KWS | ELECTRONIC TEST EQUIPMENT GMBH

APPLICATION NOTE AN 001

SNMP-Remote-Control

KWS | GERMAN ENGINEERING

Contents

Chapter 1

About this document

This document contains information about the "SNMP Remote Control" software option of the antenna measuring receivers of type AMA310.

1.1 Revisions

V00.01 July 2010
First release
V00.02 January 2015
New features transport stream data, device management and analyzer control added
V00.03 December 2017
New features regarding SNMPv3 and FTP

1.2 Reference documents

This application note refers to the following documents:

- AMA310 Antenna Measuring Receiver operating manual

1.3 Contact with the manufacturer

For current information about products from KWS-Electronic, visit our website at **www.kws-electronic.de**. All contact details can also be found there.

Chapter 2

Settings on the measuring receiver

2.1 Activation of SNMP

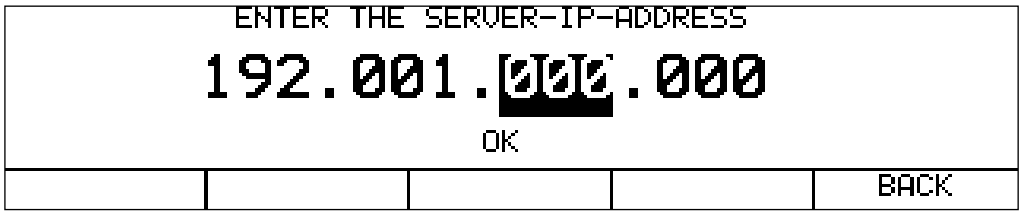
The "SNMP Remote Control" software option must be activated with an 8 digit key code on the measuring instrument. This must be requested from the manufacturer. Further information about entering the key code can be found in the operating manual for the measuring receiver in the "Instrument management" chapter under the "Activating software options" section.

2.2 Activation of FTP

The "FTP" software option must be activated with an 8 digit key code on the measuring instrument. This must be requested from the manufacturer. Further information about entering the key code can be found in the operating manual for the measuring receiver in the "Instrument management" chapter under the "Activating software options" section.

2.3 Setting of the IP address

The IP settings must be done before the measuring instrument is used in a network. For this you need IP-address, subnet-mask and standard-gateway.
These entries can be set through **MODE** -> **SETTINGS** -> **IPCONFIG** -> **IP-ADR**, **SUBNETMASK** acc. **STDGATEWAY**.



Use the numeric keypad to enter the address. After entering a position, confirm the entry by pressing **ENTER**. The cursor then jumps to the next position. Once the last position has been entered, the cursor jumps to OK. Now press the **ENTER** key a final time, causing the IP address to be stored.

After changing the IP configuration, you must switch the measuring instrument off and on again, so that the TCP/IP stack is initialized with the new setting.

Chapter 3

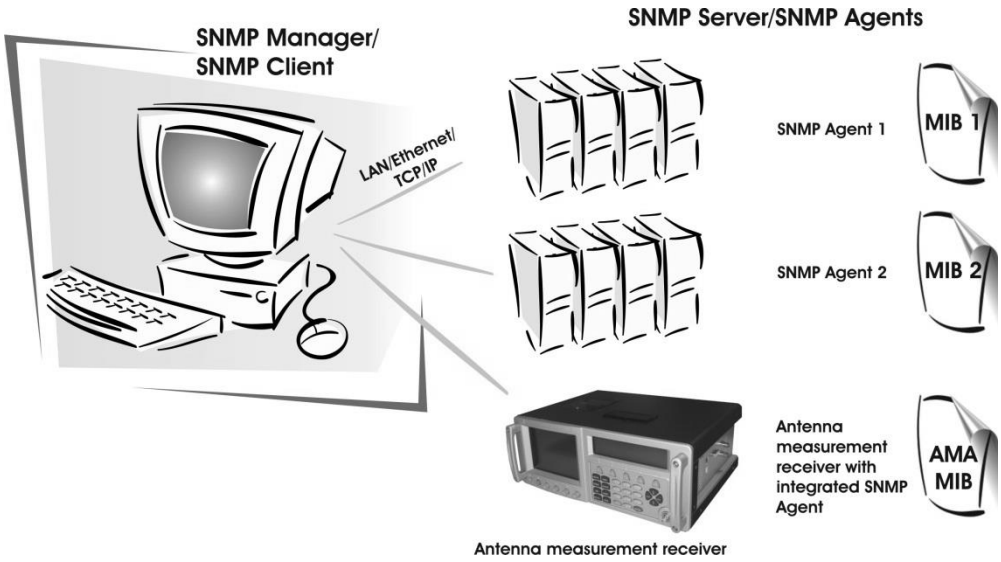
Function of SNMP

SNMP is based on the Internet Protocol (IP) and is available in three versions. The Internet standards are specified in Request for Comments documents (RFCs). Version 1 of the SNMP standard (SNMPv1), for example, is described in the documents RFC1155, RFC1156 and RFC1157. The measuring receiver's SNMP option uses SNMPv3.

A PC or network device on which SNMP-compatible network management software is installed is referred to as an SNMP Manager or SNMP Client. The network device to be monitored, such as a measuring receiver, is referred to as an SNMP Agent or SNMP Server. This client/server designation refers to the fact that the network device to be monitored, acting as a server, provides data and the monitoring program, acting as a client, retrieves this data. In the following, the network management system is referred to as the SNMP Manager and the device to be monitored is referred to as the SNMP Agent.

A network device is controlled by specifying and reading settings. A network device can also initiate "events" in order to provide information on particular incidents. SNMP primarily uses Set instructions (to specify settings) and Get instructions (to read settings, measured values and parameters) to control devices. The events that are initiated (that may be used for monitoring, for example) are referred to as "traps". The objects (mostly variables), which are required for control and monitoring, are represented by unique object identifiers (OIDs).

All OIDs are listed in a Management Information Base (MIB). The MIB is hierarchical (tree structure). Each node in the MIB tree has a name as well as a number and an OID holds all names and numbers up to the actual object. Certain MIB elements are standardized; however, a company may, for example, request a Private Enterprise Number (PEN) from the Internet Assigned Numbers Authority (IANA). According to the standard, the nodes up to the PENs are .iso(1).org(3).dod(6).internet(1).private(4).enterprise(1).



The manufacturer has the PEN 35128, for example, and the OID for the MER object of measuring receivers is .1 .3 .6 .1 .4 .1 .35128 .ama(1) .measuredValues(2) .amaMER(4). It is left up to the PEN holder to assign the OIDs after the PEN. This is carried out in a device-specific MIB. Strictly speaking, this MIB is a sub-MIB, which can normally be requested from the device manufacturer.

A (sub-) MIB is specified in a text file with the file extension .mib and the content of the file follows a predefined syntax. This ensures that an SNMP agent type can be made known to an SNMP Manager by reading in a MIB. The SNMP Manager can then manage all SNMP agents for which the read-in MIB applies. A particular network device is addressed via its IP address.

In case of SNMPv3 security mechanisms have been introduced with the User-Based Security Model (USM). Authentication and encryption are available. If authentication is active, the timeliness of the data is also checked. Apart from the assignment of a user name amaUsmUserName either no safety protocol can be active, only the authentication with the HMAC-SHA-96 protocol can be made or, in addition to the authentication, the encryption with AES-CFB-128 can secure the transmission. The HMAC-SHA-96 protocol combines with the Keyed-Hash Message Authentication Code (HMAC) an authentication algorithm with confidential key and the Secure Hash Algorithm (SHA), a group of standardized, cryptographic hash functions. AES-CFB-128 means that the power cipher mode Cipher Feedback Mode (CFB) is used for the block cipher Advanced Encryption Standard (AES) with a block length of 128 bits.

