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TECHNICAL SPECIFICATION

**Digital cellular telecommunications system (Phase 2+) (GSM);
Network Management (NM)
procedures and messages on the A-bis interface
(3GPP TS 52.021 version 19.0.0 Release 19)**

3GPP™ A GLOBAL INITIATIVE
GSM® GLOBAL SYSTEM FOR MOBILE COMMUNICATIONS

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Contents

Foreword

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

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Introduction

(Background)

The use and general aspects of the A-bis interface are given in specification 3GPP TS 48.051. The split of telecommunications functions and management procedures between BSC and BTS are defined in specification 3GPP TS 48.052. Specification 3GPP TS 48.056 defines Layer 2 of the signalling messages.

The general aspects of NM are defined in specification GSM 12.00. Qx interface and protocol stack are defined in specification GSM 12.01. GSM 12.06 provides the functional requirements supported by the present document. The NM procedures and messages to support these operations over the A-bis interface are specified here. Specification GSM 12.20 provides the information model as seen on the OMC-BSC interface. Interworking between this model and the NM messages and procedures provided here is specified in GSM 12.22.

1 Scope

The present document addresses the network management messages and procedures across the A-bis interface, which is defined as Qx in GSM. The information model included here defines the objects and how they are addressed for purposes of operations and maintenance activities.

There is a requirement for the A-bis interface to be open to allow interoperation between BTSs of different manufacturers working to the same BSC. The present document addresses this requirement from O&M point of view, which allows this interworking to take place. It shows the split of NM functions between BSC and BTS. The procedures and coding of the messages are specified in detail. In practice, in addition to the present document it is necessary that the content of manufacturer-dependent information fields be specified to fulfill the functionality.

It is essential for operation that a BSC can handle the functions used by all its BTSs. Therefore, all items in the present document are considered mandatory unless otherwise indicated in the present document.

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 TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 44.006: "Mobile Station - Base Stations System (MS - BSS) Interface Data Link (DL) Layer Specification".

[3] 3GPP TS 24.008: "Mobile radio interface Layer 3 specification; Core network protocols; Stage 3".

[4] 3GPP TS 45.002: "Multiplexing and Multiple Access on the Radio Path".

[5] 3GPP TS 45.005: "Radio transmission and reception".

[6] 3GPP TS 45.008: "Radio subsystem link control".

[7] 3GPP TS 48.051: "Base Station Controller - Base Tranceiver Station (BSC-BTS) Interface General Aspects".

[8] 3GPP TS 48.052: "Base Station Controller - Base Tranceiver Station (BSC-BTS) Interface - Interface Principles".

[9] 3GPP TS 48.056: "BSC-BTS Layer 2 Specification".

[10] 3GPP TS 48.058: "Base Station Controler - Base Transceiver Station (BCS-BTS) Interface Layer 3 Specification".

[11] GSM 12.00 (GSM Phase 2): "Objectives and structure of Network Management (NM)".

[12] GSM 12.01 (GSM Phase 2): "Common aspects of GSM Network Management (NM)".

[13] GSM 12.06 (GSM Phase 2): "GSM Network Configuration Management and Administration".

[14] GSM 12.20 (GSM Phase 2): "Base Station System (BSS) Management Information".

[15] GSM 12.22 (GSM Phase 2): "Interworking of GSM Network Management (NM) procedures and messages at the Base Station Controller (BSC)".

[16] ITU-T Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".

3 Definitions and abbreviations

3.1 Definitions

Definitions of terms used within the present document may be found mostly in clause5 in text context.

3.2 Abbreviations

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

ASN.1	(CCITT) Abstract Syntax Notation One
BSC	Base Station Controller
BSS	Base Station System
BTS	Base Transceiver Station
cont.	continued
HW	Hardware
LSB	Least Significant Byte
man. dep.	manufacturer dependent (with upper and lower case adjusted as appropriate)
MMI	Man-machine Interface
MSB	Most Significant Byte
MSC	Mobile-services Switching Centre
NE	Network Element
NM	Network Management
O&M	Operations and Maintenance
OMC	Operations and Maintenance Centre
RF	Radio Frequency
SAPI	Service Access Point Indicator
SW	Software
TEI	Terminal End-point Identifier
TMN	Telecommunications Management Network
TSC	Training Sequence Code

Further GSM related abbreviations may be found in 3GPP TS 21.905 [1].

4 Functional Split between BSC and BTS

Functional split of management functions between BSC and BTS is shown in table 1.

Table 1/GSM 12.2: Split of management functions between BSC and BTS

	BSC	BTS
Fault Management		
BTS		
test request	X	-
test execution	-	X
test analysis	NS	-
fault detection	-	X
fault localization	X (note)	X
fault reporting	X	X
Link		
testing (req,ex,rpt)	NS	-
fault detection	X	X
fault localization	X	X
fault reporting	X	X
Configuration Management		
Hardware	control/monitor	control
Software	control/monitor	monitor
State	control/monitor	control/monitor
Parameters	control/monitor	monitor
Performance Management		
Collection	X	X (radio path only)
Reporting	X	X (radio path only)
Administration	X	-
Security Management (Access Control to BTS) BTS)		
Control	-	X
Monitoring	-	X

NOTE: When fault localisation is not possible at the BTS it must be deduced at the BSC.

Legend: Abbreviations:
NS = Not Specified;
req = request;
X = Function exists;
ex = execution
- = Function non-exists;
rpt = report

5 Information Model

5.1 Managed Objects

The BCF mentioned in 3GPP TS 48.052 and 3GPP TS 48.056 is the agent at the BTS end of the A-bis O&M interface. It has four different descriptions depending on the object that is managed: Site Manager, BTS, Radio Carrier and Baseband Transceiver.

This model describes how objects are managed across A-bis interface, but it doesn't specify how information is transferred inside the site. That is, the manner of communication between an object and objects under it is not specified in the present document.

As shown in Figure 1, the Object Classes used on the A-bis interface are a subset of those found under Site Manager on the OMC-BSC interface. The Object Classes are listed below and the functionalities that describe them are found in table 2.

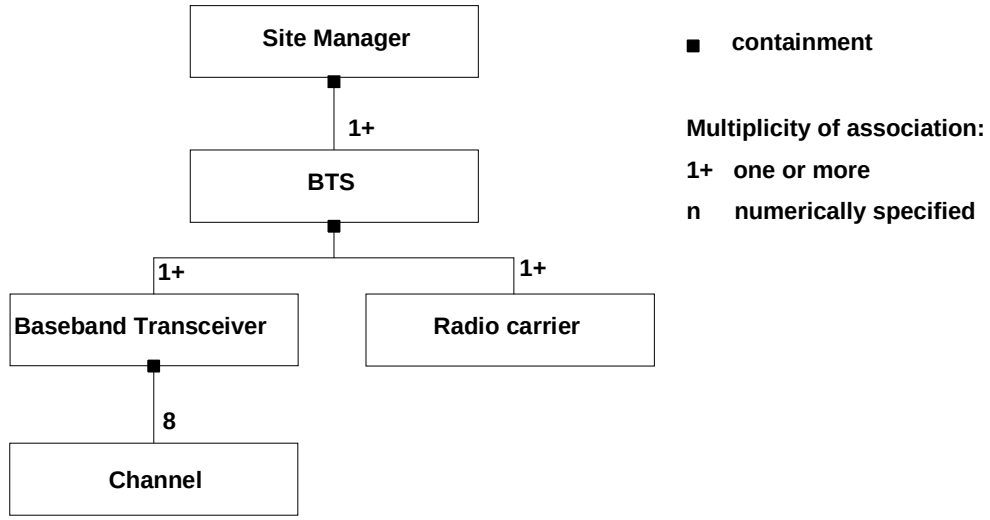
Site Manager: manages common control functions of several BTSs and transceivers on one site. These can include managing external alarms, front-end switch, etc. This model describes logical sites. There can be multiple logical sites in one physical site. Communication between entities within a logical site is manufacturer dependent.

BTS: is associated with one cell. BTSs are typically created at installation phase by connecting transceivers to antennas thus forming cells from the air interface point of view. The BTS can also contain control functions common to various transceivers. The way BTSs are formed from transceivers and how corresponding BTS numbers are determined is configuration dependent information, which is stored during installation.

Radio Carrier: represents manageable properties pertaining to radio transmission and reception of one carrier.

Baseband Transceiver: represents functions common to eight radio time slots.

Channel: is a physical channel in air interface, which can contain several logical channels depending on channel combination. A Channel is described with radio time slot and frequency hopping attributes (see 3GPP TS 45.002).



NOTE: Site Manager and BTS don't necessarily require separate equipment. For example, the Site Manager and a Baseband Transceiver can be associated with the same physical equipment.

Figure 1/GSM 12.21: Object model seen across A-bis interface

Table 2/GSM 12.21: Objects, attributes and procedures seen across A-bis interface

Object class	Attributes	Procedures
Site Manager	Abis Channel Availability Status HW Configuration Manufacturer Dependent State Manufacturer Id Operational State Site Inputs Site Outputs SW Configuration	Equipment Management Establish TEI Get Attributes Measurement Management Set Site Outputs State Management and Event Report SW Download Management Test Management
BTS	Administrative State Availability Status BCCH ARFCN BSIC BTS Air Timer CCCH Load Ind. Period CCCH Load Threshold Connection Failure Criterion GSM Time HW Configuration Intave Parameter Interterference Level Boundaries Manufacturer Dependent State Max Timing Advance Ny1 Operational State Overload Period RACH Busy Threshold RACH Load Averaging Slots SW Configuration T200	Equipment Management Get Attributes Measurement Management Report Procedures Set BTS Attributes State Management and Event Report SW Download Management Test Management
Radio Carrier	Administrative State ARFCN List Availability Status HW Configuration Manufacturer Dependent State Manufacturer Id Operational State Power Class RF Max Power Reduction SW Configuration	Equipment Management Get Attributes Measurement Management Set RadioCarrier Attributes State Management and Event Report SW Download Management Test Management
Baseband Transceiver	Abis Channel* Administrative State Availability Status HW Configuration Manufacturer Dependent State Manufacturer Id Operational State SW Configuration	Connect Terrestrial Signalling Disconnect Terrestrial Signalling Equipment Management Get Attributes Measurement Management State Management and Event Report SW Download Management Test Management
Channel	Abis Channel* Administrative State ARFCN List* Availability Status Channel Combination HW Configuration HSN* MAIO* Operational State SW Configuration TSC	Connect Terrestrial Traffic Disconnect Terrestrial Traffic Equipment Management Get Attributes Measurement Management Set Channel Attributes State Management and Event Report SW Download Management Test Management

NOTE: If more than one layer 2 link is defined to handle this information model, the actual implementation may affect on which layer 2 link attributes concerning frequency hopping and front-end switch are sent. Equipment used to implement frequency hopping can be common to several radio carriers or located inside one radio carrier. Front-end switch is handled by Site Manager, therefore all 'Abis Channel' attributes must be sent to it. Those attributes that need a link identifier in BSC data structures are marked with an asterisk (*).

5.2 Addressing of Objects

It is a GSM requirement that the BSC is capable of operating with BTSs from different manufacturers. So, it is necessary that the differences between BTSs, as seen by the BSC, are minimised as much as possible. This is achieved by addressing NM messages by the Managed Object Class and Managed Object Instance. There must be in the BSC an object model with a complete layer 2 link description for each object instance in the BTS (e.g., Baseband Transceiver 1, Baseband Transceiver 2, Baseband Transceiver 3,...). When a message has to be sent to an object instance this mapping is used to find the correct link.

The first connection shall be established from the BTS site by using a (semi-) permanently programmed default TEI. Subsequent to the establishment of the default connection to the site, further initial connections to other objects shall be established using TEIs provided by procedures in subclause 6.3.1.

Possible additional TEIs to an object already having an initial TEI are assigned with a GSM 12.21 message found in subclause 6.3.1 through an already assigned signalling link.

