and the software version may be returned. The software version should indicate the version number of the currently executed software.

The parameters HWVersion and SWVersion in the response message refer to the version designators of the hardware and installed software of the secondary device. If the application is missing or no version number is found, then an empty string shall be returned as the version number.

### Initiating message data format:

No data carried.

### Response message data format:

<OK><LengthOctet><ProdNr><LengthOctet><SerNr><LengthOctet><HWVersion><LengthOctet><SWVersion>

### Response message data format upon error:

<FAIL><ReturnCode1>...<ReturnCodeN>

### Applicable return codes:

Busy, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError, UnknownParameter, DownloadInProgress

## 6.5.4 Clear Active Alarms

**Table 6.5.4.1: Elementary Procedure Clear Active Alarms**

Name: <b>ClearActiveAlarms</b>				
Code: <b>0x06</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.4.2: Initiating Message Parameters for Clear Active Alarms**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

On receipt of the initiating message the secondary device first clears all stored alarm information and then returns a procedure response message.

**Initiating message data format:**

No data carried.

**Response message data format:**

<OK>

**Response message data format upon error:**

<FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, FlashEraseError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError, UnknownParameter, DownloadInProgress.

## 6.5.5 Alarm Subscribe

**Table 6.5.5.1: Elementary Procedure Alarm Subscribe**

Name: <b>AlarmSubscribe</b>				
Code: <b>0x12</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.5.2: Initiating Message Parameters for Alarm Subscribe**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

On receipt of the initiating message the secondary device shall start executing its normal operation code.

**Initiating message data format:**

No Data carried.

**Response message data format:**

<OK>

**Response message data format upon error:**

<FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Invalid Software

NOTE1: UnknownParameter is the response code used if any data is carried in the initiating message.

## 6.5.6 Self Test

**Table 6.5.6.1: Elementary Procedure Self Test**

Name: <b>SelfTest</b>				
Code: <b>0x0A</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.5.6.2: Initiating Message Parameters for Self Test**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

### Description:

On receipt of the initiating message the secondary device executes a test procedure which may include a check of physical and processor functions. The specific tests to be performed are implementation specific, and may include the movement of the adjuster up to <FFS> degrees.

The response message of the secondary device on the procedure provides information on detected faults or, if no fault is detected, with confidence that the operation of the device is normal in all respects.

During the test the operational parameters of the device shall not change beyond operationally acceptable limits and on completion all parameters shall be returned to their initial values.

In the normal response message, in which the self test was executed successfully, the return codes are set to report possible detected functional errors during the self test. If no errors are detected, this shall be signalled by no return codes following <OK>.

In the case of an error response message, the self test could not be executed and the return codes relate to the inability of the device to perform the requested self-test operation.

### Initiating message data format:

No data carried.

### Response message data format:

<OK><ReturnCode1>...<ReturnCodeN>

### Response message data format upon error:

<FAIL><ReturnCode1>...<ReturnCodeN>

### Applicable return codes:

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, Busy, DataError, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTError, WorkingSoftwareMissing, DownloadInProgress.

NOTE1: Only Busy, DataError, DeviceDisabled, EEPROMError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError, WorkingSoftwareMissing, DownloadInProgress may be return codes in the fail response message.



## 6.5.7 Set Device Data

**Table 6.5.7.1: Elementary Procedure Set Device Data**

Name: <b>SetDeviceData</b>				
Code: <b>0x0E</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.5.7.2: Initiating Message Parameters for Set Device Data**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>Field number, see annex B</b>
<b>2</b>	<b>See annex B</b>	<b>See annex B</b>	<b>Data to write</b>

### Description:

On receipt of the initiating message the secondary device should write the data given in the parameters of the initiating message into the fields optionally provided for configuration data and listed in annex B of this TS. If an attempt is made to write to fields which are designated as read only, the return code *ReadOnly* is returned and the data for those fields is ignored. If an attempt is made to write to fields which are not supported by the device the return code *UnknownParameter* is returned and the data for those fields is ignored.

### Initiating message data format:

<field number><data octets for field>

### Response message data format:

<OK>

### Response message data format upon error:

<FAIL><ReturnCode1>...<ReturnCodeN>

### Applicable return codes:

Busy, DataError, DeviceDisabled, EEPROMError, FlashError, FlashEraseError, OtherHardwareError, OtherSoftwareError, OutOfRange, RAMError, UARTError, ReadOnly, UnknownParameter, DownloadInProgress

## 6.5.8 Get Device Data

**Table 6.5.8.1: Elementary Procedure Get Device Data**

Name: <b>GetDeviceData</b>				
Code: <b>0x0F</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.5.8.2: Initiating Message Parameters for Get Device Data**

Number	Length	Type	Description
--------	--------	------	-------------

<b>i</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>Field number; see annex B</b>
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**i = 1 ... N**

**Description:**

In this procedure the secondary device shall return the data stored in the fields for configuration data specified by the field numbers in the procedure and listed in annex B of this TS. The field numbers are not necessarily contiguous or ordered. For field numbers which are not supported by the secondary device those parameters are not returned.