Chapter 4

AMA-MIB structure

The AMA MIB is divided into five sections.

- control:
This category includes all objects that are necessary for tuning the measuring receiver. Various objects need to be used, depending on the measuring range etc. The order in which the settings are specified corresponds to how the measuring receiver is operated. Furthermore, some of the objects in particular configurations do not need to be set, as these parameters are determined automatically by the measuring receiver.

- measuredValues:
Objects from this section return the measured values. The number of objects with valid measured values varies depending on the measuring range. For a tuned measuring instrument, the amaLevel object always returns a measured value for the level.

- receivedParameters:
These are parameters that are determined automatically by the measuring receiver. Here too, the number of objects with valid values varies depending on the measuring range.

- trapControl :
This is where the settings for sending trap messages are specified. The following three tables are provided for this: amaEventTable, amaAlarmTable and amaTrapTable. All settings relating to the event recipient are specified in the amaEventTable. The amaAlarmTable contains all information on the measurement parameters to be monitored and the amaTrapTable is used to monitor states, such as amaState.

- traps:
This section lists the traps that are sent by the measuring receiver when certain events occur.

-transportStreamData:
Some SI-table information from the MPEG data streams can be queried via this section. The data query initiates a Transport Stream analysis of the relevant table, the results of which are then transmitted.

- deviceManagement:
Instrument-specific data is transmitted via the deviceManagement objects. This includes the querying of serial numbers or setting up a key lock. In addition there is the USM table which allows specifying the security parameters for SNMPv3.

- analyzerControl:
Some of the settings in the spectrum analyze mode of the measuring receiver can be made via this section.

- fileTransferConfig:
The objects from this section can be used for data transmission by FTP. Among other things it is possible to specify a user name and a password for the FTP transmission.

To be able to receive measured values and parameters, the measuring receiver must have been tuned and therefore at least one control object set as an SNMP command. When a control object is set, SNMP functionality is activated in the measuring receiver and measured values and parameters can be read.

Chapter 5

Monitoring with trap messages

5.1 Initiating traps

As previously mentioned, an SNMP Agent can inform an SNMP Manager about an event that has occurred by initiating a trap. This makes it easier for the SNMP Manager to monitor SNMP Agents, as particular objects do not need to be cyclically queried. An SNMP Agent reports automatically to the SNMP Manager. Certain measured values and states can be monitored by the measuring receiver. More detailed information on the individual objects is contained in the AMA MIB.

According to the monitoring program of the measuring receiver (see "Monitoring Program" chapter in the operating manual of the measuring receiver), different measurement parameters can be monitored according to the measuring range:

Range	Operating mode	Monitored parameters
SAT		
	ATV	Level, S/N (only with S/N option)
	DVB-S	Level, MER, CBER, VBER, PE (packet errors)
	DVB-S2	Level, MER, CBER, LBER, PE (packet errors)
TV		
	ATV	Level, S/N (only with S/N option)
	DVB-C	Level, MER, BER, PE (packet errors)
	DVB-T	Level, MER, CBER, VBER, PE (packet errors)
	Euro-DOCSIS	Level, MER, BER, PE (packet errors)
	US-DOCSIS	Level, MER, VBER, PE (packet errors)
FM		Level
RC		Level

Furthermore, the locked/unlocked status can be controlled for digital reception.

5.1.1 AmaEventTable

The SNMP Manager must first prepare the SNMP Agent for sending traps. Entries made in the amaEventTable tell the SNMP Agent which SNMP Manager it should send traps to and in what form.

amaEventTable			
OID	**Access**	**Values with index 0**	**Values with index 1**
amaEventIndex	Read~	0	1
amaEventDescription	Read~/Write~	Description of the trap recipient	…
amaEventType	Read~/Write~	snmptrap(3)	
amaEventCommunity	Read~/Write~	Community string	
amaEventLastTimeSent	Read~	Always 0 (not yet implemented)	
amaEventOwner	Read~/Write~	IP address of the trap recipient	
amaEventStatus	Read~/Write~	valid(1), [createRequest(2), underCreation(3)], invalid(4)	

A free index can be determined by querying amaEventIndex, as an index that is unused returns the “no such value” error. amaEventCommunity and amaEventOwner are required entries. The remaining entries are optional as the amaEventType has so far always been “snmptrap”. Once all the information has been entered, the entries are concluded by setting amaEventStatus to “valid”. The event index used is subsequently required for the entries in the amaAlarmTable and amaTrapTable so that the trap recipient can be specified. If an SNMP Manager should no longer receive traps, the amaEventStatus with the respective index must be set to “invalid”. All entries in the amaAlarmTable and amaTrapTable, which specify this event index, are thereby also set to “invalid”.

Once a trap recipient has been set up, traps that are required can be specified by making entries in the amaAlarmTable and amaTrapTable. Here too, a free index can be determined by querying amaAlarmIndex or amaTrapIndex.

