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SERIES Q: SWITCHING AND SIGNALLING

Specifications of Signalling System No. 7 – Q3 interface

Line and line circuit test management of ISDN and analogue customer accesses

ITU-T Recommendation Q.835

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION Q.835

LINE AND LINE CIRCUIT TEST MANAGEMENT OF ISDN AND ANALOGUE CUSTOMER ACCESSES

Summary

The purpose of this Recommendation is to define the Q3 interface between a network element for customer access (i.e. local exchange, access network) and the telecommunications management network (TMN) for the support of line and line circuit test functions and the associated management for ISDN and analogue customer accesses which are connected either directly to a local exchange or remotely at an access network and across V5.1 and/or V5.2 interfaces to a local exchange.

The focus of this Recommendation is on defining an object model based on ITU-T Recommendations Q.824.0, Q.824.5, Q.831, and X.745. Existing protocols are used where possible. The definition of Operations System (OS) functionality is outside the scope of this Recommendation.

Source

ITU-T Recommendation Q.835 was prepared by ITU-T Study Group 4 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 26th of March 1999.

Keywords

Access network, information model, line and line circuit testing, local exchange, Q3 interface, TMN.

FOREWORD

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The World Telecommunication Standardization Conference (WTSC), which meets every four years, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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As of the date of approval of this Recommendation, the ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

CONTENTS

Introduction

Line and circuit testing of analogue customer accesses and ISDN customer accesses is part of a management activity which is performed by the operator in order to detect failure conditions and to bring the customer access back to its normal state of operation whenever a deviation occurs.

A customer access is considered as being that part of the local network which extends from the network termination equipment up to and including the exchange termination.

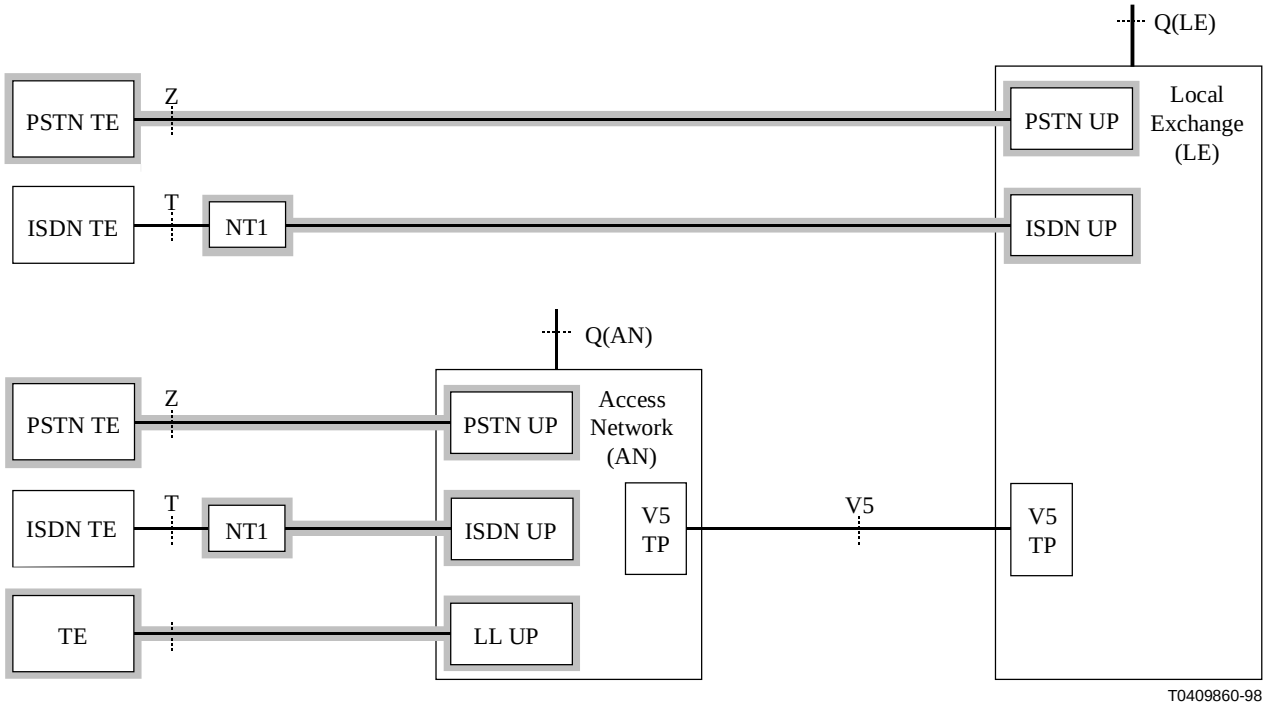
Here, only these parts of the activity are covered which are related directly to that part of the customer access which extends from the local exchange to the network termination equipment. An ISDN access extends to but does not include the T reference point. An analogue access extends to and may include the customer premises equipment (CPE) (see Figure 0).

In Figure 0 both customer access scenarios are illustrated:

a) Direct access case for PSTN and ISDN customer to a local exchange (LE), which is shown in the top of Figure 0;

b) Remote access case for PSTN and ISDN customer as well as for leased lines (semi-permanent lines) via an access network (AN) and across the V5.1 and/or V5.2 interface (as specified in Recommendations I.414, G.964 and G.965), shown in the bottom part of Figure 0.

The shaded areas are subject to line and circuit testing and the associated management as presented within this Recommendation is based on the specifications within Recommendation Q.831.



NOTE – Shaded areas are subject to line and circuit testing. User ports (UP) represent the different configurations for line circuit, line termination, exchange termination and network termination (NT). The option of ISDN access without remote NT1 is valid for ISDN BA only.

Figure 0/Q.835 – Direct and remote customer access case scenarios

Recommendation Q.835

LINE AND LINE CIRCUIT TEST MANAGEMENT OF ISDN AND ANALOGUE CUSTOMER ACCESSES

(Geneva, 1999)

1 Scope

This Recommendation specifies the Q3 interface between a network element for customer access (i.e. local exchange, access network) and the Telecommunications Management Network (TMN) for the support of line and line circuit test functions and the associated management for ISDN and analogue customer accesses which are connected either directly to a local exchange or remotely at an access network and across V5.1 and/or V5.2 interfaces to a local exchange.

It is not mandatory to implement the test and measurements specified in this Recommendation for all types of customer access realisations. However, if any test is implemented and is required to be managed via the Q3 interface on the network element, it shall be modelled as described in this Recommendation.

The focus of this Recommendation is on defining an object model based on Recommendation X.745 [22]. Existing protocols are used where possible. The definition of Operations System (OS) functionality is outside the scope of this Recommendation.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation G.964 (1994), *V-Interfaces at the digital local exchange (LE) – V5.1-interface (based on 2048 kbit/s) for the support of access network (AN)*.

[2] ITU-T Recommendation G.965 (1995), *V-Interfaces at the digital local exchange (LE) – V5.2 Interface (based on 2048 kbit/s) for the support of access network (AN)*.

[3] ITU-T Recommendation M.3010 (1996), *Principles for a telecommunications management network*.

[4] ITU-T Recommendation M.3100 (1995), *Generic network information model*.

[5] CCITT Recommendation M.3603 (1992), *Application of maintenance principles to ISDN basic rate access*.

[6] CCITT Recommendation M.3604 (1992), *Application of maintenance principles to ISDN primary rate access*.

[7] ITU-T Recommendation Q.543 (1993), *Digital exchange performance design objectives*.

[8] ITU-T Recommendation Q.811 (1997), *Lower layer protocol profiles for the Q3 and X interfaces*.

[9] ITU-T Recommendation Q.812 (1997), *Upper layer protocol profiles for the Q3 and X interfaces*.

[10] ITU-T Recommendation Q.824.0 (1995), *Stage 2 and stage 3 description for the Q3 interface – Customer administration – Common information*.

[11] ITU-T Recommendation Q.824.5 (1997), *Stage 2 and stage 3 description for the Q3 interface – Configuration management of V5 interface environments and associated customer profiles*.

[12] ITU-T Recommendation Q.831 (1997), *Fault and performance management of V5 interface environments and associated customer profiles*.

[13] CCITT Recommendation X.208 (1988), *Specification of Abstract Syntax Notation One (ASN.1)*.

[14] CCITT Recommendation X.720 (1992) | ISO/IEC 10165-1:1993, *Information technology – Open Systems Interconnection – Structure of management information: Management information model.*

[15] CCITT Recommendation X.721 (1992) | ISO/IEC 10165-2:1992, *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information.*

[16] CCITT Recommendation X.730 (1992) | ISO/IEC 10164-1:1993, *Information technology – Open Systems Interconnection – Systems Management: Object management function.*

[17] CCITT Recommendation X.731 (1992) | ISO/IEC 10164-2:1993, *Information technology – Open Systems Interconnection – Systems management: State management function.*

[18] CCITT Recommendation X.732 (1992) | ISO/IEC 10164-3:1993, *Information technology – Open Systems Interconnection – Systems Management: Attributes for representing relationships.*

[19] CCITT Recommendation X.734 (1992) | ISO/IEC 10164-5:1993, *Information technology – Open Systems Interconnection – Systems Management: Event report management function.*

[20] CCITT Recommendation X.735 (1992) | ISO/IEC 10164-6:1993, *Information technology – Open Systems Interconnection – Systems Management: Log control function.*

[21] ITU-T Recommendation X.737 (1995) | ISO/IEC 10164-14:1996, *Information technology – Open Systems Interconnection – Systems management: Confidence and diagnostic test categories.*

[22] ITU-T Recommendation X.745 (1993) | ISO/IEC 10164-12:1994, *Information technology – Open Systems Interconnection – Systems Management: Test management function.*

[23] ITU-T Recommendation X.746 (1995) | ISO/IEC 10164-15:1995, *Information technology – Open Systems interconnection – Systems management: Scheduling function.*

[24] ITU-T Recommendation X.680 (1997) | ISO/IEC 8824-1:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

[25] ITU-T Recommendation X.681 (1997) | ISO/IEC 8824-2:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification.*

[26] ITU-T Recommendation X.682 (1997) | ISO/IEC 8824-3:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification.*

[27] ITU-T Recommendation X.683 (1997) | ISO/IEC 8824-4:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications.*

3 Terms and definitions, abbreviations

3.1 Definitions

This Recommendation defines the following terms:

– Access Network (AN): See Recommendation G.964 [1].
– bearer channel: See Recommendation G.964 [1].
– Bearer Channel Connection (BCC): See Recommendation G.965 [2].
– cable pair identification tone: See A.2.5.1.10.
– capacitance measurement: See A.2.5.1.2.
– codec testing: See A.2.5.2.1.6.
– Communication Channel (C-Channel): See Recommendation G.964 [1].
– communication path: See Recommendation G.964 [1].
– control protocol: See Recommendation G.964 [1].
– dial pulse test: See A.2.5.1.5.
– dial tone test: See A.2.5.2.2.1.
– digit reception: See A.2.5.2.1.7.
– dry loop: See A.2.5.1.11.
– DTMF dialling test: See A.2.5.1.6.
– envelope function address: See Recommendation G.964 [1].
– feeding current: See A.2.5.2.1.2.
– feeding voltage: See A.2.5.2.1.1.
– foreign voltage or current: See A.2.5.1.1.
– insulation resistance measurement: See A.2.5.1.3.
– layer 3 address: See Recommendation G.964 [1].
– leased lines: See Recommendation G.964 [1].
– PSTN line testing: See A.2.5.1.
– line circuit testing: See A.2.5.2.1.
– Local Exchange (LE): See Recommendation G.964 [1].
– loop and ring trip detection: See A.2.5.2.1.3.
– loop resistance measurement: See A.2.5.1.4.
– loopback 1 (line termination loopback): See A.2.5.3.2.1.
– loopback 2, 2_1 and 1A (NT1 loopbacks): See A.2.5.3.2.1.
– monitoring of the line: See A.2.5.1.9.
– Operation System (OS): See Recommendation M.3010 [3].
– power feed: See A.2.5.3.3.1.
– private meter pulses: See A.2.5.2.1.5.
– protection protocol: See Recommendation G.965 [2].

– register recall button test: See A.2.5.1.12.

– subscriber private meter testing: See A.2.5.1.7.

– V5 interface: See Recommendation G.964 [1].

– V5 interface messages: This term refers to all Function Elements (FEs) and other V5 protocol messages as defined in Recommendations G.964 [1] and G.965 [2] which are communicated via the V5 interface.

– V5 time slot: See Recommendation G.964 [1].

3.2 Abbreviations

This Recommendation uses the following abbreviations:

AN	Access Network
CMIP	Common Management Information Protocol
CPE	Customer Premises Equipment
LC	Line Circuit
LE	Local Exchange
LL	Leased Line
MORT	Managed Object Referring to Test
MTA	Metallic Test Access
NE	Network Element
OS	Operations System
REG	Regenerator
RDN	Relative Distinguished Name
SPM	Subscriber Private Meter
TMN	Telecommunication Management Network
TE	Terminal Equipment
TO	Test Object
TP	Termination Point
UP	User Port

4 Line and line circuit testing functions

4.1 Description of the service

Line and circuit testing is part of a management activity which is performed by the operator in order to detect failure conditions and to bring the customer access back to its normal state of operation whenever a deviation occurs. A customer access is considered as being that part of the local network which extends from the network termination equipment up to and including the exchange termination.

In this clause, only the parts of the activities are covered which are directly related to that part of the customer access which extends from the exchange termination to the network termination equipment. An ISDN access extends to but does not include the T reference point. An analogue access extends to and may include the CPE.

4.2 Components of service

a) *Failure detection*

Observe or supervise the subscriber access and collect relevant data in order to detect failures or degradation. Perform continuous or periodic checks of the system functions.

b) *Failure information*

Send alarms and event reports from the NE to TMN with failure information related to subscriber access.

c) *Failure localization*

Receive failure information from NEs which may be generated by performing tests and measurements on subscriber access. Initiate additional fault localization procedures and receive information from these procedures.

d) *Fault correction*

Replace faulty access port equipment with working replacements.

e) *Verification*

Apply the appropriate tests and measurements to the replaced component before bringing it back to service.

f) *Restoration*

Restore the component to service.

4.3 Management function list

a) *Request status*

TMN requests NE to send the current status information related to the access port.

b) *Set service state*

TMN directs NE to place a access port in a specified service state, e.g. in service (available for use), standby (not for normal use), out of service (unavailable for use).

c) *Alarm report*

NE notifies TMN of alarm information concerning access ports.

d) *Set alarm conditions*

TMN directs NE to assign specific alarm parameters, modes and thresholds to alarms concerning access ports.

e) *Start line or circuit test*

TMN directs NE to start an on-demand or a periodic test of the subscriber line or access port.

f) *Stop line or circuit test*

TMN directs NE to stop an on-demand or a periodic test of the subscriber line or access port.

g) *Set test conditions*

TMN directs NE to assign parameters, modes and thresholds to tests and measurements of the subscriber line or access port.

h) *Apply test signals*

TMN directs NE to send test signals to the terminating equipment or to the line circuit, e.g. ringing signals, dial pulses, meter pulses.

i) *Remove test signals*

TMN directs NE to remove the test signal sent by the apply function.

j) *Connect external test equipment*

TMN directs NE to connect the customer line or access port to an external test equipment.

k) *Disconnect external test equipment*

TMN directs NE to disconnect the subscriber line or access port from a previously connected external test equipment.

l) *Request test results*

TMN requests NE to report intermediate or final results from a test applied to a subscriber line or an access port.

m) *Test result report*

NE sends the results of a test applied to a subscriber line or an access port to TMN.

4.4 Description of management functions

Management functions related to testing are defined in Recommendation X.745 [22]. No specific functions are defined in the context of line and circuit testing at the network element for customer access (i.e. local exchange, access network).

5 Information model diagrams

The entity relationship diagram is given in 5.1 and the inheritance hierarchy ("is-a" relationships) and naming hierarchy (containment relationships) are given in 5.2 and 5.3, respectively.

The conventions given in Figure 1 are used in the entity relationship diagrams.

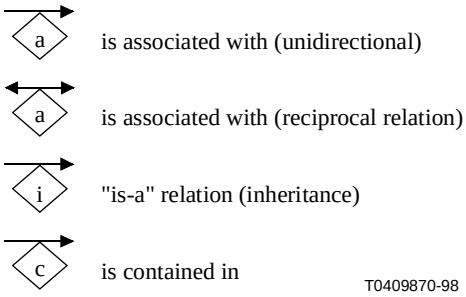
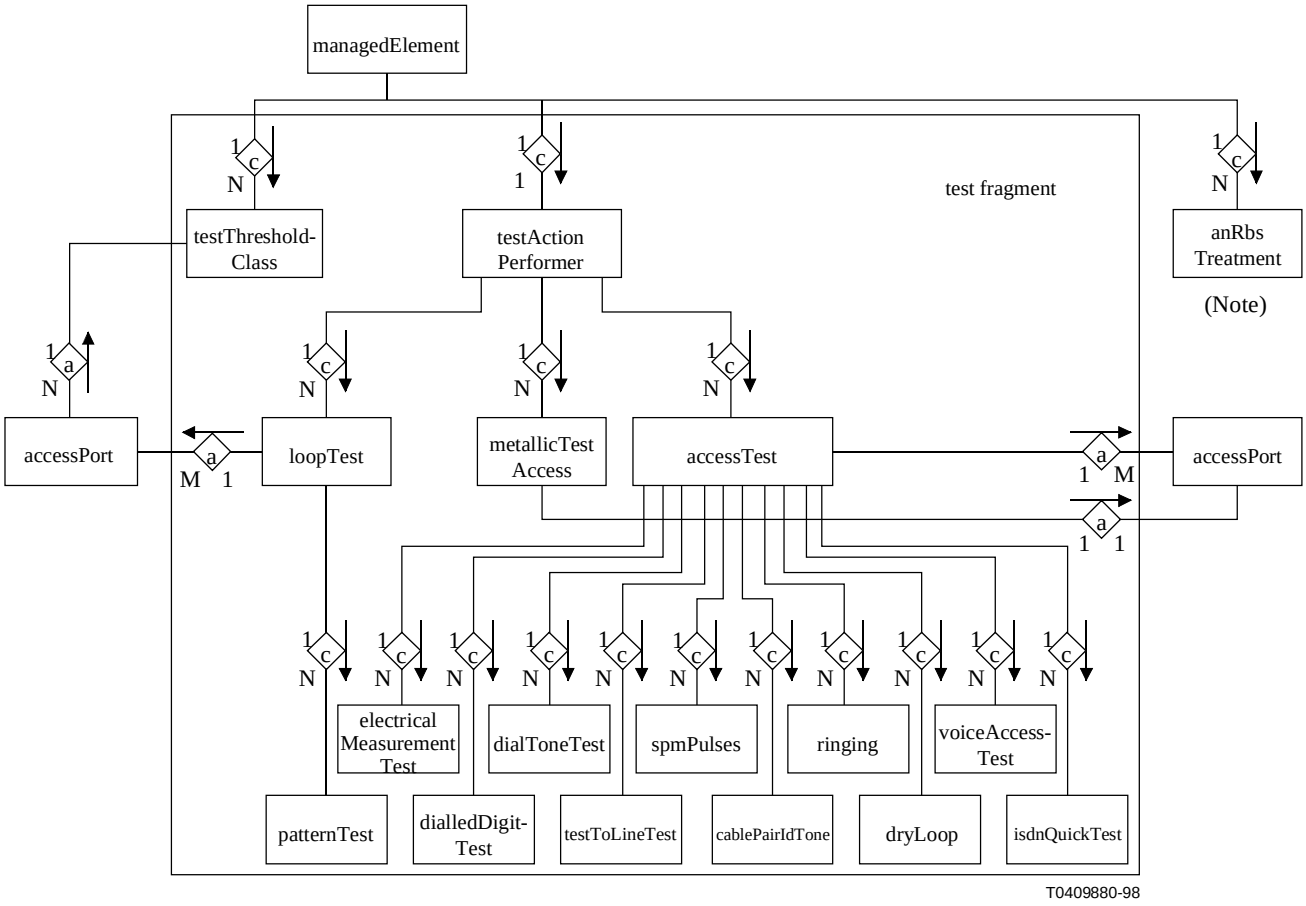


Figure 1/Q.835 – Conventions used in diagrams for entity relationship diagrams

5.1 Entity relationship diagram

Figure 2 shows the various entities related to line and circuit testing at the network element for customer access (i.e. local exchange, access network). They extend the information model described in Recommendations Q.824.0 [10] and Q.824.5 [11], which specifies management information describing the various user port aspects.