**Initiating message data format:**

<field number 1><field number 2>...<field number N>

**Response message data format:**

<OK><field number 1><data octets for field number 1><field number 2><data octets for field number 2> ...<field number N><data octets for field number N>

**Response message data format upon error:**

<FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, DeviceDisabled, EEPROMError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError, DownloadInProgress

## 6.5.9 Read User Data

**Table 6.5.9.1: Elementary Procedure Read User Data**

Name: <b>ReadUserData</b>				
Code: <b>0x10</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.2.9.2: Initiating Message Parameters for Read User Data**

Number	Length	Type	Description
<b>1</b>	<b>2 octets</b>	<b>Integer</b>	<b>Memory offset</b>
<b>2</b>	<b>1 octet</b>	<b>Integer</b>	<b>Number of octets to read</b>

**Description:**

On receipt of the initiating message the secondary device sends back stored user specific data to the primary device.

**Initiating message data format:**

<OffsetLowOctet><OffsetHighOctet><NumberOfOctetsToRead>

**Response message data format:**

<OK><octet 1> ... <octet N>

**Response message data format upon error:**

<FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, DataError, DeviceDisabled, EEPROMError, FlashError, OtherHardwareError, OtherSoftwareError, OutOfRange, RAMError, UARTError, DownloadInProgress

NOTE1: The return code OutOfRange is used if the given memory offset is outside the valid range.

## 6.5.10 Write User Data

**Table 6.5.10.1: Elementary Procedure Write User Data**

Name: <b>WriteUserData</b>				
Code: <b>0x11</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.5.10.2: Initiating Message Parameters for Write User Data**

Number	Length	Type	Description
<b>1</b>	<b>2 octets</b>	<b>Integer</b>	<b>Memory offset</b>
<b>2</b>	<b>1 octet</b>	<b>Integer</b>	<b>Number of octets to write</b>
<b>3</b>	<b>Message specific, given by parameter 2</b>	<b>Octets</b>	<b>Data to write</b>

**Description:**

On receipt of the initiating message the secondary device shall store user specific data in non-volatile memory. The user data is stored using the relative memory address offset given in the initiating message and starting with zero.

**Initiating message data format:**

<OffsetLowOctet><OffsetHighOctet><NumberOfOctetsToWrite><octet 1> ... <octet N>

**Response message data format:**

<OK>

**Response message data format upon error:**

<FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, DeviceDisabled, EEPROMError, FlashError, OtherHardwareError, OtherSoftwareError, OutOfRange, RAMError, UARTError, DownloadInProgress

NOTE1: The return code OutOfRange is used if the needed data field is too long or if the given memory address is outside the valid address space.

## 6.5.11 Boot Mode Start

**Table 6.5.11.1: Elementary Procedure Boot Mode Start**

Name: <b>BootModeStart</b>				
Code: <b>0x40</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>Yes</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.11.2: Initiating Message Parameters for Boot Mode Start**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

### Description:

On receipt of this initiating message the software download process shall be initiated. Following transition to the boot state, the secondary device sends <OK>. Non-volatile memory in the secondary device may be erased after this procedure is completed.

### Initiating message data format:

No data carried.

### Response message data format:

<OK>

### Response message data format upon error:

<FAIL><ReturnCode 1>...<ReturnCode N>

### Applicable return codes:

Busy, FlashEraseError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError

## 6.5.12 Download Application

**Table 6.2.12.1: Elementary Procedure Download Application**

Name: <b>DownloadApplication</b>				
Code: <b>0x41</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>Yes</b>	Download boot mode: <b>Mandatory</b>

**Table 6.2.12.2: Initiating Message Parameters for Download Application**

Number	Length	Type	Description
<b>None</b>	<b>Vendor specific</b>	<b>Vendor specific</b>	<b>Software data</b>

### Description:

Repeated use of this elementary procedure transfers software data from the primary device to the secondary device.

**Initiating message data format:**

&lt;octet 1&gt;&lt;octet 2&gt;...&lt;octet N&gt;

**Response message data format:**

&lt;OK&gt;

**Response message data format upon error:**

&lt;FAIL&gt;&lt;ReturnCode 1&gt;...&lt;ReturnCode N&gt;

**Applicable return codes:**

Busy, ChecksumError, DataError, EEPROMError, FlashEraseError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError, UnknownProcedure, InvalidSoftware, TooMuchData

NOTE1: UnknownProcedure may not be returned in boot mode.