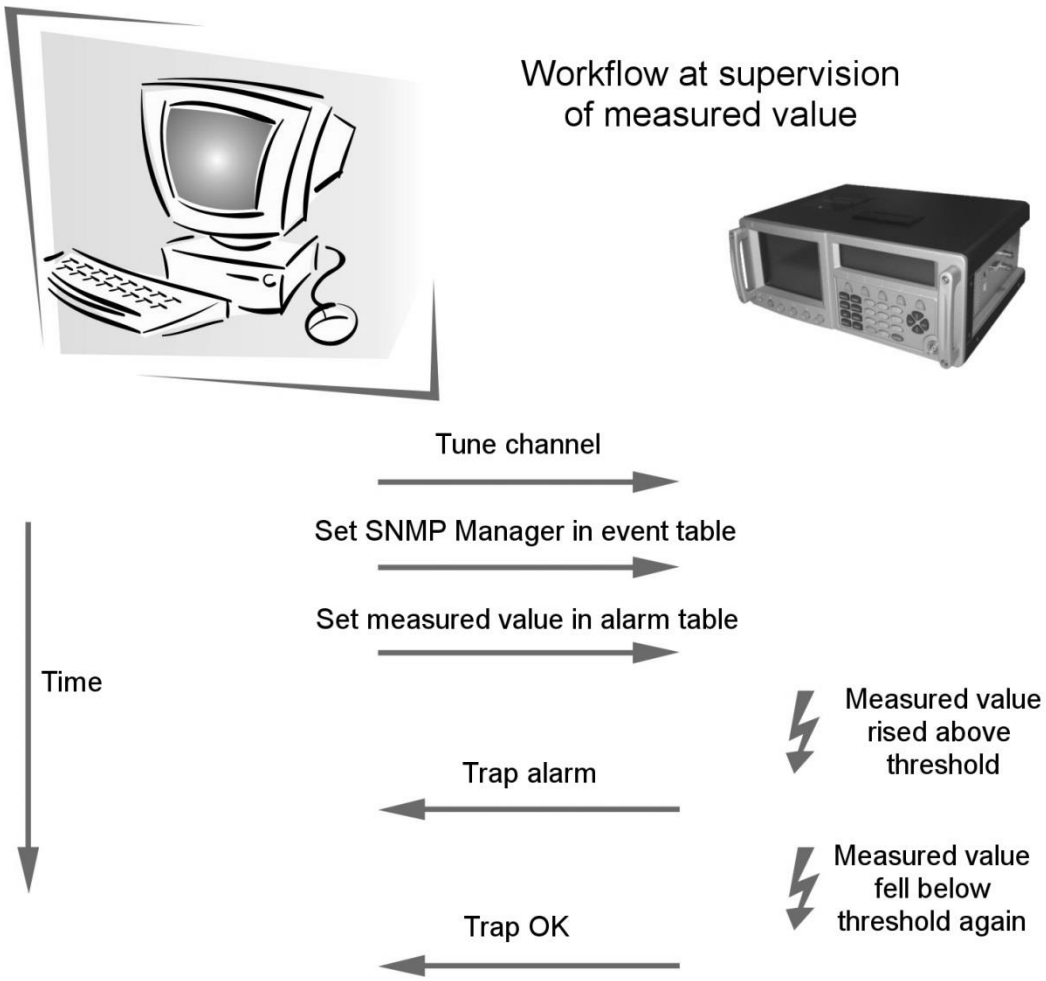
5.1.2 AmaAlarmTable

The amaAlarmVariable, amaAlarmSampleType, amaAlarmRisingThreshold or amaAlarmFallingThreshold and amaAlarmEventIndex entries are required in the alarm table.
The upper (amaAlarmRisingThreshold) and lower (amaAlarmFallingThreshold) threshold values may either be specified alone or together. In certain cases, there is no reason to specify one of the two threshold values and the respective value can be omitted.

amaAlarmTable			
OID	**Access**	**Values with index 0**	**Values with index 1**
amaAlarmIndex	Read~	0	1
amaAlarmVariable	Read~/Write~	OID of the measured value to be monitored	…
amaAlarmSampleType	Read~/Write~	absoluteValue(1), deltaValue(2)	
amaAlarmValue	Read~	Measured value at the time the threshold is exceeded	
amaAlarmRisingThreshold	Read~/Write~	Upper threshold value	
amaAlarmFallingThreshold	Read~/Write~	Lower threshold value	
amaAlarmEventIndex	Read~/Write~	Index of the associated event table entry	
amaAlarmStatus	Read~/Write~	valid(1), [createRequest(2), underCreation(3)], invalid(4)	

AmaAlarmEventIndex refers to the index of the event table entry, which describes the required trap recipient. Here too, the entries are concluded by setting the status object (in this case, amaAlarmStatus) to “valid”.

Entries in the alarm table trigger amaTrapAlarms when an upper or lower threshold value has been violated. If a monitored measured value falls within the threshold values again, the measuring receiver sends an amaTrapOK trap. If a measured value should no longer be monitored, the respective entry in the alarm table must be cancelled by setting amaAlarmStatus to “invalid”.



5.1.3 *AmaTrapTable*

In order to allow the measuring receiver's states to be monitored, amaTrapVariable and amaTrapEventIndex must be entered in the trap table. Here too, amaTrapEventIndex refers to the index of the event table entry, which describes the required trap recipient. The entries for an index are also once again concluded by setting the status object (in this case, amaTrapStatus) to “valid”. Threshold values do not need to be specified for the monitoring of states. Instead, an amaTrapState trap is triggered if the state to be monitored changes. If a state should no longer be monitored, the respective entry in the trap table must be cancelled by setting amaTrapStatus to “invalid”.

amaTrapTable			
OID	**Access**	**Values with index 0**	**Values with index 1**
amaTrapIndex	Read~	0	1
amaTrapVariable	Read~/Write~	OID of the state to be monitored	…
amaTrapValue	Read~	State at the time of the change	
amaTrapEventIndex	Read~/Write~	Index of the associated event table entry	
amaEventStatus	Read~/Write~	valid(1), [createRequest(2), underCreation(3)], invalid(4)	

5.2 *An example*

The following are specific examples of how the instrument must be set to send traps. In order to configure settings, an SNMP/network management program with which the AMA-MIB was read is required.

IP port 162 may have been blocked by a firewall and must be enabled to receive traps.
Furthermore, a trap reception program to represent the incoming traps must be activated. This usually involves tools or functions of the management program that only have to be started after all settings have been configured.

First, the measuring receiver is tuned on a digital transmitter for the following examples. The quickest way to achieve this is using a set command for the OID amaRecall on a tuning memory station on which a digital transmitter is stored. Get commands are used to check whether tuning was successful.

5.2.1 Configuring the measuring receiver

In order to notify the measuring receiver of the trap receiver, the following entries are made in the amaEventTable.

- **amaEventCommunity with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.1.1.4.0) **to 'public' value**
- **amaEventOwner with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.1.1.6.0) **to IP address of the trap receiver,** e.g. '192.1.1.0'. For example, the IP address of a Windows PC can be called via the entry prompt with ipconfig.
- **amaEventStatus with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.1.1.7.0) **to '1'** (valid) to complete the entries in this table line (line 0, because index 0).

In this way, all necessary specifications for the trap receiver are entered.

5.2.2 Monitoring the reception status

In order to monitor the locked/unlocked status, the following entries are entered in the amaTrapTable.

- **amaTrapVariable with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.3.1.2.0) **to OID to be monitored '.1.3.6.1.4.1.35128.1.3.1.0'**, currently only possible for amaState
- **amaTrapEventIndex with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.3.1.4.0) **to '0'**, corresponds to the table index of the trap receiver in the amaEventTable
- **amaTrapStatus with index 0** (.1.3.6.1.4.1.35128.1.4.3.1.5.0) **to '1'** (valid), to complete the entries in this table line (line 0, because index 0).

All required values for monitoring the locked/unlocked status are now set. A trap reception program/tool must now be activated. If the measuring instrument shifts to the unlocked status (e.g. triggered by disconnecting the measuring cable), a trap message can be received.

5.2.3 Monitoring the level

A measured value, e.g. the level, is monitored by entering the following in the amaAlarmTable:

- **amaAlarmVariable with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.2.1.2.0) **to OID to be monitored '.1.3.6.1.4.1.35128.1.2.1.0'**, corresponds to amaLevel
- **amaAlarmSampleType with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.2.1.3.0) **to '1'**, corresponds to "absolute value"
- **amaAlarmFallingThreshold with Index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.2.1.6.0) **to '30.0dBµV'**, a 'u' instead of 'µ' is also possible
- **amaAlarmEventIndex with Index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.2.1.7.0) **to '0'**, corresponds to the table index of the trap receiver in the amaEventTable
- **amaAlarmStatus with index 0** (i.e. OID: .1.3.6.1.4.1.35128.1.4.2.1.8.0) **to '1'** (valid), to complete the entries in this table line (line 0, because index 0).

In this way, all necessary specifications for monitoring when the level drops below 30.0dBµV have been made. A trap reception program/tool must also be activated here to be able to receive the trap message. If the level drops under 30.0dBµV (e.g. also triggered by disconnecting the measuring cable), the measuring receiver sends a message. You can also enter a value for the amaAlarmRisingThreshold, which triggers a trap message when the value specified has been exceeded.

Chapter 6

Transport Stream data queries

6.1 General data structure

The seven sections tsPATPMT, tsSDT, tsNIT, tsEIT, tsTDTTOT, tsBAT and tsLCNT all have similar structures. The status of every ama*XY*TTable table is specified (ama*XY*TState) as well as the number of table entries (ama*XY*TSize). It is also possible to query additional information about the whole table, for example, the Original Network ID for SDT and NIT.

The specific details about the sections are described in the chapter “Transport Stream Tables”.

6.1.1 Table status

A Transport Stream analysis of the desired table is initiated by querying the table status. A response will appear after varying lengths of time according to the volume of data and frequency of transmission.