NOTE – Only for customers connected remotely via an access network (AN) and V5 interface to the local exchange (LE).

Figure 2/Q.835 – Entity relationship diagram – test fragment

5.1.1 Line testing and line circuit testing

Test requests from the OS are sent as Common Management Information Protocol (CMIP) testRequestControlled or testRequestUncontrolled action to an instance of testActionPerformer. In this model, all controlled tests are delegated by instances of testActionPerformer to instances of subclasses of testObject, i.e. when receiving a test request the testActionPerformer automatically creates the required instances of these classes. Further instances of subclasses of testObject are created if further delegation of the performance of the test is required. This creation is achieved by sending additional testRequestControlled actions; the testSessionId parameter is used to identify in which access test instance the new tests should be contained. All instances of these subclasses of testObject exist only for the duration of their delegated operations. Details of the mechanism how to transmit test requests to testActionPerformer and how test results are generated are described in Recommendation X.745 [22].

Management information related to uncontrolled tests can be found in Annex B.

Controlled testing is initially delegated to an instance of accessTest or to an instance of loopTest or to an instance of metallicTestAccess. Each instance of loopTest or accessTest or metallicTestAccess is contained in an instance of testActionPerformer.

The object class loopTest is used to set up loopbacks for the user port to which it is associated by an attribute. If patterns are to be injected and compared within the NE as part of the loopback test, then this is delegated to an instance of patternTest which is contained in the delegating instance of loopTest.

The object class accessTest has all specific non-loopback tests allocated to it. It has an attribute which specifies one or a list of user ports which are to be tested.

If external test systems are used for line testing, the metallicTestAccess allows to connect it to each subscriber line (outbound or bridged) and to each line circuit (inbound) of the NE. The implementation of the metallic test access is outside the scope of this Recommendation.

The creation of an instance of accessTest represents a test session and permits test access to lines or line circuits during which a number of different tests can be performed. These delegated tests are handled by specific contained test objects. Each contained test object triggers the specific test on one or more user ports which are specified in accessTest.

Electrical measurements, such as voltage, capacitance and resistance, are delegated to instances of electricalMeasurementTest. Dialled digit tests, dial tone tests and other tests (in particular those involving sending meter pulses to the line, cable pair identification tone and ringing) are triggered by the creation of instances of dialledDigitTest, dialToneTest, spmPulses, cablePairIdTone and ringing, respectively. The dry loop condition is set up by instances of dryLoopTest. The inward line circuit tests are delegated to instances of testToLineCircuit. The voiceAccessTest allows for the provision of those tests which involve the establishment of a voice connection with the line under test. A quick check of an ISDN access is represented by an isdnQuickTest object.

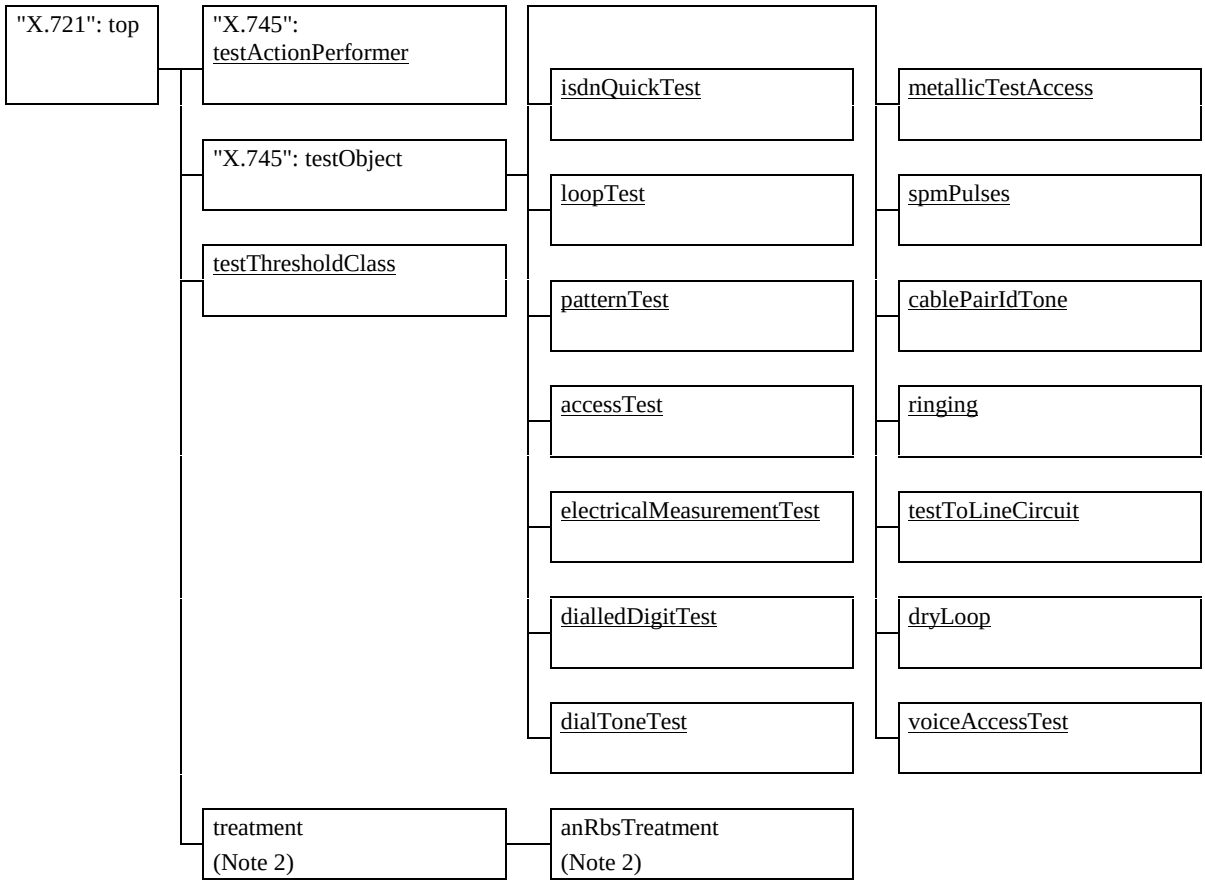
The object class testThresholdClass can be used to modify predefined test thresholds via the Q3 interface.

5.1.2 The testResultNotifications of the tests

The sending time, the information contents and the number of testResultNotifications sent per test request are not restricted. It is a matter up to the NE implementation. If the testResultNotification contains results whose testing time has importance, they shall be ordered in the ASN.1 sequence oldest first.

5.2 Inheritance hierarchy

Figure 3 traces the inheritance from the highest level object "ITU-T Recommendation X.721":top to the managed objects defined in this Recommendation.

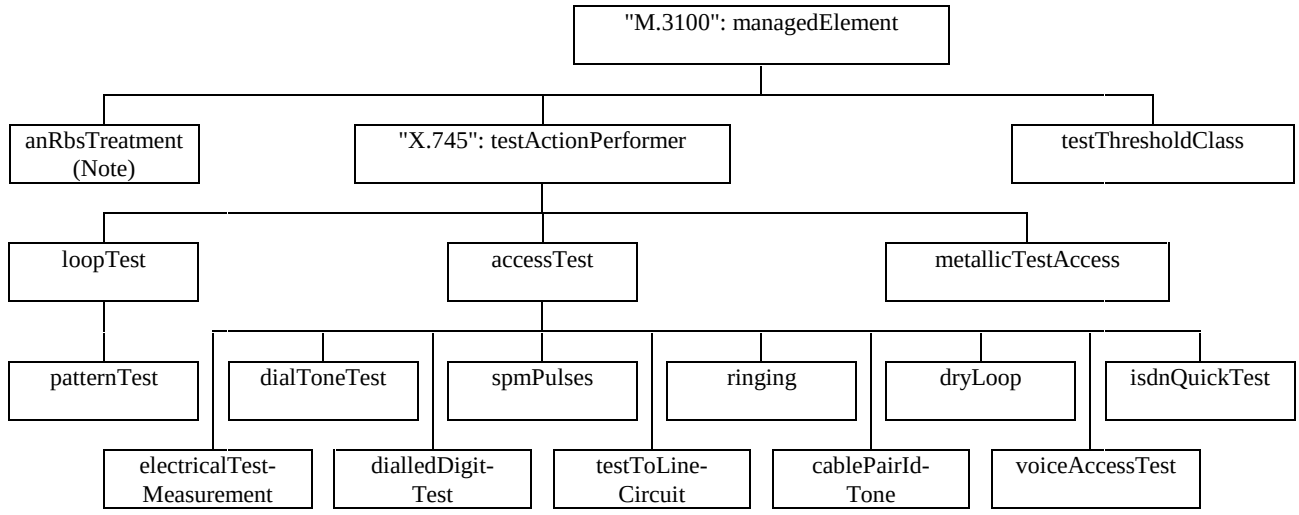


NOTE 1 – Only classes which are underlined may be instantiated.
NOTE 2 – Only for customers connected remotely via an access network (AN) and V5 interface to the local exchange (LE).

Figure 3/Q.835 – Inheritance hierarchy

5.3 Naming hierarchy

Figure 4 shows the naming (i.e. containment) relationships for the NE's managed objects associated with line and circuit testing.



NOTE – Only for customers connected remotely via an access network (AN) and V5 interface to the local exchange (LE).

Figure 4/Q.835 – Naming hierarchy

6 Formal object class definitions

This clause gives the formal definitions of the managed object classes, name bindings, general packages, behaviours, attributes, actions and notifications.

6.1 Definitions of object classes

This subclause specifies the object classes for all of the managed objects used in the management information model. These object classes are either defined here or by reference to other specifications. Classes of managed objects which are defined elsewhere and which are only used for containment are not included, but are identified by the name bindings for the classes specified here.

6.1.1 Access port fragment

6.1.1.1 Access port fragment at the local exchange

In this fragment, the following object classes are used. They are used in the test operations to identify the MORTs. They are defined in Recommendation Q.824.0 [10]:

– analogueAccess;

– "ITU-T Recommendation Q.824.1":accessPortISDNBasicRate;

– "ITU-T Recommendation Q.824.1":accessPortISDNPrimaryRate.

6.1.1.2 Access port fragment at the access network

In this fragment, the following object classes are used. They are used in the test operations to identify the MORTs. They are defined in Recommendation Q.824.5 [11]:

– "ITU-T Recommendation Q.824.5":pstnUserPort;

– "ITU-T Recommendation Q.824.5":isdnBAUserPort;

– "ITU-T Recommendation Q.824.5":isdnPRAUserPort;

– "ITU-T Recommendation Q.824.5":leasedPort;

– "ITU-T Recommendation Q.824.5":userPortBearerChannelCtp.

6.1.2 Support fragment

The following classes which are defined in Recommendation X.721 [15] may be instantiated:

– "ITU-T Recommendation X.721:1992":attributeValueChangeRecord;

– "ITU-T Recommendation X.721:1992":eventForwardingDiscriminator;

– "ITU-T Recommendation X.721:1992":log.

The following classes which are defined in Recommendation X.745 [22] may be instantiated.

– "ITU-T Recommendation X.745:1993":schedulingConflictRecord;

– "ITU-T Recommendation X.745:1993":testActionPerformer;

– "ITU-T Recommendation X.745:1993":testResultsRecord.

6.1.3 Test fragment

The following classes which are required for the testing of lines and line circuits are defined in the following subclauses. They may all be instantiated.

6.1.3.1 Access test

accessTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
testEnvironmentConditionsPackage,
"ITU-T Recommendation X.745": mORTsPackage,
accessTestPkg **PACKAGE**
BEHAVIOUR
accessTestPkgBehaviour **BEHAVIOUR**
DEFINED AS "The MORTs which are subject to test are listed in the mORTs attribute.
The creation of an instance of this object class represents a test session and permits test access to lines or line circuits during which a number of different tests can be performed. These tests are executed by instances of specific test object classes contained in the accessTest object, which acts for them as a common framework in terms of state handling (dependent on the performed tests) and test mechanism reservation (implementation specific).
If this object class is instantiated with a contained voiceAccessTest object instance, the mORTs attribute shall contain only one user port.
If an instance of this object class contains instances of specific test object classes, the line access conditions are those implicitly specified by the individual test objects. The procedure for the sequential or parallel performance of the tests specified by the contained objects on the user port(s) listed in their mORTs, attributes is up to the implementation.
The testEnvironmentConditionsPackage is used to control any possible interference between tests ordered by the manager and all other activities taking place in the NE.
In case of multiple MORTs testing, the additionalInformation field of the test result notification shall contain the results for each MORT under test. In the case that at least one test of a MORT fails to seize sufficient test resources, the testOutcome field of test result notification shall contain the value 'fail'. The test result notification shall only be sent for the MORTs for which there was a failure to set up an adequate test environment.
The NE may perform, at any time during the lifespan of the accessTest object, a check for the presence of a dangerous voltage. If this condition is detected, then this is reported in the test result of the accessTest and the affected test is terminated (in the case of multiple MORTs testing, the effective MORT is skipped).";;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification accessResult;;;
REGISTERED AS {q835ManagedObjectClass 1};

6.1.3.2 Cable pair identification tone

cablePairIdTone **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
cablePairIdTonePkg **PACKAGE**
BEHAVIOUR
cablePairIdTonePkgBehaviour **BEHAVIOUR**
DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
This test shall be performed in the following way: a tone shall be sent out on a 2-wire pair to assist in identifying cable pairs in the field.";;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification genericTestResult;;;
REGISTERED AS {q835ManagedObjectClass 2};

6.1.3.3 Dialled digit test

dialledDigitTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
dialledDigitTestPkg **PACKAGE**
BEHAVIOUR
dialledDigitTestPkgBehaviour **BEHAVIOUR**
DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT to which the test is to be applied.
DTMF tone (if possible) or pulses received are decoded and results reported after the specified number of digits have been received. This value is stored in the numberOfDigits attribute (default 1 digit).
The wrongSignal value of the NotDigit data type result may be generated by the NE if a signal has been detected of similar nature as the expected one, but out of the range for any of its aspects, e.g., invalid duration (loop break or DTMF tones), invalid level and/or frequency (DTMF) or one-tone-missing (DTMF). If an implementation generates this result, it shall be well specified under which conditions it is done.";;
ATTRIBUTES
numberOfDigits DEFAULT VALUE
ASN1LLCTTypeModule.defaultNumberOfDigits GET-REPLACE,
requestedResultType DEFAULT VALUE
ASN1LLCTTypeModule.defaultRequestedResultType GET-REPLACE;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification dialledDigitTestResult;;;
REGISTERED AS {q835ManagedObjectClass 3};

6.1.3.4 Dial tone test

dialToneTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
dialToneTestPkg **PACKAGE**
BEHAVIOUR
dialToneTestPkgBehaviour **BEHAVIOUR**
DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
An off-hook is simulated by the NE according to the offHookSimulation attribute and the time is measured until the dial tone appears on the line circuit termination. This time is compared with a predefined threshold. If a number of iterations are specified, then the results are returned in a single test result notification.
In case of multiple MORTs testing, the additionalInformation field of the test result notification shall contain the results for each MORT under test. When all MORTs passed the tests, the testOutcome field of the test result notification shall contain the value 'pass'. In case at least one MORT test fails, the testOutcome field of the test result notification shall contain the value 'fail'.
The requestedResultType is used to control the test result notification. Its three Boolean parameters define whether the MORTs which passed and/or those which failed and/or the measured values are to be reported.";;
ATTRIBUTES
offHookSimulation GET,
requestedResultType DEFAULT VALUE
ASN1LLCTTypeModule.defaultRequestedResultType GET-REPLACE,
iterations DEFAULT VALUE ASN1LLCTTypeModule.defaultIterations;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification dialToneTestResult;;;
REGISTERED AS {q835ManagedObjectClass 4};

6.1.3.5 Dry loop

dryLoop **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
dryLoopPkg **PACKAGE**
BEHAVIOUR
dryLoopPkgBehaviour **BEHAVIOUR**
DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
When an object is instantiated, the lines related to the user ports listed in the MORTs attribute are disconnected from the corresponding line circuit.
The result of the attempt to switch the requested dry loop(s) may be reported immediately or after the appropriate wait time as given in the test request.
A dry loop is terminated by time-out, by deleting the dryLoop object or by terminating the function with a testTerminate action.";;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification genericTestResult;;;
REGISTERED AS {q835ManagedObjectClass 5};

6.1.3.6 Electrical measurement test

electricalMeasurementTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
electricalMeasurementTestPkg **PACKAGE**
BEHAVIOUR
electricalMeasurementTestPkgBehaviour **BEHAVIOUR**
DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
The electricalMeasurementTestToBePerformed attribute defines which electrical measurements are to be performed, what results are required and (optionally) thresholds that override predefined NE thresholds to be used only during this test.
The appropriate testOutcome shall be set to 'pass' only if all performed tests were successful. If requested, measured values will be returned in the electricalMeasurementTestResult parameter carried in the test result notification. If a requested measurement could not be executed by the NE because it is not supported, the NE shall omit the related optional elements within the electricalMeasurementTestResult.
In case of multiple MORTs testing, the additionalInformation field of the test result notification shall contain the results for each MORT under test. When all MORTs passed the tests, the testOutcome field of the test result notification shall contain the value 'pass'. In case at least one MORT test fails, the testOutcome field of the test result notification shall contain the value 'fail'.
The requestedResultType is used to control the test result notification. Its three Boolean parameters define whether the MORTs which passed and/or those which failed and/or the measured values are to be reported.";;
ATTRIBUTES
electricalMeasurementTestToBePerformed DEFAULT VALUE
ASN1LLCTTypeModule.defaultElectricalMeasurementTestToBePerformed GET-REPLACE,
requestedResultType DEFAULT VALUE
ASN1LLCTTypeModule.defaultRequestedResultType GET-REPLACE;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification electricalMeasurementTestResult;;;
REGISTERED AS {q835ManagedObjectClass 6};

6.1.3.7 ISDN quick test

isdnQuickTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
"ITU-T Recommendation X.745":mORTsPackage,
isdnQuickTestPkg **PACKAGE**
BEHAVIOUR
isdnQuickTestPkgBehaviour **BEHAVIOUR**
DEFINED AS "The ISDN quick test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745 for the MORT(s) to which the test is to be applied.
The isdnQuickTestToBePerformed attribute defines which quick tests are to be performed.
The appropriate testOutcome shall be set to 'pass' only if all test steps performed by the quick test were successful. If requested, detailed error reasons will be returned in the isdnQuickTestResult parameter carried in the test result notification. If a requested isdnQuickTest could not be executed by the NE because it is not supported, the NE shall generate the appropriate specific error indicating the not supported test.
In case of multiple MORTs testing the additionalInformation field of the test result notification shall contain the results for each MORT under test. When all MORTs passed the tests, the testOutcome field of the test result notification contains the value 'pass'. In case at least one MORT test fails, the testOutcome field of the test result notification shall contain the value 'fail'.
The requestedResultType is used to control the test result notification. Its three Boolean parameters define whether the MORTs which passed and/or those which failed and/or the measured values are to be reported.";;
ATTRIBUTES
isdnQuickTestToBePerformed DEFAULT VALUE
ASN1LLCTTypeModule.defaultIsdnQuickTestToBePerformed GET-REPLACE,
requestedResultType DEFAULT VALUE
ASN1LLCTTypeModule.defaultRequestedResultType GET-REPLACE;
NOTIFICATIONS
"ITU-T Recommendation X.745":testResultNotification isdnQuickTestResult;;;
REGISTERED AS {q835ManagedObjectClass 7};

6.1.3.8 Loop test

loopTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
testEnvironmentConditionsPackage,
"ITU-T Recommendation X.745": mORTsPackage,
loopTestPkg **PACKAGE**
BEHAVIOUR
loopTestPkgBehaviour **BEHAVIOUR**
DEFINED AS "Instances of this object class represent loopbacks which are used for testing.
When an instance of this object class is applied to a set of user ports which are represented by objects, then the inherited mORTs attribute consists of a set of object identifiers which indicates the ports to which loopback are to be applied. Patterns are transmitted towards the user, then looped back towards the port for each indicated port.
Further details about the generation and comparison of patterns may be modeled using one or more objects which are contained in this loopTest object instance. If there are no such contained objects, then pattern generation and detection may be performed remotely or implicitly performed locally.
The loopbackDuration attribute indicates for how long a loopback is to be applied. It shall have a finite value to ensure that the loopback will be eventually removed, and any request which would result in a loopback being applied infinitely shall be rejected. The loopback shall be removed before the instance of this class is deleted.
The loopbackPosition attribute indicates the position where loopback is to be applied. Loopbacks in different positions may be used in the testing of a single object. The loopbackPosition attribute indicates both the position and the direction of the loopback.
The loopbackChannel attribute indicates the nature of the loopback, in particular the channels or connections which are looped back at the loopback position.