## 6.5.13 Download End

**Table 6.5.13.1: Elementary Procedure Download End**

Name: <b>DownloadEnd</b>				
Code: <b>0x42</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>Yes</b>	Download boot mode: <b>Mandatory</b>

**Table 6.5.13.2: Initiating Message Parameters for Download End**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

This elementary procedure signals the end of a multi-message data transfer to the secondary device. The secondary device responds after verifying the received data. If new software has been downloaded, the secondary device shall reset autonomously after completion of the layer 2 response to activate the new software.

**Initiating message data format:**

No data carried.

**Response message data format:**

&lt;OK&gt;

**Response message data format upon error:**

&lt;FAIL&gt;&lt;ReturnCode 1&gt;...&lt;ReturnCode N&gt;

**Applicable return codes:**

Busy, ChecksumError, EEPROMError, FlashEraseError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTError, UnknownProcedure, WorkingSoftwareMissing, InvalidSoftware, TooMuchData

NOTE1: UnknownProcedure may not be returned during software download.

## 6.6 Single-Antenna Elementary Procedures

### 6.6.1 Calibrate

**Table 6.6.1.1: Elementary Procedure Calibrate**

Name: <b>Calibrate</b>				
Code: <b>0x31</b>	Issued by: <b>Primary Device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.6.1.2: Initiating Message Parameters for Calibrate**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

#### Description:

On receipt of the initiating message the secondary device shall perform a calibration of the RET antenna where the actuator is driven through its whole tilt range.

The response time to this Calibrate procedure shall be less than 4 minutes.

#### Initiating message data format:

No data carried.

#### Response message data format:

<OK>

#### Response message data format upon error:

<FAIL><ReturnCode1>...<ReturnCodeN>

#### Applicable return codes:

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, Busy, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTErrror,UnknownProcedure, DownloadInProgress

### 6.6.2 Send Configuration Data

**Table 6.6.2.1: Elementary Procedure Send Configuration Data**

Name: <b>SendConfigurationData</b>				
Code: <b>0x32</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.6.2.2: Initiating Message Parameters for Send Configuration Data**

Number	Length	Type	Description
<b>1</b>	<b>Vendor specific;</b>	<b>Vendor specific</b>	<b>Configuration data</b>

	<b>Maximum of 70 octets</b>		
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**Description:**

On receipt of the initiating message the secondary device shall store the provided vendor and antenna specific configuration data for the relationship between the movement of the drive system and the beam tilt position of the antenna.

If the configuration data exceeds 70 octets, the data shall be split into a number of 70 octet segments and one final segment with whatever is left. The primary device transmits the segments in order. The layer 2 sequence numbers guarantee that no segment will be lost or received out of order.

**Initiating message data format:**

<DataOctet1>...<DataOctetN>

**Response message data format:**

<OK>

**Response message data format upon error:**

<FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

tdb

### 6.6.3 Set Tilt

**Table 6.6.3.1: Elementary Procedure Set Tilt**

Name: <b>SetTilt</b>				
Code: <b>0x33</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.6.3.2: Initiating Message Parameters for Set Tilt**

Number	Length	Type	Description
<b>1</b>	<b>2 octets</b>	<b>16 bit signed little-endian</b>	<b>Tilt value</b>

**Description:**

On receipt of the initiating message the secondary device shall set the electrical tilt in increments of 0.1°. The electrical tilt value describes the elevation angle between the direction orthogonal to the antenna element axis and the maximum of its main beam in the elevation plane. A positive electrical tilt angle means that the antenna beam is directed below the direction orthogonal to the antenna axis.

The secondary device shall respond to the initiating message in less than 2 minutes.

The format of the provided tilt value is a 2-complement 16 bit signed number sent in little-endian order. Tilt values are given in 0.1° increments starting from zero, for example: Tilt 3.2° is 0x0020, Tilt – 3.2° is 0xFFE0.

**Initiating message data format:**

<TiltLowOctet><TiltHighOctet>

**Response message data format:**

&lt;OK&gt;

**Response message data format upon error:**

&lt;FAIL&gt;&lt;ReturnCode1&gt;...&lt;ReturnCodeN&gt;

**Applicable return codes:**

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, Busy, DataError, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, OutOfRange, PositionLost, RAMErrror, UARTError, UnknownProcedure, DownloadInProgress

## 6.6.4 Get Tilt

**Table 6.6.4.1: Elementary Procedure Get Tilt**

Name: <b>GetTilt</b>				
Code: <b>0x34</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.6.4.2: Initiating Message Parameters for Get Tilt**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

On receipt of the initiating message the secondary device will return the current tilt value.

