



EUROPEAN
TELECOMMUNICATION
STANDARD

DRAFT
pr **ETS 300 645**

April 1996

Source: ETSI TC-TM

Reference: DE/TM-02218

ICS: 33.020

Key words: SDH, transmission, DRRS, information model

**Transmission and Multiplexing (TM);
Synchronous Digital Hierarchy (SDH) radio relay equipment;
Information model for use on Q interfaces**

ETSI

European Telecommunications Standards Institute

ETSI Secretariat

Postal address: F-06921 Sophia Antipolis CEDEX - FRANCE

Office address: 650 Route des Lucioles - Sophia Antipolis - Valbonne - FRANCE

X.400: c=fr, a=atlas, p=etsi, s=secretariat - **Internet:** secretariat@etsi.fr

Tel.: +33 92 94 42 00 - Fax: +33 93 65 47 16

*

Copyright Notification: No part may be reproduced except as authorized by written permission. The copyright and the foregoing restriction extend to reproduction in all media.

© European Telecommunications Standards Institute 1996. All rights reserved.

Contents

Foreword	5
1 Scope	7
2 Normative references	7
3 Abbreviations.....	8
4 Registration supporting ASN.1 for this ETS	9
5 SDH Radio TP Fragment	9
5.1 Object classes definitions	9
5.1.1 Radio Synchronous Physical Interface.....	9
5.2 Packages definitions.....	11
5.3 Attributes definitions.....	12
5.4 Name bindings definitions.....	13
5.5 Object relations	14
5.6 Supporting ASN.1	14
6 SDH Radio Protection Fragment.....	15
6.1 Object classes definitions	15
6.1.1 Generic Object definitions	15
6.1.1.1 SDH Radio Protection Group.....	15
6.1.1.2 SDH Radio Protection Unit	16
6.1.2 MS Tandem Connection Protection Object definitions.....	16
6.1.2.1 MS Tandem Connection CTP.....	17
6.1.2.2 MS Tandem Connection TTP	18
6.1.3 High Order Path Connection Protection Object definitions	19
6.1.3.1 High Order Path Connection CTP	19
6.1.3.2 Protected High Order Path Connection TTP	21
6.1.4 Multiplex Section Trail Protection (by means of RPS) Object definitions	22
6.1.4.1 Radio Unprotected CTP	22
6.1.4.2 Radio Protected TTP	23
6.2 Packages definitions.....	24
6.3 Attributes definitions.....	25
6.3.1 hitless	25
6.3.2 radioHoldOffTime	25
6.3.3 rpsSummaryStatus.....	25
6.3.4 exerciseOn	26
6.3.5 privilegedChannel.....	26
6.3.6 radioProtectionStatus	26
6.4 Actions definitions	27
6.5 Parameters definitions	27
6.5.1 Radio Protection Status Parameter.....	27
6.6 Name bindings definitions.....	28
6.6.1 augSink	28
6.6.2 augSource	28
6.6.3 msTcCTPSink	28
6.6.4 msTcCTP Source.....	29
6.6.5 msTcTTP Sink.....	29
6.6.6 msTcTTP Source	29
6.6.7 vc4HopcTTP Sink	29
6.6.8 vc4HopcTTP Source	30
6.6.9 au4HopcCTPSink.....	30
6.6.10 au4HopcCTP Source	30
6.7 Supporting ASN.1	30

Annex A (informative):	Figures	33
Annex B (informative):	Bibliography	38
History		39

Foreword

This draft European Telecommunications Standard (ETS) was produced by the Transmission and Multiplexing (TM) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is submitted for the Public Enquiry phase of the ETSI standards approval procedure.

This draft ETS describes the information model for Radio Relay Network Elements, which use the Synchronous Digital Hierarchy (SDH) multiplexing structure, in object oriented terms, using ISO templates.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	6 months after doa
Date of withdrawal of any conflicting National Standard (dow):	6 months after doa

Blank page

1 Scope

This European Telecommunications Standard (ETS) defines the information model to be used at the interface between network elements and management systems, for the management of Radio Relays equipments which use the Synchronous Digital Hierarchy (SDH).

This ETS defines:

- the information model fragment for Radio Relay Network Elements using SDH multiplexing.

This ETS does not define:

- the protocol stack to be used for message communication;
- the network level management processes;
- the application contexts;
- the conformance requirements to be met by an implementation of this information model;
- information models for other systems or equipment.