The loopbackSelect action may be used to select new durations, positions and types for further loopback testing, without deleting the instance of this object class.
If an invalid loopback is requested, then the request shall be rejected with an invalidLoopbackRequest parameter. If the test is terminated before completion of the specified duration, then the loopback shall be removed before the result is returned and the instance deleted. If the loopback is successful, then the loopbackResult parameter shall be returned in the testResult notification.
The testEnvironmentalConditionsPackage package is used to control any possible interference between tests ordered by the manager and all other activities taking place in the NE.";;
ATTRIBUTES
loopbackDuration DEFAULT VALUE ASN1LLCTTypeModule.defaultLoopBackDuration GET,
loopbackPosition DEFAULT VALUE ASN1LLCTTypeModule.defaultLoopBackPosition GET,
loopbackChannel DEFAULT VALUE ASN1LLCTTypeModule.defaultLoopBackChannel GET;
ACTIONS
loopbackSelect;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification loopbackTestResult;;;
REGISTERED AS {q835ManagedObjectClass 8};

6.1.3.9 Metallic test access

metallicTestAccess **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
"ITU-T Recommendation X.745":mORTsPackage,
metallicTestAccessPkg **PACKAGE**
BEHAVIOUR
metallicTestAccessPkgBehaviour **BEHAVIOUR**
DEFINED AS "The test establishes a physical connection between an instance of MORT and a measurement interface of an external test system.
The OS identifies the measurement interface in parameter numberOfMTA, which is included in the information syntax of testRequestControlledAction.
In case the measurement interface is not available for any reason, the NE automatically tries to connect the MORT to an alternative measurement interface. In both cases, the attribute proposedMTA indicates the measurement interface where the MORT is physically connected to.
The attribute mtaMsg contains the return value of a successful connection.
The connection will be released after the time defined by attribute mtaTimeoutPeriod. In this case, all test-related resources are released, the instance of metallicTestAccess is implicitly deleted, and an objectDeletionNotification is generated. Setting the attribute mtaTimeoutPeriod extends the connection time by the indicated value.";;
ATTRIBUTES
mtaTimeoutPeriod DEFAULT VALUE
ASN1LLCTTypeModule.defaultMtaTimeoutPeriod GET-REPLACE,
mtaMsg GET,
proposedMTA GET;
NOTIFICATIONS
"ITU-T Recommendation X.721":objectDeletion;;;
CONDITIONAL PACKAGES
testEnvironmentConditionsPackage **PRESENT IF** "an instance supports it",
mtaLinePackage **PRESENT IF** "the metallic test access is a two-wire interface.";
REGISTERED AS {q835ManagedObjectClass 9};

6.1.3.10 Pattern test

patternTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
patternTestPkg **PACKAGE**
BEHAVIOUR
patternTestPkgBehaviour **BEHAVIOUR**

DEFINED AS "A Pattern Test is an object class which represents the generation and matching of bit patterns which may be used in association with loopback testing. The mORTs attribute consists of a set of two objects identifiers. The first of these defines how pattern generation is applied, and the second defines how pattern matching is applied. Patterns are injected at the object identified by the first identifier unless it is null, in which case pattern generation shall be disabled. Patterns received from the object identified by the second identifier are used for comparison unless this identifier is null, in which case pattern matching shall be disabled.
Possible ambiguities about the signal paths by which injected signals leave or arrive at the objects identified in the mORTs attribute is normally resolved in the object which contains the instance of this object. If ambiguities remain, they may be clarified in an object contained in this object.";;

ATTRIBUTES

"ITU-T Recommendation X.737": testPattern GET-REPLACE,
requestedResultType DEFAULT VALUE
ASN1LLCTTypeModule.defaultRequestedResultType GET-REPLACE,
"ITU-T Recommendation X.737": errorRatioReportType GET;

NOTIFICATIONS

"ITU-T Recommendation X.745": testResultNotification patternTestResult;;;

REGISTERED AS {q835ManagedObjectClass 10};

6.1.3.11 Ringing

ringing **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
ringingPkg **PACKAGE**

BEHAVIOUR

ringingPkgBehaviour **BEHAVIOUR**

DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
An instance of this object class represent the application of a ringing current to the line. The current shall be removed either on request or after a time-out. The testOutcome parameter of the testResult shall indicate 'pass' if the ringing was tripped. When a time-out occurs, it shall be indicated in the appropriate testOutcome parameter.
The ring attribute indicates for how long ringing is to be applied.";;

ATTRIBUTES

ring DEFAULT VALUE ASN1LLCTTypeModule.defaultRing GET-REPLACE;

NOTIFICATIONS

"ITU-T Recommendation X.745": testResultNotification genericTestResult;;;

REGISTERED AS {q835ManagedObjectClass 11};

6.1.3.12 Subscriber private meter (SPM) pulses

spmPulses **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
spmPulsesPkg **PACKAGE**

BEHAVIOUR

spmPulsesPkgBehaviour **BEHAVIOUR**

DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
This test shall be performed in the following way: apply the requested number of Subscriber Private Metering pulses (0-99) at the required frequency level to the line. After the pulses have been sent or after a time-out, the test result notification shall be emitted, with the testOutcome parameter set to 'inconclusive' or 'timed-out'.
The spmPulsesNo indicates the number of pulses which shall be applied.";;

ATTRIBUTES

spmPulsesNo DEFAULT VALUE ASN1LLCTTypeModule.defaultSpmPulses GET-REPLACE;

NOTIFICATIONS

"ITU-T Recommendation X.745": testResultNotification genericTestResult;;;

REGISTERED AS {q835ManagedObjectClass 12};

6.1.3.13 Test to line circuit

testToLineCircuit **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
testToLineCircuitPkg **PACKAGE**
BEHAVIOUR
testToLineCircuitPkgBehaviour **BEHAVIOUR**
DEFINED AS "This test is only performed given that the containing accessTest object instance exists and that it is in the testing state, as defined in ITU-T Recommendation X.745, for the MORT(s) to which the test is to be applied.
This managed object class is instantiated whenever an OS requests an inward test on a specified user port or on a set of user ports. This consists of executing a set of specific circuit tests.
The test result is based on a GO/NOGO method covering all circuit tests on a global way. If the NE supports the transfer of result values, these may be additionally provided in the test result notification.
In case of multiple MORTs testing, the additionalInformation field of the test result notification shall contain the results for each MORT under test. When all tests on a MORT passed, the testOutcome field of the test result notification contains the value 'pass'. In case at least one test on a MORT fails, the testOutcome field of the test result notification shall contain the value 'fail'. If the testOutcome for a MORT is 'fail' and the NE is able to, it provides a list of the line circuit tests which have failed.";;
NOTIFICATIONS
"ITU-T Recommendation X.745": testResultNotification testToLineCircuitResult;;;
REGISTERED AS {q835ManagedObjectClass 13};

6.1.3.14 Test Threshold Class

testThresholdClass **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.721":top;
CHARACTERIZED BY
testThresholdClassPkg **PACKAGE**
BEHAVIOUR
testThresholdClassPkgBehaviour **BEHAVIOUR**
DEFINED AS "When a passed/not passed result is requested, provisionable threshold values are used, unless the test request contains threshold values which override the provisioned thresholds. After the termination of that test, the provisioned thresholds will be restored.
Provisionable thresholds are default thresholds for tests which can be modified via the Q3 interface. For each type of test it is possible to specify a number of different thresholds. Each of these thresholds may be assigned to a particular group of thresholds, so-called threshold classes.
Access ports may be associated with one of these threshold classes, e.g. by using the supportedByObjectList attribute.";;
ATTRIBUTES
testThresholdClassId GET,
capacitanceThreshold DEFAULT VALUE
ASN1LLCTTypeModule.defaultCapacitanceThreshold GET-REPLACE,
resistanceThreshold DEFAULT VALUE
ASN1LLCTTypeModule.defaultResistanceThreshold GET-REPLACE,
acVoltageThreshold DEFAULT VALUE
ASN1LLCTTypeModule.defaultAcVoltageThreshold GET-REPLACE,
dcVoltageThreshold DEFAULT VALUE
ASN1LLCTTypeModule.defaultDcVoltageThreshold GET-REPLACE,
dialSpeedThreshold DEFAULT VALUE
ASN1LLCTTypeModule.defaultDialSpeedThreshold GET-REPLACE,
pulseNoPulseRatio DEFAULT VALUE
ASN1LLCTTypeModule.defaultPulseNoPulseRatio GET-REPLACE;;;
REGISTERED AS {q835ManagedObjectClass 14};

6.1.3.15 Voice access test

voiceAccessTest **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.745": testObject;
CHARACTERIZED BY
voiceAccessPackage,
voiceAccessTestPackage **PACKAGE**
BEHAVIOUR
voiceAccessTestBehaviour **BEHAVIOUR**
DEFINED AS "This object class allows for the provision of a voice access test";;
NOTIFICATIONS
"ITU-T Recommendation X.745":testResultNotification voiceAccessTestResult;;;
REGISTERED AS {q835ManagedObjectClass 15};

6.1.3.16 Access network ringback service treatment

anRbsTreatment **MANAGED OBJECT CLASS**
DERIVED FROM "ITU-T Recommendation X.721": top;
CHARACTERIZED BY
anRbsTreatmentPackage **PACKAGE**
BEHAVIOUR
anRbsTreatmentBehaviour **BEHAVIOUR**
DEFINED AS "The anRbsTreatment object class is a class of managed objects that represent the capability of an LE to support AN-based tests initiated from the subscriber premises by dialling special service codes (ringback service). Instances of this object class will be pointed at by instances of object classes representing the special service codes. In addition, instances of anRbsTreatment may be pointed at by instances of other object classes representing tones or announcements which are related to particular steps and results of the test procedure identified by the service code.
Whenever one of those service codes is dialled, the call routing function in the LE selects an appropriate instance of this object class. This instance shall then emit the offHook notification.
When a CPE under test goes on-hook, this shall be reported by means of the onHook notification. Test results produced in the LE, e.g. by DTMF measurements, may optionally be contained in the information syntax of this notification.
When a user port address is added to the list contained in the applyRingingCurrent attribute, the ringing current shall be applied to the associated subscriber line. The feeding shall stop when the CPE goes off-hook or when a pre-defined timer in the LE expires. The user port address shall then be removed from the attribute. A time out shall be reported by means of the timeOut notification.
When a user port address is added to the list contained in the applyTone attribute, a tone or announcement related to the test result as specified in the information syntax of the attribute shall be applied to the associated subscriber line in order to indicate the test result. The tone or announcement shall stop when the CPE goes on-hook or when a pre-defined timer in the LE expires or optionally when the next code is typed in at the CPE. The user port address and any related test result shall then be removed from the attribute. A time out shall be reported by means of the timeOut notification. The applyTone attribute may also be set by LE internal test procedures, e.g. DTMF measurements.";;
ATTRIBUTES
anRbsTreatmentId GET,
applyTone GET-REPLACE ADD-REMOVE,
applyRingingCurrent GET-REPLACE ADD-REMOVE;
NOTIFICATIONS
"ITU-T Recommendation X.721": objectCreation,
"ITU-T Recommendation X.721": objectDeletion,
offHook,
onHook,
timeOut;;;
REGISTERED AS {q835ManagedObjectClass 16};

6.2 Name bindings

6.2.1 Test fragment

6.2.1.1 accessTest-testActionPerformer

accessTest-testActionPerformer **NAME BINDING**
SUBORDINATE OBJECT CLASS accessTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation X.745": testActionPerformer
AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE DELETES-CONTAINED-OBJECTS;
REGISTERED AS {q835NameBinding 1};

6.2.1.2 anRbsTreatment-managedElement

anRbsTreatment-managedElement **NAME BINDING**
SUBORDINATE OBJECT CLASS anRbsTreatment;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation M.3100": managedElement
AND SUBCLASSES;
WITH ATTRIBUTE anRbsTreatmentId;
CREATE WITH-REFERENCE-OBJECT, WITH-AUTOMATIC-INSTANCE-NAMING;
DELETE;
REGISTERED AS {q835NameBinding 2};

6.2.1.3 cablePairIdTone-accessTest

cablePairIdTone-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS cablePairIdTone AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 3};

6.2.1.4 dialledDigitTest-accessTest

dialledDigitTest-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS dialledDigitTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 4};

6.2.1.5 dialToneTest-accessTest

dialToneTest-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS dialToneTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 5};

6.2.1.6 dryLoop-accessTest

dryLoop-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS dryLoop AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 6};

6.2.1.7 electricalMeasurementTest-accessTest

electricalMeasurementTest-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS electricalMeasurementTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 7};

6.2.1.8 isdnQuickTest-accessTest

isdnQuickTest-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS isdnQuickTest AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745":testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 8};

6.2.1.9 loopTest-testActionPerformer

loopTest-testActionPerformer **NAME BINDING**
SUBORDINATE OBJECT CLASS loopTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS "ITU-T Recommendation X.745": testActionPerformer
AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE DELETES-CONTAINED-OBJECTS;
REGISTERED AS {q835NameBinding 9};

6.2.1.10 metallicTestAccess-testActionPerformer

metallicTestAccess-testActionPerformer **NAME BINDING**
SUBORDINATE OBJECT CLASS metallicTestAccess AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "ITU-T Recommendation X.745":testActionPerformer AND
SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745":testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 10};

6.2.1.11 patternTest-loopTest

patternTest-loopTest **NAME BINDING**
SUBORDINATE OBJECT CLASS patternTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS loopTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 11};

6.2.1.12 spmPulses-accessTest

spmPulses-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS spmPulses AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 12};

6.2.1.13 ringing-accessTest

ringing-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS ringing AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 13};

6.2.1.14 testThresholdClass-managedElement

testThresholdClass-managedElement **NAME BINDING**
SUBORDINATE OBJECT CLASS testThresholdClass AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "ITU-T Recommendation M.3100": managedElement AND SUBCLASSES;
WITH ATTRIBUTE testThresholdClassId;
CREATE;
DELETE;
REGISTERED AS {q835NameBinding 14};

6.2.1.15 testToLineCircuit-accessTest

testToLineCircuit-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS testToLineCircuit AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 15};

6.2.1.16 voiceAccessTest-accessTest

voiceAccessTest-accessTest **NAME BINDING**
SUBORDINATE OBJECT CLASS voiceAccessTest AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS accessTest AND SUBCLASSES;
WITH ATTRIBUTE "ITU-T Recommendation X.745": testObjectId;
DELETE;
REGISTERED AS {q835NameBinding 16};

6.3 Definition of packages

6.3.1 Metallic Test Access Line Package

mtaLinePackage **PACKAGE**
BEHAVIOUR
mtaLinePackageBehaviour **BEHAVIOUR**
DEFINED AS "The package mtaLinePackage is instantiated if the metallic test access supports a two-wire interface. The attribute typeOfLine identifies the direction of the connection, inbound or outbound or bridged. Setting the attribute typeOfLine switches the direction of the metallic test access.";;
ATTRIBUTES
typeOfLine GET-REPLACE;
REGISTERED AS {q835Package 1};

6.3.2 Test environment conditions package

testEnvironmentConditionsPackage **PACKAGE**
BEHAVIOUR
testEnvironmentConditionsBehaviour **BEHAVIOUR**
DEFINED AS "This package allows the manager to specify the relative priorities between a test request and normal traffic. This package does not work in case a voiceAccessTest is instantiated, contained in the same accessTest object and its monitorSpeak attribute is set to existingConnection.
The priority between normal traffic and a test request is determined by the testConditions attribute.
If this attribute is set to testIfBusy, then testing shall proceed.
In the case of an active connection and the attribute is set to waitIfBusy, then the test shall wait at most for the period of time specified in the attribute waitTime. If the active connection has not been released within this time, then the test shall enter the terminating phase, skipping the testing phase. The manager shall be notified about the termination using the test result notification with the value busyAccessAborted. Otherwise, testing shall proceed.
In the case of an active connection and the attribute is set to rejectIfBusy, then the test shall enter the terminating phase, skipping the testing phase immediately. The manager may be notified about the termination using the test result notification with the value busyAccessAborted.
During the initialization of the testing phase, an outgoing call attempt may be detected, depending on the particular test and implementation. If the value of the testConditions attribute is noCustomerOverrideTest, the test shall continue; otherwise, the terminating phase shall be entered and the call shall proceed. The termination shall be notified to the manager using the test result notification with the value customerOverrideAborted.";;
ATTRIBUTES
"ITU-T Recommendation X.737": testConditions
DEFAULT VALUE ASN1LLCTTypeModule.defaultTestConditions GET,
waitTime DEFAULT VALUE ASN1LLCTTypeModule.defaultBusyLCWaitTime GET-REPLACE;
REGISTERED AS {q835Package 2};

6.3.3 Voice access package

voiceAccessPackage **PACKAGE**
BEHAVIOUR
voiceAccessPackageBehaviour **BEHAVIOUR**
DEFINED AS "This package provides the central operator with a voice access to the line to be tested. This test shall only be applied to a single User Port. An agent provides the voice path by one or both of the following methods.
For the 'existing connection' method, an object instance with the attribute monitorSpeak set to existingConnection shall enter its initializing phase during an ongoing, previously established normal connection between the User Port and the Operator Port. Then the existing connection shall be transformed into a test condition; i.e. the voice connection shall be maintained (ignoring the testConditions parameter), but the line signalling shall now be controlled by the Q3 interface of the agent by means of other possible test objects for subscriber assisted tests, so that, an on-hook shall not clear the connection at this time, but be indicated to the manager. This allows the use of an existing connection for a subscriber-assisted test.
For the 'parallel voice path' method, the monitorSpeak attribute shall be set to monitorWithoutMark, monitorWithMark or speakAndMonitor. In this method, a parallel voice path across the test function instead of

the User Port line circuit is used. The ringBackNo attribute may be used to inform the test function of the operator's directory number to which the parallel voice path shall be established. If the establishment of the parallel voice path fails, an error shall be reported (ringBackFailed) and the test shall be aborted. After successful establishment of the parallel voice path, the agent shall connect the parallel voice path to the User Port line as requested in the monitorSpeak attribute. An initial intrusion tone shall be applied if the values monitorWithMark or speakAndMonitor are requested.
When a connection is successful, a test result notification with the value connectionEstablished shall be emitted.";;
ATTRIBUTES
monitorSpeak DEFAULT VALUE
ASN1LLCTTypeModule.defaultMonitorSpeak GET-REPLACE,
ringBackNo GET-REPLACE;
REGISTERED AS {q835Package 3};