The returned tilt value is given in increments of 0.1° in the format specified in section 6.6.3.

**Initiating message data format:**

No data carried.

**Response message data format:**

&lt;OK&gt;&lt;TiltLowOctet&gt;&lt;TiltHighOctet&gt;

**Response message data format upon error:**

&lt;FAIL&gt;&lt;ReturnCode1&gt;...&lt;ReturnCodeN&gt;

**Applicable return codes:**

Busy, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMErrror, UARTError, UnknownProcedure, DownloadInProgress

## 6.6.5 Alarm

**Table 6.6.5.1: Elementary Procedure Alarm**

Name: <b>Alarm</b>				
Code:	Issued by:	Procedure class:	Download operation:	Download boot mode:



<b>0x07</b>	<b>Secondary device</b>	<b>2</b>	<b>Yes</b>	<b>Mandatory</b>
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**Table 6.6.5.2: Initiating Message Parameters for Alarm**

Number	Length	Type	Description
<b>2 i – 1</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>Return code i; see annex A</b>
<b>2 I</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>State flag i</b>

**i = 1 ... N**

**Description:**

The secondary device uses this procedure to report alarms to the primary device. An alarm procedure is performed if an error state has changed since the previous alarm message. All return codes marked as alarms in Annex A of this TS may be used in the initiating message.

**Initiating message data format:**

<ReturnCode1><StateFlag1>...<ReturnCodeN><StateFlagN>

## 6.7 Multi-Antenna Elementary Procedures

### 6.7.1 Antenna Calibrate

**Table 6.7.1.1: Elementary Procedure Antenna Calibrate**

Name: <b>AntennaCalibrate</b>				
Code: <b>0x80</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.1.2: Initiating Message Parameters for Antenna Calibrate**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Integer</b>	<b>Antenna number</b>

**Description:**

On receipt of the initiating message the secondary device shall perform a calibration of the antenna addressed by the antenna number. During the calibration the actuator is driven through the whole tilt range of the antenna.

The response time to this Antenna Calibrate procedure shall be less than 4 minutes.

**Initiating message data format:**

<antenna number>

**Response message data format:**

<antenna number><OK>

**Response message data format upon error:**

<antenna number><FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, Busy, DataError, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTError, UnknownProcedure, UnknownAntennaNumber, DownloadInProgress

**6.7.2 Antenna Set Tilt****Table 6.7.2.1: Elementary Procedure Antenna Set Tilt**

Name: <b>AntennaSetTilt</b>				
Code: <b>0x81</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.2.2: Initiating Message Parameters for Antenna Set Tilt**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Integer</b>	<b>Antenna number</b>
<b>2</b>	<b>2 octets</b>	<b>16-bit signed little-endian</b>	<b>Tilt value</b>

**Description:**

On receipt of the initiating message the secondary device shall set the electrical tilt of the antenna addressed by the antenna number in increments of 0.1°. The electrical tilt value describes the elevation angle between the direction orthogonal to the antenna element axis and the maximum of its main beam in the elevation plane. A positive electrical tilt angle means that the antenna beam is directed below the direction orthogonal to the antenna axis.

The secondary device shall respond to the initiating message in less than 2 minutes.

The format of the provided tilt value is a 2-complement 16 bit signed number sent in little-endian order. Tilt values are given in 0.1° increments starting from zero, for example: Tilt 3.2° is 0x0020, Tilt – 3.2° is 0xFFE0.

**Initiating message data format:**

<antenna number><TiltLowOctet><TiltHighOctet>

**Response message data format:**

<antenna number><OK>

**Response message data format upon error:**

<antenna number><FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, Busy, DataError, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, OutOfRange, PositionLost, RAMError, UARTError, UnknownProcedure, UnknownAntennaNumber, DownloadInProgress

## 6.7.3 Antenna Get Tilt

**Table 6.7.3.1: Elementary Procedure Antenna Get Tilt**

Name: <b>AntennaGetTilt</b>				
Code: <b>0x82</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.3.2: Initiating Message Parameters for Antenna Get Tilt**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Integer</b>	<b>Antenna number</b>

### Description:

On receipt of the initiating message the secondary device will return the current tilt value of the antenna addressed by the antenna number.

The returned tilt value is given in increments of 0.1° in the format specified in section 6.7.2.