The Information Model defined here (and the corresponding Message Set) is concerned with the management of network elements, the equipment by which they are implemented and the functions contained within them. More precisely, it applies to an Equipment Domain visible at the Element Manager to Element interface and is only concerned with information available within that domain. Information proper to the domain of a Network Level Management Process is not included within this model.

2 Normative references

This ETS incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] ITU-T Recommendation X.721: "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".
- [2] ITU-T Recommendation M.3100: "Generic Network Information Model".
- [3] ITU-T Recommendation X.720: "Information technology - Open Systems Interconnection - Structure of management information: Management information model".
- [4] ITU-T Recommendation G.774: "Synchronous digital hierarchy (SDH) management information model for the network element view".
- [5] ITU-T Recommendation X.722: "Information technology - Open Systems Interconnection - Structure of Management Information: Guidelines for the definition of managed objects".
- [6] ITU-T Recommendation X.701: "Information technology - Open Systems Interconnection - Systems management overview".
- [7] ITU-T Recommendation X.710: "Common management information service definition for CCITT applications".
- [8] ITU-T Recommendation X.711: "Common management information protocol specification for CCITT applications".

- [9] ITU-T Recommendation X.731: "Information technology - Open Systems Interconnection - Systems Management: State management function".
- [10] ITU-T Recommendation X.730: "Information technology - Open Systems Interconnection - Systems Management: Object management function".
- [11] ITU-T Recommendation X.733: "Information technology - Open Systems Interconnection - Systems Management: Alarm reporting function".
- [12] ITU-T Recommendation X.734: "Information technology - Open Systems Interconnection - Systems Management: Event report management function".
- [13] ITU-T Recommendation X.735: "Information technology - Open Systems Interconnection - Systems Management: Log control function".
- [14] ETS 300 304: "Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) information model for the Network Element (NE) view".

3 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AIS	Alarm Indication Signal
AP	Access Point
ITU-T	International Telecommunication Union - Telecommunications sector
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CP	Connection Point
CTP	Connection Termination Point
DRR	Digital Radio Relay
GTP	Group Termination Point
HPA	Higher Order Path Adaptation
IA	Indirect Adapter
IOS	Intra-Office Section
ISO	International Organization for Standardization
LOF	Loss Of Frame
LPA	Lower Order Path Adaptation
NE	Network Element
OS	Operation System
OSI	Open System Interconnection
PDH	Plesiochronous Digital Hierarchy
Pkg	Packages
RF	Radio Frequency
RPS	Radio Protection Switching
RRR	Radio Relay Regenerator
RRT	Radio Relay Terminal
RS	Regenerator Section
RSPI	Radio Synchronous Physical Interface
SDH	Synchronous Digital Hierarchy
Snk	Sink
Src	Source
STM-n	Synchronous Transport Module n
STM-RR	Synchronous Transport Module for Sub-STM-1 Radio Relay
TMN	Telecommunication Management Network
TP	Termination Point
TTP	Trail Termination Point
VC-n	Virtual Container n

4 Registration supporting ASN.1 for this ETS

```
PrETSdetm2218 {itu(0) identified-organization(4) etsi(0) ets(645) informationModel(0) asn1Module(2) detm2218(0)}
```

```
DEFINITIONS IMPLICIT TAGS ::= BEGIN
```

```
-- EXPORT Everything
```

```
prETSdetm2218 OBJECT IDENTIFIER ::= {itu(0) identified-organization(4) etsi(0) ets(645) informationModel(0)}
```

```
etsObjectClass OBJECT IDENTIFIER ::= {prETSdetm2218 managedObjectClass(3)}
```

```
etsNameBinding OBJECT IDENTIFIER ::= {prETSdetm2218 nameBinding(6)}
```

```
etsAttribute OBJECT IDENTIFIER ::= {prETSdetm2218 attribute(7)}
```

```
etsAction OBJECT IDENTIFIER ::= {prETSdetm2218 action(9)}
```

```
etsNotification OBJECT IDENTIFIER ::= {prETSdetm2218 Notification(10)}
```

```
END
```

5 SDH Radio TP Fragment

This section provides Managed Objects required to model Radio SDH Physical interfaces.