6.4 Definition of attributes

6.4.1 AC voltage threshold

acVoltageThreshold **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.AcVoltageThreshold;
MATCHES FOR EQUALITY;
BEHAVIOUR
acVoltageThresholdBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the thresholds for AC voltage testing.";;
REGISTERED AS {q835Attribute 1};

6.4.2 Access network ringback service treatment ID

anRbsTreatmentId **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
anRbsTreatmentIdBehaviour **BEHAVIOUR**
DEFINED AS "It is the object identifier.";;
REGISTERED AS {q835Attribute 2};

6.4.3 Apply ringing current

applyRingingCurrent **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.AnRingTest;
MATCHES FOR EQUALITY;
BEHAVIOUR
applyRingingCurrentBehaviour **BEHAVIOUR**
DEFINED AS "This attribute indicates all subscriber lines under test where a ringing current is currently applied to the line.";;
REGISTERED AS {q835Attribute 3};

6.4.4 Apply tone

applyTone **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.Results;
MATCHES FOR EQUALITY;
BEHAVIOUR
applyToneBehaviour BEHAVIOUR
DEFINED AS "This attribute indicates for each subscriber line under test the last test result which shall be used to apply the appropriate tones or announcements to the line.";;
REGISTERED AS {q835Attribute 4};

6.4.5 Capacitance threshold

capacitanceThreshold **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.CapacitanceThreshold;
MATCHES FOR EQUALITY;
BEHAVIOUR
capacitanceThresholdBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the thresholds for capacitance testing.";;
REGISTERED AS {q835Attribute 5};

6.4.6 DC voltage threshold

dcVoltageThreshold **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.DcVoltageThreshold;
MATCHES FOR EQUALITY;
BEHAVIOUR
dcVoltageThresholdBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the thresholds for DC voltage testing.";;
REGISTERED AS {q835Attribute 6};

6.4.7 Dial speed threshold

dialSpeedThreshold **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.DialSpeedThreshold;
MATCHES FOR EQUALITY;
BEHAVIOUR
dialSpeedThresholdBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the thresholds for testing the dial speed.";;
REGISTERED AS {q835Attribute 7};

6.4.8 Electrical measurement test

electricalMeasurementTestToBePerformed **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.ElectricalMeasurementTestToBePerformed;
MATCHES FOR EQUALITY;
BEHAVIOUR
electricalMeasurementTestToBePerformedBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies which electrical parameters are to be tested. Multiple parameters may be identified in the same request. The default is that all parameters which the tester can support shall be tested, excluding subscriber-assisted tests.";;
REGISTERED AS {q835Attribute 8};

6.4.9 ISDN quick test

isdnQuickTestToBePerformed **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.IsdnQuickTestToBePerformed;
MATCHES FOR EQUALITY;
BEHAVIOUR
isdnQuickTestToBePerformedBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies which types of quick tests are to be performed.";;
REGISTERED AS {q835Attribute 9};

6.4.10 Iterations

iterations **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.Iterations;
MATCHES FOR EQUALITY;
BEHAVIOUR
iterationsBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the number of iterations to be performed.";;
REGISTERED AS {q835Attribute 10};

6.4.11 Loopback channel

loopbackChannel **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.LoopbackChannel;
MATCHES FOR EQUALITY;
BEHAVIOUR
loopbackChannelBehaviour **BEHAVIOUR**
DEFINED AS "The loopbackChannel attribute specifies the channels or connections which are to be looped back.";;
REGISTERED AS {q835Attribute 11};

6.4.12 Loopback duration

loopbackDuration **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.LoopbackDuration;
MATCHES FOR EQUALITY;
BEHAVIOUR
loopbackDurationBehaviour **BEHAVIOUR**
DEFINED AS "The loopbackDuration attribute specifies for how long the loopback is applied. The duration is measured from the time of the application of the loopback, and not from the time when the loopback request is received.";;
REGISTERED AS {q835Attribute 12};

6.4.13 Loopback position

loopbackPosition **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.LoopbackPosition;
MATCHES FOR EQUALITY;
BEHAVIOUR
loopbackPositionBehaviour **BEHAVIOUR**
DEFINED AS "The loopbackPosition attribute specifies the location and direction of the loopback which is to be applied.";;
REGISTERED AS {q835Attribute 13};

6.4.14 Metallic test access message

mtaMsg **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.MtaMsg;
MATCHES FOR EQUALITY;
BEHAVIOUR
mtaMsgBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the return value of a metallic test access connection.
Possible values of a successful connection to the metallic test access are:

– analogueFree	the analogueAccess is in the idle state
– analogueOccupied	the analogueAccess is in the busy state
– analogueOccupiedNotUsed	the analogueAccess is in a blocked state because of a permanent off-hook situation (blocked permanent)
– analogueBlocked	the analogueAccess is in a blocked state because of administrative or maintenance reasons or due to a transient line fault
– isdnAccess	successful connection of a basicRateAccess to the metallic test access

In case of a not successful connection of the MORT to the metallic test access, the attribute mtaMsg is included in the generated independent test invocation error, having one of the following values:

– error	not successful connection to the metallic test access due to a general error situation, that is not represented by one of the specific errors described below
– testing	the MORT is already busy testing via MTA
– mTAoccupied	all measurement interfaces that would be accessible by the MORT are occupied
– noAccess-noSub	the MORT exists as physical access, but has no subscriber assigned to it

– noAccess-hdh the MORT is an access using higher digital hierarchy that does not support the metallic test access connection
– noAccess-aconc the MORT is connected to an analogue access concentrator that does not support the metallic test access connection
– notAccessible the metallic test access is temporarily not accessible (e.g. internal testbus busy by another test than MTA)
– noAccess-nuc the MORT is part of a nailed-up connection
– noAccess-any the MORT is part of an equipment that does not support the connection to the metallic test access due to any reason.";;

REGISTERED AS {q835Attribute 14};

6.4.15 Metallic test access timeout period

mtaTimeoutPeriod **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.MtaTimeoutPeriod;
MATCHES FOR EQUALITY;
BEHAVIOUR
mtaTimeoutPeriodBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the time of a metallic test access connection.";;
REGISTERED AS {q835Attribute 15};

6.4.16 Monitor and speak

monitorSpeak **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.MonitorSpeak;
MATCHES FOR EQUALITY;
BEHAVIOUR
monitorSpeakBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies whether the line is to be monitored, whether speech can be injected, and whether a tone is used to indicate to the user that the line is being monitored.";;
REGISTERED AS {q835Attribute 16};

6.4.17 Number of digits

numberOfDigits **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.NumberOfDigits;
MATCHES FOR EQUALITY;
BEHAVIOUR
numberOfDigitsBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the number of digits which are to be tested during a dialled digit test. The default value is 1.";;
REGISTERED AS {q835Attribute 17};

6.4.18 Off hook simulation

offHookSimulation **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.OffHookSimulation;
MATCHES FOR EQUALITY;
BEHAVIOUR
offHookSimulationBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies how offHook for the dial tone test is realized depending on national, vendor or operator specific conditions. The default value is 0, which means loop calling.";;
REGISTERED AS {q835Attribute 18};

6.4.19 Proposed metallic test access

proposedMTA **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.NumberOfMTA;
MATCHES FOR EQUALITY;
BEHAVIOUR
proposedMTABehaviour **BEHAVIOUR**
DEFINED AS "This attribute identifies the measurement interface to which the MORT is connected.";;
REGISTERED AS {q835Attribute 19};

6.4.20 Pulse no pulse ratio

pulseNoPulseRatio **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.PulseNoPulseRatio;
MATCHES FOR EQUALITY;
BEHAVIOUR
pulseNoPulseRatioBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the threshold for testing the pulse no pulse ratio.";;
REGISTERED AS {q835Attribute 20};

6.4.21 Request result type

requestedResultType **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.RequestedResultType;
MATCHES FOR EQUALITY;
BEHAVIOUR
requestedResultTypeBehaviour **BEHAVIOUR**
DEFINED AS "This attribute is used to control the test result reports by a combination of the three Boolean parameters GO, NOGO and VALUE. If GO is true, a result report is sent only if a port passed a test. If NOGO is true, a result report is sent only if a port did not pass a test. If VALUE is true, the measured value is reported.";;
REGISTERED AS {q835Attribute 21};

6.4.22 Resistance threshold

resistanceThreshold **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.ResistanceThreshold;
MATCHES FOR EQUALITY;
BEHAVIOUR
resistanceThresholdBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the thresholds for resistance testing.";;
REGISTERED AS {q835Attribute 22};

6.4.23 Ring

ring **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.Ring;
MATCHES FOR EQUALITY;
BEHAVIOUR
ringBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the time for which ringing is applied. The ring attribute is used to generate continuous or timed ringing. If it has an integer value, then it specifies the time in seconds for which ringing is applied. If it has a Null value, then continuous ringing shall be applied. If the value is not specified, then the default value shall be used.";;
REGISTERED AS {q835Attribute 23};

6.4.24 Ring back number

ringBackNo **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.RingBackNo;
MATCHES FOR EQUALITY;
BEHAVIOUR
ringBackNoBehaviour **BEHAVIOUR**
DEFINED AS "The ringBackNo attribute allows the test function to be informed of the telephone number of the operator and to dial back to set up a monitor or a monitor and speak path.";;
REGISTERED AS {q835Attribute 24};

6.4.25 Number of subscriber private meter (SPM) pulses

spmPulsesNo **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.SpmPulses;
MATCHES FOR EQUALITY;
BEHAVIOUR
spmPulsesNoBehaviour **BEHAVIOUR**
DEFINED AS "The spmPulsesNo attribute indicates the number of SPM pulses which shall be applied. This number ranges between 0 and 99.";;
REGISTERED AS {q835Attribute 25};

6.4.26 Type of Line

typeOfLine **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.TypeOfLine;
MATCHES FOR EQUALITY;
BEHAVIOUR
typeOfLineBehaviour **BEHAVIOUR**
DEFINED AS "This attribute specifies the switched direction of the measurement interface in case of a two-wire interface.";;
REGISTERED AS {q835Attribute 26};

6.4.27 Wait time

waitTime **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.WaitTime;
MATCHES FOR EQUALITY;
BEHAVIOUR
waitTimeBehaviour **BEHAVIOUR**
DEFINED AS "In case of waitIfBusy as value for testConditions attribute, this attribute defines the maximum amount of time to wait for the end of the busy condition before performing a test.";;
REGISTERED AS {q835Attribute 27};

6.4.28 Test threshold class identifier

testThresholdClassId **ATTRIBUTE**
WITH ATTRIBUTE SYNTAX ASN1LLCTTypeModule.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
testThresholdClassIdBehaviour **BEHAVIOUR**
DEFINED AS "It is the object identifier, the RDN of the test threshold class.";;
REGISTERED AS {q835Attribute 28};

6.5 Definition of actions

6.5.1 Loopback select

loopbackSelect **ACTION**
BEHAVIOUR
loopbackSelectActionBehaviour **BEHAVIOUR**
DEFINED AS "The loopbackSelect action is used either to change duration, position and type of already existing loopbacks, or to remove one. If the loopbackSelect action specifies a new loopback duration, position and type, it causes any existing loopbacks specified by the managed object to be removed, regardless of their specified duration or time to completion. It then causes a new loopback to be applied according to the new specified parameters of duration, position and type.
If the action specifies as loopback position the value noloopback, the existing loopback specified by the managed object is removed.
If the new parameters specified are invalid, then the request is rejected and the original loopback is not removed or otherwise affected.
The result returns the parameters which are given in the request and confirms the correct reception of the requested.";;
MODE CONFIRMED;
WITH INFORMATION SYNTAX ASN1LLCTTypeModule.LoopbackSelectRequestInfo;
WITH REPLY SYNTAX ASN1LLCTTypeModule.LoopbackSelectRequestResult;
REGISTERED AS {q835Action 1};

6.6 Definition of notifications

6.6.1 Off hook

offHook **NOTIFICATION**
BEHAVIOUR
offHookBehaviour **BEHAVIOUR**
DEFINED AS "This notification indicates that a CPE under test has changed to the off-hook condition. It contains the associated user port address and the dialled service code.";;
WITH INFORMATION SYNTAX ASN1LLCTTypeModule.OffHook;
REGISTERED AS {q835Notification 1};

6.6.2 On hook

onHook **NOTIFICATION**
BEHAVIOUR
onHookBehaviour **BEHAVIOUR**
DEFINED AS "This notification indicates that a CPE under test has changed to the on-hook condition. It contains the associated user port address and optionally test results produced in the LE for this user port.";;
WITH INFORMATION SYNTAX ASN1LLCTTypeModule.OnHook;
REGISTERED AS {q835Notification 2};

6.6.3 Time out

timeOut **NOTIFICATION**
BEHAVIOUR
timeOutBehaviour **BEHAVIOUR**
DEFINED AS "This notification indicates that a procedure applying a tone or ringing current to a subscriber line under test has been terminated. It contains the associated user port address.";;
WITH INFORMATION SYNTAX ASN1LLCTTypeModule.UserPort;
REGISTERED AS {q835Notification 3};

6.7 Definition of parameters

6.7.1 Access result

accessResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.AccessResult;
BEHAVIOUR
accessResultBehaviour **BEHAVIOUR**
DEFINED AS "The accessResult is carried in the test result notification testResultInfo additionalInformation field.";;
REGISTERED AS {q835Parameter 1};

6.7.2 Dialled digit test result

dialledDigitTestResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.DialledDigitTestResult;
BEHAVIOUR
dialledDigitTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The dialledDigitTestResult is carried in the test result notification testResultInfo additional information field when the dialled digit test is invoked.";;
REGISTERED AS {q835Parameter 2};

6.7.3 Dialled digit test uncontrolled request

dialledDigitTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.DialledDigitTestUncontrolledRequestType;
BEHAVIOUR
dialledDigitTestUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The dialledDigitTestUncontrolledRequest parameter is used to check the proper operation of the subscriber's terminal equipment with the testCategoryInformation field of an uncontrolled test request.";;
REGISTERED AS {q835Parameter 3};

6.7.4 Dialled digit test uncontrolled result

dialledDigitTestUncontrolledResult **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledResult.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.DialledDigitTestResult;
BEHAVIOUR
dialledDigitTestUncontrolledResultBehaviour **BEHAVIOUR**
DEFINED AS "The dialledDigitTestUncontrolledResult parameter contains the result(s) of previously requested dialled digit tests and is carried in the additional information field of the uncontrolled test response.";;
REGISTERED AS {q835Parameter 4};

6.7.5 Dial tone test result

dialToneTestResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.DialToneTestResult;
BEHAVIOUR
dialToneTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The dialToneTestResult is carried in the test result notification testResultInfo additional information field when the dial tone test is invoked.";;
REGISTERED AS {q835Parameter 5};

6.7.6 Dial tone test uncontrolled request

dialToneTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.DialToneTestUncontrolledRequestType;
BEHAVIOUR
dialToneTestUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The dialToneTestUncontrolledRequest parameter is used to request the simulation of an off-hook condition in the NE. It is checked whether the dial tone appears at the line circuit termination or not.";;
REGISTERED AS {q835Parameter 6};

6.7.7 Dial tone test uncontrolled result

dialToneTestUncontrolledResult **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledResult.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.DialToneTestResult;
BEHAVIOUR
dialToneTestUncontrolledResultBehaviour **BEHAVIOUR**
DEFINED AS "The dialToneTestUncontrolledResult parameter contains the result(s) of previously requested dial tone tests and is carried in the additional information field of the uncontrolled test response.";;
REGISTERED AS {q835Parameter 7};

6.7.8 Electrical measurement test result

electricalMeasurementTestResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.ElectricalMeasurementTestResult;
BEHAVIOUR
electricalMeasurementTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The electricalMeasurementTestResult is carried in the test result notification testResultInfo additionalInformation field.";;
REGISTERED AS {q835Parameter 8};

6.7.9 Electrical measurement test uncontrolled request

electricalMeasurementTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.ElectricalMeasurementTestUncontrolledRequestType;
BEHAVIOUR
electricalMeasurementTestUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The electricalMeasurementTestUncontrolledRequest parameter is used to request one or more electrical measurement tests with the testCategoryInformation field of an uncontrolled test request.";;
REGISTERED AS {q835Parameter 9};

6.7.10 Electrical measurement test uncontrolled result

electricalMeasurementTestUncontrolledResult **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledResult.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.ElectricalMeasurementTestResult;
BEHAVIOUR
electricalMeasurementTestUncontrolledResultBehaviour **BEHAVIOUR**
DEFINED AS "The electricalMeasurementTestUncontrolledResult parameter contains the result(s) of previously requested electrical measurement tests and is carried in the additional information field of the uncontrolled test response.";;
REGISTERED AS {q835Parameter 10};

6.7.11 Generic test result

genericTestResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.GenericTestResult ;
BEHAVIOUR
genericTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The genericTestResult is carried in the test result notification testResultInfo additionalInformation field.";;
REGISTERED AS {q835Parameter 11};

6.7.12 Invalid loopback request

invalidLoopbackRequest **PARAMETER**
CONTEXT SPECIFIC-ERROR;
WITH SYNTAX ASN1LLCTTypeModule.InvalidLoopbackRequest;
BEHAVIOUR
invalidLoopbackRequestBehaviour **BEHAVIOUR**
DEFINED AS "The invalidLoopbackRequest parameter type is used to report that the requested loopback cannot be applied. This may be due to invalid parameters or to a loopback already in existence.";;
REGISTERED AS {q835Parameter 12};

6.7.13 ISDN quick test uncontrolled request

isdnQuickTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.IsdnQuickTestUncontrolledRequestType;
BEHAVIOUR isdnQuickTestUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The isdnQuickTestUncontrolledRequest parameter is used to request one of a set of possible ISDN tests, as layer 1 activation (in case of an ISDN BA: test on the capability to activate the layer 1; in case of an ISDN PRA: test on the presence of an active layer 1), loop back test, power feeding test and function test.";;
REGISTERED AS {q835Parameter 13};

6.7.14 ISDN quick test uncontrolled result

isdnQuickTestUncontrolledResult **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledResult.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.IsdnQuickTestResult;
BEHAVIOUR isdnQuickTestUncontrolledResultBehaviour **BEHAVIOUR**
DEFINED AS "The isdnQuickTestUncontrolledResult parameter contains the result of previously requested ISDN quick tests and is carried in the additional information field of the uncontrolled test response. The way, how the test results are achieved is implementation specific; the function test e.g. may be implemented as a sequence of the other test functions.";;
REGISTERED AS {q835Parameter 14};

6.7.15 Loopback test result

loopbackTestResult **PARAMETER**
CONTEXT EVENT-INFO;
WITH SYNTAX ASN1LLCTTypeModule.LoopTestResult;
BEHAVIOUR
loopbackTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The loopbackTestResult is carried in the test result notification testResultInfo additionalInformation field.";;
REGISTERED AS {q835Parameter 15};

6.7.16 Loop back test uncontrolled request

loopBackTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.LoopBackTestUncontrolledRequestType;
BEHAVIOUR
loopBackTestUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The loopBackTestUncontrolledRequest parameter is used to request a loopback at a certain loopback point, to apply a test pattern and to determine differences between the sent and received test pattern. Contained in the request are duration and position of the loopback and the channel(s) to which the loopback shall be applied.";;
REGISTERED AS {q835Parameter 16};

6.7.17 Loop back test uncontrolled result

loopBackTestUncontrolledResult **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledResult.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.LoopBackTestUncontrolledResult;
BEHAVIOUR
loopBackTestUncontrolledResultBehaviour **BEHAVIOUR**
DEFINED AS "The loopBackTestUncontrolledResult parameter contains the result(s) of previously requested loopback tests including the comparison of the sent and received test patterns and is carried in the additional information field of the uncontrolled test response";;
REGISTERED AS {q835Parameter 17};

6.7.18 Number of metallic test accesses

numberOfMTA **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestControlledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.NumberOfMTA;
BEHAVIOUR numberOfMTABehaviour **BEHAVIOUR**
DEFINED AS "The numberOfMTA parameter is used to request a metallic test access connection at the measurement interface identified by NumberOfMTA. The definition of a naming scheme is not part of this standard and is up to the implementation.";;
REGISTERED AS {q835Parameter 18};