### Initiating message data format:

<antenna number>

### Response message data format:

<antenna number><OK><TiltLowOctet><TiltHighOctet>

### Response message data format upon error:

<antenna number><FAIL><ReturnCode1>...<ReturnCodeN>

### Applicable return codes:

ActuatorDetectionFail, Busy, DataError, DeviceDisabled, EEPROMError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTError, UnknownProcedure, UnknownAntennaNumber, DownloadInProgress

## 6.7.4 Antenna Set Data

**Table 6.7.4.1: Elementary Procedure Antenna Set Data**

Name: <b>AntennaSetData</b>				
Code: <b>0x83</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.4.2: Initiating Message Parameters for Antenna Set Data**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Integer</b>	<b>Antenna number</b>
<b>2</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>Field number; see annex B</b>

3	See annex B	See annex B	Data to write
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**Description:**

On receipt of the initiating message the secondary device should write the provided data for the antenna addressed by the antenna number into the fields optionally provided for configuration data and listed in annex B of this TS. If an attempt is made to write to fields which are not supported by a particular device no error is returned but the data for those fields is ignored. If an attempt is made to write to fields which are not supported for the addressed antenna the return code UnknownParameter is returned and the data for those fields is ignored.

**Initiating message data format:**

<antenna number><field number><data octets for field>

**Response message data format:**

<antenna number><OK>

**Response message data format upon error:**

<antenna number><FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, DataError, DeviceDisabled, EEPROMError, FlasheError, OtherHardwareError, OtherSoftwareError, OutOfRange, RAMErrror, UARTErrror, UnknownProcedure, ReadOnly, UnknownParameter, UnknownAntennaNumber, DownloadInProgress

## 6.7.5 Antenna Get Data

**Table 6.7.5.1: Elementary Procedure Antenna Get Data**

Name: <b>AntennaGetData</b>				
Code: <b>0x84</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.5.2: Initiating Message Parameters for Antenna Get Data**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Integer</b>	<b>Antenna number</b>
<b>-i</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>Field number to read; see annex B</b>

**i = 1 ... N**

**Description:**

On receipt of the initiating message the secondary device shall return the data stored for the addressed antenna in the fields for configuration data specified by the field numbers in the initiating message and listed in annex B of this TS. The field numbers are not necessarily contiguous or ordered. For field numbers which are not supported by the secondary device for the addressed antenna no data is returned for that field.

**Initiating message data format:**

<antenna number><field number 1><field number 2> ...<field number N>

**Response message data format:**

<antenna number><OK><field number 1><data octets for field number 1><field number 2><data octets for field number 2> ... <field number N><data octets for field number N>

**Response message data format upon error:**

<antenna number><FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, DataError, DeviceDisabled, EEPROMError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTErrror, UnknownProcedure, UnknownAntennaNumber, DownloadInProgress

## 6.7.6 Antenna Alarm

**Table 6.7.6.1: Elementary Procedure Antenna Alarm**

Name: <b>AntennaAlarm</b>				
Code: 0x85	Issued by: <b>Secondary device</b>	Procedure class: <b>2</b>	Download operation: <b>Yes</b>	Download boot mode: <b>Mandatory</b>

**Table 6.7.6.2: Initiating Message Parameters for Antenna Alarm**

Number	Length	Type	Description
<b>1</b>	<b>1 octet</b>	<b>Integer</b>	<b>Antenna number</b>
<b>2 i – 1</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>Return code i; see annex A</b>
<b>2 i</b>	<b>1 octet</b>	<b>Hexadecimal</b>	<b>State flag i</b>

**i = 1 ... N**

**Description:**

The multi-antenna secondary device uses this procedure to report antenna alarms to the primary device. This procedure shall only be performed if the secondary has performed an AlarmSubscribe procedure since its latest reset. Multi-antenna devices shall use this *AntennaAlarm* procedure only for multi-antenna specific alarms and the *Alarm* procedure in subclause 6.6.5 for the other alarms.

**Initiating message data format:**

<antenna number><ReturnCode1><StateFlag1>...<ReturnCodeN><StateFlagN>

## 6.7.7 Antenna Clear Active Alarms

**Table 6.7.7.1: Elementary Procedure Clear Antenna Alarms**

Name: <b>AntennaClearActiveAlarms</b>				
Code: 0x86	Issued by: <b>Secondary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.6.2: Initiating Message Parameters for ClearAntenna Alarm**

Number	Length	Type	Description
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1	1 octet	Integer	Antenna number
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**Description:**

On receipt of the initiating message the secondary device first clears all stored alarm information for the addressed antenna and then returns a procedure response message.