The table status is shown as "idling" if the measurement receiver has just been tuned and the initial analysis of the MPEG data stream has not yet been completed. Interruption of the analysis due to the occurrence of CRC errors is indicated by “CRC errors”. The “time out" status means that, for a specific period of time, it was not possible to determine information about the desired table in the MPEG data stream.

If the Transport Stream analysis has been successfully completed, the table status “complete” appears and the remaining data can be queried.

6.1.2 Table size

The number of table entries indicates the length of the table. Since the OID index (the last number of the OID) cannot be larger than 127, the LCN table is divided into sections. The LCN list often has more than 127 entries and is therefore divided into sections with a size of 127.

6.1.3 Table content

Table entries cannot be queried with Get instructions, but only with GetNext or Walk commands. Once the table state has been recalled using a Get command for ama*XY*TState, the table is read, for example, using a Walk instruction for ama*XY*TTable. The table content is transmitted in columns. This means, firstly, that all ama*XY*TIndex indexes are received and then the remaining columns are transmitted with these indexes in the last position of the OID in each case.

As a result of dividing the amaLCNTTable into sections, this table is queried in a slightly different way, see chapter “Specific features of transmitting the amaLCNTTable”.

6.1.4 Specific features of transmitting the amaLCNTTable

The first section index is queried and at the same time internally set using a GetNext command for amaLCNTSectionIndex**.0**. Using a Walk instruction for amaLCNTIndex**.0**, a maximum of the first 127 rows of the table are read.

If the table has more than 127 entries and there is therefore a second section, then the switch can be made to the second section using GetNext for amaLCNTSectionIndex**.1**. In this case, the content of this section of the table is also read using GetNext or Walk from amaLCNTIndex**.0**. Proceed accordingly for additional sections.

The following illustrates this procedure by means of an example for an LCN table with 260 lines.

amaLCNTTable				
Row	amaLCNTTSID	amaLCNTOrgNID	…	amaLCNTBouquetName
1	1019	1		…
2	1011	…		…
…	…	…		…
127	1051	…		…
128	1203	43		…
…	…	…		…
254	1105	…		…
255	1105	55		…
…	…	…		…
260	1051	…		Bouquet 5152

This table is divided into two sections, each with 127 entries and one section with the remaining 6 lines.

amaLCNTTable					
GetNext OID	**Answer OID**	**Answer**	**Row**	**Column**	**OID Index**
amaLCNTSectionIndex.**0**	amaLCNTSectionIndex.**1**				
amaLCNTIndex.**0**	amaLCNTIndex.**1**	1	1	1	1
amaLCNTIndex.**1**	amaLCNTIndex.**2**	2	2	1	2
…	…	…	…	…	…
amaLCNTIndex.**126**	amaLCNTIndex.**127**	127	127	1	127
amaLCNTIndex.**127**	amaLCNTTSID.**1**	1019	1	2	1
amaLCNTTSID.**1**	amaLCNTTSID.**2**	1011	2	2	2
…	…	…	…	…	…
amaLCNTTSID.**126**	amaLCNTTSID.**127**	1051	127	2	127
amaLCNTTSID.**127**	amaLCNTOrgNID.**1**	1	1	3	1
…	…	…	…	…	…
amaLCNTSectionIndex.**1**	amaLCNTSectionIndex.**2**				
amaLCNTIndex.**0**	amaLCNTIndex.**1**	1	128	1	1
…	…	…	…	…	…
amaLCNTIndex.**126**	amaLCNTIndex.**127**	127	254	1	127
amaLCNTIndex.**127**	amaLCNTTSID.**1**	1203	128	2	1
…	…	…	…	…	…
amaLCNTTSID.**126**	amaLCNTTSID.**127**	1105	254	2	127
amaLCNTTSID.**127**	amaLCNTOrgNID.**1**	43	128	3	1
…	…	…	…	…	…
amaLCNTSectionIndex.**2**	amaLCNTSectionIndex.**3**				
amaLCNTIndex.**0**	amaLCNTIndex.**1**	1	255	1	1
amaLCNTIndex.**1**	amaLCNTIndex.**2**	2	256	1	2
…	…	…	…	…	…
amaLCNTIndex.**5**	amaLCNTIndex.**6**	6	260	1	6
amaLCNTIndex.**6**	amaLCNTTSID.**1**	1105	255	2	1
amaLCNTTSID.**1**	amaLCNTTSID.**2**	1105	256	2	2
…	…	…	…	…	…
amaLCNTTSID.**5**	amaLCNTTSID.**6**	1051	260	2	6
amaLCNTTSID.**6**	amaLCNTOrgNID.**1**	55	255	3	1
…	…	…	…	…	…
amaLCNTBouquetName.**5**	amaLCNTBouquetName.**6**	Bouquet 5152	260	10	6

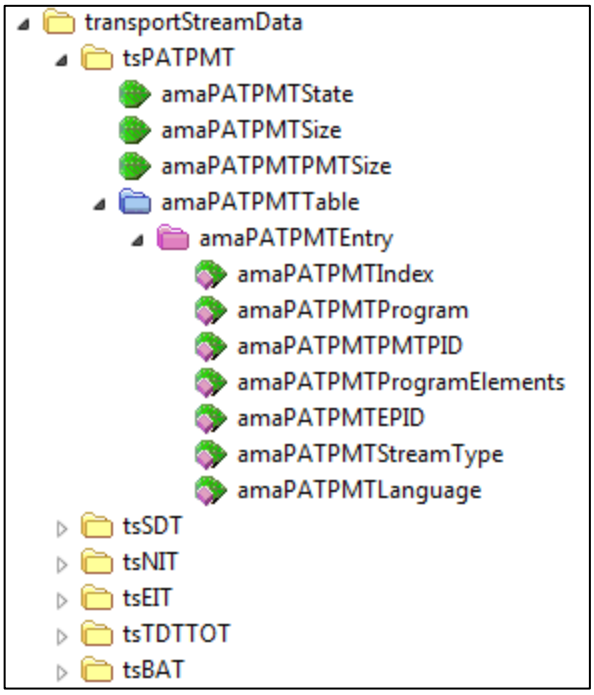
6.2 Transport Stream Tables

6.2.1 PATPMT

The Program Association Table (PAT) provides the correspondence between a program number and the PID value of the Transport Stream packets which carry the program definition. The program number is the numeric label associated with a program.

The Program Map Table provides the mappings between program numbers and the program elements that comprise them. A single instance of such a mapping is referred to as a “program definition”. The PMT is the complete collection of all program definitions for a Transport Stream.

Because the PAT contains program numbers, which are repeated in the PMT, these two tables are combined. The amaPATPMTPMTSize specifies the number of programs including the NIT.



The following figure shows an example of a PATPMT which has been logically recombined after being read in columns via SNMP.