Object instances also have a layer 3 address. The instance number is used to address the object instance. Regardless of whether the layer 2 address uniquely identifies the object instance or not, the layer 3 address must also be provided so that it can be used by management agent to determine which object instance is being addressed. This combination of layer 2 and layer 3 addressing accommodates BTS sites with either single or multiple physical links.

Specific equipment configuration information is manufacturer dependent. However, for interoperability, link configuration, default TEI assignment and instance numbering must be known by both manager and agent. This, as well as supported functions, is considered as Shared Management Knowledge.

5.3 State Management of Objects

State management in the present document is generally in line with ITU-T Recommendation X.731. How state values are applied is explained below.

ITU-T Recommendation X.731 states that "the management state of a managed object represents the instantaneous condition of availability and operability of the associated resources from the point of view of management".

In the present document there are two different factors (ITU-T Recommendation X.731 defines usage state in addition to these two) that are considered to affect the management state of a managed object. They are:

- administration: permission to use or prohibition against using the resource, imposed through the management services;
- operability: whether or not the resource is physically installed and working.

The present document defines the following three state management attributes to represent the management state of a managed object:

- administrative state;
- operational state;
- availability status (this elaborates the operational state).

5.3.1 Administrative State

Administrative states of the managed objects can be controlled only by the BSC. In fact, the control of resource usage comes from the MSC).

Setting the administrative state of a Channel to **locked** means that it has to discontinue all transmission and reception of information on Air interface and all telecommunication (traffic and signalling) information transmission on A-bis interface.

Setting the administrative state of a Radio Carrier to **locked** means that it has to discontinue all RF emission on Air interface for the frequencies it is responsible.

Setting the administrative state of a Baseband Transceiver to **locked** means that it has to discontinue all telecommunication tramissions and the Channels which are affected should indicate that they are Disabled or Degraded.

Setting the administrative state of a BTS to locked means it has to discontinue all RF emission on all Radio Carriers and all telecommunication transmissions on all Channels of all Baseband Transceivers, i.e., Radio Carriers, Channels and Baseband Transceivers are in Disabled, Dependency state.

The administrative state at the BTS site is also used to provide information e.g., for a local MMI user at a BTS site.

The **locked** state of a 12.21 managed object means that BSC has disconnected all the calls that go through the resource that is represented by the managed object. No new traffic is connected through this resource any more.

The **shutting down** state means that no new traffic is connected through this resource any more. The on-going calls remain.

The **unlocked** state means that new traffic is allowed through the resource represented by the managed object.

5.3.2 Operational State and Availability Status

ITU-T Recommendation X.731 gives the following definitions for the values of the operational state attribute:

- **disabled**: the resource is totally inoperable and unable to provide service to the user(s);
- **enabled**: the resource is partially or fully operable and available for use.

In the present document the value Disabled represents the following conditions that the resources could have:

- hardware or software is not installed;
- power is turned off;
- failure has occurred;
- radio parameters has not yet been set by elementary procedures, therefore, the resource is off line.

The availability status elaborates the operational state attribute. In the present document the following values are used (availability status is a set value):

In test: the resource is undergoing a test procedure.

Failed: the resource has an internal fault that prevents it from operating. The operational state is *disabled*.

Power off: the resource requires power to be applied and is not powered on. The operational state is *disabled*.

Off line: the resource requires some manual and/or automatic operation(s) to be performed to make it available for the use.

Dependency: the resource cannot operate because some other resource on which it depends is unavailable. The operational state is *disabled*.

Degraded: the service available from the resource is degraded in some respect, such as in speed or operating capacity. The operational state is *enabled*.

Not installed: the hardware or the software associated with the managed object has not been installed at the site. Operational state is *disabled*.

Figure 2 illustrates the operational state and availability status behaviour of GSM 12.21 objects (i.e., Site Manager, BTS, Radio Carrier, and Baseband Transceiver) during initialization. The initial value of the administrative state is *locked*.

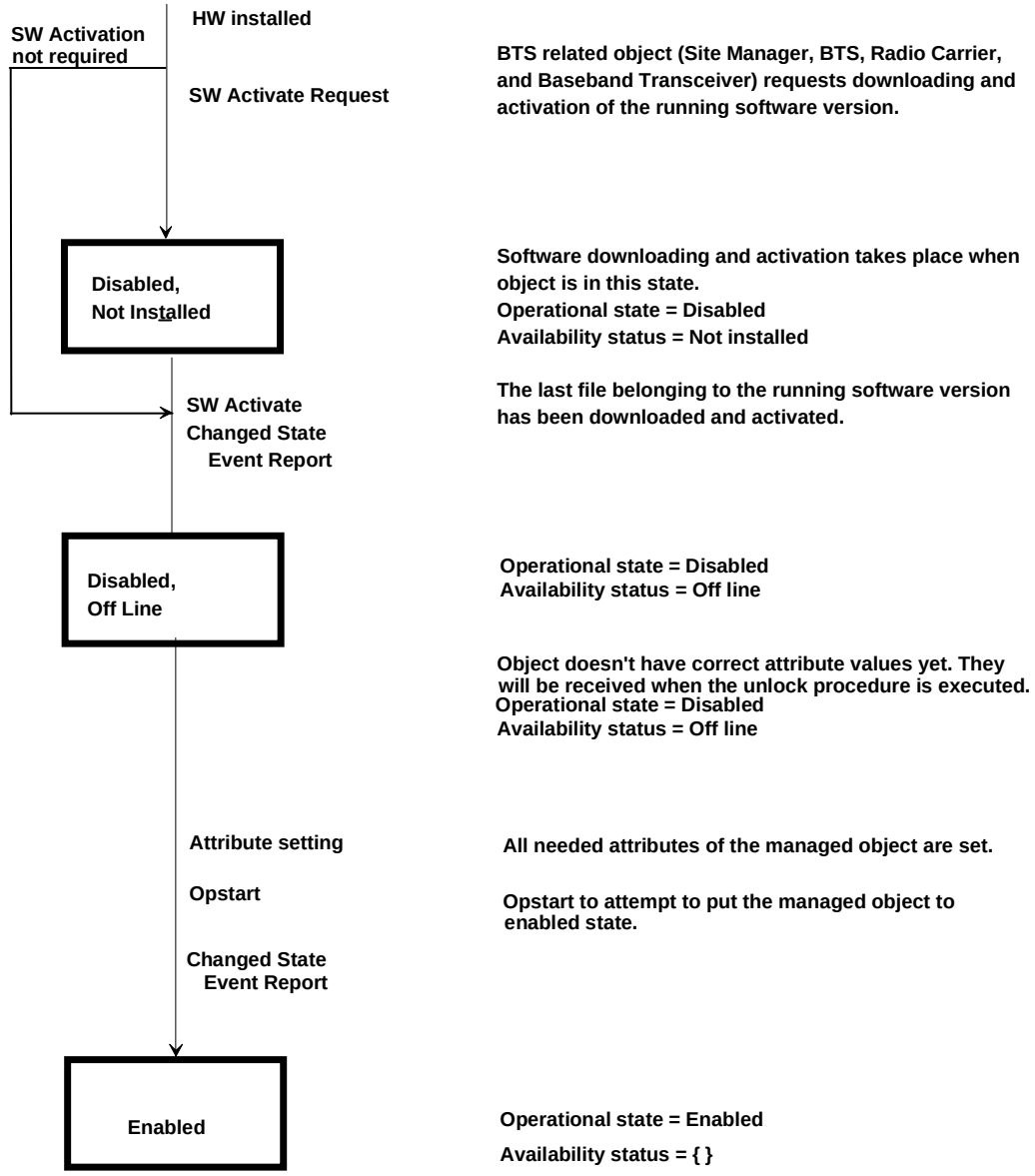


Figure 2/GSM 12.21: GSM 12.21 Objects' Operational state and availability status behaviour during initialization

6 Elementary Procedures

The operational procedures applicable to the BTS consist of bringing BTS equipment and software into (or taking them out of) service, initiation of tests at the BTS, collection of test results made at the BTS, reporting and clearing of any BTS faults, and reporting of any BTS external alarms. Bringing into service of equipment at the BTS will include manual operations, including turning the switch on, and performing local testing where relevant at the BTS, followed by an indication of the availability of the equipment to the BTS via some man-machine interface (MMI terminal, telephone). It is then a BSC function to ensure that relevant data on the existence of the equipment is resident at the BTS, and to activate (bring into service) the new equipment. Manual procedures may also be employed for software loading, at least initially.

As far as software is concerned, all operational software used at the BTS shall also be kept at the BSC, and can be downloaded from the BSC. At the BTS there may be either single instance of the software, or there may also be back-up versions.

6.1 Definition of the Procedures

All the procedures covered in the present document are based on formatted O&M messages. Most formatted O&M messages initiated by the BSC (or by a BTS) will receive a response or acknowledgement at Layer 3. A pair of such messages, or single message if a response is not required, is referred to as an elementary procedure. All messages shall be sent using I frames at Layer 2.

A number of procedures, referred to as structured procedures (see GSM 12.22), are based on a multiplicity of elementary procedures. Some structured procedures may also involve MMI messages, but these are not defined in the present document. For all elementary procedures described in Subclauses 6.2 through 6.10, the protocol scenarios are illustrated with no further explicit reference made from their corresponding subclauses because of their self-explanatory nature.

Descriptions of the messages and the direction of transmission are given in the following subclauses.

No elementary procedure shall be initiated to an object instance which has not yet replied to a previously initiated elementary procedure with a response, an ACK or a NACK within a layer 3 time-out. The layer 3 timeout for ACK, NACK and responses shall have a default value of 10 seconds.

An ACK message is returned to inform the application which initialized the message that the command is performed or will be performed.

The whole message must be rejected if there is something not understood/supported in the original message.

A NACK may not be relevant for some elementary procedures.

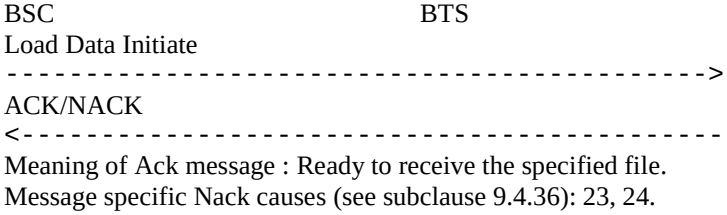
The most relevant Nack causes, not covered by the general causes (which are used for understanding of header fields), are given for each elementary procedure with reference to the coding of the Nack causes in subclause 9.4.36.

The general Nack causes are relevant for any Nack message and are also found in subclause 9.4.36.

6.2 SW Download Management Procedures

6.2.1 Load Data Initiate

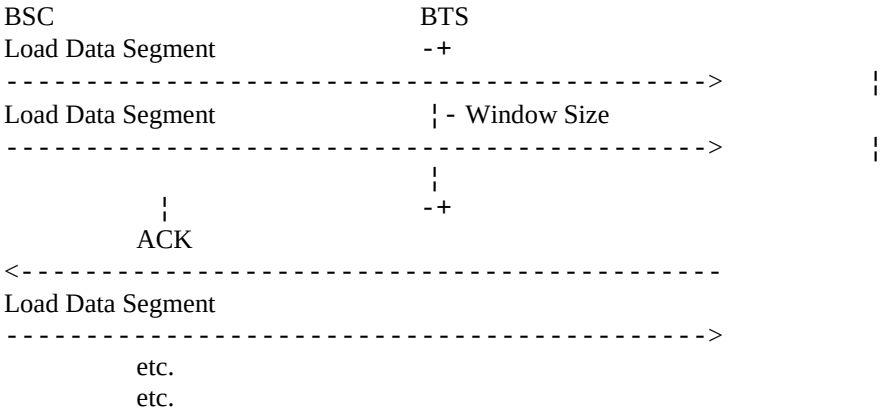
This message shall be sent from the BSC to the BTS to initiate the loading of a file. It indicates the number of segments for which a Layer 3 acknowledgement is required (window size). When receiving data the BTS shall send an ACK after this number of segments, except for the last batch.