**Initiating message data format:**

<antenna number>

**Response message data format:**

<antenna number><OK>

**Response message data format upon error:**

<antenna number><FAIL><ReturnCode1>...<ReturnCodeN>

**Applicable return codes:**

Busy, FlashEraseError, FlashError, OtherHardwareError, OtherSoftwareError, RAMErrors, UARTError, UnknownParameter, DownloadInProgress.

## 6.7.8 Antenna Get Error Status

**Table 6.5.2.1: Elementary Procedure Antenna Get Error Status**

Name: <b>AntennaGetErrorStatus</b>				
Code: <b>0x87</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>No</b>

**Table 6.5.2.2: Initiating Message Parameters for Get Error Status**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

**Description:**

On receipt of the initiating message the secondary device reports back the return codes for the addressed antenna corresponding to the active errors in the secondary device to the primary device.

**Initiating message data format:**

No data carried.

**Response message data format:**

<antenna number><OK><ReturnCode1>...<ReturnCodeN>

**Response message data format upon error:**

<antenna number><FAIL><ReturnCode1><ReturnCode2>...<ReturnCodeN>

**Applicable return codes:**

ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, EEPROMError, FlashEraseError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTErrors, Busy, DataError, DeviceDisabled, UnknownParameter, WorkingSoftwareMissing, DownloadInProgress

NOTE1: ActuatorDetectionFail, ActuatorJamPermanent, ActuatorJamTemporary, EEPROMError, FlashEraseError, FlashError, NotCalibrated, NotScaled, OtherHardwareError, OtherSoftwareError, PositionLost, RAMError, UARTErrors WorkingSoftwareMissing may be part of OK response message

NOTE2: Busy, DataError, DeviceDisabled, UnknownParameter, OtherHardwareError, OtherSoftwareError, FlashError, RAMError, UARTErrors, DownloadInProgress may be part of FAIL response message.

## 6.7.9 Antenna Get Number Of Antennas

**Table 6.7.5.1: Elementary Procedure Antenna Get Number Of Antennas**

Name: <b>AntennaGetNumberOfAntennas</b>				
Code: <b>0x88</b>	Issued by: <b>Primary device</b>	Procedure class: <b>1</b>	Download operation: <b>No</b>	Download boot mode: <b>Optional</b>

**Table 6.7.5.2: Initiating Message Parameters for Antenna Get Data**

Number	Length	Type	Description
<b>None</b>	<b>0 octets</b>	<b>None</b>	<b>No data carried</b>

### Description:

On receipt of the initiating message the secondary device shall return the number of antennas it controls.

### Initiating message data format:

No data carried.

### Response message data format:

<OK><number of antennas>

### Response message data format upon error:

<FAIL><ReturnCode1>...<ReturnCodeN>

### Applicable return codes:

Busy, DataError, DeviceDisabled, EEPROMError, FlashError, OtherHardwareError, OtherSoftwareError, RAMError, UARTErrors, UnknownProcedure, UnknownAntennaNumber, DownloadInProgress

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## 7 Unknown Elementary Procedures

If a secondary device is unable to recognise an initiating message, the secondary device shall respond as follows:

### Response message data format:

<FAIL><ReturnCode for UnknownProcedure>

## Annex A (normative): Return Codes for Secondary Devices

**Table A.1: Return Codes for Secondary Devices**

Code	Meaning		Alarm	Software Download	Download Boot Mode
0x00	OK	Normal response		X	X
0x01	Actuator Detection Fail	Signals from the actuator are detected but are abnormal, for example due to failed calibration.	X		
0x02	Actuator Jam Permanent	Actuator cannot be moved permanently.	X		
0x03	Actuator Jam Temporary	Actuator jam has been detected. No movement was detected in response to the normal stimulus.	X		
0x04	Block Number Sequence Error	Used in combination with software download; block number sequence is wrong.			
0x05	Busy	The device is busy and cannot respond until an activity is complete.			
0x06	Checksum Error	Used in combination with software download; checksum incorrect.			
0x07	Procedure Sequence Error	Used in combination with software download; procedure sequence is not permitted, e.g. a SetTilt procedure is received during software update sequence.			
0x08	Data Error	RET AP data fault, e.g. length of data is inconsistent with length fields.			
0x09	Device Disabled	Device is in logical Disabled state and cannot execute Set procedures.			
0x0A	EEPROM Error	EEPROM error detected	X	X	X
0x0B	FAIL	Abnormal response. Indicates that a procedure has not been executed.		X	X
0x0C	Flash Erase Error	Used in combination with software download; indicates error when erasing flash memory.	X	X	X
0x0D	Flash Error	Used in combination with software download; indicates error when writing to flash memory.	X	X	X
0x0E	Not Calibrated	The device has not completed a calibration operation, or calibration has been lost.	X		
0x0F	Not Scaled	No setup table has been stored in the device.	X		
0x11	Other Hardware Error	Any hardware error which cannot be classified.	X	X	X
0x12	Other Software Error	Any software error which cannot be classified.	X	X	X
0x13	Out of Range	A given parameter (e.g. tilt value or memory offset) is out of range.			
0x14	Position Lost	RET controller is unable to return a correct position value, for example there was a power failure while a SetTilt procedure was being executed.	X		