5.1 Object classes definitions

5.1.1 Radio Synchronous Physical Interface

This section describes the object classes required to model the Radio SDH physical interface.

```
radioSPITTPBidirectional MANAGED OBJECT CLASS  
DERIVED FROM "Recommendation M.3100":trailTerminationPointBidirectional,  
radioSPITTPSink  
radioSPITTPSource;  
REGISTERED AS { etsObjectClass 1 };
```

```
radioSPITTPSink MANAGED OBJECT CLASS  
DERIVED FROM "Recommendation M.3100":trailTerminationPointSink;  
CHARACTERIZED BY  
"Recommendation X.721":administrativeStatePackage,  
"Recommendation M.3100":createDeleteNotificationsPackage,  
"Recommendation M.3100":stateChangeNotificationPackage,  
"Recommendation M.3100":tmnCommunicationsAlarmInformationPkg,  
radioSPIPackage,  
radioSPITTPSinkPkg PACKAGE  
BEHAVIOUR  
radioSPITTPSinkPkgBehaviour BEHAVIOUR  
DEFINED AS
```

"This managed object class represents the process of converting the incoming radio frequency signal into an internal logic level STM-N signal and the recovering of the timing from the incoming signal.

The upstream connectivity pointer is NULL for an instance of this class.

The aforementioned process is composed of two subfunctions, namely the RX subfunction and the Demodulation subfunction.

A communicationsAlarm notification shall be issued if the RX subfunction fails. The probableCause parameter of the notification shall indicate rxFail.

A communicationsAlarm notification shall be issued if the Demodulation subfunction fails. The probableCause parameter of the notification shall indicate demodulationFail.

When an alarm is pending on an instance, its operationalState is disabled."

;;;

CONDITIONAL PACKAGES

rxLOSNotificationPackage PRESENT IF "an instance supports it",
demLOSNotificationPackage PRESENT IF "an instance supports it";

REGISTERED AS { etsObjectClass 2 };

radioSPITTPSource MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100":trailTerminationPointSource;

CHARACTERIZED BY

"Recommendation X.721":administrativeStatePackage,
"Recommendation M.3100":createDeleteNotificationsPackage,
"Recommendation M.3100":stateChangeNotificationPackage,
"Recommendation M.3100":tmnCommunicationsAlarmInformationPkg,
radioSPIPackage,
radioSPITTPSourcePkg PACKAGE

BEHAVIOUR

radioSPITTPSourcePkgBehaviour BEHAVIOUR

DEFINED AS

"This managed object class represents the process of converting an outgoing internal logic level STM-N signal into a radio frequency signal.

The downstream connectivity pointer is NULL for an instance of this class.

The aforementioned process is composed of two subfunctions, namely the TX subfunction and the Modulation subfunction.

A communicationsAlarm notification shall be issued if the TX subfunction fails. The probableCause parameter of the notification shall indicate txFail.

A communicationsAlarm notification shall be issued if the Modulation subfunction fails. The probableCause parameter of the notification shall indicate modulationFail.

When an alarm is pending on an instance, its operationalState is disabled.";

ATTRIBUTES atpcImplemented GET;;;

CONDITIONAL PACKAGES

atpcPackage PRESENT IF "the ATPC is implemented and an instance supports it",
txLOSNotificationPackage PRESENT IF "an instance supports it",
modLOSNotificationPackage PRESENT IF "an instance supports it";

REGISTERED AS { etsObjectClass 3 };