Meaning of Ack message : Ready to receive the specified file.
Message specific Nack causes (see subclause 9.4.36): 23, 24.

6.2.2 Load Data Segment

These multi-segment messages shall be used to carry the files for the transfer initiated by the Load Data Initiate message. No other file transfer shall be allowed until the current transfer is finished.



An ACK shall be sent from the BTS to the BSC every time when *Window Size* number of segments specified in the Load Data Initiate message are downloaded. A reception of an ACK must not reset the value of the *sequence number* of the subsequent message segments (see subclause 8.1.1). When all the expected blocks have been received, an ACK must be sent regardless of the window size. If the timer for a time-out for the Layer 3 acknowledgement expires, the BSC shall send a Load Data Abort message and the file transfer shall be aborted.

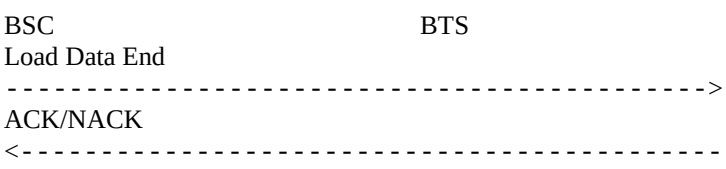
Meaning of Ack message: A window of Load data segment messages or a complete file has been received.

6.2.3 Load Data Abort

This message shall be used by either end if the file transfer can no longer be supported. This message shall also be used by the BTS if the received amount of data exceeds the expected amount.

6.2.4 Load Data End

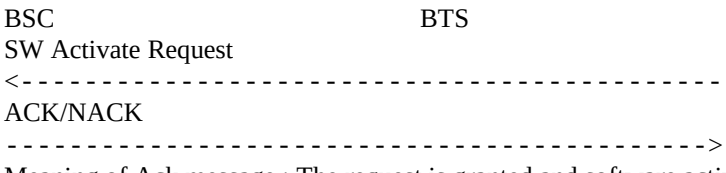
This message shall be sent by the BSC to the BTS. The BTS sends an ACK when the file has been received in the BTS.



Meaning of Ack message : File download is successfully terminated.
Message specific Nack causes (see subclause 9.4.36): 25.

6.2.5 SW Activate Request

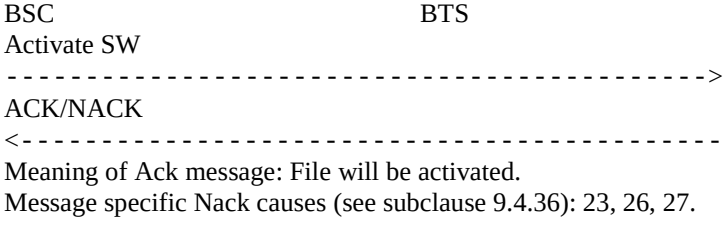
This message shall be sent by the BTS when the resource represented by the object instance (Site Manager, BTS, Radio Carrier, or Baseband Transceiver) has started up. The initialization of mentioned object instance shall be started with software activation, which may include software download continuing with attribute setting.



Meaning of Ack message : The request is granted and software activation will be commenced.
Message specific Nack causes (see subclause 9.4.36): None.

6.2.6 Activate SW

This message from the BSC to the BTS shall be used to activate the loaded software, indicating which file (or files) is to be activated. The acknowledgement of the Activate SW indicates that the software can be activated. If the software cannot be activated, a NACK must be sent. The activation may include BTS internal software distribution.



6.2.7 SW Activated Report

This message from the BTS to the BSC shall be sent from the addressed object on the BTS at a successful completion of the software distribution to and activation on all indicated destinations in the BTS.

6.3 A-bis Interface Management Procedures

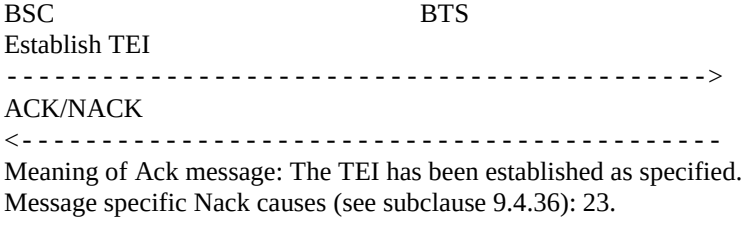
These procedures (excluding 'Establish TEI') are only relevant with BTSs having flexibility to configure A-bis channels to different Baseband Transceivers. This configuration flexibility is realized with equipment that can be called BTS front-end switch. In other words this switch allows an A-bis channel to be able to be connected in several possibilities.

There must be a default connection to the Site Manager, which manages the front-end switch. The default connection information (AbisLink, TEI) must be (semi-)permanently programmable so that it is available at power up. Through the default connection other A-bis connections are established by configuring the front-end switch.

It is optional for BTS equipment to have front-end switch features.

6.3.1 Establish TEI

When an initial/additional TEI is to be established (see 3GPP TS 48.056), this message shall be sent from the BSC on a previously established link giving initial/additional TEI number and the corresponding physical connection. For establishment of additional TEI the procedure specified in specification 3GPP TS 48.056 must be performed and the result shall be indicated in the ACK/NACK response message. If an initial TEI assignment fails, it can mean that TEIs cannot be assigned through the default link (e.g., physical implementation doesn't support transferring TEIs from Site Manager to Baseband Transceivers). In that case there must be subsequent preprogrammed TEIs to establish more links.



6.3.2 Connect Terrestrial Signalling

This message shall be used to connect a particular terrestrial transmission circuit to a Baseband Transceiver. The procedure can be used only for a BTS that has the relevant flexibility.

BSC BTS
Connect Terrestrial Signalling
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified signalling link has been connected.
Message specific Nack causes (see subclause 9.4.36): 1E.

6.3.3 Disconnect Terrestrial Signalling

This message shall be used to disconnect a Baseband Transceiver from a terrestrial circuit.

BSC BTS
Disconnect Terrestrial Signalling
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified signalling link has been disconnected.
Message specific Nack causes (see subclause 9.4.36): 20.

6.3.4 Connect Terrestrial Traffic

This message shall be used to relate a terrestrial circuit to a radio time slot, if the BTS has the flexibility. If half rate coding is implemented, two *Connect Terrestrial Traffic* messages shall be sent for each radio timeslot.

BSC BTS
Connect Terrestrial Traffic
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified traffic link has been connected.
Message specific Nack causes (see subclause 9.4.36): 1E.

6.3.5 Disconnect Terrestrial Traffic

This message shall be used to disconnect a terrestrial circuit from a radio timeslot.

BSC BTS
Disconnect Terrestrial Traffic
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified traffic link has been disconnected.
Message specific Nack causes (see subclause 9.4.36): 20.

6.4 Transmission Management Procedures

These prodecures are used to configure on-site transmission equipment. They may not be sufficient and are subject to further standardization.

6.4.1 Connect Multi-drop Link

This message shall be used to relate two terrestrial circuits (64 kbps timeslot in a 2 Mbps system to a radio time slot), if the BTS has the flexibility of setting up multi-drop configuration.

BSC BTS
Connect Multi-drop Link
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified multi-drop link connection has been connected.
Message specific Nack causes (see subclause 9.4.36): 1E.

6.4.2 Disconnect Multi-drop Link

This message shall be used to disconnect a multi-drop configuration in the BTS.

BSC BTS
Disconnect Multi-drop Link
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified multi-drop link connection has been disconnected.
Message specific Nack causes (see subclause 9.4.36): 20.

6.5 Air Interface Management Procedures

6.5.1 Set BTS Attributes

This message shall be sent to provide an object instance on BTS with all the necessary attributes relating to that BTS object. This message does also include common information for all logical channels of one type, e.g., CCCH parameters.

BSC BTS
Set BTS Attributes
---------->
ACK/NACK
<----------
Meaning of Ack message: All specified BTS attributes have been set.
Message specific Nack causes (see subclause 9.4.36): 23.

6.5.2 Set Radio Carrier Attributes

This message shall be used to set a Radio Carrier's RF-related attributes such as the frequencies and the power.

BSC BTS
Set Radio Carrier Attributes
---------->
ACK/NACK
<----------
Meaning of Ack message: All specified Radio Carrier attributes have been set.
Message specific Nack causes (see subclause 9.4.36): 1B, 23.

6.5.3 Set Channel Attributes

This message shall be sent for each Channel instance to give the channel combination as defined in 3GPP TS 45.002 for that time slot. It shall be possible to send one message, if all 8 radio time slots need the same attribute value. This shall be done by not addressing one specific Channel instance in the *Instance* field in the header, but using a broadcast address. The message may include starting time.

BSC BTS
Set Channel Attributes
---------->
ACK/NACK
<----------
Meaning of Ack message: All specified channel attributes have been set.
Message specific Nack causes (see subclause 9.4.36): 23.

6.6 Test Management Procedures

6.6.1 Perform Test

This message shall be used to tell the BTS to perform a test, if necessary to set a physical configuration for the BSC to carry out a test on the BTS, or to perform a test using a particular configuration. Any measurements may be performed as specific tests. Duration for the test can be given, after which the test report may be autonomously sent if so requested.

Three tests are defined.

1) A radio loop test via the antenna shall be used to test all equipment needed to provide service of one traffic channel. The loop starts and ends in the transceiver baseband parts and loops one traffic channel back in the air interface i.e., using actual antenna equipment. The baseband parts of the transceiver calculate the bit error rate to describe the quality of service that channel provides.

2) A radio loop test via the transceiver shall be used to test most of the equipment needed to provide service of one traffic channel. The loop starts and ends in the transceiver baseband parts and loops one traffic channel back inside the transceiver before the antenna combining equipment. The baseband parts of the transceiver calculate the bit error rate to describe the quality of service that channel provides. This test can be used in conjunction with the previous test to discriminate the location of a possible hardware failure.

3) A functional object self test shall be used to activate an internal self test procedure of a functional object on the BTS made to test equipment that provides the services of the functional object. By its nature this test and its results are proprietary.

BSC BTS
Perform Test
---------->
ACK/NACK
<----------
Meaning of Ack message: Test configuration has been set (if necessary) and the specified test has been started.
Message specific Nack causes (see subclause 9.4.36): 1C, 1D, 1E.

6.6.2 Test Report

This message shall be sent by the BTS giving the result of a test ordered by the BSC and is sent autonomously as soon as the result is available. A *Test Report* shall also be sent after a specific request from the BSC by a *Send Test Report* message. The *Test Report* indicates what was tested, the test type, and the result. No Ack or Nack is returned to the BTS.

BSC BTS
Test Report
<----------

6.6.3 Send Test Report

This message shall be sent from the BSC to ask for the result/report of a test which was not to be sent autonomously now to be started being reported. If the test result was already made to be autonomously reported, this message can also be used to have the present result of the test be reported immediately. The message must include identification of the test.

BSC BTS
Send Test Report
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified test report will be sent.
Message specific Nack causes (see subclause 9.4.36): 1C, 1F.

6.6.4 Stop Test

This message shall be used by the BSC to stop a continuously recurring test at the BTS, to reset a physical test configuration to the normal configuration, or to stop the test and to restore to the normal physical configuration. The message must include identification of the test being performed.

BSC BTS
Stop Test
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified test has been stopped and test configuration reset to normal (if necessary).
Message specific Nack causes (see subclause 9.4.36): 20, 21, 22.

6.7 State Management and Event Report Procedures

6.7.1 State Changed Event Report

An unsolicited report shall be sent from the BTS to the BSC whenever a change of the operational state or of the optional manufacturer dependent state of a managed object defined in the present document occurs. The message shall be also sent when any site input changes its state.

A failure, causing change of operational state, shall generate two event reports: *State Changed Event Report* and *Failure Event Report*.

No Ack or Nack is returned to the BTS.