0x15	RAM Error	An error was detected in reading data to/from RAM	X	X	X
0x16	Segment Number Sequence Error	Used in combination with software download; block sequence number is wrong.			
0x17	UART Error	Hardware specific. This error may be sent after recovery from a temporary error which has prevented the sending or receiving of data.	X	X	X
0x19	Unknown Procedure	Received procedure is not defined in the 3GPP release version		X	X
0x1D	Read Only	Used in combination with SetDeviceData procedure when the device parameter cannot be changed		X	X
0x1E	Unknown Parameter	Specified parameter is not supported for the used procedure. Used as a response to SetDeviceData if an attempt is made to set an unsupported field			
0x1F	Unknown Antenna Number	Specified antenna number for mult-antenna devices is not supported			
0x20	Too Much Data	More data received during software download than can be stored		X	X
0x21	Working Software Missing	Application code is missing or broken. The unit is in boot mode and may be supporting a limited set of commands. Returned upon unknown procedure when in boot mode.	X		X
0x22	Invalid Software	Application code being downloaded is detected to be of wrong type. Download of the application code will not be permitted.		X	X
0x23	Download In Progress	Used instead of UnknownProcedure during software download as response to all commands not supported in boot mode. May also be useful for one physical unit co-siting of several logical units to indicate that other logical units cannot be operated until software download has finished.		X	

## Annex B (normative): Assigned Fields for Additional Data

The following standard fields have no operational impact and are used by the procedures SetDeviceData and GetDeviceData. Little-endian order is used for storage of multiple-octet numbers. Where ASCII variables are shorter than the assigned field lengths the characters are right aligned and leading blanks are filled with null characters (0x00).

**Table B.1: Assigned Fields for Additional Data**

Field No.	Length (octets)	Format	Description
0x01	15	ASCII	Antenna model number
0x02	17	ASCII	Antenna serial number
0x03	2	16-bit unsigned	Antenna frequency band(s): see below
0x04	3	3 x 8-bit unsigned	Beamwidth for each band in frequency order (deg) (example 800/900MHz, 1800/1900MHz, 2100MHz)
0x05	3	3 x 8-bit unsigned	Gain for each band in frequency order (dB/10) (example 800/900MHz, 1800/1900MHz, 2100MHz)
0x06	2	16-bit signed	Maximum supported tilt (degrees/10), Format as in section 6.11
0x07	2	16-bit signed	Minimum supported tilt (degrees/10), Format as in section 6.11
0x21	6	ASCII	Installation date
0x22	5	ASCII	Installer's ID
0x23	12	ASCII	Base station ID
0x24	4	ASCII	Sector ID
0x25	2	16-bit unsigned	Antenna bearing
0x26	1	8-bit signed	Installed mechanical tilt (degrees/10)

**Table B.2: Coding for Antenna Frequency Bands in Field 0x03**

Bit No	Frequency band(MHz)
1	800
2	900
3	1500
4	1800
5	1900
6	2100

7 and above	Reserved
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Examples of frequency bands:

0000 0000 0001 0000 = 1800MHz,

0000 0000 0001 1100 = 1800, 1900 and 2100MHz

# Annex C (normative): Procedure Sequence for Download of Software to a Secondary Device

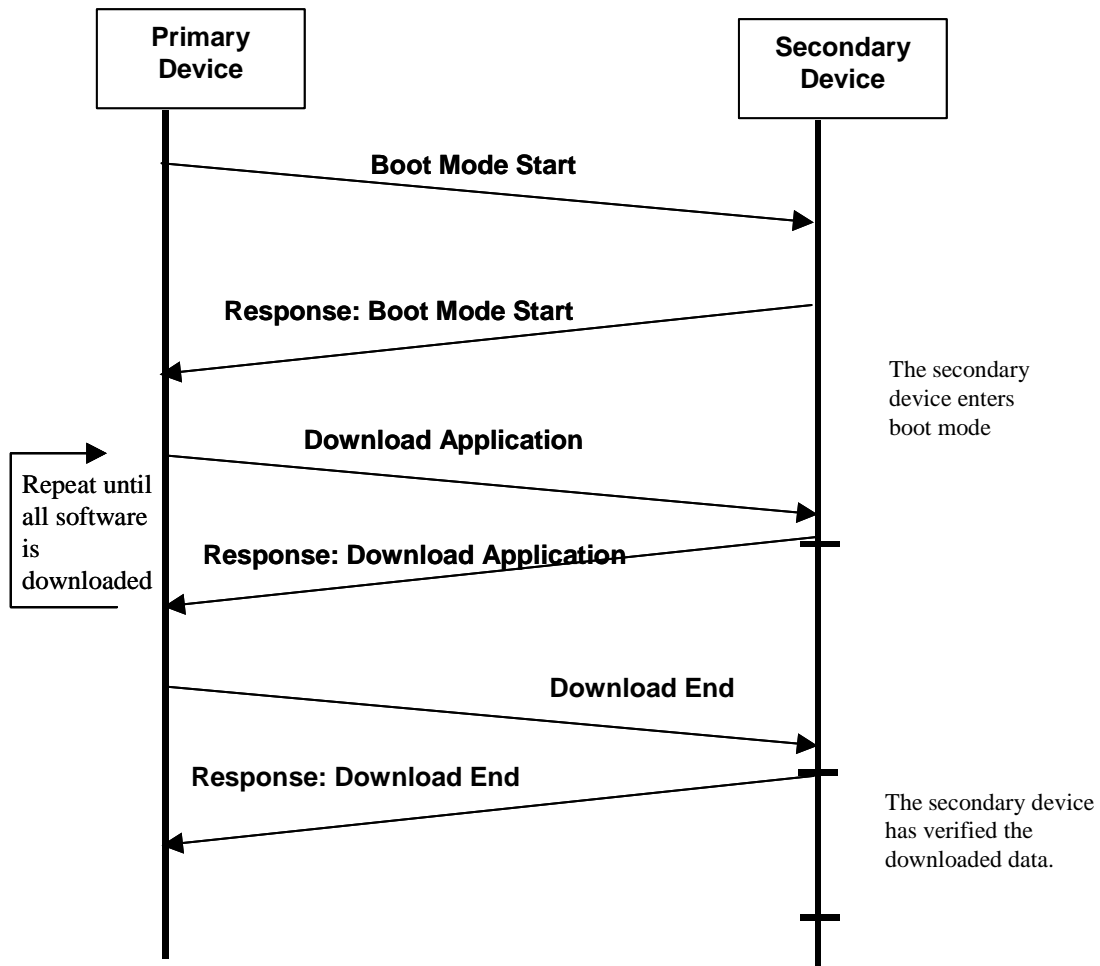


Figure C.1: Procedure Sequence for Software Download.

## Annex D (informative): Overview of Elementary Procedures

**Table D.1: Elementary Procedures and Procedure Codes**

Elementary Procedure	Procedure Code	Issued by	Download boot mode operation
<u>Common Procedure Set</u>			
(Reserved)	0x01		
Reset Software	0x03	primary device	mandatory
Get Error Status	0x04	primary device	mandatory
Get Information	0x05	primary device	mandatory
Clear Active Alarms	0x06	primary device	mandatory
Read User Data	0x10	primary device	optional
Write User Data	0x11	primary device	optional
Alarm Subscribe	0x12	primary device	mandatory
Self Test	0x0A	primary device	optional
Set Device Data	0x0E	primary device	optional
Get Device Data	0x0F	primary device	optional
Boot Mode Start	0x40	primary device	mandatory
Download Application	0x41	primary device	mandatory
Download End	0x42	primary device	mandatory
<u>Single-Antenna Procedure Set</u>			
Calibrate	0x31	primary device	optional
Send Configuration Data	0x32	primary device	optional
Set Tilt	0x33	primary device	optional
Get Tilt	0x34	primary device	optional
Alarm	0x07	secondary device	mandatory
<u>Multi-Antenna Procedure Set</u>			
Antenna Calibrate	0x80	primary device	optional
Antenna SetTilt	0x81	primary device	optional
Antenna GetTilt	0x82	primary device	optional
Antenna SetData	0x83	primary device	optional
Antenna GetData	0x84	primary device	optional
Antenna Alarm	0x85	secondary device	mandatory

NOTE: The notion mandatory in the download boot mode operation indicates that the listed procedures are mandatory if the download boot mode state can be entered by the secondary device.

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## Annex E (informative): Change history

Change history							
Date	TSG #	TSG Doc.	CR	Rev	Subject/Comment	Old	New
September 2004	TSG-RAN#25	RP-040304	-	-	presentation to TSG-RAN for information	-	1.0.0