5.2 Packages definitions

```
atpcPackage PACKAGE
  ATTRIBUTES
    atpcEnabled GET-REPLACE;
REGISTERED AS { etsPackage 1 };
```

```
radioSPIPackage PACKAGE
  ATTRIBUTES
    radioSPITTPId GET,
    radioFrequency GET,
    "Recommendation G.774:1992":stmLevel GET;
REGISTERED AS { etsPackage 2 };
```

```
rxLOSNotificationPackage PACKAGE
  BEHAVIOUR
    rxLOSNotificationPackageBehaviour BEHAVIOUR
  DEFINED AS
    "A communicationsAlarm notification shall be issued if a loss of the incoming signal for the RX
    subfunctions is detected. The probableCause parameter of the notification shall indicate rxLOS.
    The rxLOS probableCause in the communicationsAlarm notification should be used only when
    the distinction between the fail of the RX subfunction and the loss of the incoming signal can be
    carried out with sufficient degree of confidence. "
    ;;
REGISTERED AS { etsPackage 3 };
```

```
demLOSNotificationPackage PACKAGE
  demLOSNotificationPackageBehaviour BEHAVIOUR
  DEFINED AS
    "A communicationsAlarm notification shall be issued if a loss of the incoming signal for the
    Demodulation subfunctions is detected. The probableCause parameter of the notification shall
    indicate demLOS. The demLOS probableCause in the communicationsAlarm notification should
    be used only when the distinction between the fail of the Demodulation subfunction and the loss
    of the incoming signal can be carried out with sufficient degree of confidence. "
    ;;
REGISTERED AS { etsPackage 4 };
```

```
txLOSNotificationPackage PACKAGE
  txLOSNotificationPackageBehaviour BEHAVIOUR
  DEFINED AS
    "A communicationsAlarm notification shall be issued if a loss of the incoming signal for the TX
    subfunctions is detected. The probableCause parameter of the notification shall indicate txLOS.
    The txLOS probableCause in the communicationsAlarm notification should be used only when
    the distinction between the fail of the TX subfunction and the loss of the incoming signal can be
    carried out with sufficient degree of confidence. "
    ;;
REGISTERED AS { etsPackage 5 };
```

```
modLOSNotificationPackage PACKAGE
  modLOSNotificationPackageBehaviour BEHAVIOUR
  DEFINED AS
    "A communicationsAlarm notification shall be issued if a loss of the incoming signal for the
    Modulation subfunctions is detected. The probableCause parameter of the notification shall
    indicate modLOS. The modLOS probableCause in the communicationsAlarm notification should
    be used only when the distinction between the fail of the Modulation subfunction and the loss of
    the incoming signal can be carried out with sufficient degree of confidence. "
    ;;
REGISTERED AS { etsPackage 6 };
```

5.3 Attributes definitions

atpcImplemented ATTRIBUTE
WITH ATTRIBUTE SYNTAX SDHRRadioTpASN1.Boolean;
MATCHES FOR EQUALITY;
BEHAVIOUR
atpcImplementedBeh BEHAVIOUR
DEFINED AS
"This attribute specifies whether the ATRC capability is present or not.
A value of TRUE indicates that the ATRC capability is present and a value of FALSE indicates that
the ATRC capability is not present" ;;

REGISTERED AS {etsAttribute 1};

atpcEnabled ATTRIBUTE
WITH ATTRIBUTE SYNTAX SDHRRadioTpASN1.Boolean;
MATCHES FOR EQUALITY;
BEHAVIOUR
atpcEnabledBeh BEHAVIOUR
DEFINED AS
"This attribute specifies whether the ATRC device is currently allowed to work or not.
A value of TRUE indicates that the ATRC device is allowed to work and a value of FALSE indicates
that the device is not allowed to work (i.e. the transmit power has a fixed value)." ;;

REGISTERED AS {etsAttribute 2};

radioFrequency ATTRIBUTE
WITH ATTRIBUTE SYNTAX SDHRRadioTpASN1.RadioFrequency;
MATCHES FOR EQUALITY;
BEHAVIOUR
radioFrequencyBehaviour BEHAVIOUR
DEFINED AS
"This attribute is used to specify the carrier radio frequencies and optionally the related polarization
states associated to instances of radioSPITTPSink, radioSPITTPSource and
radioSPITTPBidirectional managed object Classes.

It also indicates if each specified radio frequency is used at transmit or receive side.

Frequency value are expressed in MHz.

For instances of radioSPITTPSink (radioSPITTPSource) managed object Class, the FrequencyUsage
sub-field can take only the receive (transmit) value."

;;
REGISTERED AS {etsAttribute 3};

radioSPITTPId ATTRIBUTE
WITH ATTRIBUTE SYNTAX SDHRRadioTpASN1.NameType;
MATCHES FOR EQUALITY;
BEHAVIOUR
radioSPITTPIdBehaviour BEHAVIOUR
DEFINED AS
"This attribute is used as a RDN for naming instances of the radioSPITTP object classes."