PATPMT

State	complete
Size (amount of entries)	36
PMT Size (including NIT)	5

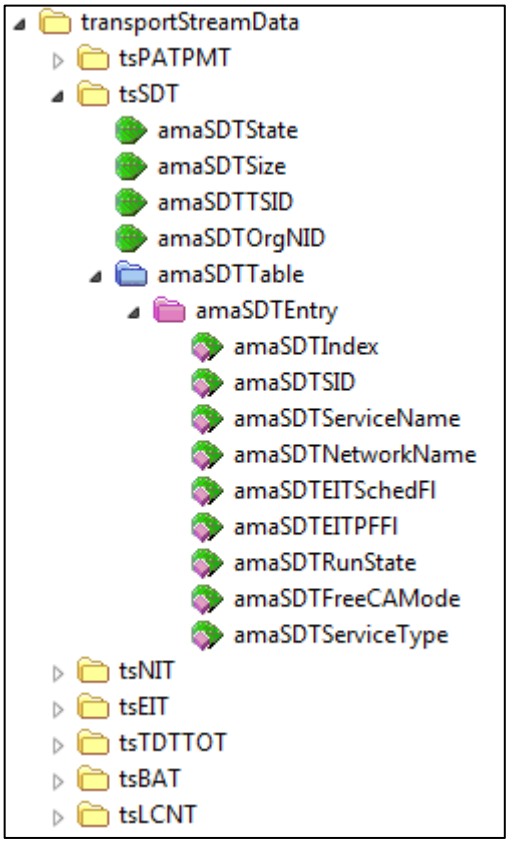
PATPMT Table:

Index	Program Number	PMT PID	Program Elements	Elementary PID	Streamtype	Language
1	10301	5100	10	5101	27 (Video MPEG4)	
2	10301	5100	10	5102	3 (Audio MPEG)	deu
3	10301	5100	10	5103	3 (Audio MPEG)	mis
4	10301	5100	10	5106	27142 (Audio AC-3)	deu
5	10301	5100	10	5104	6 (PRIV_PES, Teletext)	
6	10301	5100	10	5105	6 (PRIV_PES, Subtitle)	deu
7	10301	5100	10	1170	5	
8	10301	5100	10	2171	11	
9	10301	5100	10	5108	6	
10	10301	5100	10	5172	11	
11	10302	5110	10	5111	27 (Video MPEG4)	
12	10302	5110	10	5112	3 (Audio MPEG)	deu
13	10302	5110	10	5113	3 (Audio MPEG)	fra
14	10302	5110	10	5116	27142 (Audio AC-3)	mul
15	10302	5110	10	5117	3 (Audio MPEG)	mis
16	10302	5110	10	5114	6 (PRIV_PES, Teletext)	
17	10302	5110	10	5115	6 (PRIV_PES, Subtitle)	deu

6.2.2 SDT

A Service Description Table (SDT) shall describe services that are contained within a particular Transport Stream. The program number from the PATPMT equates to the service ID in the SDT.

In addition to the actual table, the Transport Stream ID and the Original Network ID are made available in the SDT section.



The following figure shows an example of an SDT, which has been recombined logically after being read in columns via SNMP.

SDT

State	complete
Size (amount of entries)	4
TS ID	1019
Original Network ID	1

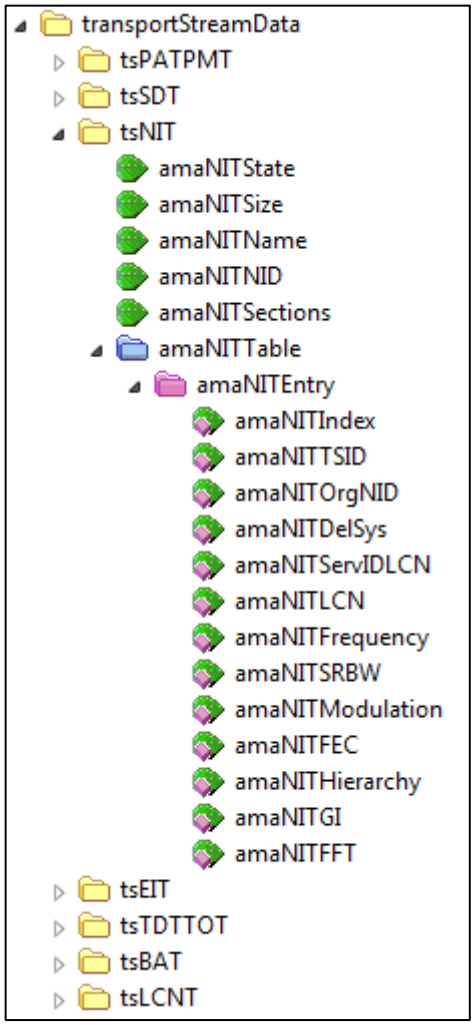
SDT Table:

Index	Service ID	Service Name	Network Name	EIT schedule flag	EIT p/f flag	Running Status	Free CA mode	Service Type
1	10301	Das Erste HD	ARD	1	1	4	0	25
2	10302	arte HD	ARD	1	1	4	0	25
3	10303	SWR BW HD	ARD	1	1	4	0	25
4	10304	SWR RP HD	ARD	1	1	4	0	25

6.2.3 NIT

The Network Information Table (NIT) conveys information relating to the physical organization of the multiplexes/Transport Streams carried via a given network, and the characteristics of the network itself. The combination of Original Network ID and Transport Stream ID allow each Transport Stream to be uniquely identified throughout the application area.

The NIT name, network ID and number of sections are added to the NIT. Provided logical channel numbering (LCN) information is present in the NIT, an LCN and the associated service ID are specified. The entire LCN table can be separately queried, see chapter “LCNT”.



The following figure shows an example of an NIT, which has been recombined logically after being read in columns via SNMP.

NIT

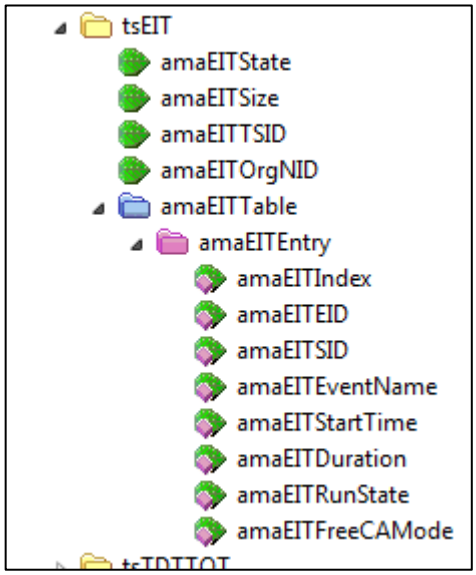
State	complete
Size (amount of entries)	45
Name	KWS
Network ID	1
NIT Sections	4

NIT Table:

Index	TS ID	ONID	Delivery System	Service ID LCN	LCN	Frequency	SR/BW	Modulation
1	1051	1	68	28724	11	113.000MHz	6900kBd	256QAM
2	1011	1	68	0	0	121.000MHz	6900kBd	256QAM
3	1078	1	68	0	0	130.000MHz	6900kBd	256QAM
4	1101	1	68	28106	1	346.000MHz	6900kBd	256QAM
5	1073	1	68	28206	15	354.000MHz	6900kBd	64QAM
6	1201	1	68	0	0	362.000MHz	6900kBd	64QAM
7	1093	1	68	0	0	370.000MHz	6900kBd	256QAM
8	1079	1	68	28006	2	378.000MHz	6900kBd	256QAM
9	1089	1	68	12003	5	386.000MHz	6900kBd	256QAM
10	1107	1	68	17500	4	394.000MHz	6900kBd	256QAM
11	33	133	68	0	0	402.000MHz	6900kBd	256QAM
12	5	133	68	0	0	410.000MHz	6900kBd	256QAM
13	1025	1	68	0	0	426.000MHz	6900kBd	256QAM

6.2.4 *EIT*

The Event Information Table (EIT) provides information in chronological order regarding the events contained within each service. The Transport Stream ID and the Original Network ID uniquely identify the Transport Stream.



The following figure shows an example of an EIT, which has been recombined logically after being read in columns via SNMP.