6.7.19 Pattern test result

patternTestResult **PARAMETER**
CONTEXT EVENT-INFO;
WITH SYNTAX ASN1LLCTTypeModule.PatternTestResult;
BEHAVIOUR
patternTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The patternTestResult is carried in the test result notification testResultInfo additionalInformation field.";;
REGISTERED AS {q835Parameter 19};

6.7.20 Ringing test uncontrolled request

ringingTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.GenericUncontrolledRequestType;
BEHAVIOUR
ringingTestUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The ringingTestUncontrolledRequest parameter is used to apply ringing to the subscriber line with the testCategoryInformation field of an uncontrolled test request.";;
REGISTERED AS {q835Parameter 20};

6.7.21 SPM pulses test uncontrolled request

spmPulsesTestUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.SpmPulsesTestUncontrolledRequestType;
BEHAVIOUR
spmPulsesUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The spmPulsesUncontrolledRequest parameter is used to request one or more SPM pulses to be sent to the subscriber private meter with the testCategoryInformation field of an uncontrolled test request.";;
REGISTERED AS {q835Parameter 21};

6.7.22 Test to line circuit result

testToLineCircuitResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.TestToLineCircuitResult;
BEHAVIOUR
testToLineCircuitResultBehaviour **BEHAVIOUR**
DEFINED AS "The testToLineCircuitResult is carried in the test result notification testResultInfo additionalInformation field.";;
REGISTERED AS {q835Parameter 22};

6.7.23 Test to line circuit uncontrolled request

testToLineCircuitUncontrolledRequest **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledInfo.testCategoryInformation;
WITH SYNTAX ASN1LLCTTypeModule.GenericUncontrolledRequestType;
BEHAVIOUR
testToLineCircuitUncontrolledRequestBehaviour **BEHAVIOUR**
DEFINED AS "The testToLineCircuitUncontrolledRequest parameter is used to request the check of the ability of the line circuit to provide and to detect certain signals and feeding voltage with the testCategoryInformation field of an uncontrolled test request.";;
REGISTERED AS {q835Parameter 23};

6.7.24 Test to line circuit uncontrolled result

testToLineCircuitUncontrolledResult **PARAMETER**
CONTEXT Test-ASN1Module.TestRequestUncontrolledResult.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.TestToLineCircuitResult;
BEHAVIOUR
testToLineCircuitUncontrolledResultBehaviour **BEHAVIOUR**
DEFINED AS "The testToLineCircuitUncontrolledResult parameter contains the result(s) of previously requested inward tests and is carried in the additional information field of the uncontrolled test response.";;
REGISTERED AS {q835Parameter 24};

6.7.25 Voice access test result

voiceAccessTestResult **PARAMETER**
CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
WITH SYNTAX ASN1LLCTTypeModule.VoiceAccessTestResult;
BEHAVIOUR
voiceAccessTestResultBehaviour **BEHAVIOUR**
DEFINED AS "The voiceAccessTestResult is carried in the test result notification testResultInfo additional information field.";;
REGISTERED AS {q835Parameter 25};

6.7.26 ISDN quick test result

```
isdnQuickTestResult PARAMETER
        CONTEXT Test-ASN1Module.TestResultInfo.additionalInformation;
        WITH SYNTAX ASN1LLCTTypeModule.IsdnQuickTestResult;
        BEHAVIOUR
        isdnQuickTestResultBehaviour BEHAVIOUR
        DEFINED AS "The isdnQuickTestResult is carried in the test result notification testResultInfo additional
        information field.";;
REGISTERED AS {q835Parameter 26};
```

6.8 ASN.1 defined types module

```
ASN1LLCTTypeModule {itu-t(0) recommendation(0) q(17) q835 (835) informationModel(0) asn1Module(2)
asn1TypeModule(0)}
DEFINITIONS IMPLICIT TAGS ::=
BEGIN -- EXPORTS everything

IMPORTS
        -- ITU-T Recommendation M.3100
        NameType
        FROM ASN1DefinedTypesModule {ccitt recommendation m gnm(3100) informationModel(0)
        asn1Module(2)
        asn1DefinedTypesModule(0)}
        -- ITU-T Recommendation Q.824.5
        EnvelopeFunctionAddress, Layer3PortAddress
        FROM ASN1CMLETypeModule {itu-t(0) recommendation(0) q(17) ca(824) dot(127) v5interface(5)
            informationModel(0) asn1Modules(2) cAV5LEModule(0)}
        -- ITU-T Recommendation Q.831
        DigitComb
        FROM ASN1FPLETypeModule {itu-t(0) recommendation(0) q(17) fpv5(831)
            informationModel(0) asn1Modules(2) fpV5LEModule(0)}
        -- ITU-T Recommendation X.711
        ObjectInstance
        FROM CMIP-1{joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)}
        -- ITU-T Recommendation Q.824.0
        E164DN
        FROM CACommonModule {itu-t(0) recommendation(0) q(17) ca(824) dot(127) common(0)
            informationModel(0) asn1Modules(2) cACommonModule(0)}
        -- ITU-T Recommendation X.745
        ActualStartTime,
        ActualStopTime,
        EndTime,
        TestOutcome,
        TestRequestControlledInfo,
        TestRequestUncontrolledInfo,
        TestRequestUncontrolledResult,
        TestResultInfo,
        Timespec
        FROM Test-ASN1Module { joint-iso-ccitt ms(9) function(2) part12(12) asn1Module(2) 0 }
        -- ITU-T Recommendation X.737
        ErrorRatioReportType,
        LoopBackTestResults,
        TestPattern,
        TestConditions
        FROM TestCategories-ASN1Module {joint-iso-ccitt ms(9) function(2) part14(14) asn1Module(2) 1}
;
```

```
q835InformationModel        OBJECT IDENTIFIER ::= {itu-t(0) recommendation(0) q(17) q835 (835)
                            informationModel(0)}
q835ManagedObjectClass      OBJECT IDENTIFIER ::= {q835InformationModel-managedObjectClass(3)}
q835Package                 OBJECT IDENTIFIER ::= {q835InformationModel package(4)}
q835Parameter               OBJECT IDENTIFIER ::= {q835InformationModel parameter(5)}
q835NameBinding             OBJECT IDENTIFIER ::= {q835InformationModel nameBinding(6)}
q835Attribute               OBJECT IDENTIFIER ::= {q835InformationModel attribute(7)}
q835Action                  OBJECT IDENTIFIER ::= {q835InformationModel action(9)}
q835Notification            OBJECT IDENTIFIER ::= {q835InformationModel notification(10)}
AccessResult ::= SET OF SEQUENCE{
        mORT                [0] MORT,
        realStartTime       [1] ActualStartTime     OPTIONAL,
        realStopTime        [2] ActualStopTime      OPTIONAL,
        accessTestResult    [3] AccessTestResult}
AccessTestResult ::= ENUMERATED {
        connectionEstablished       (0),
        accessFailed                (1),
        busyAccessAborted           (2),
        dangerousVoltage            (3),
        testMechanismBusy           (4),
        customerOverrideAborted     (5)}
AcVoltage ::= INTEGER (0..250000) -- milli Volt
AcVoltageThreshold ::= SEQUENCE {
        acaEarth    [1] AcVoltage   OPTIONAL,
        acbEarth    [2] AcVoltage   OPTIONAL,
        acab        [3] AcVoltage   OPTIONAL}
AnRingTest ::= SET OF UserPort
Between ::= SET OF SEQUENCE{
        between     BetweenType,
        threshold   Threshold       OPTIONAL}
BetweenType ::= ENUMERATED {
        aTob                (0),
        aToEarth            (1),
        bToEarth            (2),
        aToBattery          (3),
        bToBattery          (4),
        aTobReverse         (5),
        aToEarthReverse     (6),
        bToEarthReverse     (7),
        aToBatteryReverse   (8),
        bToBatteryReverse   (9)}
Capacitance ::= INTEGER (0..10000) -- nano Farad
CapacitanceThreshold ::= SEQUENCE {
        caEarth             [1] Capacitance OPTIONAL,
        cbEarth             [2] Capacitance OPTIONAL,
        cabUpperLimit       [3] Capacitance OPTIONAL,
        cabLowerLimit       [4] Capacitance OPTIONAL}
DcVoltage ::= INTEGER (0..150000) -- milli Volt
DcVoltageThreshold ::= SEQUENCE {
        dcaEarth    [1] DcVoltage   OPTIONAL,
        dcbEarth    [2] DcVoltage   OPTIONAL,
        dcab        [3] DcVoltage   OPTIONAL}
defaultAcVoltageThreshold AcVoltageThreshold ::= {
        acaEarth 250000,
        acbEarth 250000,
        acab 250000}
defaultCapacitanceThreshold CapacitanceThreshold ::= {
        caEarth 0,
        cbEarth 0,
        cabUpperLimit 10000,
        cabLowerLimit 0}
```

defaultDcVoltageThreshold DcVoltageThreshold ::= {
dcaEarth 150000,
dcbEarth 150000,
dcab 150000}
defaultDialSpeedThreshold DialSpeedThreshold ::= {
dialSpeedUpperLimit 255,
dialSpeedLowerLimit 0}
defaultIsdnQuickTestToBePerformed IsdnQuickTestToBePerformed ::= functionTest
defaultMtaTimeoutPeriod MtaTimeoutPeriod ::= minutes : 5
defaultPulseNoPulseRatio PulseNoPulseRatio ::= {
pulseNoPulseRatioUpperLimit 100,
pulseNoPulseRatioLowerLimit 0}
defaultResistanceThreshold ResistanceThreshold ::= {
raEarth milliOhm : 0,
rbEarth milliOhm : 0,
rabUpperLimit kiloOhm : 100000,
rabLowerLimit milliOhm : 0,
rLoop milliOhm : 0,
rEarth milliOhm : 0}
DialledDigits ::= IA5String (FROM ("0"|"1"|"2"|"3"|"4"|"5"|"6"|"7"|"8"|"9"|"*"|"#"))
DialledDigitTestResult ::= SEQUENCE OF ReceivedDigit
DialledDigitTestUncontrolledRequestType ::= SEQUENCE {
numberOfDigits [1] NumberOfDigits,
testConditions [2] TestConditions OPTIONAL,
waitTime [3] INTEGER OPTIONAL}
-- waitTime has importance only if TestConditions are set to waitIfBusy.
DialSpeed ::= INTEGER (0..255) -- x 0.1 Hz
DialSpeedThreshold ::= SEQUENCE {
dialSpeedUpperLimit [1] DialSpeed OPTIONAL,
dialSpeedLowerLimit [2] DialSpeed OPTIONAL}
DialToneTestResult ::= SET OF SEQUENCE {
mORT [0] MORT,
realStartTime [1] ActualStartTime OPTIONAL,
realStopTime [2] ActualStopTime OPTIONAL,
result [3] Result}
DialToneTestUncontrolledRequestType ::= SEQUENCE {
offHookSimulation [0] OffHookSimulation,
requestedResultType [1] RequestedResultType,
iterations [2] Iterations,
testConditions [3] TestConditions OPTIONAL,
waitTime [4] INTEGER OPTIONAL}
-- waitTime has importance only if TestConditions are set to waitIfBusy.
ElectricalMeasurementTestResult ::= SET OF SEQUENCE {
mORT [0] MORT,
realStartTime [1] ActualStartTime OPTIONAL,
realStopTime [2] ActualStopTime OPTIONAL,
foreignAcVoltage [3] Reading OPTIONAL,
foreignDcVoltage [4] Reading OPTIONAL,
foreignACCurrent [5] Reading OPTIONAL,
foreignDCCurrent [6] Reading OPTIONAL,
resistanceInsulation [7] Reading OPTIONAL,
resistanceLoop [8] Reading OPTIONAL,
capacitance [9] Reading OPTIONAL,
termination [10] Termination OPTIONAL,
feedingVoltage [11] Reading OPTIONAL,
feedingCurrent [12] Reading OPTIONAL,
testOutcome [13] TestOutcome OPTIONAL}

```
ElectricalMeasurementTests ::= SEQUENCE {
        foreignAcVoltage    [0] Between              OPTIONAL,
        foreignDcVoltage    [1] Between              OPTIONAL,
        foreignACCurrent    [2] Between              OPTIONAL,
        foreignDCCurrent    [3] Between              OPTIONAL,
        capacitance         [4] Between              OPTIONAL,
        resistance          [5] ResistanceBetween    OPTIONAL,
        termination [6] NULL                         OPTIONAL,
        feedingVoltage      [7] Between              OPTIONAL,
        feedingCurrent      [8] Between              OPTIONAL,
        ring                [9] Between              OPTIONAL}
ElectricalMeasurementTestToBePerformed ::= CHOICE {
        full                        NULL,
        electricalMeasurementTests  ElectricalMeasurementTests}
ElectricalMeasurementTestUncontrolledRequestType ::= SEQUENCE {
        electrMeasToBePerformed     [0] ElectricalMeasurementTestToBePerformed,
        requestedResultType         [1] RequestedResultType,
        testConditions              [2] TestConditions      OPTIONAL,
        waitTime                    [3] INTEGER             OPTIONAL}
        -- waitTime has importance only if TestConditions are set to waitIfBusy.
FunctionTestResult ::= ENUMERATED {
        noFailure                   (0),
        activationLayer1Failure     (1),
        ntLoopFailure               (2),
        leLoopFailure               (3),
        dtrLoopFailure              (4),
        shortCircuit                (5),
        neError                     (6),
        alarmCheckFailure           (7),
        leLoopAndPowerFeedingFailure (8)}

GenericTestResult ::= SET OF SEQUENCE {
        mORT            [0] MORT,
        realStartTime   [1] ActualStartTime     OPTIONAL,
        realStopTime    [2] ActualStopTime      OPTIONAL,
        testOutcome     [3] TestOutcome}
GenericUncontrolledRequestType      ::= SEQUENCE {
        testConditions  [1] TestConditions      OPTIONAL,
        waitTime        [2] INTEGER             OPTIONAL}
        -- waitTime has importance only if TestConditions are set to waitIfBusy.
InvalidLoopbackRequest ::= ENUMERATED {
        loopExists          (0),
        loopNotSupported    (1),
        loopTimeTooLarge    (2)}
IsdnQuickTestResult ::= SET OF SEQUENCE{
        mORT            [0]  MORT,
        realStartTime   [1]  ActualStartTime        OPTIONAL,
        realStopTime    [2]  ActualStopTime         OPTIONAL,
        layer1Activation [3] Layer1ActivationResult OPTIONAL,
        loopbackTest    [4]  LoopbackQuickTestResult OPTIONAL,
        powerFeedingTest [5] PowerFeedingTestResult OPTIONAL,
        functionTest    [6]  FunctionTestResult     OPTIONAL,
        testOutcome     [7]  TestOutcome            OPTIONAL}
IsdnQuickTestToBePerformed ::= ENUMERATED {
        layer1Activation    (0),
        loopbackTest        (1),
        powerFeedingTest    (2),
        functionTest        (3)}
```

```
IsdnQuickTestUncontrolledRequestType ::= SEQUENCE {
        isdnQuickTestToBePerformed    [1] IsdnQuickTestToBePerformed,
        requestedResultType           [2] RequestedResultType,
        testConditions                [3] TestConditions    OPTIONAL
        waitTime                      [4] INTEGER           OPTIONAL}
        -- waitTime has importance only if TestConditions are set to waitIfBusy.
Iterations ::= INTEGER
Layer1ActivationResult ::= ENUMERATED {
        noFailure                 (0),
        activationLayer1Failure   (1)}
LoopbackChannel ::= ENUMERATED {
        b1        (0),
        b2        (1),
        b1b2d     (2),
        pra       (3)}
LoopbackDuration ::= Timespec
LoopbackPosition ::= ENUMERATED {
        noLoopback      (0),
        ltNetwork       (1),
        nt1Network      (2),
        repNetwork      (3)}
LoopbackQuickTestResult ::= ENUMERATED {
        noFailure       (0),
        ntLoopFailure   (1),
        leLoopFailure   (2)}
LoopbackResult ::= ENUMERATED {
        override  (0)}
        -- Further values for this syntax are for further study.
LoopbackSelectRequestInfo ::= SEQUENCE{
        loopbackPosition    LoopbackPosition,
        loopbackTime        LoopbackDuration,
        loopbackChannel     LoopbackChannel       OPTIONAL}
LoopbackSelectRequestResult ::= ENUMERATED{
        loopbackSet             (1),
        loopNotSupported        (2),
        loopbackTimeTooLarge    (3)}
LoopTestResult ::= SET OF SEQUENCE {
        mORT                [0] MORT,
        realStartTime       [1] ActualStartTime       OPTIONAL,
        realStopTime        [2] ActualStopTime        OPTIONAL,
        testOutcome         [3] TestOutcome,
        loopbackResult      [4] LoopbackResult        OPTIONAL}
LoopbackTestUncontrolledRequestType ::= SEQUENCE {
        loopbackDuration    [1] LoopbackDuration,
        loopbackPosition    [2] LoopbackPosition,
        loopbackChannel     [3] LoopbackChannel,
        testPattern         [4] TestPattern           OPTIONAL,
        errorRatioReport    [5] ErrorRatioReportType  OPTIONAL,
        testConditions      [6] TestConditions        OPTIONAL,
        waitTime            [7] INTEGER               OPTIONAL}
        -- waitTime has importance only if TestConditions are set to waitIfBusy.
LoopbackTestUncontrolledResult ::= LoopbackTestResults
MonitorSpeak ::= ENUMERATED {
        monitorWithMark         (0),
        speakAndMonitor         (1),
        monitorWithOutMark      (2),
        existingConnection      (3)}
```

```
MORT ::= ObjectInstance
MtaMsg ::= ENUMERATED {
        error                       (0),
        analogueFree                (1),
        analogueOccupied            (2),
        analogueOccupiedNotUsed     (3),
        analogueBlocked             (4),
        testing                     (5),
        mTAoccupied                 (6),
        noAccess-noSub              (7),
        noAccess-hdh                (8),
        noAccess-aconc              (9),
        notAccessible               (10),
        noAccess-nuc                (11),
        isdnAccess                  (12),
        noAccess-any                (13)}
MtaTimeoutPeriod ::= Timespec
NotDigit                ::= ENUMERATED {
        recallButton    (0),
        onhook          (1),
        wrongSignal     (2),
        offhook         (3)}
Null ::= NULL
NumberOfDigits ::= INTEGER
NumberOfMTA ::= INTEGER
OffHook ::= SEQUENCE {
        port            [0] UserPort,
        serviceNumber   [1] DigitComb}
OffHookSimulation ::= ENUMERATED {
        loopCalling     (0),
        earthCalling    (1)}
OnHook ::= SEQUENCE {
        port            [0] UserPort,
        dtmfResult      [1] TestOutcome     OPTIONAL}
PatternTestResult ::= SET OF SEQUENCE {
        mORT            [0] MORT,
        realStartTime   [1] ActualStartTime     OPTIONAL,
        realStopTime    [2] ActualStopTime      OPTIONAL,
        testOutcome     [3] TestOutcome,
        loopbackTestResult  [4] LoopbackTestResult  OPTIONAL}
PowerFeedingTestResult ::= ENUMERATED {
        noFailure       (0),
        shortCircuit    (1),
        neError         (2)}
PulseNoPulseRatio ::= SEQUENCE {
        pulseNoPulseRatioUpperLimit     [1] Ratio   OPTIONAL,
        pulseNoPulseRatioLowerLimit     [2] Ratio   OPTIONAL}
Range ::= INTEGER
Ratio ::= INTEGER (0..100) -- percentage
Reading ::= SEQUENCE {
        aTob            [0] Result      OPTIONAL,
        aToEarth        [1] Result      OPTIONAL,
        bToEarth        [2] Result      OPTIONAL,
        aToBattery      [3] Result      OPTIONAL,
        bToBattery      [4] Result      OPTIONAL,
        bToEarthReverse [5] Result      OPTIONAL,
        aToEarthReverse [6] Result      OPTIONAL,
        bToa            [7] Result      OPTIONAL,
        aToBatteryReverse   [8] Result  OPTIONAL,
        bToBatteryReverse   [9] Result  OPTIONAL}
```

```
ReceivedDigit ::= SEQUENCE {
        digit           [0] CHOICE {
                        normalDigits    [0] DialledDigits,
                        notDigit [8] NotDigit},
        lowLevel        [1] REAL        OPTIONAL,
        highLevel       [2] REAL        OPTIONAL,
        lowFrequency    [3] REAL        OPTIONAL,
        highFrequency   [4] REAL        OPTIONAL,
        pulseLength     [5] REAL        OPTIONAL,
        makeDuration    [6] REAL        OPTIONAL,
        breakDuration   [7] REAL        OPTIONAL}
RequestedResultType ::= SEQUENCE {
        passed      BOOLEAN,
        notPassed   BOOLEAN,
        value       BOOLEAN}
ResistanceBetween ::= CHOICE {
        insulation  [0] Between,
        loop        [1] Between}
Resistance ::= CHOICE {
        milliOhm    [0] INTEGER (0..100000),
        ohm         [1] INTEGER (0..100000),
        kiloOhm     [2] INTEGER (0..100000)}
ResistanceThreshold ::= SEQUENCE {
        raEarth         [1] Resistance  OPTIONAL,
        rbEarth         [2] Resistance  OPTIONAL,
        rabUpperLimit   [3] Resistance  OPTIONAL,
        rabLowerLimit   [4] Resistance  OPTIONAL,
        rLoop           [5] Resistance  OPTIONAL,
        rEarth          [6] Resistance  OPTIONAL}
Result ::= SEQUENCE {
        testOutcome TestOutcome     OPTIONAL,
        value           REAL        OPTIONAL}
ResultOfTestToLineCircuit ::= SEQUENCE {
        feedingVoltage          [0] Result  OPTIONAL,
        feedingCurrent          [1] Result  OPTIONAL,
        loopRingTripDetection   [2] Result  OPTIONAL,
        ringingCurrent          [3] Result  OPTIONAL,
        privateMeterPulses      [4] Result  OPTIONAL,
        codecTesting            [5] Result  OPTIONAL,
        digitReception          [6] Result  OPTIONAL}
Results ::= SET OF SEQUENCE {
    port    [0] UserPort,
    result  [1] TestOutcome}
Ring ::= CHOICE {
        timedRing       [0] INTEGER, -- number of seconds
        continuousRing  [1] NULL}
RingBackNo ::= E164DN
SpmPulses ::= INTEGER (0..99)
SpmPulsesTestUncontrolledRequestType ::= SEQUENCE {
        numberOfPulses  [1] SpmPulses,
        testConditions  [2] TestConditions  OPTIONAL,
        waitTime        [3] INTEGER         OPTIONAL}
        -- waitTime has importance only if TestConditions are set to waitIfBusy.

Termination ::= ENUMERATED {
        nTEAndCPE           (0),
        nTE                 (1),
        leakageCurrent      (2),
        noTermination       (3),
        offHook             (4),
        nonStandardTermination  (5)}
```

```
TestsPassed ::= ENUMERATED {
                timesTaken          (0)}
TestToLineCircuitResult ::= SET OF SEQUENCE{
                mORT                        [0] MORT,
                realStartTime               [1] ActualStartTime             OPTIONAL,
                realStopTime                [2] ActualStopTime              OPTIONAL,
                testOutcome                 [3] TestOutcome,
                resultOfTestToLineCircuit   [4] ResultOfTestToLineCircuit   OPTIONAL}
Threshold ::= SEQUENCE {
                min       [0] REAL      OPTIONAL,
                max [1] REAL            OPTIONAL}
TypeOfLine ::= ENUMERATED {
                inbound     (0),
                outbound    (1),
                bridged     (2)}
UserPort ::= CHOICE {
           pstn       [0] Layer3PortAddress,
           isdn       [1] EnvelopeFunctionAddress}
VoiceAccessTestResult ::= ENUMERATED {
                connectionEstablished       (0),
                ringbackFailed              (3),
                noExistingConnection        (6)}
WaitTime ::= EndTime
-- default value definitions
defaultBusyLCWaitTime          EndTime ::= relative : minutes : 5
defaultElectricalMeasurementTestToBePerformed   ElectricalMeasurementTestToBePerformed ::= full : NULL
defaultIterations    Iterations ::= 1
defaultLoopbackChannel          LoopbackChannel ::= b1b2d
defaultLoopbackDuration         LoopbackDuration ::= seconds : 500
defaultLoopbackPosition         LoopbackPosition ::= noLoopback
defaultMonitorSpeak       MonitorSpeak ::= monitorWithMark
defaultNumberOfDigits     NumberOfDigits ::= 1
defaultRequestedResultType      RequestedResultType ::= {passed FALSE, notPassed TRUE, value FALSE}
defaultRing          Ring ::= timedRing : 3
defaultSpmPulses     SpmPulses ::= 1
defaultTestConditions      TestConditions ::= {first rejectIfBusy, second noCustomerOverride}
END -- of ASN1LCTTypeModule
```