;;
REGISTERED AS {etsAttribute 4};

5.4 Name bindings definitions

```
radioSPITTPSink-managedElement    NAME BINDING
SUBORDINATE OBJECT CLASS          radioSPITTPSink AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS             managedElement AND SUBCLASSES;
WITH ATTRIBUTE                    radioSPITTPId;
BEHAVIOUR
    radioSPITTPSink-managedElementBehaviour    BEHAVIOUR
DEFINED AS
    "The subordinate managed object may be automatically instantiated when the superior managed
    object is instantiated, according to the make-up and mode of operation of the equipment."
;;
REGISTERED AS { etsNameBinding 1};
```

```
radioSPITTPSource-managedElement  NAME BINDING
SUBORDINATE OBJECT CLASS          radioSPITTPSource AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS             managedElement AND SUBCLASSES;
WITH ATTRIBUTE                    radioSPITTPId;
BEHAVIOUR
    radioSPITTPSource-managedElementBehaviour  BEHAVIOUR
DEFINED AS
    "The subordinate managed object may be automatically instantiated when the superior managed
    object is instantiated, according to the make-up and mode of operation of the equipment."
;;
REGISTERED AS { etsNameBinding 2};
```

```
rsCTPSink-radioSPITTPSink        NAME BINDING
SUBORDINATE OBJECT CLASS          rsCTPSink AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS             radioSPITTPSink AND SUBCLASSES;
WITH ATTRIBUTE                    rsCTPId;
BEHAVIOUR
    rsCTPSink-radioSPITTPSinkBehaviour        BEHAVIOUR
DEFINED AS
    "The subordinate managed object may be automatically instantiated when the superior managed
    object is instantiated, according to the make-up and mode of operation of the equipment."
;;
REGISTERED AS {etsNameBinding 3};
```

```
rsCTPSource-radioSPITTPSource    NAME BINDING
SUBORDINATE OBJECT CLASS          rsCTPSource AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS             radioSPITTPSource AND SUBCLASSES;
WITH ATTRIBUTE                    rsCTPId;
BEHAVIOUR
    rsCTPSource-radioSPITTPSourceBehaviour    BEHAVIOUR
DEFINED AS
    "The subordinate managed object may be automatically instantiated when the superior managed
    object is instantiated, according to the make-up and mode of operation of the equipment."
;;
REGISTERED AS {etsNameBinding 4};
```

5.5 Object relations

```

radioSPITTPBidirectionalSubordination      SUBORDINATION RULE
SUPERIOR OBJECT CLASS
  radioSPITTPBidirectional;
NAMES SUBORDINATES
  rsCTPSink, rsCTPSource, rsCTPBidirectional;
ACCORDING TO RULE
  SET SIZE(1) OF CHOICE {
    rsCTPSink, rsCTPSource, rsCTPBidirectional };
;

```

```

radioSPITTPSinkSubordination              SUBORDINATION RULE
SUPERIOR OBJECT CLASS
  radioSPITTPSink;
NAMES SUBORDINATES
  rsCTPSink;
ACCORDING TO RULE
  SET SIZE(1) OF rsCTPSink;
;

```

```

radioSPITTPSourceSubordination           SUBORDINATION RULE
SUPERIOR OBJECT CLASS
  radioSPITTPSource;
NAMES SUBORDINATES
  rsCTPSource;
ACCORDING TO RULE
  SET SIZE(1) OF rsCTPSource;
;

```

5.6 Supporting ASN.1

```
SDHRadioTpASN1 {prETSdetm2218 asn1Module(2) sdhRadioTpASN1(0)}
```

```
DEFINITIONS IMPLICIT TAGS ::= BEGIN
```

```
-- EXPORT Everything
```

```
IMPORTS
```

```
NameType FROM ASN1DefinedTypesModule {itu(0) recommendation(0) m(13) gnm(3100)
informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)};
```

```
RadioFrequency ::= SEQUENCE OF SEQUENCE {
    frequencyValue [0] INTEGER,
    frequencyUsage [1] FrequencyUsage,
    polarization [2] Polarization OPTIONAL
}
```

```
Boolean ::= BOOLEAN
```

```
Integer ::= INTEGER
```

```
Polarization ::= ENUMERATED {vertical (0), horizontal (1),unspecified (2)}
```

```
FrequencyUsage ::= ENUMERATED {receive (0), transmit (1)}
```

-- The following value assignments specify the Probable Cause value related to Radio Relay
-- management within the TMN application context. The choiced values are reserved by the
-- M.3100 Recommendation for communication alarm related probable causes.

```
rxFail ProbableCause ::= localValue : 30
rxLOS ProbableCause ::= localValue : 31
demodulationFail ProbableCause ::= localValue : 32
demLOS ProbableCause ::= localValue : 33
txFail ProbableCause ::= localValue : 34
txLOS ProbableCause ::= localValue : 35
modulationFail ProbableCause ::= localValue : 36
modLOS ProbableCause ::= localValue : 37
```

END

6 SDH Radio Protection Fragment

This section provides Managed Objects required to model the Radio Protection Switching function.