EIT

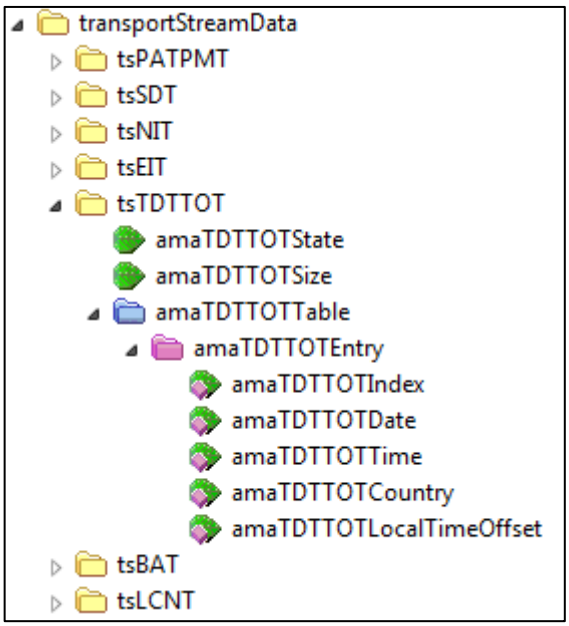
State	complete
Size (amount of entries)	8
TS ID	1019
Original Network ID	1

EIT Table:

Index	Event ID	Service ID	Event Name	Starttime	Duration	Running Status	Free CA mode
1	28585	10303	Eisenbahn-Romantik	2014/12/08 13:15:00	00:30:00	1	0
2	29099	10301	Tagesschau	2014/12/08 13:00:00	00:10:00	1	0
3	25087	10304	Planet Wissen: Wenn Frauen bra	2014/12/08 12:15:00	01:00:00	4	0
4	16549	10302	Wie das Land, so der Mensch	2014/12/08 11:50:00	00:30:00	1	0
5	28584	10303	Planet Wissen: Wenn Frauen bra	2014/12/08 12:15:00	01:00:00	4	0
6	29097	10301	ZDF-Mittagsmagazin	2014/12/08 12:00:00	01:00:00	4	0
7	25088	10304	Eisenbahn-Romantik	2014/12/08 13:15:00	00:30:00	1	0
8	16550	10302	ARTE Journal	2014/12/08 12:20:00	00:40:00	2	0

6.2.5 TDTTOT

The Time and Date Table (TDT) carries the UTC-time and date information. Additionally the Time Offset Table (TOT) includes the local time offset. Since both tables contain the UTC-time and date information, they are combined. The entry from the TOT can be identified by the presence of the local time offset information.



The following figure shows an example of a TDTTOT, which has been recombined logically after being read in columns via SNMP.

TDTTOT

State	complete
Size (amount of entries)	2

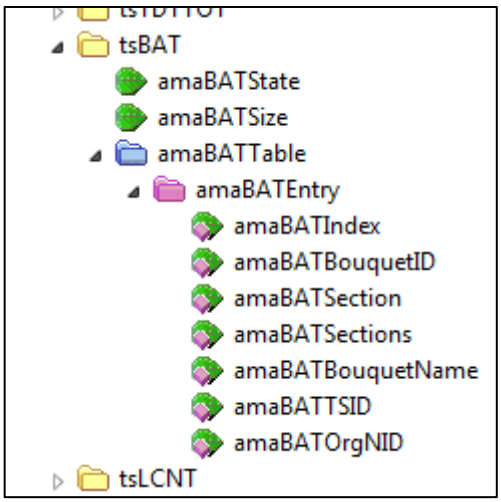
TDTTOT Table:

Index	Date	Time	Country	Local Time Offset
1	2014/12/08	12:26:03	DEU	+01:00
2	2014/12/08	12:26:03		

6.2.6 BAT

The Bouquet Association Table (BAT) provides information regarding bouquets. A bouquet is a collection of services, which may traverse the boundary of a network.

One application is the LCN information which, as in the NIT, can also be transmitted in the BAT. This data is not displayed in the BAT section, but in the LCNT section. After specifying a bouquet ID from the BAT using the control command amaBouquetID, the LCN data for the desired LCNT can be recalled (see chapter “LCNT”).



The following figure shows an example of a BAT, which has been recombined logically after being read in columns via SNMP.

BAT

State	complete
Size (amount of entries)	1

BAT Table:

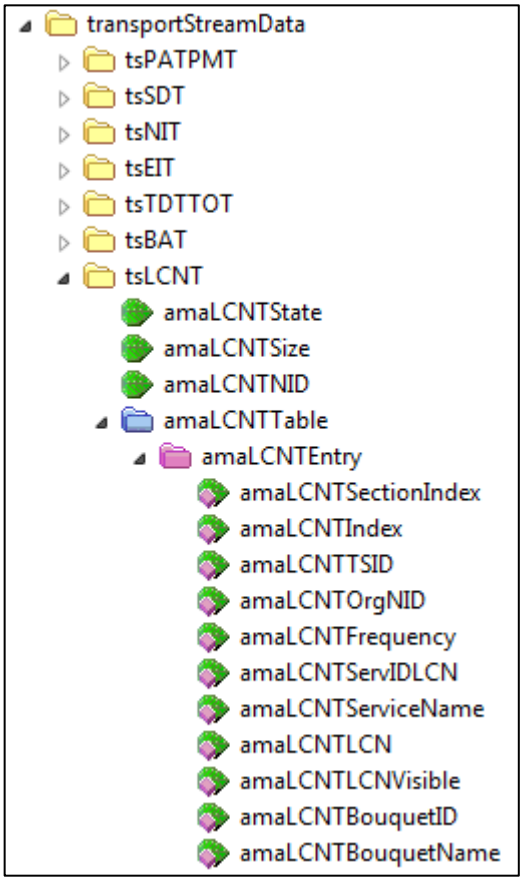
Index	Bouquet ID	Section	Sections	Bouquet Name	TS ID	ONID
1	1380	0	2	Bouquet 564 (1380)	6500	156
2	20818	0	5	Bouquet 5152 (20818)	5700	156
3	20820	4	6	Bouquet 5150 (20816)	4	133
4	20820	5	6	Bouquet 5150 (20816)	1019	1
5	20818	2	5	Bouquet 5152 (20818)	1093	1
6	20816	0	6	Bouquet 5150 (20816)	5700	156
7	20818	3	5	Bouquet 5152 (20818)	9	41028
8	20816	1	6	Bouquet 5150 (20816)	8500	156
9	20831	2	4	Bouquet 515F (20831)	1093	1
10	20816	2	6	Bouquet 5150 (20816)	1093	1
11	20831	3	4	Bouquet 515F (20831)	1201	1
12	20819	1	5	Bouquet 5153 (20819)	8500	156
13	20819	2	5	Bouquet 5153 (20819)	1093	1
14	20819	3	5	Bouquet 5153 (20819)	1201	1

6.2.7 LCNT

The intention of the Logical Channel Numbering (LCN) is to provide a broadcaster assigned virtual channel number for each of the services available. If a receiver supports LCN, the received services are sorted in a certain order according to the parameters.

Because a channel number is generally issued for each program, the LCNT is often longer than the other tables with transport information. The LCNT is therefore transmitted slightly differently than the other tables and is described in the chapter “Specific features of transmitting the amaLCNTTable”.

As already mentioned in the previous chapters, LCN information may be present in the NIT or in the BAT. If no settings are made on the measuring instrument, LCN data is searched for when querying amaLCNTState in the NIT. If a bouquet ID was established in the measuring instrument using the control command, the LCN information is filtered from the BAT with the aid of the relevant ID.



The following figure shows an example of an LCNT, which has been recombined logically after being read in columns via SNMP. The LCN information was acquired from the NIT, which is why a network IT and frequencies are displayed.