BSC BTS
State Changed Event Report
<----------

6.7.2 Failure Event Report

An unsolicited report shall be sent from the BTS to the BSC whenever failure events occur in the BTS.

Such failure events are:

- fault in a resource resulting from passing a threshold but not constituting a failure;
- failure of a resource.

Pertaining to a failure, there shall be a report for its start and another for its cease.

A failure causing change of operational state shall generate two event reports: *State Changed Event Report* and *Failure Event Report*.

No Ack or Nack is returned to the BTS.

BSC BTS
Failure Event Report
<----------

6.7.3 Stop Sending Event Reports

This inhibition of sending of event reports shall be used by the BSC to prevent a flood of event reports which are of no benefit to the BSC. One example of this occurs at a BTS restart following a power failure. The operational capability of the BTS hardware is unlikely to be different from what it was before the failure, and a flood of reports, each stating that a piece of hardware is operating, will delay the software download. Another example concerns the case of a frequently occurring transient fault.

BSC BTS
Stop Sending Events Reports
---------->
ACK/NACK
<----------
Meaning of Ack message: Sending of specified Event Report has been stopped.
Message specific Nack causes (see subclause 9.4.36): None.

6.7.4 Restart Sending Event Reports

When the BTS is back in normal operation or if it is of interest to check whether the BTS still generates a flood of Event Reports, a Restart Sending Event Reports shall be sent.

BSC BTS
Restart Sending Events Reports
---------->
ACK/NACK
<----------
Meaning of Ack message: Sending of specified Event Report has been restarted.
Message specific Nack causes (see subclause 9.4.36): None.

6.7.5 Change Administrative State

The Change Administrative State message shall be used by the BSC to change the administrative state (as specified by specification GSM 12.20) of a managed object.

BSC BTS
Change Administrative State
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified change of administrative state has been performed.
Message specific Nack causes (see subclause 9.4.36): None.

6.7.6 Change Administrative State Request

This request message shall be sent by the BTS when there is a need to change the administrative state of a managed object at the BTS site. This message can only be initiated as a result of a local MMI command.

BSC BTS
Change Administrative State Request
<----------
ACK/NACK
---------->
Meaning of Ack message: The request is granted and a change administrative state message will be sent.
Message specific Nack causes (see subclause 9.4.36): 28, 29.

6.7.7 Report Outstanding Alarms

This message shall be used by the BSC to ask BTS to report all outstanding alarms related to the object instance indicated in the message. The BTS shall report alarms by sending a series of *Failure Event Report* messages for all outstanding alarms. Only those alarms previously reported and still outstanding shall be re-reported through this procedure. Any new alarms not yet reported but about to be reported shall be excluded and they shall be reported through a separate *Failure Event Report* procedure spontaneously initiated by the BTS itself. If there is no outstanding alarm, the BTS shall reply with a NACK with that cause indicated.

BSC BTS
Report Outstanding Alarms
---------->
ACK/NACK
<----------
Meaning of Ack message: Sending of *Failure Event Report* will start.
Message specific Nack causes (see subclause 9.4.36): 28, 29, 2A.

6.8 Equipment Management Procedures

6.8.1 Change-over

This message shall be sent to change over between active and standby units of equipment. The action may be performed on any addressable BTS entity, manufacturer dependent HW units included. Which type of HW unit to address and how to identify certain units of this type of HW are manufacturer dependent.

BSC BTS
Changeover
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified change-over operation has been performed.
Message specific Nack causes (see subclause 9.4.36): 19, 1A, 1E, 23.

6.8.2 Opstart

This message shall be sent by the BSC to tell the BTS to attempt to operatethe identified object putting it to an initial normal operational state (i.e., "enabled", see subclause 5.3.2). This message does not affect the object's administrative state if there exists a value explicitly assigned by the BSC. If there is yet no administrative state value explicitly set by the BSC (e.g., at an initialization time), the object shall be presumed to be administratively locked by default. No BTS function is required to be responsible for testing the operability of the identified resource as a consequence of this message. Prior to this message being issued, all necessary physical and logical preparations (such as repair of equipment, software downloading, parameter setting, etc., as needed) are expected to have been completed. If the object is in fact not ready to be in an enabled state, the object will be in a fault condition as a consequence of this message, and the condition shall be handled by the object's normal fault handling function as the condition is detected.

BSC BTS
Opstart
---------->
ACK/NACK
<----------
Meaning of Ack message: The BTS has reset the operational state of the specified object to "enabled" state.
Message specific Nack causes (see subclause 9.4.36): 19, 1A, 23.

6.8.3 Reinitialize

This message shall be sent by the BSC to tell the BTS to have specified hardware resource of the indicated object start a re-initialization procedure as sketched in figure 2. The specifics of a re-initialization procedure, which typically takes

place at the time of a cold start of the resource, is manufacturer-dependent. For a software reinitialization, *Activate SW* message shall be used.

BSC BTS.
Reinitialize
---------->
ACK/NACK
<----------
Meaning of Ack message: The BTS has received the message and is about to start a reinitialization of the specified resource.
Message specific Nack causes (see subclause 9.4.36): 19, 1A, 23.

6.8.4 Set Site Outputs

This message shall be sent by the BSC to tell the BTS to set specified site outputs to the specified state.

BSC BTS
Set Site Outputs
---------->
ACK/NACK
<----------
Meaning of Ack message: The outputs have been set.
Message specific Nack causes (see subclause 9.4.36): None.

6.9 Measurement Management Procedures

6.9.1 Measurement Result Request

This message shall be used by the BSC to request the result of a certain measurement which is running in the BTS to be sent to the BSC. After having responded with the current result, the BTS initializes the measurement result buffer (e.g. setting to zero) and continues the measurement.

BSC BTS
Measurement Result Request
---------->
Response/NACK
<----------
Message specific Nack causes (see subclause 9.4.36): 2A, 2B.

6.9.2 Measurement Result Response

This message shall be used by the BTS to successfully respond to the BSC on an associated *Measurement Result Request* completing a *Measurement Result Request* elementary procedure. By this message, the presently registered measurement result requested shall be reported. If it is not possible for any reason, a NACK message must be used instead of this.

6.9.3 Stop Measurement

This message shall be used by the BSC to stop a continuously running measurement at the BTS. The message must include identification of the measurement to be stopped.

BSC BTS
Stop Measurement
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified measurement has been stopped
Message specific Nack causes (see subclause 9.4.36): 2A

6.9.4 Start Measurement

This message shall be used by the BSC to start a measurement continuously at the BTS. The message must include identification of the measurement to be started.

BSC BTS
Start Measurement
---------->
ACK/NACK
<----------
Meaning of Ack message: The specified measurement has been started
Message specific Nack causes (see subclause 9.4.36): 2A

6.10 Miscellaneous Procedures

6.10.1 Get Attributes

This message shall be used by the BSC to tell the BTS to send attributes which have previously been set by the BTS. It may be used as a check on accuracy and be incorporated into normal procedures, or may be used by the BSC to recover information which it has lost.

BSC BTS
Get Attributes
---------->
Response/NACK
<----------
Message specific Nack causes (see subclause 9.4.36): None.

6.10.2 Set Alarm Threshold

This message shall be used by the BSC to tell the BTS some threshold parameters related to fault thresholds.

BSC BTS
Set Alarm Threshold
---------->
ACK/NACK
<----------
Message specific Nack causes (see subclause 9.4.36): None.

6.10.3 Get Attributes Response

This message shall be used by the BTS to successfully respond to the BSC on an associated *Get Attribute* elementary procedure. By this message, the presently set values of all requested attributes shall be reported. Otherwise, a NACK message shall be used instead of this.

7 Structured Procedures

Applicable structured A-bis procedures are described in GSM 12.22.

8 Message Details

The formats of all messages in subclauses 8.3 through 8.11 are described each by a table format illustration with no formal text description provided because of the self-explanatory nature of the illustration.

8.1 Message Categories

This subclause defines the transport format and coding of the four Network. Management message categories sent over the Abis interface. The various message categories may be sent in either direction. In each message, the message discriminator identifies the category and is transmitted first. In a message the octets must be sent in the order shown in the description of the messages. In an octet, bit 1 must be transmitted first.

In the following subclauses, M and O denote whether information elements are mandatory or optional.

8.1.1 Formatted O&M Messages

The message format and coding of these messages are as below.

INFORMATION ELEMENT	M/O	LENGTH	CODING 8 1
Message Discriminator	M	1	1 0 0 0 0 0 0 0
Placement Indicator	M	1	1)
Sequence Number	M	1	2)
Length Indicator	M	1	Binary, 3)
O&M Data Field	M	V	4)

NOTE 1: The meanings and codings of the Placement Indicator are:

- only: This message is contained within one segment 1 0 0 0 0 0 0 0;
- first: The first segment of a multi-segment message 0 1 0 0 0 0 0 0;
- middle: A middle segment of a multi-segment message 0 0 1 0 0 0 0 0;
- last: The last segment of a multi-segment message 0 0 0 1 0 0 0 0.

NOTE 2: This is the sequence number of the segment in the message, modulo 256, starting with 00000000. Thus a single segment message is here coded 00000000. The number can be incremented unlimitedly being wrapped around the modulo to transport very long multi-segment messages.

NOTE 3: The Length Indicator gives the length of the O&M data field in the message segment being transported which is less than or equal to 255 octets. This length indicator should not be confused with the actual length of the message at the logical level that may go over multiple segments. This length indicator should not be confused also with attribute value length indicator described in subclause 8.2.

NOTE 4: Coding for O&M Data field is found in subclause 8.2 and the following subclauses.

8.1.2 MMI Transfer

The message format and coding of these messages are as below.

INFORMATION ELEMENT	M/O	LENGTH	CODING 8 1
Message Discriminator	M	1	0 1 0 0 0 0 0 0
Placement Indicator	M	1	note 1 of subclause 8.1.1
Sequence Number	M	1	note 2 of subclause 8.1.1
Length Indicator	M	1	Binary, 1)
MMI Data Field	M	V	Proprietary

NOTE: The Length Indicator gives the length of the MMI data field in the message segment being transported which is less than or equal to 255 octets. See also note 3 of subclause 8.1.1.

The protocol for MMI is not covered in the present document.

8.1.3 TRAU O&M Messages

These messages are required for option (ii) of subclause 4.10.1 of specification GSM 08.60. The message format is as below.

INFORMATION ELEMENT	M/O	LENGTH	CODING 8 1
Message Discriminator	M	1	0 0 1 0 0 0 0 0
Channel Number	M	1	1)
Repetition Indicator	M	1	2)
TRAU O&M Message	O	33	3)

NOTE 1: The channel number element shall be coded as defined for the octet of the channel number information element of specification 3GPP TS 48.058.

NOTE 2: The meanings and codings of the Repetition Indicator are:

- terminate sending of O&M TRAU frames: 0 0 0 0 0 0 0 1;
- repeat sending of O&M TRAU frames every 20 ms until a terminate order is received 0 0 0 0 0 0 1 0;
- send O&M TRAU frame once: 0 0 0 0 0 1 0 0.

NOTE 3: The TRAU O&M message is not sent when the Repetition Indicator is set to 00000001, but sending of the TRAU O&M message is mandatory otherwise. All 264 bits of the TRAU O&M frame information field are sent unchanged in the 33 octets.

8.1.4 Manufacturer-Defined O&M messages

The message format and coding of these messages is as below.

INFORMATION ELEMENT	M/O	LENGTH	CODING 8 1
Message Discriminator	M	1	0 0 0 1 0 0 0 0
Placement Indicator	M	1	note 1 of subclause 8.1.1
Sequence Number	M	1	note 2 of subclause 8.1.1
Length Indicator	M	1	Binary, 1)
ManId Length Indicator	M	1	Binary, 2)
Manuf. Identifier	M	V	3)
Man-Def O&M Data Field	M	V	Proprietary

NOTE 1: The Length Indicator gives the length of the Manufacturer-defined O&M data field in the message segment being transported which is less than or equal to 255 octets. See also note 3 of subclause 8.1.1

NOTE 2: The Length Indicator gives the length of the Manufacturer Identifier field which must be less than or equal to 255 octets.