7 Protocol requirements

Protocol suites for the Q3 interface are specified in Recommendations Q.811 [8] and Q.812 [9]. No specific requirements are identified.

ANNEX A

Requirements and specification of parameters for access port tests

It is not mandatory to implement test requirements and functionalities described in this Recommendation, but if any test is required to be managed via the Q3 interface on the NE, it shall be modelled as described in the relevant subclause(s) of this Recommendation.

A.1 General test requirements

These are the general requirements for the test management of access ports via the Q3 interface of an NE.

A.1.1 Scheduled testing

The Q3 interface provides the functionality to control scheduling of tests in the NE, if the scheduling functionality is implemented in the NE.

A.1.2 Test capability

Information about which tests the NE is able to perform is required at the Q3 interface. The manager should be able to retrieve information about the test capabilities of an NE. If the OS is requesting the execution of a non-existing test, then the NE shall reply with an error message.

A.2 Access port test requirements

These are the requirements for line and circuit testing of analogue and ISDN subscriber lines managed via the Q3 interface of an NE.

Further complex test procedures may be operator dependant. These procedures may involve the execution of simple tests or other procedures such as subscriber-assisted tests described in this subclause.

A.2.1 Access port test management functions

Whenever a test request is sent by the manager to the NE, the following information may be associated to it, as given in Table A.1.

Table A.1/Q.835 – Possible test request parameters and values

Parameter	Value
Type of tests and/or procedures	See list of test requirement description
Scheduling of test	Start time, stop time
ID of access ports under test	List of 1 or N access port object instances involved in the test
Type of result	Any conceivable combination among three possible results: passed, not passed, values

If one of the parameters is not permitted in the relevant test request, it shall be ignored by the NE.

If the NE is not able to manage one of the parameters listed above, a notification shall be emitted to the manager indicating the error cause.

A.2.2 Test scheduling

The following tests are suitable for scheduled tests:

– foreign voltage and current measurement;

– capacitance measurement;

– insulation resistance measurement;

– all line circuit tests;

– dial tone test;

– loopback test;

– ISDN quick test.

The following requirements are valid for scheduling:

– routine tests shall have lower priority than on-demand test and normal traffic;

– the test result shall indicate those ports which have not been tested due to any reason;

– it shall be possible to specify the start time and the stop time of the whole test sequence;

– it shall be possible to specify the test interval between the start of consecutive test sequences (e.g. daily, weekly).

The information model for scheduling and test repetition shall be based on already existing models specified in Recommendation X.746 [23].

A.2.3 Test result management

The result for a test request shall be reported on a per test and per port basis. These reports are controlled by a combination of the following three Boolean conditions:

a) pass: if TRUE, send a result report if the port passed the test (the testOutcome field of the additional information parameter of the test result notification in Recommendation X.745 [22] contains the value "pass");

b) not passed: if TRUE, send a result report only if the port did not pass the test (in this case the testOutcome field of the additional information parameter of the test result notification in Recommendation X.745 [22] contains one of the following values: "fail", "inconclusive", "timed out" or "premature termination");

c) measured values: if TRUE, send the measured values (for these tests producing values as result).

These Boolean values shall be combined by means of the logical operator AND in order to determine when the result is to be sent.

EXAMPLE: When the following combination is used:

pass = FALSE;

not passed = TRUE;

values = TRUE,

the expected result contains the list of measured values for such ports that have not passed the test.

A.2.4 Test threshold management

When a passed/not passed result is requested, provisionable threshold values are used, unless the test request contains threshold values which override the provisioned thresholds. After the termination of that test, the provisioned thresholds shall be restored.

Provisionable thresholds are default thresholds for tests which can be modified via the Q3 interface. For each type of test it shall be possible to specify a number of different thresholds. Each of these thresholds shall be assigned to a particular group of thresholds, so-called threshold classes. Access ports may be associated with one of these threshold classes.

A.2.5 Test requirements description

This subclause deals with requirements for line testing purposes. It is subdivided into PSTN line tests and PSTN inward tests: ISDN BA testing and ISDN PRA testing.

Accuracy and range of measurements are out of the scope of this Recommendation.

A.2.5.1 PSTN line testing

In general, line testing requires that a certain line condition is established (e.g. off-hook or a line termination); then a test is performed and after the test the line is restored to its normal condition. In some cases, not all of these steps are under the control of the Q3 interface (e.g. where the test action is carried out by craft personnel), and so a test function may include all, or only some, of these steps.

The dry loop test, for example, is concerned only with disconnecting a line from the line circuit. In this case, the actual test conduct and the observation of the test outcome are assumed to be controlled separately.

In the following, "subscriber assisted" and "voice connection" mean that an operator gives instructions to the subscriber on how to perform a test. The subscriber returns the result back to the operator, when applicable.

A.2.5.1.1 Foreign voltage or current

It is required to check for the presence of foreign voltage or foreign current on the line.

This test is performed by disconnecting the line from the line circuit and measuring foreign voltage or foreign current between a/b, a/E or b/E. Both AC and DC voltage measurement are required. The manager may select one or more of these measurements. Results shall be: passed, not passed and/or the values. Units are V (Volt) or A (Ampere).

A.2.5.1.2 Capacitance measurement

It is required to measure the capacitance on the line.

This test is performed by disconnecting the line from the line circuit and measuring the capacitance between a/b, a/E or b/E. The manager may select one or more of these measurements. Results shall be: passed, not passed and/or the values. The unit is F (Farad).

A.2.5.1.3 Insulation resistance measurement

It is required to measure the insulation resistance.

This test is performed by disconnecting the line from the line circuit and measuring the insulation resistance between a/b, a/Earth, b/Earth, aToBattery or bToBattery (both polarities are possible). The manager may select one or more of these measurements. Results shall be: passed, not passed and/or the values. The unit is Ω (Ohm).

A.2.5.1.4 Loop resistance measurement

It is required to measure the loop resistance during off-hook.

The loop resistance between a/b (both polarities are possible) is measured during off-hook. The manager may select one or both measurements. Results shall be: passed, not passed and/or the values. Subscriber assistance may be required. The unit is Ω (Ohm).

A.2.5.1.5 Dial pulse test

It is required to check the proper operation of the subscriber terminal.

The subscriber is requested to dial one or more digits: it is required to verify that the correct sequence of dialled digits is received by the NE. Results shall be: passed, not passed and/or the values. The reported values are number of pulses, average make and break duration.

A.2.5.1.6 DTMF dialling test

It is required to check the proper operation of the subscriber terminal.

The subscriber is requested to dial one or more digits. It is required to verify that the correct sequence of digits is received by the NE in normal operation. DTMF handling is out of the scope of the V5 interface because the tones are carried transparently through the NE and call processing is performed at the NE. However, an NE implementation may have this test functionality, thus providing a common maintenance support for both types of dialling. Results shall be: passed, not

passed and/or values for dialled digits, tone levels, tone frequencies, pulse length. Units are dBm (decibel relative to 1 milliwatt), Hz (Hertz), s (seconds).

A.2.5.1.7 Subscriber private meter testing

It is required to check the subscriber's private meter.

The NE sends a specified number of metering pulses to the subscriber. The private meter at the customer premises should then step the same number of pulses. As a result, a comparison is made at the manager between subscriber answer and the notification from the NE about the number of pulses sent. The result parameter is number of pulses.

A.2.5.1.8 Ring subscriber

It is required to check the proper operation of the subscriber terminal.

The test is carried out by applying the ring signal and checking the answer of the subscriber. When off-hook is detected (both during the ringing tone itself or during the silent interval), no ringing current shall be sent anymore, according to the limits described in Recommendation Q.543 [7]. The digital exchange performance design objectives are:

a) <100 ms (mean value);

b) <150 ms (95% value).

A.2.5.1.9 Monitoring of the line

It is required that the operator may either listen into the line with or without sending a mark tone, or listen and speak.

A.2.5.1.10 Cable pair identification tone

It is required to assist the identification of cable pairs in the field, by generating a trace tone at the NE side. The tone shall continue until it is stopped by a manager command or after a timeout.

A.2.5.1.11 Dry loop

It is required to disconnect the line from the line circuit. This condition is called "dry loop". After a dry loop is established, tests may be performed on the line outside the influence of the Q3 interface, until normal conditions are re-established.

a and b wires are disconnected from the line circuit, leaving them in an open circuit state. The subscriber line shall remain in dry loop condition until re-connected by a manager command or after a timeout.

A.2.5.1.12 Register recall button test

It is required to check the proper operation of the register recall button of the subscriber terminal.

The subscriber is requested to press the button. The pulse break time is then checked for acceptability. Results shall be passed/not passed.

A.2.5.1.13 Ring back procedure

The installer at the subscriber site may initiate a test procedure by dialling a special ring back code to the NE. The NE shall then initiate the ring back procedure. If during this procedure line or line circuit tests are required, those already defined in this Recommendation shall be applied. More detailed information on execution of this procedure is contained in Appendix II.

A.2.5.2 PSTN inward tests

A.2.5.2.1 Line circuit testing

PSTN line circuit test results shall be reported as passed/not passed covering all circuit tests in a global way, in order to identify the replaceable units.

If the NE is able to provide the relevant information, the manager may be notified about which test failed and the related measured values. Even if the NE supports this information, the management application still requires a pass/fail (passed/not passed) result.

In the following, detailed requirements are described. This list is not exhaustive, and new items may be added in the future.

Thresholds for result comparison are specific to the line card implementation and the manager is not required to manage (both reading and setting) them.

A.2.5.2.1.1 Feeding voltage

Feeding voltage between a and b wires shall be measured.

A.2.5.2.1.2 Feeding current

Feeding current between a and b wires shall be measured.

A.2.5.2.1.3 Loop and ring trip detection

It is checked whether the line circuit is able to detect a loop (i.e. an off-hook) with both normal and reversed polarity, while the line circuit is busy or idle (busy means ongoing call on the line). The ring trip detection is carried out by applying the ring signal and simulating the answer of the subscriber. When off-hook simulation is detected (during the ringing tone itself or during the silent interval), the ringing current shall be stopped immediately, according to the limits described in Recommendation Q.543 [7]:

a) <100 ms (mean value);

b) <150 ms (95% value).

A.2.5.2.1.4 Ringing current sending

The ringing current shall be measured at the line side of the line circuit.

A.2.5.2.1.5 Private meter pulses

The duration and the level of private meter pulses shall be tested.

A.2.5.2.1.6 Codec testing

The analogue-to-digital and the digital-to-analogue conversion shall be tested including hybrid functionality.

A.2.5.2.1.7 Digit reception

The line circuit is tested to check whether it receives a hexadecimal digit. The test shall be performed with both normal and reversal polarities.

A.2.5.2.2 Other inward tests

A.2.5.2.2.1 Dial tone test

An off-hook condition is simulated in the NE. It shall be checked whether the dial tone appears at the LC termination or not.

A.2.5.3 ISDN BA testing

A.2.5.3.1 ISDN BA line testing

If copper wires are used, the following line tests as defined for PSTN lines shall be carried out:

– foreign voltage;

– current measurement;

– capacitance measurement;

– insulation resistance measurement (only normal polarity is possible);

– dry loop.

A.2.5.3.2 ISDN BA line termination testing

A.2.5.3.2.1 Loopbacks

Generally, a loopback is set up to test the integrity of the devices and the line between two points, by applying a known signal (pattern) on one side and checking whether the signal received is the same as the sent one. The input signal may be applied either by a device embedded in the network element which contains the port (or related line) under test, or by an external equipment. In the latter case, it is required that a loopback is set up without signal generation.

According to Recommendation M.3603 [5], the terminology for ISDN BA loopbacks is:

– loopback 1: complete Line Termination (LT) loopback;

– loopback 1A: Regenerator (REG) loopback;

– loopback 2: complete NT1 loopback;

– loopback 2_1: B1, B2, NT1 loopback.

The NT1 may be located either within or outside the NE (see Figure 1).

All the loopbacks mentioned above may be applied in connection with either an NE internal equipment or an external equipment to inject and detect a test pattern. The line under test is activated and a loopback is established.

The manager shall be notified whether the loopback is set up or not.

If the pattern injection and detection equipment are under the control of the manager via the Q3 interface, pattern injection and detection shall be initiated after the set-up of the loopback. The pattern may be injected at a particular point and detected either at the same point or at another one. The received pattern shall be compared with the sent one and the result shall be: passed, not passed and/or bit error rate.

A.2.5.3.2.2 Activation and deactivation of lines

It is required to check the capability for activating and deactivating the line under test.

A.2.5.3.3 ISDN BA line circuit testing

A.2.5.3.3.1 Power feed

It is required to measure the feeding voltage between a and b wires provided by the line circuit. The voltage between a and b shall be measured in order to verify the proper operation of the power feeding of the NT1. The reported result shall be: passed/not passed.

A.2.5.4 ISDN PRA testing

A.2.5.4.1 ISDN PRA line testing

Not applicable.

A.2.5.4.2 ISDN PRA line termination testing

Set-up of loopbacks at the LT (loopback 1) at the regenerator [if more than one regenerator is installed, it shall be the one which is closest to the line termination (loopback 1A)] and at the NT1 (loopback 2) shall be possible.

According to Recommendation M.3604 [6], the terminology for ISDN PRA loopbacks is:

– loopback 1: complete Line Termination (LT) loopback;

– loopback 1A: Regenerator (REG) loopback;

– loopback 2: complete NT1 loopback.

A.2.5.5 ISDN BA and PRA quick tests

In order to perform a quick test of the basic functionality of an ISDN BA or PRA, it shall be possible to apply a certain set of tests on the ISDN line. This includes the following tests:

– layer 1 activation (in case of an ISDN BA: test on the capability to activate the layer 1; in case of an ISDN PRA: test on the presence of an active layer 1);

– loopback test;

– power feeding test;

– function test.

If the ISDN quick test function is implemented in the NE, it shall be possible to invoke this quick test via the Q3 interface.

A.2.5.6 Connection of external test systems

For external test systems used for line testing, a metallic test access shall be provided to each subscriber line (outbound) and to each line circuit (inbound) of the NE. It shall be possible to connect the test system to the outbound or inbound line and to disconnect it via the Q3 interface of the NE.

ANNEX B

Test categories

This annex specifies the test categories for all tests in a NE which are invoked by the uncontrolled test request as defined in Recommendation X.745 [22].

B.1 Electrical measurement tests

Test category name: Electrical Measurement Tests

Test category purpose: The purpose of tests of this category is measurement of electrical parameters. Possible tests according to the ASN.1 definition of electricalMeasurementTest, e.g.:

– foreign voltage;

– foreign current;

– capacitance;

– resistance;
– termination;
– feeding voltage;
– feeding current;
– ring.