LCNT

State	complete
Size (amount of entries)	358
Network ID	61697

LCNT Table:

Index	TS ID	ONID	Frequency	Service ID LCN	Service Name	LCN	LCNVisible	Bouquet ID	Bouquet Name
1	1019	1	402,00MHz	10301		1	1	0	
2	1011	1	122,00MHz	11110		2	1	0	
3	1061	1	418,00MHz	10351		3	1	0	
4	7900	156	322,00MHz	301		4	1	0	
5	7900	156	322,00MHz	303		5	1	0	
6	7900	156	322,00MHz	304		6	1	0	
7	7900	156	322,00MHz	302		7	1	0	
8	6500	156	338,00MHz	417		8	1	0	
9	5700	156	330,00MHz	230		9	1	0	

The figure below shows an example of an LCNT with data from the BAT. A bouquet ID and name are shown.

LCNT

State	complete
Size (amount of entries)	301
Network ID	0

LCNT Table:

Index	TS ID	ONID	Frequency	Service ID LCN	Service Name	LCN	LCNVisible	Bouquet ID	Bouquet Name
1	1019	1		10301		1	0	20818	Bouquet 5152 (20818)
2	1011	1		11110		2	0	20818	Bouquet 5152 (20818)
3	7900	156		303		3	0	20818	Bouquet 5152 (20818)
4	7900	156		301		4	0	20818	Bouquet 5152 (20818)
5	7900	156		304		5	0	20818	Bouquet 5152 (20818)
6	6500	156		417		6	0	20818	Bouquet 5152 (20818)
7	7900	156		302		7	0	20818	Bouquet 5152 (20818)
8	6500	156		406		8	0	20818	Bouquet 5152 (20818)
9	5700	156		230	Kabel eins HD	9	0	20818	Bouquet 5152 (20818)

Information about service names are only specified for the Transport Stream to which the measuring instrument is tuned at the time of the data query.

Chapter 7

Access protection

7.1 Registering a user

It is possible to store a user name in the instrument via amaCurrentRemoteUser from the DeviceManagement section. Other users seeking to access the measuring instrument can establish whether a user is already using the instrument by querying this value.

This avoids several users operating a measurement receiver remotely without being aware of each other. It is recommended that meaningful user names are issued, in order to make it easier to identify the user.

7.2 Setting up a key lock

It can be sensible to set up a key lock if a measurement instrument is used both remotely as well as manually in the field. By setting amaKeyLock from the DeviceManagement section to “ON”, a key lock is activated on the device. A user in the field will initially no longer be able to use the keys. This prevents, for example, unintentional disruption of remote monitoring.

By pressing the keys HOME->3->1->0->ENTER on the measurement device, the key lock can be removed. An amaTrapState trap message is then sent from the measuring instrument to all trap receivers entered in the trap table. An SNMP Management program is therefore informed by means of manual access to the measurement instrument.

The key lock can also be removed remotely using the value “OFF” for amaKeyLock.

Chapter 8

Instrument mode

You can set the measuring receiver mode to normal measurement, analyzer, constellation diagram and scope display.

This is useful, for example, for screenshots. The user can then activate the analyzer, constellation diagram or scope display and create a BMP file remotely. This picture file is stored in the flash memory automatically and may be transmitted to a PC via FTP.

8.1 Analyzer

In order to activate the measuring instrument's analyzer, the “ANALYZMODE” is sent to amaDeviceMode from the DeviceManagement section. Using the relevant commands from the AnalyzerControl section, the measuring instrument can then be set to Freeze or MaxHold mode.

By sending “RECMODE” to amaDeviceMode, the device is switched back to normal operation.

8.2 Constellation diagram

The constellation diagram can be activated and deactivated using the control command amaConstDiag.

You should only switch to the constellation diagram display when the instrument is tuned to a digital channel or a modulated return channel.

8.3 Scope display

The control command amaScope switches the scope display on or off.

The switch to scope display is only successful with a tuned, analogue channel.

Chapter 9

Function of FTP

FTP is the abbreviation for File Transfer Protocol, just as SNMP it uses the IP protocol and serves for transmitting data via IP networks.

An instrument in the network which makes files available is called FTP server. A PC program which is able to up- or download files, serves as FTP client. Windows Explorer for example can be used as FTP client by entering “ftp://“ and the desired IP address of the FTP Server into the address bar.

It is possible to secure an FTP connection with a user name and a password. If this security is not required, the user name "anonymous" permits to publicly access an FTP server. In the measuring receiver the desired access data can be specified via SNMP with amaFTPUserName and amaFTPPassword in the section fileTransferConfig.

Chapter 10

File transmission

The memory space in the measuring instrument for data exchange is the flash memory. Files which are saved there, such as screenshots, tuning memory tables, channel tables, DataLogger files and UMS configuration files can be downloaded via FTP. To remotely generate files for downloading, settings can be made via SNMP. In addition FTP allows loading files transmitted to the measuring receiver, such as firmware files, tuning memory tables, channel tables and UMS configuration files via SNMP commands into the instrument.

10.1 Upload

10.1.1 General Procedure

To be able to remotely load files into the instrument, the files are first transmitted with an FTP client program to the measuring receiver. After successful transmission of the file the measuring instrument is induced to use the file from the flash memory. By setting the OID amaUploadedFileName via SNMP the measuring instrument is advised of the name of the file to be used. The file extension provides information on the desired use of the file. With the OIDs amaUploadedFileExecutionParam1…5 parameters for loading the file can be transmitted, if required. The setting of amaUploadedFileStartExecution to “1“ starts the loading process.

The OID amaUploadedFileExecutionState provides information on whether the loading was successful or failed. In the basic state “1” is provided for “idle” (idling circle). By starting the loading process the status is set to “2” for “executionStarted“ and after successful execution it is set to “3” for executionSuccessful. If no file name or no file extension has been set or the file could not been found, “4” is given for “errorNoFile”. If no file with the file extension stated in the file name set could be found on the flash drive, the file type cannot be edited, or - if verifiable - the file content is not valid, the status “5” for “errorWrongFile” is given. If the loading of the file failed, “6” for “errorExecutionFailed” is given. The following table shows the possible statuses and their meanings.

amaUploadedFileExecutionState		
Value	Meaning	Occurrence after
1	idle	Instrument start
2	executionStarted	amaUploadedFileStartExecution to “1“
3	executionSuccessful	Loading process successfully executed
4	errorNoFile	- File name not set
		- no file extension set
		- file not found
5	errorWrongFile	- no file with the file extension stated on the flash drive
		- File type cannot be edited
		- File content (if verifiable) not valid

10.1.2 Firmware Update via the Network

To perform a software update of the measuring instrument via the network, at first the relevant firmware file *.bin2 will be transmitted to the measuring instrument via FTP. For this purpose an FTP client program is started and a connection to the measuring instrument is established stating the relevant IP address. Then the firmware file will be transmitted, if desired with FTP user name and password, otherwise with the user name “anonymous”.

Via SNMP the file name including the file extension *.bin2 as amaUploadedFileName is given. The software update will be performed by setting amaUploadedFileStartExecution to “1“. By checking the amaUploadedFileExecutionState it can be seen when the update has been executed successfully, the return value is ”1” then.

As the measuring instrument is restarted after an update, an FTP connection has to be established again, if required.

10.1.3 Upload Channel Table via the Network

As in case of a firmware update (see chapter 10.1.2 Firmware Update via the Network) for the loading of a user channel table at first the file *.cha is transmitted via FTP. A user channel table can be generated with the PC software AMA.remote or after a blind scan in the measuring instrument.

Via SNMP the file name including the file extension *.cha is stated as amaUploadedFileName. The loading of the user channel table is executed by setting the amaUploadedFileStartExecution to “1”. By checking the amaUploadedFileExecutionState it can be seen when the loading process has been successful, the return value is “3“ then.