NOTE 3: The Manufacturer Identifier is an octet string of maximally 255 octets. This value, to be appropriately determined by an arrangement between the operator and the manufacturer, may or may not be related to the value of the attribute *Manufacturer Id* (Attribute Id: 1E) listed in subclause 9.4.

Remarks: Since the Data Field of messages of this category is not subject to a GSM standardization, it should be noted that a compliance to messages of this category does not guarrantee an interoperability between different manufacturers.

8.2 Structure of Formatted O&M Messages

This subclause provides details of all the formatted O&M messages.

In every case when particular header octets provide no usable information at the receiver, they shall be coded all 1's.

All fields in the messages are marked with M for Mandatory or O for Optional. This indicates whether the field is mandatory or optional to be contained in a message, and **not** whether it is mandatory or optional to be used or set for every BTS. This allows to change a single attribute without having to repeat all the attributes not to be changed.

The header fields of formatted O&M messages (see below) are always mandatory. The attributes defined for a certain message supported by the BTS implementation are mandatory to be used if not stated otherwise in an explanatory note.

The first octet of the formatted O&M messages shall identify the message types. Some messages are replied by an ACK or a NACK response. The replies shall be distinguished by different codings of the message type (the first octet of formatted O&M messages). See subclause 9.1.

ACK messages shall return all the attributes in the original message. NACK messages shall add a *Nack cause* field (two octets) at the end of the message.

None of the messages concerned requires all of the capacity available in a Layer 2 segment, so the NACK message will not need a second Layer 2 frame.

An ACK to a number of *Load Data Segments* shall consist of only the header with the 'Load Data Segment Ack' message type.

All attributes shall overwrite those defined in an earlier message since start-up or the last restart. Optional attributes provide new information if they have not been defined in an earlier message.

The message type and managed object identification are given in the message header as is illustrated below:

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3

The Object Class information element shall be filled in with the correct information in accordance with the present document.

The Object Instance information element shall contain three fields:

1) the BTS Number identifies one BTS in a multi cell site;

2) the Baseband Transceiver number or the Radio Carrier number identifies which Baseband Transceiver or Radio Carrier is concerned in the message;

3) the third element identifies a radio timeslot (0-7) of the Baseband Transceiver identified by 2).

For further information see subclause 9.3.

The FORMAT field describes the structure of each information element using T(Tag), L(Length) and V(Value) coding. *T* is the attribute identifier. *V* is the actual information presented. *L* must be indicated if the the information element is of

variable length and its prediction is not possible in the context . L shall binary-represent in a two octet space the the number of octets in the remaining part of information element. Note that this Length code differs from the "Length Indicator" described in subclause 8.1.

8.3 SW Download Management Messages

8.3.1 Load Data Initiate

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
SW Description	9.4.62	M	TV	>=2
Window Size	9.4.59	M	TV	2

8.3.2 Load Data Segment

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
File Data	9.4.17	M (note)	TLV	>=2

NOTE: *File Data* is segments of the actual file to be transferred.

8.3.3 Load Data Abort

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3

8.3.4 Load Data End

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
SW Description	9.4.62	M (note)	TV	>=2

NOTE: The same SW Description as in the corresponding Load Data Initiate message.

8.3.5 SW Activate Request

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
HW Configuration	9.4.62	M	TLV	>=2
SW Configuration	9.4.61	M	TLV	>=2

8.3.6 Activate SW

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
SW Description	9.4.62	O (note)	TV	>=2

NOTE: *SW Descriptions* may be repeated for multiple software activation. No SW Description entry implies all software for the object instance.

8.3.7 SW Activated Report

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3

8.4 A-bis Interface Management Messages

8.4.1 Establish TEI

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
TEI	9.4.54	M	TV	2
Abis Channel	9.4.1	M	TV	4

8.4.2 Connect Terrestrial Signalling

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Abis Channel	9.4.1	M	TV	4

8.4.3 Disconnect Terrestrial Signalling

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Abis Channel	9.4.1	M	TV	4

8.4.4 Connect Terrestrial Traffic

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Abis Channel	9.4.1	M	TV	4
Radio Sub Channel	9.4.46	O	TV	2

8.4.5 Disconnect Terrestrial Traffic

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Abis Channel	9.4.1	M	TV	4
Radio Sub Channel	9.4.46	O	TV	2

8.5 Transmission Management Messages

8.5.1 Connect Multi-drop link

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Multi-drop BSC Link	9.4.34	M (note 1)	TV	3
Multi-drop next BTS Link	9.4.35	M (note 2)	TV	3

NOTE 1: This attribute specifies the incoming (in BSC direction) 64 kbps timeslot to be set up to another BTS in a multi-drop configuration.

NOTE 2: This attribute specifies the outgoing (to the next BTS direction) 64 kbps timeslot to be set up through the BTS in a multi-drop configuration.

8.5.2 Disconnect Multi-drop link

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Multi-drop BSC Link	9.4.34	M (note 1)	TV	3
Multi-drop next BTS Link	9.4.35	M (note 2)	TV	3

NOTE 1: This attribute specifies the incoming (in BSC direction) 64 kbps timeslot to be taken down from another BTS in a multi-drop configuration.

NOTE 2: This attribute specifies the outgoing (to the next BTS direction) 64 kbps timeslot to be taken down through the BTS in a multi-drop configuration.

8.6 Air Interface Management Messages

8.6.1 Set BTS Attributes

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Interference Level Boundaries	9.4.25	O (note 1)	TV	7
Intave Parameter	9.4.24	O	TV	2
Connection Failure Criterion	9.4.14	O	TLV	>=4
T200	9.4.53	O (note 2)	TV	8
Max Timing Advance	9.4.31	O (note 3)	TV	2
Overload Period	9.4.39	O (note 5)	TLV	>=2
CCCH Load Threshold	9.4.12	O (notes 4 and 5)	TV	2
CCCH Load Indication Period	9.4.11	O (note 5)	TV	2
RACH Busy Threshold	9.4.44	O (note 5)	TV	2
RACH Load Averaging Slots	9.4.45	O (note 5)	TV	3
BTS Air Timer	9.4.10	O	TV	2
NY1	9.4.37	O	TV	2
BCCH ARFCN	9.4.8	O	TV	3
BSIC	9.4.9	O	TV	2
Starting Time	9.4.52	O (note 6)	TV	3

NOTE 1: Interference Level Boundaries Boundary 0
(see 3GPP TS 45.008) Boundary x1
⋮
Boundary x5

NOTE 2: For FACCH and SACCH.

NOTE 3: Optional in BTS design and administration use.

NOTE 4: Presentation of the load threshold in 1% steps.

NOTE 5: These attributes are special CCCH Parameters

NOTE 6: For synchronisation of when the specific action defined in the message shall be performed. Needed only to change BCCH ARFCN or BSIC while in operation.

8.6.2 Set Radio Carrier Attributes

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
RF Max Power Reduction	9.4.47	O	TV	2
ARFCN list	9.4.5	O (note)	TLV	>=2

NOTE: The structure of value will vary depending on the mode of frequency hopping supported.

8.6.3 Set Channel Attributes

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Channel Combination	9.4.13	O	TV	2
HSN	9.4.21	O (note 1)	TV	2
MAIO	9.4.27	O (note 1)	TV	2
ARFCN list	9.4.5	O (note 2)	TLV	>=2
Starting Time	9.4.52	O (note 3)	TV	3
TSC	9.4.60	O (note 4)	TV	2

NOTE 1: Used only in a hopping channel.

NOTE 2: If frequency hopping is not in use, the only frequency of the Radio Carrier is set with the message Radio Carrier Attributes.

NOTE 3: For synchronisation of when the specific action defined in the message shall be performed.

NOTE 4: A NULL value signifies that the BCC shall be used as the TSC value for the channel.

8.7 Test Management Messages

8.7.1 Perform Test

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Test No	9.4.56	M	TV	2
Autonomously Report	9.4.6	M	TV	2
Test Duration	9.4.55	O	TV	3
Physical Configuration	9.4.40	O (note)	TLV	>=2

NOTE: Use of *Physical Configuration* depends on the need on extra information in setting up specific test configurations.

8.7.2 Test Report

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Test No	9.4.56	M	TV	2
Test Report Info	9.4.57	M (note)	TLV	>=2

NOTE: The test report information may give a numerical result or an indication of the range into which the test report falls.

8.7.3 Send Test Report

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Test No	9.4.56	M	TV	2

8.7.4 Stop Test

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Test No	9.4.56	M	TV	2

8.8 State Management and Event Report Messages

8.8.1 State Changed Event Report

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Operational State	9.4.38	O	TV	2
Availability Status	9.4.7	O	TLV	>=2
Man.dep. State	9.4.28	O	TV	2
Site Inputs	9.4.48	O	TLV	>=2

8.8.2 Failure Event Report

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Event Type	9.4.16	M	TV	2
Perceived Severity	9.4.63	M	TV	2
Probable Cause	9.4.43	M	TV	4
Specific Problems	9.4.51	O (note 1)	TV	2
HW Description	9.4.23	O (notes 1 and 2)	TV	>=2
SW Description	9.4.62	O (notes 1 and 2)	TV	>=2
Additional Text	9.4.3	O (note 1)	TLV	>=2
Additional Info	9.4.2	O (note 1)	TLV	>=2
Outstanding Alarm Sequence	9.4.65	O (note 3)	TV	2

NOTE 1: Depending on the nature of the specific failure and the BTS implementation, only the needed and supported attributes shall be sent.

NOTE 2: This field shall be included to identify the specific associated equipment or software in case the addressed functional object alone is not sufficient to localize the failure.

NOTE 3: This field shall be included if and only if this report is a response to a *Report Outstanding Alarms* message.

8.8.3 Stop Sending Event Reports

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Operational State	9.4.38	O (note 1)	TV	2
Availability Status	9.4.7	O (note 1)	TLV	>=2
Manufacturer Dependant State	9.4.28	O (note 1)	TV	2
Probable Cause	9.4.43	O (note 1)	TV	4
Specific Problems	9.4.51	O (note 1)	TV	2

NOTE 1: Stop sending event reports concerning events with any of the parameter values in this attribute list. Depending on the type of event report that shall be stopped, one or some of the attributes shall be sent. The effect of multiple optional attributes in one message is that only those events that satisfy all the attributes simultaneously shall stop. The effect of repeated uses of this message with each different optional attribute is accumulative, thus, is different from the effect of putting all the optional attributes listed together at once in one message. If there occurs any inconsistency or confusion between the conditions for stopping and starting (see subclause 8.8.4), the event shall be reported instead of being stopped.

NOTE 2: This message with no optional attributes means that all event reports shall be stopped from now.

8.8.4 Restart Sending Event Reports

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Operational State	9.4.38	O (note 1)	TV	2
Availability Status	9.4.7	O (note 1)	TLV	>=2
Manufacturer Dependent State	9.4.28	O (note 1)	TV	2
Probable Cause	9.4.43	O (note 1)	TV	4
Specific Problems	9.4.51	O (note 1)	TV	2

NOTE 1: Restart sending event reports concerning events with any of the parameter values in this attribute list. Depending on the type of event report that needs to be restarted, one or some of the attributes shall be sent. The effect of multiple optional attributes is just same as multiple messages repeated with each attribute one by one and events that satisfy any one of the attribute set shall be reported. Note the difference from the condition stated in note 1 of subclause 8.8.3.

NOTE 2: This message with no optional attributes means that all event reports shall be started from now.

8.8.5 Change Administrative State

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Administrative State	9.4.4	M (note)	TV	2

NOTE: Required new administrative state for the specified managed object.

8.8.6 Change Administrative State Request

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Administrative State	9.4.4	M (note)	TV	2

NOTE: The requested administrative state for the specified managed object.