MORT requirements: The test invocation involves one object class (analogueAccess or accessPortISDNBasicRate as defined in Recommendation Q.824.0 [10]), which represents the access port under test. One or more object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this category are outward tests or inward tests. Tests of this category do not require customer assistance.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:
– "ITU-T Recommendation X.745:1993":noSuchMORT;
– "ITU-T Recommendation X.745:1993":mORTNotAvailable;
– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The electricalMeasurementTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: The electricalMeasurementTest-UncontrolledResult parameter as content of the additionalInformation field in the reply syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

B.2 Dialled digit test

Test category name: Dialled Digit Test

Test category purpose: The purpose of tests of this category is to check the proper operation of the subscriber equipment's (pulse or DTMF) dialling. Possible tests according to the ASN.1 definition of dialledDigitTest, e.g.:
– dial pulse test;
– DTMF dialling test;
– register recall button test.

MORT requirements: The test invocation involves one object class (analogueAccess as defined in Recommendation Q.824.0 [10]), which represents the line being measured. Only one object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are outward tests. Tests of this category require customer assistance.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:
– "ITU-T Recommendation X.745:1993":noSuchMORT;
– "ITU-T Recommendation X.745:1993":mORTNotAvailable;
– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The dialledDigitTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: The dialledDigitTestUncontrolledResult parameter as content of the additionalInformation field in the reply syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

B.3 Dial tone test

Test category name: Dial Tone Test

Test category purpose: The purpose of tests of this category is to check the ability of the line circuit to detect an off-hook and to check the provision of the dial tone from the NE. Possible tests according to the ASN.1 definition of dialToneTest:

– dial tone test.

MORT requirements: The test invocation involves one object class (analogueAccess as defined in Recommendation Q.824.0 [10]), which represents the line being measured. One or more object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are inward tests. They are performed with disconnected line. Tests of this category do not require customer assistance.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:

– "ITU-T Recommendation X.745:1993":noSuchMORT;

– "ITU-T Recommendation X.745:1993":mORTNotAvailable;

– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The dialToneTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: The dialToneTestUncontrolledResult parameter as content of the additionalInformation field in the reply syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

B.4 Subscriber private meter pulses test

Test category name: SPM Pulses Test

Test category purpose: The purpose of tests of this category is to check the cable and equipment in the customer's premises by sending SPM pulses to the private meter of the subscriber. Possible tests according to the ASN.1 definition of spmPulses test:

– subscriber private meter testing.

MORT requirements: The test invocation involves one object class (analogueAccess as defined in Recommendation Q.824.0 [10]), which represents the line being measured. One or more object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are outward tests. They are performed with the line connected to the line circuit or with disconnected line. Tests of this category either require customer assistance or assist an operator's craftsman in detecting an error in the field.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:

– "ITU-T Recommendation X.745:1993":noSuchMORT;

– "ITU-T Recommendation X.745:1993":mORTNotAvailable;

– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The spmPulsesTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: None.

B.5 Ringing test

Test category name: Ringing Test

Test category purpose: The purpose of tests of this category is to check the cable and equipment in the customer's premises by applying ringing to the subscriber. Possible tests according to the ASN.1 definition of ringing test:

– ringing test.

MORT requirements: The test invocation involves one object class (analogueAccess as defined in Recommendation Q.824.0 [10]) which represents the line being measured. One or more object instances can be involved in the test;

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are outward tests. They are performed with the line connected to the line circuit or with disconnected line. Tests of this category either require customer assistance or assist an operator's craftsman in detecting an error in the field.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:

– "ITU-T Recommendation X.745:1993":noSuchMORT;

– "ITU-T Recommendation X.745:1993":mORTNotAvailable;

– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The ringingTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: None.

B.6 Test to line circuit

Test category name: Test To Line Circuit

Test category purpose: The purpose of tests of this category is to check the ability of the inward test to provide or detect certain signals or feeding voltage. The test comprises of a set of possible tests, which are predefined in the NE and performed all together, e.g.:

– feeding voltage;

– feeding current;

– loop detection and ring trip detection;

– ringing current sending;

– private meter pulse generator test;

– Codec testing;

– digit reception.

MORT requirements: The test invocation involves one object class (analogueAccess or accessPortISDNBasicRate as defined in Recommendation Q.824.0 [10]), as under test, which represents the line being measured. One or more object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are inward tests. They are performed with disconnected line. Tests of this category do not require customer assistance.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:

– "ITU-T Recommendation X.745:1993":noSuchMORT;

– "ITU-T Recommendation X.745:1993":mORTNotAvailable;

– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The testToLineCircuitUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: The testToLineCircuit-UncontrolledResult parameter as content of the additionalInformation field in the reply syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

B.7 ISDN loopback test

Test category name: ISDN Loopback Test

Test category purpose: The purpose of tests of this category is to perform an internal loop test for ISDN basic or primary rate accesses. Possible tests according to the ASN.1 definition of iSDNLoopTest:

– loopback test.

MORT requirements: The test invocation involves one object class (accessPortISDNBasicRate or accessPortISDNPrimaryRate as defined in Recommendation Q.824.0 [10]), which represents the line being measured. One or more object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are outward tests. Tests of this category do not require customer assistance.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:

– "ITU-T Recommendation X.745:1993":noSuchMORT;

– "ITU-T Recommendation X.745:1993":mORTNotAvailable;

– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The loopBackTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: The loopBackTestUncontrolledResult parameter as content of the additionalInformation field in the reply syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

B.8 ISDN quick test

Test category name: ISDN Quick Test

Test category purpose: The purpose of tests of this category is to check the proper operation of certain functionalities of the subscriber equipment. Possible tests according to the ASN.1 definition IsdnQuickTestUncontrolledRequestType are:

– layer 1 activation (in case of an ISDN BA: test on the capability to activate the layer 1; in case of an ISDN PRA: test on the presence of an active layer 1)

– loopback test

– power feeding test

– function test

MORT requirements: The test invocation involves one object class (accessPortISDNBasicRate or accessPortISDNPrimaryRate as defined in Recommendation Q.824.0 [10]), which represents the line being tested. One or more object instances can be involved in the test.

Associated object requirements: There are no associated object classes.

Test environment: Tests of this test category are outward and inward tests. They do not require customer assistance.

Test request service type: "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Specific errors:

– "ITU-T Recommendation X.745:1993":noSuchMORT;

– "ITU-T Recommendation X.745:1993":mORTNotAvailable;

– "ITU-T Recommendation X.745:1993":mistypedTestCategoryInformation.

Test category information parameter: The isdnQuickTestUncontrolledRequest parameter as content of the test category information field in the information syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction.

Uncontrolled test response additional information parameter: The isdnQuickTestUncontrolledResult parameter as content of the additionalInformation field in the reply syntax of "ITU-T Recommendation X.745:1993":testRequestUncontrolledAction

ANNEX C

Test termination

As specified in Recommendation X.745 [22], a test may terminate spontaneously or by request. In the following subclauses, guidelines are given on termination of line and circuit tests.

C.1 Termination of uncontrolled tests

Uncontrolled tests terminate spontaneously:

– upon completion of the test; or

– upon fault situations; or

– upon the fulfilment of predefined criteria.

These predefined criteria and some specific fault situations are specified by the test category. The final test results or test failure response shall be returned using the test request uncontrolled action response message.

C.2 Termination of controlled tests

Controlled tests shall terminate depending on the test invocation:

C.2.1 One-step test

A one-step test is specified by one or more tests being invoked by a single test request controlled action. The request specifies a new access test object together with the test object(s) representing the specific test(s) to be performed.

A one-step test shall terminate spontaneously:

– upon completion of the test; or

– upon fault situations; or

– upon the fulfilment of predefined criteria.

These predefined criteria and some specific fault situations shall be specified by the test category or TO class. The final test results shall be returned using one or more controlled test result notifications. A test failure response shall be returned in the test request controlled action response or be contained in result notifications.

Before completion of the requested tests, a one-step test may be terminated by a test terminate action directed to the test action performer which received the test request. The tests are identified in termination requests using the test invocation id. All TO(s) identified by the test shall be terminated; otherwise, an error shall be returned. The tests that have been terminated successfully as a result of this termination request shall be returned in the action response. In case an error occurs during test termination, the agent shall respond with a test termination error.

C.2.2 Test session

A test session is invoked by a test request controlled action which specifies a new access test object without any contained specific test objects. Subsequently, one or more other test requests are given which specify the specific tests to be performed within the already existing test session.

Test sessions shall be terminated by a test terminate action directed to the test action performer which received the test request. Test sessions may terminate spontaneously in case of fault situations or due to a time out specified in the test request. In case specific tests represented by contained test objects are invoked for this test session, these tests shall also be terminated. Test sessions are identified in termination requests using the test session id or the corresponding list of test invocation id(s). If a test session id is provided in the termination request, test invocations identified by the session shall be terminated in a best effort fashion. If a test invocation id is provided in the termination request, all TO(s) identified by the test shall be terminated; otherwise, an error shall be returned. In the response to the termination request, the list of all test invocations that have been terminated as a result of this request shall be returned.

Specific controlled tests invoked during a test session shall terminate spontaneously or may be terminated by a test terminate action before completion of the test. Requirements are the same as for one-step tests.

C.2.3 Aborting tests

Controlled tests may also be aborted by deleting all TO(s) related by the same test invocation identifier. Test objects accepting deletion requests shall not emit any further test result reports. Where available it is recommended that the Scope parameter include all TOs with the same Test invocation identifier and that the Filter parameter select TOs with the same Test invocation identifier. If an abort request results in the deletion of some, but not all, TOs with the same test invocation identifier, the test becomes indeterminate. In this case, it is recommended to terminate the

test by subsequent attempts to delete the surviving test objects. Yet, it may depend on the specific implementation how to resolve this situation.

C.2.4 Termination sequence

When a controlled test or test session is terminated, the TO(s) of the test or test session will execute a termination sequence which may include issuing test result reports and performing any necessary clean-up including ending the test activity of MORT(s) and associated object(s). Successfully terminating a test or a test session implies that all the TO(s) of the test or test session are deleted automatically. If a result report is issued and the test outcome has not been concluded, then the test outcome shall indicate a value of premature termination. The temporal order in which the termination sequence(s) are carried out is system specific and not defined by the test.

ANNEX D

Test result notification

As specified in Recommendation X.745 [22], test results of controlled tests may be emitted as notifications from the TO. The results are provided by one or more notifications.

1) A result notification shall contain the test invocation identifier of the test.
2) If present in the test request, the test session identifier and the associated object identifier shall also be present in the result notification. They may be used for the correlation of test results.
3) The additional information identifier shall be present in the notification if specified in the behaviour of a specific test.
4) The MORTs identifier shall be present if not included in the test-specific additional information field.
5) The test outcome parameter shall be included in the result notification to indicate the completion of a test. In case a TO is sending more than one test result notification during the execution of a test, then the test outcome parameter also indicates that the TO is sending no more reports for the execution of the test. The parameter shall not be included in intermediate result notifications. It may take one of the following values: pass, fail, inconclusive, timed-out or premature termination, indicating the overall outcome of the test. In addition, notifications may contain specific test outcome information pertinent to the type of test.

The use of further generic information of the test result notification is left up to the implementation.

ANNEX E

Additional requirements on the test action performer

This annex contains additional requirements on the implementation of the test action performer which detail the generic capabilities specified in Recommendation X.745 [22].

E.1 Indication of supported tests

It shall be possible to retrieve the line and circuit test capabilities of an agent system. For this purpose the testActionPerformer object class specified in Recommendation X.745 [22] shall support the following packages:

– supportedTOClassesPackage, if controlled tests are supported; and

– supportedUncontrolledTestsPackage, if uncontrolled tests are supported.

Supported controlled tests are identified by a set of object identifiers of their related TO classes. Supported uncontrolled tests are identified by a set of object identifiers of their respective uncontrolled request parameter.

On receipt of a test request indicating a controlled test not supported by the agent system, an independent or related test invocation error shall be generated. On receipt of a test request indicating a not supported uncontrolled test, a mistyped test category information error shall be generated in the agent system.

E.2 Indication of unsuccessful test requests

The response to a not successful line or circuit test request shall contain a failure indication and information pertaining to the failure. According to Recommendation X.745 [22], these failures shall be reported as Specific Errors.

ANNEX F

Requirements and specification of parameters for V5 interface tests

F.1 V5 interface test requirements

These are the requirements for the test management of V5 interfaces via the Q3 interface at either side of a V5 interface. They are covered by the information model defined in this Recommendation.

F.1.1 V5 interface ID testing

The testing of consistency between the V5 interface IDs at either side of a V5 interface is required.

F.1.2 Link ID testing

The testing of consistency between the link IDs at either side of a V5 2048 kbit/s link is required.

F.1.3 Provisioning variant testing

The testing of consistency between the provisioning variant labels at either side of a V5 interface is required.

APPENDIX I

Message flows

In Figures I.1 to I.5 the principles of the message flows are introduced as examples.

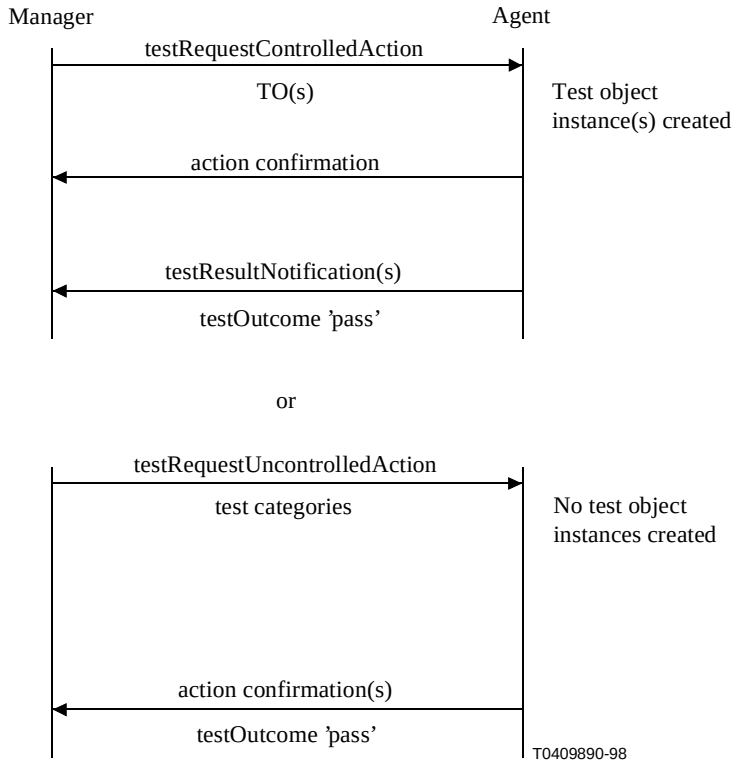


Figure I.1/Q.835 – The simple cases: a successful on-demand test

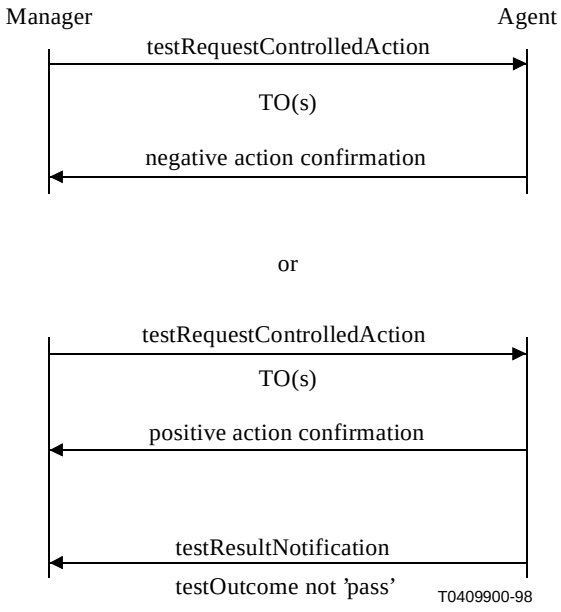


Figure I.2/Q.835 – Any failed test

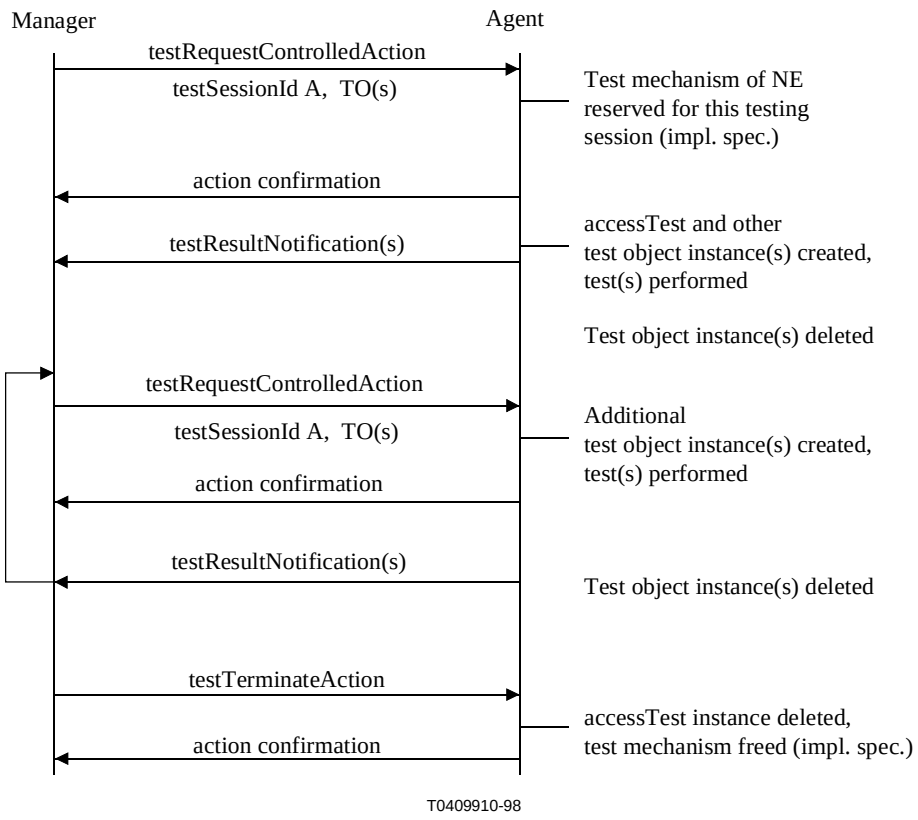


Figure I.3/Q.835 – A test session

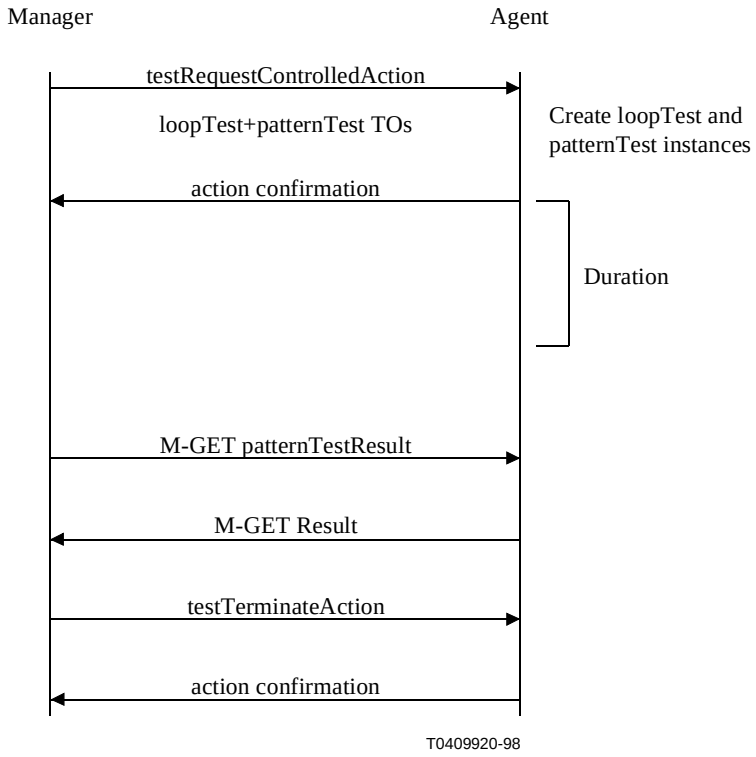


Figure I.4/Q.835 – Internal pattern injection

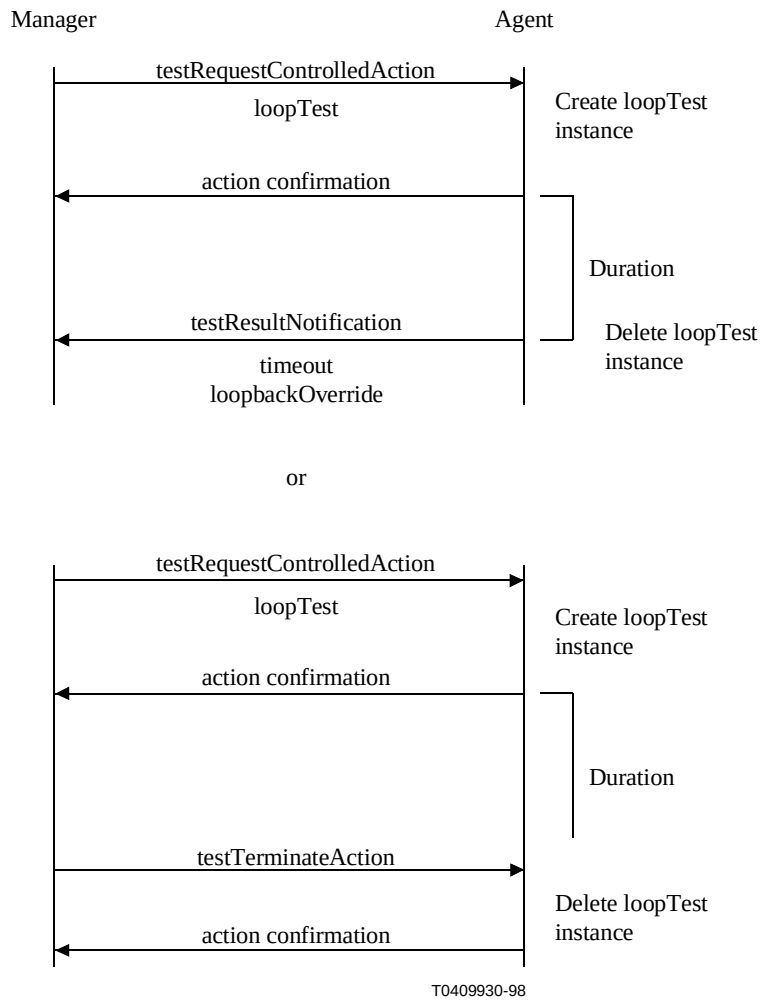


Figure I.5/Q.835 – External pattern injection

APPENDIX II

Description of test procedures – Application for V5 access networks

II.1 Background

This appendix describes complex test procedures, as ringback service and all subscriber-assisted tests at the AN side, to show the impact that they have on both Q3 interfaces.