6.1 Object classes definitions

6.1.1 Generic Object definitions

6.1.1.1 SDH Radio Protection Group

```
sdhRadioProtectionGroup MANAGED OBJECT CLASS
DERIVED FROM "Rec. G.774-03:1994":protectionGroup;
  CHARACTERIZED BY
    sdhRadioProtectionGroupPkg PACKAGE
    BEHAVIOUR sdhRadioProtectionGroupBeh;
  ATTRIBUTES
    rpsSummaryStatus GET,
    "Rec. G.774-03:1994":protectionSwitchMode GET,
    hitless GET;
  NOTIFICATIONS
    protectionSwitchReporting radioProtectionStatusParameter;;;
  CONDITIONAL PACKAGES
    protectionMismatchStatusPkg PRESENT IF "An APS protocol is used",
    radioHoldOffTimePkg PRESENT IF "the hitless functionality is not present and an instance
    supports it",
    singleExercisePkg PRESENT IF " An instance supports it ":
    exerciseOnOffPkg PRESENT IF "an instance supports it";
REGISTERED AS {etsObjectClass 4 } ;
```

```
sdhRadioProtectionGroupBeh BEHAVIOUR
DEFINED AS
```

" This object class is used to model all radio protection schemes envisaged for the Radio Protection Switch function. This object class is the focal point for management operations and notifications related to management of the protection system.

The protectionMismatchStatus indicates a mismatch between the provisioned protectionGroupType of this protectionGroup and the provisioned protectionGroupType of the far-end. It also indicates mismatch of uni-directional versus bi-directional switch provisioning between the two protection groups.

Actual signal flow across any specific transport entity is reflected by the connectivity pointers of the TPs involved in the protection scheme represented by an instance of this class.

For instances of this managed object class the REPLACE operation on the attributes revertive, waitToRestoreTime and protectionGroupType is not mandatorily required.

When the exerciseOnOffPkg package is present, it is possible to start and to stop the exercise procedure on the RPS acting on the exerciseOn boolean attribute. When the exerciseOn attribute is TRUE, possible malfunctioning of the exercise procedure shall be signaled setting the 'degraded' component in the availabilityStatus attribute.

If the attributeValueChangeNotification package is present, then changes to the exerciseOn and radioHoldOffTime (if they are present) shall cause an attributeValueChange notification to be emitted.

The protectionUnit sub-field of the protectionSwitchReportingInfo has no meaning in protectionSwitchReporting notification emitted by instances of this managed object class. The conditions for emitting the protectionSwitchReporting notifications are specified in the behaviour of the radioProtectionStatusParameter parameter.";

6.1.1.2 SDH Radio Protection Unit

sdhRadioProtectionUnit MANAGED OBJECT CLASS

DERIVED FROM protectionUnit;

CHARACTERIZED BY

sdhRadioProtectionUnitPkg PACKAGE

BEHAVIOUR sdhRadioProtectionUnitBeh ;

ATTRIBUTES

"Rec. G.774-03 :1994":channelNumber GET,

radioProtectionStatus GET,

"Rec. G.774-03 :1994":reliableResourcePointer PERMITTED VALUES

SDHRadioProtANS1.SDHRadioResourcePointer,

"Rec. G.774-03 :1994":unreliableResourcePointer PERMITTED VALUES

SDHRadioProtANS1.SDHRadioResourcePointer ;;;

CONDITIONAL PACKAGES

"Rec. G.774-03 :1994":extraTrafficControlPkg PRESENT IF " extra traffic may be suspended and resumed " ,

privilegedChannelPkg

PRESENT IF "an instance supports it and the instance is protecting";

REGISTERED AS {etsObjectClass 5 } ;

sdhRadioProtectionUnitBeh BEHAVIOUR

DEFINED AS

" This object class is specific to SDH Radio Protection Systems. Instances of this object class are used to represent the assignment between an unreliable resource (termination point) and a reliable resource (termination point) for the purpose of protection of the transport entity involved in any particular RPS protection scheme.

If this is a protecting protection unit , the reliableResourcePointer points to the protected termination point for extra traffic or NULL if there is no extra traffic.

The channelNumber attribute value represents the number of the channel used by the automatic protection switching protocol, if any. ";

6.1.2 MS Tandem Connection Protection Object definitions

This section provides the object classes required to model protection of Multiplex Section Tandem Connections.