8.8.7 Report Outstanding Alarms

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3

8.9 Equipment Management Messages

8.9.1 Changeover

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Source	9.4.50	M (note 1)	TLV	>=2
Destination	9.4.15	M (note 2)	TLV	>=2

NOTE 1: *Source* is the manufacturer dependent identity of piece of equipment that shall be taken out of active servicing (changed-over from) and replaced by the *Destination*.

NOTE 2: *Destination* is the manufacturer dependent identity of piece of equipment that shall be put into active servicing (changed-over to) in place of the *Source*.

8.9.2 Opstart

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3

8.9.3 Reinitialize

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
HW Description	9.4.23	O (note)	TV	>=2

NOTE: *HW Descriptions* may be repreated for multiple resources. If no *HW Description* is provided, all resource for the objectis is implied. For a software reinitialization, *Activate SW* message shall be used.

8.9.4 Set Site Outputs

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Site Outputs	9.4.49	M	TLV	>=2

8.9.5 Change HW Configuration

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Site Outputs	9.4.49	M	TLV	>=2

8.10 Measurement Management Messages

8.10.1 Measurement Result Request

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Measurement Identifier	9.4.33	M	TV	2

8.10.2 Measurement Result Response

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Measurement Identifier	9.4.33	M	TV	2
Measurement Result	9.4.32	M	TLV	>= 2

8.10.3 Start Measurement

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Measurement Identifier	9.4.33	M	TV	2

8.10.4 Stop Measurement

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Measurement Identifier	9.4.33	M	TV	2

8.11 Miscellaneous Messages

8.11.1 Get Attributes

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
List of Required Attributes	9.4.26	M (note)	TLV	>=2

NOTE: Any of the attributes defined in subclause 9.4, including those **not** marked with an X in the GET column, can be requested by *Get Attributes* message.

8.11.2 Set Alarm Threshold

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Probable Cause	9.4.43	M	TV	4
Power Output Thresholds	9.4.42	O	TV	4
VSWR Thresholds	9.4.58	O	TV	3
Manufacturer Dependent Thresholds	9.4.29	O	TLV	>=2

8.11.3 Get Attribute Response

INFORMATION ELEMENT	REFERENCE	PRESENCE	FORMAT	LENGTH
Message Type	9.1	M	V	1
Object Class	9.2	M	V	1
Object Instance	9.3	M	V	3
Get Attribute Response Info	9.4.64	M	TLV	>=4

9 Coding

This clause defines the coding of each field in the messages defined in earlier clauses.

The following conventions are required:

- the least significant bit shall be transmitted first, followed by bits 2, 3, 4, etc;
- in an element where octets are identified by an octer number, Octet 1 shall be transmitted first, then octet 2, etc;
- when a field extends over more than one octet, the order of bit values shall progressively decrease as the octet number increases. The least significant bit of the field shall be represented by the lowest numbered bit of the highest numbered octet of the field;
- for unpredictable variable length elements, a length indication coding method defined in subclause 8.2 shall be used. Always the length information shall indicate the number of element units (which is octets) following the length indicator excluding the space for the length findicator itself;
- all defined values are indicated in the present document. Other values are reserved.

9.1 Message Type

The Message Type is coded with 1 octet as illustrated below.

Message Type	1

The following message types are used (all other values reserved).

Message Type	hexadecimal code
SW Download Management Messages:	
Load Data Initiate	01
Load Data Initiate Ack	02
Load Data Initiate Nack	03
Load Data Segment	04
Load Data Segment Ack	05
Load Data Abort	06
Load Data End	07
Load Data End Ack	08
Load Data End Nack	09
SW Activate Request	0A
SW Activate Request Ack	0B
SW Activate Request Nack	0C
Activate SW	0D
Activate SW Ack	0E
Activate SW Nack	0F
SW Activated Report	10
A-bis Interface Management Messages:	
Establish TEI	21
Establish TEI Ack	22
Establish TEI Nack	23
Connect Terrestrial Signalling	24
Connect Terrestrial Signalling Ack	25
Connect Terrestrial Signalling Nack	26
Disconnect Terrestrial Signalling	27
Disconnect Terrestrial Signalling Ack	28
Disconnect Terrestrial Signalling Nack	29
Connect Terrestrial Traffic	2A

Connect Terrestrial Traffic Ack	2B
Connect Terrestrial Traffic Nack	2C
Disconnect Terrestrial Traffic	2D
Disconnect Terrestrial Traffic Ack	2E
Disconnect Terrestrial Traffic Nack	2F
Transmission Management Messages:	
Connect Multi-Drop Link	31
Connect Multi-Drop Link Ack	32
Connect Multi-Drop Link Nack	33
Disconnect Multi-Drop Link	34
Disconnect Multi-Drop Link Ack	35
Disconnect Multi-Drop Link Nack	36
Air Interface Management Messages:	
Set BTS Attributes	41
Set BTS Attributes Ack	42
Set BTS Attributes Nack	43
Set Radio Carrier Attributes	44
Set Radio Carrier Attributes Ack	45
Set Radio Carrier Attributes Nack	46
Set Channel Attributes	47
Set Channel Attributes Ack	48
Set Channel Attributes Nack	49
Test Management Messages:	
Perform Test	51
Perform Test Ack	52
Perform Test Nack	53
Test Report	54
Send Test Report	55
Send Test Report Ack	56
Send Test Report Nack	57
Stop Test	58
Stop Test Ack	59
Stop Test Nack	5A
State Management and Event Report Messages:	
State Changed Event Report	61

Stop Measurement	8C
Start Measurement	8D

Other Messages:

Get Attributes	81
Get Attributes Response	82
Get Attributes Nack	83
Set Alarm Threshold	84
Set Alarm Threshold Ack	85
Set Alarm Threshold Nack	86

9.2 Object Class

An Object Class shall be coded with 1 octet. The values of the object class code are as defined below.

Object Class	**1**

Object Class	hexadecimal code
Site Manager	00
BTS	01
Radio Carrier	02
Baseband Transceiver	04
Channel	03
<reserved for future use>	<05-FE>
NULL	FF

9.3 Object Instance

The Object Instance shall be coded with 3 octets, addressing the specific object of the given object class as illustrated below.

BTS number	1
Baseband Transceiver *or* Radio Carrier number	2
Radio Timeslot number	3

All 3 octets are mandatory in the header of every message.

The BTS number distinguishes BTSs which are unique for each cells at a site under the Site Manager.

The Baseband Transceiver *or* Radio Carrier number distinguishes either Baseband Transceivers or Radio Carriers under the BTS.

The Radio Timeslot number distinguishes channels under the Baseband Transceiver.

When the object class is *Site Manager*, all three octets shall be NULLs, because there is only one Site Manager, which doesn't need an identifier.

When the object class is *BTS*, octet 1 shall be a binary presentation of the identifier of the addressed BTS. Octets 2 and 3 shall be coded NULLs. If the BTS number is NULL, it shall be understood as referring to all BTSs under the Site Manager.

When the object class is *Baseband Transceiver* or *Radio Carrier*, octet 2 shall be a binary presentation of the identifier of the addressed Baseband Transceiver or Radio Carrier object, and octet 1 is the identiferrof the BTS above it. Octet 3 is coded NULL. If the Baseband Transceiver or Radio Carrier number is NULL, it shall be understood as referring to all instances of the class under the BTS.

When the object class is *Channel*, octet 3 shall be a binary presentation of the identifier of the addressed radio timeslot, octet 2 shall be the identifier of the Baseband Transceiver, and octet 1 shall be the identifer of the BTS above the addressed Channel. If the radio timeslot number is NULL, it shall be understood as referring to all Channels under the Baseband Transceiver.

To avoid unnecessary complexity of BTS implementation, it shall not be allowed to assign a NULL value to any object above the addressed object class. For example, if the addressed object class is the Baseband Transceiver, it is not allowed to assign a NULL value to both BTS and Baseband Transceiver instances (without this constraint, this could be understood as referring to all the Baseband Transceivers of all the BTSs).

The value for NULL shall be <FF> in all the cases mentioned above in this subclause.

9.4 Attributes and Parameters

The Attribute Identifier is coded with 1 octet. The number of parameters within an attribute is at least one. The length of the parameters within an attribute will vary. The attributes used and the coding of their Attribute Identifier fields are listed below. The values are in hexadecimal. The attributes marked with an X in "Get" column are only *get*able by the BSC, and BSC is not permitted to alter their values.

Attribute Name	Attribute Id.	Get
Abis Channel	01	X
Additional Info	02	
Additional Text	03	
Administrative State	04	X
ARFCN List	05	X
Autonomously Report	06	
Availability Status	07	X
BCCH ARFCN	08	X
BSIC	09	X
BTS Air Timer	0A	X
CCCH Load Indication Period	0B	X
CCCH Load Threshold	0C	X
Channel Combination	0D	X
Connection Failure Criterion	0E	X
Destination	0F	
Event Type	11	
File Data	47	
File Id	12	X

File Version	13	X
GSM Time	14	X
Get Attribute Response Info	44	
HSN	15	X
HW Configuration	16	X
HW Conf Change Info	45	
HW Description	17	X
Intave Parameter	18	X
Interference Level Boundaries	19	X
List of Required Attributes	1A	
MAIO	1B	X
Manufacturer Dependent State	1C	X
Manufacturer Dependent Thresholds	1D	X
Manufacturer Id	1E	X
Max Timing Advance	1F	X
Multi-drop BSC Link	20	
Multi-drop next BTS Link	21	
Nack Causes	22	
Ny1	23	X
Operational State	24	X
Outstanding Alarm Sequence	46	
Overload Period	25	X
Physical Config	26	
Power Class	27	X
Power Output Thresholds	28	X
Probable Cause	29	
RACH Busy Threshold	2A	X
RACH Load Averaging Slots	2B	X
Radio Sub Channel	2C	
RF Max Power Reduction	2D	X
Site Inputs	2E	X
Site Outputs	2F	X
Source	30	
Specific Problems	31	
Starting Time	32	

T200	33	X
TEI	34	X
Test Duration	35	
Test No	36	
Test Report Info	37	
VSWR Thresholds	38	X
Window Size	39	
TSC	40	X
SW Configuration	41	X
SW Description	42	X
Perceived Severity	43	
Measurement Result	48	
Measurement Type	49	

All other values are reserved for future use.

The data structures of the attributes and parameters are described in the remaining part of this subclause in tablular forms with no formal text description of the individual subclauses provided because of their self-explanatory nature.

Henceforth "Attribute Identifier" in this subclause means the identifier for an *attribute* or a *parameter*.

9.4.1 Abis Channel

Attribute Identifier	1
BTS Port Number	2
Timeslot Number	3
Subslot Number	4

BTS Port Number <0-FF>

Timeslot Number

Time slot in 2 Mbps link <0-1F>

Subslot Number

a (bits 1,2) 00

b (bits 3,4) 01

c (bits 5,6) 02

d (bits 7,8) 03

64 kbps signalling FF

9.4.2 Additional Info

Attribute Identifier	1
Length	2-3
Additional Info <man.dep.>	4
(cont.)	
(cont.)	N

Additional Info is a manufacturer dependent field.

9.4.3 Additional Text

Attribute Identifier	1
Length	2-3
Additional Text <man.dep.>	4
(cont.)	
(cont.)	N

Additional Text is a manufacturer dependent field and shall be used to include fault localization information.

9.4.4 Administrative State

Attribute Identifier	1
Administrative State	2

Administrative State shall be coded as follows:

Locked	01
Unlocked	02
Shutting Down	03
NULL (Adm. state not supported)	FF

9.4.5 ARFCN List

Attribute Identifier	1
Length	2-3
ARFCN1 (MSB)	4
ARFCN1 (LSB)	5
ARFCNn (MSB)	N-1
ARFCNn (LSB)	N

ARFCN (see 3GPP TS 45.005) <0-3FF>

9.4.6 Autonomously Report

Attribute Identifier	1
Autonomously Report	2

The toggle switch for autonomous report shall be coded as follows:

Autonomously Report 01;

Not Autonomously Report 00.