10.1.4 Upload Tuning Memory via the Network

As in case of a firmware update (see chapter 10.1.2 Firmware Updated via the Network) for loading a tuning memory table at first the file *.mem is transmitted via FTP. A tuning memory table can be generated with the PC software AMA.remote or in the measuring instrument.

Via SNMP the file name including the file extension *.mem is stated as amaUploadedFileName. The loading of the tuning memory table is executed by setting the amaUploadedFileStartExecution to “1”. By checking the amaUploadedFileExecutionState it can be seen when the loading process has been successful, the return value is “3” then.

10.1.5 Upload UMS Configuration File via the Network

As in case of a firmware update (see chapter 10.1.2 Firmware Update via the Network) for the loading of a file with the UMS settings, at first the file *.ums is transmitted via FTP. A UMS configuration file can be generated in the measuring instrument.

Via SMP the file name including the file extension *.ums is stated as amaUploadedFileName. The loading of the UMS configuration file is executed by setting amaUploadedFileStartExecution to “1”. By checking the amaUploadedFileExecutionState it can be seen when the loading process has been successful, the return value is “3” then.

10.2 Download

10.2.1 General Procedure

To be able to download files remotely from the measuring receiver, these first have to be available in the flash memory. Which file shall be generated for a download will be determined via SNMP by the file extension of the amaFileToDownloadName value. With the OIDs amaFileToDownloadGenerationParam1…5 parameters for generating the file can be transmitted, if required. By setting amaFileToDownloadStartGeneration to “1”, the generation of the file is started.

The OID amaFileToDownloadGenerationState gives information on the success or failure of the file generation. In the basic state “1” is given for “idle” (idling circle). By starting the generation process the status is set to “2” for “generationStarted” and after successful completion to “3” for “generationSuccessful”. If a file with the file name stated already exists, the value “4” for “errorFileAlreadyExists” is given. If not enough memory space is available, the value “5” for “errorNotEnoughMemorySpace” is transmitted. In this case files which are not required or have already been saved otherwise may be deleted via FTP to create memory space. If the file name is missing or no file extension has been given, the status is “6” for “errorFilenameInvalid”. If the generation of a file fails “7” is given for “errorGenerationFailed”, if the file system is not ready, the measuring instrument is in the wrong mode, the required data are not available, the activation of a certain option is missing or the generation failed. The following table summarizes the possible statuses and their meanings.

amaFileToDownloadGenerationState		
Value	Meaning	Occurrence after
1	idle	Instrument start
2	generationStarted	amaFileToDownloadStartGeneration to “1”
3	generationSuccessful	Generation process successfully completed
4	errorFileAlreadyExists	File name transmitted
5	errorNotEnoughMemorySpace	Generation process started
6	errorFilenameInvalid	- File name not set
		- No file extension set
7	errorGenerationFailed	- File system not ready
		- For BMP file no graphic display (analyzer, scope, …) active
		- For CHA file no user channel table exists
		- For XML file instrument not in measuring mode
		- For UMS file UMS option not activated
		- Generation of the file failed

10.2.2 Download Channel Table via the Network

Via SNMP the desired file name including the file extension *.cha is given as amaFileToDownloadName. The generation of the user channel table is executed by setting the amaFileToDownloadStartGeneration to “1”. By checking the amaFileToDownloadGenerationState it can be seen when the generation process has been successful, the return value is “3” then.

Subsequently the relevant channel table file *.cha can be downloaded via FTP from the measuring instrument. For this purpose an FTP client program is started and a connection to the measuring instrument is established stating the relevant IP address. Then the channel table file is transmitted, if desired with FTP user name and password, otherwise with the user name “anonymous”. A user channel table can be edited with the PC software AMA.remote or in the measuring instrument.

10.2.3 Download Tuning Memory via the Network

Via SNMP the desired file name including the file extension *.mem is given as amaFileToDownloadName. The generation of the tuning memory table is executed by setting amaFileToDownloadStartGeneration to “1”. By checking amaFileToDownloadGenerationState it can be seen when the generation process has been successful, then the return value is “3”.

As in case of a download of a user channel table (see chapter 10.2.2 Download Channel Table via the Network) also for the tuning memory the relevant tuning memory table can be transmitted subsequently via FTP. A tuning memory table can be edited with the PC software AMA.remote or in a measuring instrument.

10.2.4 Generate and Download Measurement Series via the Network

Via SNMP the desired file name including the file extension *.xml is stated as amaFileToDownloadName.

The tuning memory position from where the measurement series shall start can be specified as amaFileToDownloadGenerationParam1. The measurement series ends at the first empty tuning memory location or at the latest at the end of the tuning memory. If this parameter is not set, the measurement series starts with tuning memory location 1.

For data recording which is limited to the level, the amaFileToDownloadGenerationParam2 value can be set to “1“ for “Level Only“. If this parameter is not given, all values measured at the DataLogger will be saved.

The generation of the DataLogger file will be made by setting amaFileToDownloadStartGeneration to “1“. By checking the amaFileToDownloadGenerationState it can be seen when the generation process has been successful, then the return value is “3“.

As in case of a download of a user channel table (see chapter 10.2.2 Download Channel Table via the Network) also for the measurement series the relevant DataLogger file can subsequently be transmitted via FTP. A DataLogger file can be edited on the PC with a table calculation program or by the software AMA.remote. More exact details as to the measurement data memory can be found in the operating manual AMA310 Antenna Measurement Receiver.

10.2.5 Generate and Download Hardcopy Files via the Network

To save a copy of the current graphic screen as BMP file, at first the desired display will be activated. The following table shows the required settings for the relevant screenshot.

Display	Procedure
Analyzer	amaDeviceMode to „ANALYZMODE“
Scope	Tuning to analog channel and amaScope to “ON“
Constellation Diagram	Tuning to digital channel and amaConstDiag to „ON“
UMS Spectrum	Only in AMA 310/UMS amaDeviceMode to „ANALYZMODE“
UMS System Plan	Set amaDeviceMode to “UMSMODE“ and amaFileToDownloadGenerationParam1 to desired profile “1“ or ”2“.

Via SNMP the file name including the file extension *.bmp is given as amaFileToDownloadName.

The generation of the BMP file is executed by setting amaFileToDownloadStartGeneration to ”1“. By checking amaFileToDownloadGenerationState it can be seen when the generation process has been successful, then the return value is “3”.

The measuring instrument is set to the basic state again by cancelling the settings or by setting amaRestart to “1“.

As in case of a download of a user channel table (see chapter 10.2.2 Download Channel Table via the Network) also for the hardcopy the relevant BMP file can subsequently be transmitted via FTP. A BMP file can be opened with an image viewer program on the PC, for example.

10.2.6 Download a UMS Configuration File via the Network

Via SNMP the desired file name including the file extension *.ums will be given as amaFileToDownloadName. The generation of the UMS configuration file will be made by setting amaFileToDownloadStartGeneration to “1”. By checking the amaFileToDownloadGenerationState it can be seen when the generation process has been successful, then the return value is “3“.

As in case of a download of a user channel table (see chapter 10.2.2 Download Channel Table via the Network) also for the UMS settings the relevant UMS configuration file can subsequently be transmitted via FTP. A UMS configuration file can be loaded to another measuring instrument.

KWS Electronic Test Equipment GmbH
Tattenhausen · Raiffeisenstraße 9 · 83109 Großkarolinenfeld
Phone 00 49 .(0) 80 67 .90 37-0 · Fax 00 49 .(0) 80 67 .90 37-99
info@kws-electronic.de · **www.kws-electronic.com**