II.2 Test procedures scenario

The general scenario (Figure II.1) includes four functional blocks and all reference points between them as described in Recommendation M.3010 [3].

The functional blocks are: NE functionalities which represent LE and AN, and OS functionalities managing AN and LE.

The reference points are: q (between AN or LE and respective OS) and q (or x if they belong to different TMNs) between OSs[1].

[1] This reference point and the interface relating to it are out of the scope of this Recommendation.

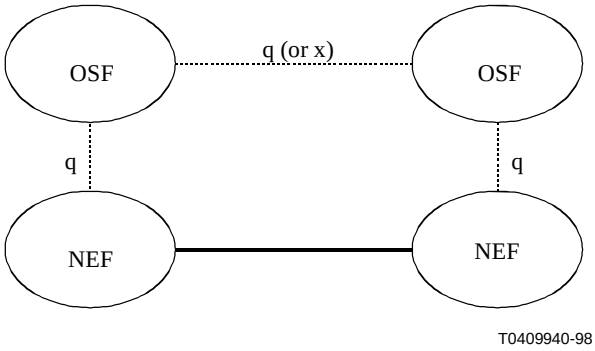


Figure II.1/Q.835 – Functional architecture for test procedures

The following subclauses describe examples of test procedures and the interactions between functional blocks via reference points.

II.2.1 Scenario for faultsman ringback tests in an AN environment

Figure II.2 gives a synopsis of all elements involved in maintenance of an AN subscriber line and set: in this example, all the previous reference points have been translated to interfaces and the OSs belong to different TMNs. The telephone set located at the AN operator premises will not be used for this scenario as the operator at the subscriber location will only get responses from the system:

1) The operator at the subscriber location (installer) dials a special service code. This special code is detected at the LE over the V5 interface (③ in Figure II.2):
   a) the LE notifies the OS_{LE} via the $Q3_{LE}$ interface (⑤ in Figure II.2);
   b) the OS_{LE} "informs" OS_{AN} via the X interface (⑥ in Figure II.2);
   c) OS_{AN} checks via $Q3_{AN}$ if Test Equipment is available at AN level and reserves this equipment (④ in Figure II.2).
   d) reporting back from OS_{AN} to OS_{LE} via X interface (⑥ in Figure II.2).
   e) OS_{LE} initiates tone LE via $Q3_{LE}$ (⑤ in Figure II.2).
2) If test equipment is available, the LE answers with a ringing tone (③ in Figure II.2), otherwise with a busy tone (③ in Figure II.2).
3) The installer puts the set on-hook (③ in Figure II.2):
   a) the LE notifies the OS_{LE} via the $Q3_{LE}$ interface of the on-hook (⑤ in Figure II.2);
   b) the OS_{LE} "informs" OS_{AN} via the X interface (⑥ in Figure II.2);
   c) OS_{AN} requests testing at AN level via $Q3_{AN}$ (④ in Figure II.2);
   d) the AN blocks the related user port object instance via the V5 protocol (③ in Figure II.2).
4) Automatic testing is performed by the AN (foreign voltage, insulation, capacitance, etc.):
   a) the AN notifies the test results via $Q3_{AN}$ to OS_{AN} (④ in Figure II.2);
   b) the test equipment is disconnected at the AN;
   c) reporting back the passed/not passed result from OS_{AN} to OS_{LE} via X interface (⑥ in Figure II.2);
   d) OS_{LE} initiates ringing to LE via $Q3_{LE}$ (⑤ in Figure II.2) and indicates which tone to apply.

5) The LE rings the installer back.

6) The installer takes the set off-hook (implying the ringer is OK).

7) The test results (of item 4 above) are communicated with a tone (passed: dial tone, not passed: busy tone) to the installer (③ in Figure II.2).

8) Faultsman receives dial tone and sends digits (DTMF or DECADIC) in a given order, removal of dial tone after first digit (③ in Figure II.2). This is just a check of the capability to dial (i.e. no measurements are performed on the dial performance).

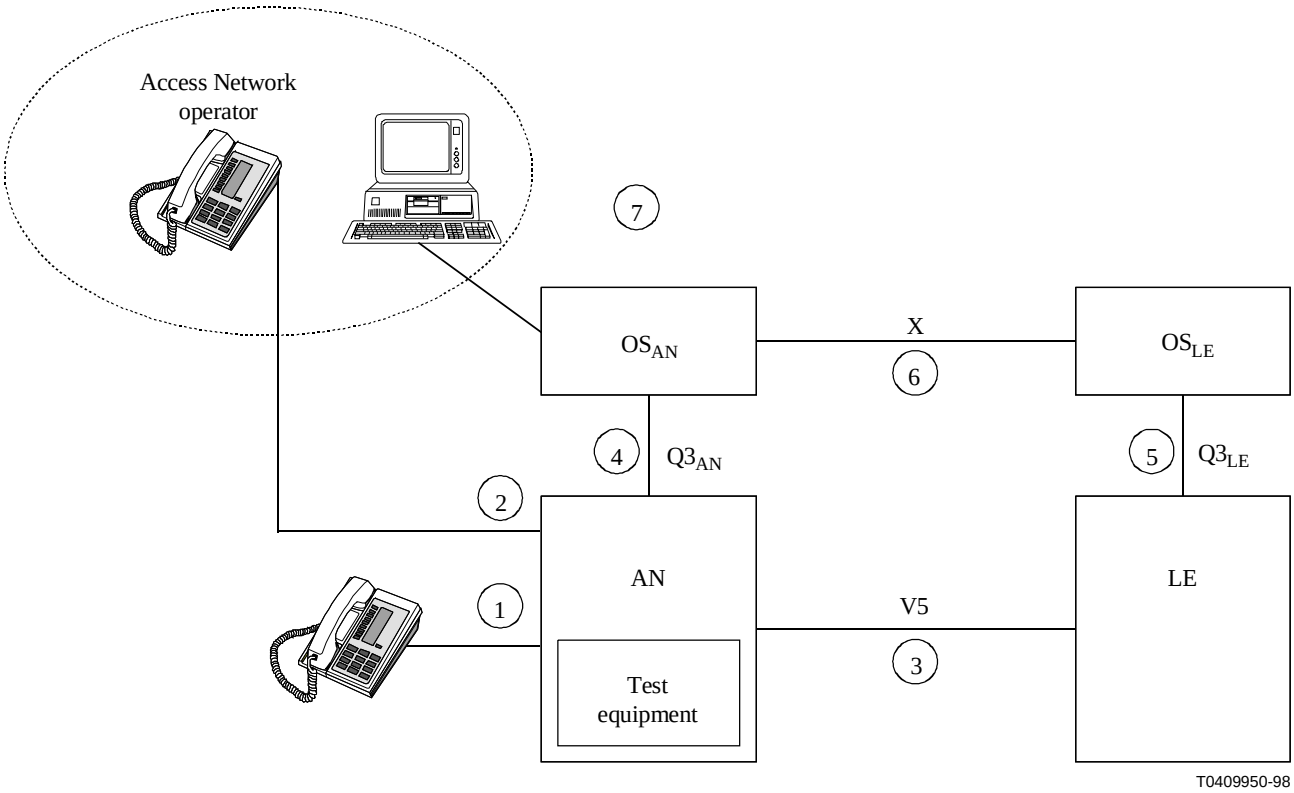
9) Passed/not passed tone to report a successful test (③ in Figure II.2).

10) End of test, set on-hook:

   a) the LE notifies the OS_{LE} via the $Q3_{LE}$ interface of the on-hook and successful test (⑤ in Figure II.2);

   b) the OS_{LE} "informs" OS_{AN} via the X interface (⑥ in Figure II.2);

   c) report is printed on the AN operator printer (⑦ in Figure II.2).



NOTE – The operator's telephone set may also be connected to another AN, or to this or another LE.

Figure II.2/Q.835 – Physical architecture for the faultsman ringback service and for subscriber-assisted tests in an AN environment

II.2.2 Scenario for a subscriber-assisted test in an AN environment

The subscriber-assisted tests, i.e. those in which the subscriber at its premises handles the telephone set and observes the SPM, are normally carried out with a speech connection between him and the operator who is also working at the OS_{AN}. This speech connection can be in two modes, as specified in the voice access package.

II.2.2.1 Existing connection mode

1) A normal connection is set up between the subscriber and the operator. This connection can be, for example, due to a claiming call from the subscriber (①-③-② in Figure II.2) (no charging should be applied) or may be originated by the operator (②-③-① in Figure II.2).

   The operator indicates to the subscriber that some tests are going to be performed, and requests assistance for this purpose according to the following instructions.

2) The operator, by means of a test request on the $Q3_{AN}$. interface (⑦-④ in Figure II.2), converts the existing voice connection into a test connection (by creating an access test object and a voice access test object contained in it with the monitorSpeak parameter set to existingConnection). The test connection condition means that the voice connection is kept (①-③-②) but the line signalling is put under the control of the OS_{AN} interface instead of the LE, which will not receive any V5 signal message.

3) If, for example, the ringing function of the telephone set has to be tested, the operator asks the subscriber to hang up and to pick up again when the set rings (or after a given time otherwise). The on-hook is noticed by the operator by listening to the line (or by previously creating within the access test object a dialled digit test object which reports the on-hook signal event through the $Q3_{AN}$ interface).

   Then the operator creates within the access test object a ringing test object. This causes the AN to generate ringing to the subscriber's line. The test object will generate a result either upon the off-hook detection or when a built-in timer expires (e.g. a little before the subscriber should pick up if the ringing does not work). In both cases the ringing test object is automatically deleted.

4) If, for example, the dialling function of the telephone set has to be tested, the operator creates within the access test object a dialled digit test object and then asks the subscriber to dial a given sequence of digits. Information on detected digits at the AN and their performance (e.g. make/break duration) are reported by the test object to the OS_{AN} where the operator checks it. The dialled digit test object is automatically deleted.

5) If, for example, the SPM pulse reception function has to be tested, the operator asks the subscriber to watch how many pulses are going to be received, then creates within the access test an SPM pulse test object with the desired number of pulses to be sent as a parameter. This causes the generation of those pulses. The subscriber counts the number of pulses accumulated in the SPM and it is checked against the generated number.

6) When no more subscriber-assisted testing is needed, the operator terminates the voice access test object and the access test object through the $Q3_{AN}$ interface. An implementation may restore the original normal connection condition (voice connection kept and line signalling again under LE control) or release the connection completely.

II.2.2.2 Parallel voice path mode

1) The operator creates through the $Q3_{AN}$ interface (⑦-④ in Figure II.2) an access test object and contained in it a voice access test object with the monitorSpeak parameter set to speakAndMonitor. This causes the AN to block the port (③ in Figure II.2) and to generate a call from the AN-internal test function (simulating to be a telephone) to the telephone number of the operator, provided in the ringBackNo parameter of the test request (③-② in Figure II.2, though the V5 interface and the LE for the test function may not be the same as for the port to be tested).

2) Once the voice path between the operator and the test function is established, the test function is connected to the subscriber's line so that the operator and the subscriber can speak to each other.

3), 4) and 5) as in the existing connection mode above.

6) When no more subscriber-assisted testing is needed, the operator terminates the voice access test object and the access test object through the $Q3_{AN}$ interface. The user port is unblocked (③ in Figure II.2) and gets ready for normal traffic.

APPENDIX III

State management in relation with line testing – Application for V5 access networks

III.1 Intrusive tests

Tests can be intrusive or non-intrusive. A test on a resource is intrusive when its testing phase is incompatible with the normal working of that resource.

Most of the test functionality modelled in this Recommendation is intrusive, the only exceptions being that of the monitoring function and of the monitor-and-speak function while a previous connection between the user port being tested and a third party is still on (if this connection is cleared, then the monitor-and-speak function becomes intrusive).

Additionally, any tests performed during a speech connection between the operator and the user in the "existingConnection" mode (as described in the voiceAccessTest object) are not considered as intrusive.

III.2 Dealing with conflicts between intrusive tests and normal service

When a resource is disabled for any reason, it cannot provide its normal service and thus there is no conflict with intrusive tests. For V5-related user ports, the disabled state of the object implies the blocked state of the corresponding V5 FSM. Disabling reasons are AN-internal, e.g. faults or a (V5-specific) blocking procedure initiated at the LE, as specified in Recommendation Q.824.5 [11].

When a resource is not disabled, a way of avoiding conflicts between intrusive testing on that resource and its normal working is by preventing the latter by setting its administrative state to "locked" (via shutting down, if desired). This state also allows the holding of a test session without risk of interruption due to call attempts between consecutive tests. With V5-related user ports, the locked state implies that the V5 FSM is blocked (see Recommendation Q.824.5 [11]).

However, the locking or shutting down and the subsequent unlocking operations on the Q3 interface may be cumbersome, e.g. in the case of series of single tests on many user ports, and for this reason the model allows to avoid them. In this case, the AN shall solve interferences between an intrusive test and normal traffic according to the priority criterion defined in the testConditions parameter of the request for the containing access test. As specified in the object model, tests to be initiated when the port is not idle may have to be rejected ("reject if busy"), or wait until the port becomes idle ("wait if busy", with a time limit set by the waitTime parameter), or force the clearance of the call ("test if busy").

NOTE 1 – A test session without call interruptions between tests can be supported, without using the locked administrative state, by means of the access test object along with the testSessionId parameter.

NOTE 2 – The above approach of using the administrative state does not cover the "reject if busy" case or the timing facility for the "wait if busy" case.

In order for the AN to appropriately use the testConditions and the waitTime parameters, two functions are necessary:

1) capability to know whether there is an ongoing call;

2) procedures for the possible cases of interference.

Regarding function 1, the general principles for ANs and in particular the V5 specifications state that the AN has limited or no knowledge of the state of the call. On that basis, there are two ways out:

a) for V5-related user ports, an approach is the use of the V5 blocking mechanisms. They only indirectly provide some call information, but at the same time cover function 2 (they are active procedures), as explained in III.4;

b) it is possible for an AN to have additional capabilities allowing it to get call state information, if an implementation goes beyond the definition of AN in the V5 specification.

   This approach has the disadvantage of making the AN more complex and dependent on possibly network-specific and time-evolving signalling issues, against the spirit of the V5 specification. However, it cannot be ruled out, and for that reason the V5 blocking approach described below is not in the normative part of this Recommendation. Moreover, keeping independence on the V5 specificities allows the model to be used in non-V5 environments.

Regarding function 2, in the case of a user port related to a V5 interface, the normal way is by means of the V5 blocking mechanisms, even if a different approach is used for function 1.

A second aspect of possible interference between service and testing is when a call attempt occurs during the execution of a test. The testConditions parameter may also be used by the manager to choose which function prevails, as described in the model. The "customer overrides" option, which is not possible if the locked administrative state is used, requires the AN to be able to detect the call attempt, as well as procedures to abort the test, and for this aspect the same considerations above are valid.

III.3 State values during intrusive testing

Whenever the user port is in the testing phase of an intrusive test, it cannot give normal service. Thus, the testing phase of an intrusive test is an AN-internal disabling reason, i.e. one of the possible reasons for its disabled operational state.

For short tests, this general rule may be simplified so that the Q3 interface state attributes of the user port are not affected, thus avoiding the corresponding notifications and manager processing. This means that during the test execution the disabled condition of the port is only known by the AN.

For V5-related user ports, the disabled condition (even if not reflected on the Q3 interface) means the blocked state of the V5 FSM, as defined in Recommendation Q.824.5 [11]. Exceptions are or may be:

– the dial tone test requires the unblocked state due to its special nature;

– for other tests, if their execution have a very short duration, an implementation might not follow this rule.

III.4 V5 blocking mechanism

This subclause describes the use of the V5 blocking mechanism for V5-related user ports to cover functions 1 and 2 (as described in III.2) as a complement of the generic behaviour description of the test environment conditions package.

– If the testConditions parameter is set to "test if busy", the V5 urgent blocking procedure is started so that the test proceeds (as far as this mechanism is concerned, the AN does not know if there was a call).

– If the parameter is set to "wait if busy", the V5 deferred blocking is started, and it is up to the LE to block the port (when this happens, the AN "knows" that the call has finished). If the timer expires, the AN cancels the block request.

– The least elegant case for this approach is when the testConditions parameter is set to "reject if busy", as there is no direct V5 mechanism. Then the AN starts the deferred blocking procedure; if after "a few seconds" the LE has not yet confirmed the blocking, the AN assumes that there is a call and rejects the test, while the block request to the LE is cancelled.

For the dial tone test, these procedures need to be complemented, once the port is blocked, by the unblocking procedure (if the concept of test session were to be supported to avoid a call to interrupt a sequence of dial tone tests, the user port would be immediately blocked after each test).

It is possible for an implementation to follow the above V5 blocking approach with the variation that, for PSTN ports and/or ISDN-BA ports without permanent line activation, the AN determines by itself whether the line is busy, only in order to simplify the "reject if busy" case (direct rejection if the port is found busy); and, on PSTN ports, also to simplify the dial tone test (direct testing when the port is found idle).

APPENDIX IV

Bibliography

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