9.4.7 Availability Status

Attribute Identifier	1
Length	2-3
Availability Status	4
(cont.)	
(cont.)	N

Availability Status may contain one or more octets. Each octet shall have a single status value, which shall be coded as follows:

In test 0

Failed 1

Power off 2

Off line 3

<not used> 4

Dependency 5

Degraded 6

Not installed 7

9.4.8 BCCH ARFCN

Attribute Identifier	1
BCCH ARFCN (MSB)	2
BCCH ARFCN (LSB)	3

BCCH ARFCN (see 3GPP TS 45.005)<1-3FF>

9.4.9 BSIC

Attribute Identifier	1
BSIC	2

BSIC (see GSM 03.03) <0-3F>

(BS colour code: bit 0-2)

(PLMN colour code: bit 3-5)

9.4.10 BTS Air Timer

Attribute Identifier	1
T3105	2

T3105 shall be coded as a binary presentation of 10 ms in the range of <0-FF>.

9.4.11 CCCH Load Indication Period

Attribute Identifier	1
CCCH Load Indication Period	2

CCCH Load Indication Period shall be coded as a binary presentation of seconds in the range of <0-FF>.

9.4.12 CCCH Load Threshold

Attribute Identifier	1
CCCH Load Threshold	2

CCCH Load Threshold shall be coded as a binary presentation of maximum (maximum is manufacturer dependent) percentage in the range of <0-64>.

9.4.13 Channel Combination

Attribute Identifier	1
Channel Combination	2

Channel Combination shall be coded as follows:

tCHFull	TCH/F + FACCH/F + SACCH/TF	00
tCHHalf	TCH/H(0,1) + FACCH/H(0,1) + SACCH/TH(0,1)	01
tCHHalf2	TCH/H(0) + FACCH/H(0) + SACCH/TH(0) + TCH/H(1)	02
sDCCH	SDCCH/8 + SACCH/C8	03
mainBCCH	FCCH + SCH + BCCH + CCCH	04
bCCHCombined	FCCH + SCH + BCCH + CCCH + SDCCH/4 + SACCH/C4	05
bCH	BCCH + CCCH	06
bCCHwithCBCH	combination of 05 with CBCH as 3GPP TS 45.002	07 1)
sDCCHwithCBCH	combination of 03 with CBCH as 3GPP TS 45.002	08 1)

NOTE: These two channel combinations are created by replacing the SDCCH number 2 in channel combination 05 and channel combination 03 by the logical channel.

See 3GPP TS 45.002 for meaning and usage of channel combinations.

9.4.14 Connection Failure Criterion

Attribute Identifier	1
Length	2-3
Connection Failure Criterion	4
Criteria Value	5
(cont.)	
(cont.)	N

Connection Failure Criterion shall be coded as follows:

Based upon uplink SACCH error rate (RADIO_LINK_TIMEOUT) 01

Based upon RXLEV/RXQUAL measurements 02

If connection failure criterion is based on SACCH error rate, the *Criteria Value* shall be one octet binary presentation of the number of SACCH multiframes used in the procedure.

If connection failure criterion is based on RXLEV/RXQUAL measurements, coding of the *Criteria Value* field will be operator/manufacturer dependent.

See 3GPP TS 45.008 subclauses 5.2 and 5.3 and 3GPP TS 24.008 subclause 3.5.2.2.

9.4.15 Destination

Attribute Identifier	1
Length	2-3
Destination	4
(cont.)	
(cont.)	N

Destination identifies a unit of equipment that shall be the destination to be "changed to" on a Change-over operation. How to identify a type of equipment and how to identify a specific unit of this type is manufacturer dependent.

9.4.16 Event Type

Attribute Identifier	1
Event Type	2

Event Type shall be coded as follows:

communication failure 00

quality of service failure 01

processing failure 02

equipment failure 03

environment failure 04

<reserved for future use> <05-0F>

<man.dep.> <10-FF>

9.4.17 File Data

Attribute Identifier	1
Length	2-3
File Data <man.dep.>	4
(cont.)	
(cont.)	N

File Data is manufacturer dependent, but must be consistent with the associated GSM 12.20 attribute.

9.4.18 File Id

Attribute Identifier	1
Length	2-3
File Id <man.dep.>	4
(cont.)	
(cont.)	N

File Id is manufacturer dependent, but must be consistent with the associated GSM 12.20 attribute.

9.4.19 File Version

Attribute Identifier	1
Length	2-3
File Version <man.dep.>	4
(cont.)	
(cont.)	N

File Version is manufacturer dependent, but must be consistent with the associated GSM 12.20 attribute.

9.4.20 GSM Time

Attribute Identifier	1
Current Frame No (MSB)	2
Current Frame No (LSB)	3

Current Frame No shall be a binary presentation of FN in Modulus 42432.

9.4.21 HSN

Attribute Identifier	1
HSN	2

HSN (see 3GPP TS 45.002) <0-3F>

9.4.22 HW Configuration

Attribute Identifier	1
Length	2-3
HW Description 1	4
...	
HW Description n	N

HW Configuration shall consist of a list of *HW Descriptions* related to a managed object.

9.4.23 HW Description

Attribute Identifier	1
Equipment Id Length	2-3
Equipment Id	
(cont.)	
Equipment Type Length	
Equipment Type	
(cont.)	
Equipment Version Length	
Equipment Version	
(cont.)	
Location Length	
Location	
(cont.)	
Man. Dep. Info Length	
Man. Dep. Info	
(cont.)	N

All fields are manufacturer dependent variable length character strings. They must be consistent with associated GSM 12.20 attributes.

Equipment Id distinguishes a piece of equipment out of others of same type.

Equipment Type codes the type of piece of equipment (e.g., Baseband Transceiver Unit).

Equipment Version codes the version of the piece of equipment.

Location codes the place where the piece of equipment is found (e.g., row -rack - shelf - slot).

Man. Dep. Info shall codes additional manufacturer dependent information.

9.4.24 Intave Parameter

Attribute Identifier	1
Intave Parameter	2

Intave Parameter (see 3GPP TS 45.008) <1-1F>

9.4.25 Interference level Boundaries

Attribute Identifier	1
Interf Boundary 0	2
Interf Boundary 1	3
Interf Boundary 2	4
Interf Boundary 3	5
Interf Boundary 4	6
Interf Boundary 5	7

Interf Boundary 0 <0-FF>

Interf Boundary X1 <0-FF>

Interf Boundary X2 <0-FF>

Interf Boundary X3 <0-FF>

Interf Boundary X4 <0-FF>

Interf Boundary X5 <0-FF>

All boundaries shall be coded as a binary presentation of -x dBm (normal values are -115 to -85). For example, an interference boundary of -105 dBm will be represented as integer "105".

9.4.26 List of Required Attributes

Attribute Identifier	1
Length	2-3
Attribute Id	4
(cont.)	
(cont.)	N

Each *Attribute Id* is one octet.

9.4.27 MAIO

Attribute Identifier	1
MAIO	2

MAIO (see 3GPP TS 45.002) <0-3F>

9.4.28 Manufacturer Dependent State

Attribute Identifier	1
Manufacturer Dependent State	2

Manufacturer Dependent State <0-FF>

This is optional to be used in addition to Operational State in accordance with GSM 12.20.

9.4.29 Manufacturer Dependent Thresholds

Attribute Identifier	1
Length	2-3
Manufacturer Dependent Thresholds	4
(cont.)	
(cont.)	N

The content *of Manufacturer Dependent Thresholds* is manufacturer dependent.

9.4.30 Manufacturer Id

Attribute Identifier	1
Length	2-3
Manufacturer Id	4
(cont.)	
(cont.)	N

The content of *Manufacturer Id* is manufacturer dependent.

9.4.31 Max Timing Advance

Attribute Identifier	1
Max Timing Advance	2

Max Timing Advance (see 3GPP TS 48.058) <0-7F>

9.4.32 Measurement Result

Attribute Identifier	1
Length of measurement result (N)	2-3
Result (MSB)	4
(cont.)	
Result (LSB)	N+3

9.4.33 Measurement Type

Attribute Identifier	1
Measurement Number	2

Measurement Number shall be coded as follows:

<reserved> <00-3F>

<man.dep.> <40-FF>

9.4.34 Multi-drop BSC Link

Attribute Identifier	1
BTS Port Number	2
Timeslot Number	3

BTS Port Number <0-FF>

Timeslot Number

Time slot in 2 Mbps link <0-1F>

9.4.35 Multi-drop next BTS Link

Attribute Identifier	1
BTS Port Number	2
Timeslot Number	3

BTS Port Number <0-FF>

Timeslot Number

Time slot in 2 Mbps link <0-1F>

9.4.36 Nack Causes

Attribute Identifier	1
NACK Cause	2

Nack Causes shall be coded as follows:

General Nack Causes:

Incorrect message structure	01
Invalid message type value	02
<reserved>	03
<reserved>	04
Invalid Object class value	05
Object class not supported	06
BTS no. unknown	07
Baseband Transceiver no. unknown	08
Object Instance unknown	09
<reserved>	<0A-0B>
Invalid attribute identifier value	0C
Attribute identifier not supported	0D
Parameter value outside permitted range	0E

Inconsistency in attribute list	0F	1)
Specified implementation not supported	10	
Message cannot be performed	11	2)
<reserved>	<12-18>	

Specific Nack Causes:

Resource not implemented	19	
Resource not available	1A	
Frequency not available	1B	
Test not supported	1C	
Capacity restrictions	1D	
Physical configuration cannot be performed	1E	
Test not initiated	1F	
Physical configuration cannot be restored	20	
No such test	21	
Test cannot be stopped	22	
Message inconsistent with physical config.	23	3)
Complete file not received	25	
File not available at destination	26	
File cannot be activated	27	
Request not granted	28	
Wait	29	
Nothing reportable existing	2A	
Measurement not supported	2B	
Measurement not started	2C	
<reserved>	<2D-7F>	
<man.dep.>	<80-FE>	
NULL	FF	

NOTE 1: This Nack cause shall apply to conflicting or incomplete data in the attribute list which prevents the BTS from performing the message.

NOTE 2: This Nack cause shall apply when the message is valid and is supported by the BTS, but cannot be performed correctly for reasons not covered by other general or special Nack causes.

NOTE 3: This Nack cause shall apply to the case where the data in attribute list is valid, but is beyond the capabilities of the particular BTS implementation.

9.4.37 Ny1

Attribute Identifier	1
Ny1	2

Ny1 shall be a binary presentation of maximum number of repetitions of PHYSICAL INFORMATION (see 3GPP TS 24.008, subclause 3.4.4.2.2).

9.4.38 Operational State

Attribute Identifier	1
Operational State	2

Operational States are in accordance with GSM 12.20 and shall be coded as follows:

Disabled	01
Enabled	02
<reserved for future use>	<03-FE>
NULL(Operat. state not supported)	FF

9.4.39 Overload Period

Attribute Identifier	1
Length	2-3
Overload Period	4
(cont.)	
(cont.)	N

9.4.40 Physical Config

Attribute Identifier	1
Length	2-3
Required Test Config <man.dep.>	4
(cont.)	
(cont.)	N

Required Test Config is manufacturer dependent.

9.4.41 Power Class

Attribute Identifier	1
Power Class	2

Power Class is a binary presentation of transceiver power class as defined in 3GPP TS 45.005.

9.4.42 Power Output Thresholds

Attribute Identifier	1
Output Power Fault Threshold	2
Reduced Output Power Threshold	3
Excessive Output Power Threshold	4

When the carrier output power of the transmitter, including power amplifier and transmitter combiner, is below or above a power level, a fault shall be generated. There are two thresholds below the output power to indicate two different levels of fault severity, and one for threshold above. The range of *Output Power Fault Threshold* and *Reduced Output Power Threshold* is from -10 to -1 dB . The values shall be coded in 1 dB steps such that -10 dB is expressed with 0 and -1 dB with 9.

Output Power Threshold <00-09>

Reduced Output Power Threshold <00-09>

The range of *Excessive Output Power Threshold* is from 2 dB to 5 dB. The value shall be coded in 1 dB steps such that 2 dB is expressed with binary value 0 and 5 dB with binary value 3.

Excessive Output Power Threshold <00-03>

9.4.43 Probable Cause

Attribute Identifier	1
Probable Cause Type	2
Probable Cause Value	3
Probable Cause Value (cont.)	4

Probable Cause Type shall be coded as follows:

ISO/CCITT values (X.721) 01

GSM specific values 02

Manufacturer specific values 03

<reserved for future use> <04-FF>

For *Probable Cause Value* coding, the last numeric value of the object identifier value specified in ASN.1 syntax coding shall be used if *Probable Cause Type* is either 01 or 02.

9.4.44 RACH Busy Threshold

Attribute Identifier	1
RACH Busy Threshold	2

RACH Busy Threshold shall be a binary presentation of -x dBm in the range <0-FF>.

9.4.45 RACH Load Averaging Slots

Attribute Identifier	1
RACH Load Averaging Slots (MSB)	2
RACH Load Averaging Slots (LSB)	3

RACH Load Averaging Slots shall be a binary presentation of number of RACH burst periods in the range <0-FFFF>.

9.4.46 Radio Sub Channel

Attribute Identifier	1
Radio Sub Channel	2

Radio Sub Channel shall be coded as follows:

Half rate channel 0 00

Half rate channel 1 01

9.4.47 RF Max Power Reduction

Attribute Identifier	1
RF Max Power Reduction	2

RF Max Power Reduction shall be a binary presentation of the number of 2 dB power reduction steps as defined in 3GPP TS 45.005.

This represents "Pn" as used in 3GPP TS 48.058.

9.4.48 Site Inputs

Attribute Identifier	1
Length	2-3
Site Input	4
(cont.)	
(cont.)	N

If *Site Inputs* are requested from Site Manager with message *Get Attributes*, all inputs shall be listed. Each octet from 4 to N controls one Site input. Each of these octets contain the input number and the state of the input and they shall be coded as follows.

8	7	6	5	4	3	2	1
State	Input number						

State shall be a binary presentation of the input state, 0 or 1. *Input number* shall be a binary presentation of input number. Note that maximally 128 binary inputs can be supported.

9.4.49 Site Outputs

Attribute Identifier	1
Length	2-3
Site Output	4
(cont.)	
(cont.)	N

If *Site Outputs* are sent to Site Manager with message *Set Site Outputs*, the site outputs shall be generated as indicated by the message. Coding of this information element shall be the same as for Site Inputs. Note that maximally 128 binary site outputs can be supported.

9.4.50 Source

Attribute Identifier	1
Length	2-3
Source	4
(cont.)	
(cont.)	N

Source identifies a unit of equipment that shall be "changed from" on a Change-over operation. How to identify a type of equipment and how to identify a specific unit of this type is manufacturer dependent.

9.4.51 Specific Problems

Attribute Identifier	1
Specific Problems	2

Specific Problems

<reserved for future use>	<00-0F>
<man.dep.>	<10-FF>

9.4.52 Starting Time

Attribute Identifier	1
Current Frame No (MSB)	2
Current Frame No (LSB)	3

Current Frame No shall be a binary presentation FN Modulus 42432.

9.4.53 T200

Attribute Identifier	1
SDCCH (5 ms)	2
FACCH/Full rate (5 ms)	3
FACCH/Half rate (5 ms)	4
SACCH with TCH SAPI0 (10 ms)	5
SACCH with SDCCH (10 ms)	6
SDCCH SAPI3 (5 ms)	7
SACCH with TCH SAPI3 (10 ms)	8

Each field shall be a binary presentation of time units mentioned in brackets.

NULL (FF) means the value is not specified (see 3GPP TS 44.006).

9.4.54 TEI

Attribute Identifier	1
TEI	2

TEI (see 3GPP TS 48.056):

Initial TEI	<00-3F>
Additional TEI	<40-7E>
<not used>	<7F-FF>

9.4.55 Test Duration

Attribute Identifier	1
Test Duration	2-3

Test Duration shall be a binary presentation of seconds in range <01-FFFF>indicating the time the test should last.

9.4.56 Test No

Attribute Identifier	1
Test Number	2

Test Number shall be coded as follows:

Radio loop test via antenna	00
Radio loop test via transceiver	01
BTS functional object self test	02
<reserved>	<03-3F>
<man.dep.>	<40-FF>

9.4.57 Test Report Info

Attribute Identifier	1
Length	2-3
Test Result Info	4
(cont.)	
(cont.)	N

If the test was either radio loop test via antenna or radio loop test via transceiver, octets 3 and 4 are defined. Octet 3 shall include a binary presentation of RXLEV value in the range of 0-3F such that value 0 equals to -110 dBm or less and 3F equals to -48 dBm or more. Octet 4 shall express bit error rate (BER) of received bit stream in 0,1% steps in the range 0,0% - 12,8% such that 0 equals to 0,0% BER and 128(dec) equals to 12,8% BER or more.

If the test was BTS functional object self test, octet 3 shall indicate pass or fail for the test of the functional object on the BTS by value 1 or 0 where 0 is the code for fail.

In the defined test cases *Test Result Info* may also contain manufacturer dependent information in subsequent octets. In other tests, *Test Result Info* is manufacturer dependent.

9.4.58 VSWR Thresholds

Attribute Identifier	1
Faulty Antenna Threshold	2
Antenna Not Adjusted Threshold	3

VSWR Thresholds shall be used in association with the "*faulty receiver (transmitter) antenna*" *or "receiver (transmitter) antenna not adjusted*" Probable Cause. The VSWR range for both thresholds is 1,2 - 3,0. The value shall be coded in 0,1 steps such that 1,2 is expressed with 0 and 3,0 with 12(hex).

Faulty Antenna Threshold <00-12>

Antenna Not Adjusted Threshold <00-12>

9.4.59 Window Size

Attribute Identifier	1
Window Size	2

Window Size shall be a binary presentation of the number of layer 3 *Load Data Segment messages* to be sent before a layer 3 acknowledgment needs to be issued. Value 0 is not used.

9.4.60 TSC

Attribute Identifier	1
Training Sequence Code	2

For details of *Traing Sequence Codes*, see 3GPP TS 45.002.

TSC values <00-07>

<not used> <08-FE>

9.4.61 SW Configuration

Attribute Identifier	1
Length	2-3
SW Description 1	4
...	
SW Description n	N

SW Configuration shall contain a list of *SW Descriptions* related to the managed object.

9.4.62 SW Description

Attribute Identifier	1
File Id	2
File Version	N

9.4.63 Perceived Severity

Attribute Identifier	1
Severity Value	2

Severity Value shall be coded as follows:

failure ceased	00
critical failure	01
major failure	02
minor failure	03
warning level failure	04
indeterminate failure	05
<reserved>	<06-3F>
<man, dep.>	<40-FF>

9.4.64 Get Attribute Response Info

Attribute Identifier	1
Length	2-3
Count of not-reported attributes	4
(Each not-reported atttribute id)	
(cont.)	
(cont.)	
.....	
(Each reported attribute id and its value)	
(cont.)	
(cont.)	N

The BTS shall make a best effort to report on all the attributes requested by the associated *Get Attributes* message. The *Length* indicates the length of the entire *Get Attribute Response Info* which may possibly go over a single segment message and should not be confused with the length of the data put in one single message frame (see subclause 8.1.1). The *Count of not reported attributes* entry shall indicate the binary integer coded value of the count of the attributes requested but the BTS could not report on because the attributes are either not supported or not yet defined. In case of a non-zero value of the above counter, the *Each not- reported attribute id* entry shall list the Id of each attrute not reported and shall continue as many as indicated by the above counter. The *Each reported attribute id and its value* entry shall list each reported attribute id and its value pair coded and formatted for every applicable attribute or parameter as specified in this subclause (subclause 9.4) and shall continue until all reported attributes are included in the response.

9.4.65 Outstanding Alarm Sequence

Attribute Identifier	1
Pending Reports	2

The integer coded *Pending Reports* field indicates the number of pending *Failure Event Report* messages to follow the current message as a response to the associated *Report Outstanding Alarms* message. This value being 0 signals that it is the last message for the outstanding alarms.

9.4.66 HW Conf Change Info

Attribute Identifier	1
Length	2-3
HW Description Position Index 1	4
Operation Code 1	5
Modification Data 1 *(only if needed)*	
.....	
HW Description Position Index K	
Operation Code K	
Modification Data K *(only if needed)*	N

HW Description Position Index, *Operation Code*, and *Modification Data* constitute an associated tripplet for each HW Description change operation. The triplet may be repeated as many as needed. All the changes indicated in one *Change HW Configuration* message must be successfully conducted or the procedure must fail otherwise. The *HW Description Position Index*, an octet coded integer, indicates the HW Description's position in the HW Configuration attribute to which the change operation indicated by the associated *Operation Code* must be applied. In case of multiple entries, all the position indices shall be interpreted against the initial HW Configuration sequence. There are three possible operations as listed below:

deletion	00
insertion	01
modification	02

By a deletion operation, the indexed HW Description is deleted from the HW Configuration attribute. A deletion operation requires no associated Modification Data. An insertion or modification operation requires an associated *Modification Data* which specifies the new data for the operation. By a modification operation, the indexed HW Description in the HW Configuration attribute is replaced with the provided Modification Data. Deletion and modification operations are mutually exclusive at one position. By an insertion operation, the provided Modification Data is inserted immediately after the indexed HW Description in the HW Configuration attribute. An insertion at a position indexed zero (0) is interpreted as prepending to the very beginning. More than one insertion operation at one identically indexed position shall produce a HW Configuration sequence in which the inserted Descriptions are ordered the way as they appear in the *HW Conf Change Info* field.

Annex A (informative): Change history

Change history							
Date	**TSG GERAN#**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2002-04	9	GP-020564			Provision of TS 12.21 release 97 version	5.0.0	6.0.0
2002-04	9	GP-020564			Provision of TS 12.21 release 98 version	6.0.0	7.0.0
2002-04	9	GP-020564			Provision of TS 12.21 release 99 version	7.0.0	8.0.0
2002-04	9	GP-020564			Provision of TS 52.021 release 4 version	8.0.0	4.0.0
2002-06	10				Provision of TS 52.021 release 5 version	4.0.0	5.0.0
2005-01	23				Provision of TS 52.021 release 6 version	5.0.0	6.0.0
2007-08	35				Provision of TS 52.021 release 7 version	6.0.0	7.0.0
2008-12	40				Provision of TS 52.021 release 8 version	7.0.0	8.0.0
2009-12	44				Provision of TS 52.021 release 9 version	8.0.0	9.0.0
2011-03	49				Provision of TS 52.021 release 10 version	9.0.0	10.0.0
2012-09	55				Provision of TS 52.021 release 11 version	10.0.0	11.0.0
2014-09	63				Version for Release 12 (frozen at SP-65)	11.0.0	12.0.0
2015-12	68				Version for Release 13 (frozen at SP-70)	12.0.0	13.0.0

Change history							
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-03	RP-75	-	-	-	-	Version for Release 14 (frozen at TSG-75)	14.0.0
2018-06	RP-80	-	-	-	-	Update to Rel-15 version (MCC)	15.0.0
2020-07	RP-88e	-	-	-		Upgrade to Rel-16 version without technical change	16.0.0
2022-03	RP-95e	-	-	-	-	Upgrade to Rel-17 version without technical change	17.0.0
2024-03	RP-103	-	-	-	-	Upgrade to Rel-18 version without technical change	18.0.0
2025-09	RP-109	-	-	-	-	Upgrade to Rel-19 version without technical change	19.0.0

History

Document history		
V19.0.0	October 2025	Publication