6.1.2.1 MS Tandem Connection CTP

msTcCTPBidirectional MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : msCTPBidirectional,
msTcCTPSource,
msTcCTPSink ;
CHARACTERIZED BY
msTcCTPBidirectionalPkg PACKAGE
BEHAVIOUR msTcCTPBidirectionalBeh ;;
REGISTERED AS {etsObjectClass 6 } ;

msTcCTPBidirectionalBeh BEHAVIOUR
DEFINED AS

" The msTcCTPBidirectional object class is a class of objects that represents either the bidirectional protected resources or the bidirectional unprotected resources in a tandem connection made up of one or more link connections at multiplex section layer.

If a bidirectional SDH Radio Protection Switching function is present, this object class shall be supported." ;

msTcCTPSink MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : msCTPSink ;
CHARACTERIZED BY
" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,
msTcCTPSinkPkg PACKAGE
BEHAVIOUR msTcCTPSinkBeh ;;
REGISTERED AS {etsObjectClass 7 } ;

msTcCTPSinkBeh BEHAVIOUR
DEFINED AS

" The msTcCTPSink object class is a class of objects that represents either the protected or the unprotected resources in a tandem connection made up of one or more link connections at multiplex section layer. An instance of this object class defines the tandem connection end-point which terminates a multiplex section connection.

An instance of this object class is pointed to by a reliableResourcePointer attribute or by an unreliableResourcePointer attribute in an instance of the protectionUnit object class according if it represents a protected or an unprotected tandem connection respectively.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer or unreliableResourcePointer attribute pointing back to the instance of this object class.

If an instance of this object class represents a protected tandem connection then the downStreamConnectivityPointer points to either null or its associated msTcCTP object instance(s) representing the unprotected tandem connection(s).

If an instance of this object class represents an unprotected tandem connection then the downStreamConnectivityPointer points to either null or its associated msTcCTP or msTcTTP object instance representing the protected tandem connection.

When a signal is switched to another unit, the value of the pointer is updated. " ;

msTcCTPSource MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : msCTPSource ;
CHARACTERIZED BY
" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,
msTcCTPSourcePkg PACKAGE
BEHAVIOUR msTcCTPSourceBeh ;;
REGISTERED AS {etsObjectClass 8 } ;

msTcCTPSourceBeh BEHAVIOUR
DEFINED AS

" The msTcCTPSource object class is a class of objects that represents either the protected resources or the unprotected resources in a tandem connection made up of one or more link connections at multiplex section layer. An instance of this object class defines the tandem connection end-point which originates a multiplex section connection.

An instance of this object class is pointed to by a reliableResourcePointer attribute or by an unreliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class according if it represents a protected or an unprotected tandem connection respectively.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer or unreliableResourcePointer attribute pointing back to the instance of this object class.

If an instance of this object class represents a protected tandem connection then the upStreamConnectivityPointer points to either null or its associated msTcCTP object instance representing the unprotected tandem connection.

If an instance of this object class represents an unprotected tandem connection then the upStreamConnectivityPointer points to either null or its associated msTcCTP or msTcTTP object instance representing the protected tandem connection.

When a signal is switched to another unit, the value of the pointer is updated. " ;

6.1.2.2 MS Tandem Connection TTP

msTcTTPBidirectional MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : msTTPBidirectional,
msTcTTPSource,
msTcTTPSink ;
CHARACTERIZED BY
msTcTTPBidirectionalPkg PACKAGE
BEHAVIOUR msTcTTPBidirectionalBeh ;;
REGISTERED AS {etsObjectClass 9 } ;

msTcTTPBidirectionalBeh BEHAVIOUR
DEFINED AS

" The msTcTTPBidirectional object class is a class of objects that represents the bidirectional protected resources in a tandem connection made up of one or more link connections at multiplex section layer.

If a bidirectional SDH Radio Protection Switching function is present, this object class shall be supported." ;

msTcTTPSink MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : msTTPSink ;
CHARACTERIZED BY
" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,
msTcTTPSinkPkg PACKAGE
BEHAVIOUR msTcTTPSinkBeh ;;
REGISTERED AS {etsObjectClass 10 } ;

msTcTTPSinkBeh BEHAVIOUR
DEFINED AS

" The msTcTTPSink object class is a class of objects that represents the protected resources in a tandem connection made up of one or more link connections at multiplex section layer. An instance of this object class defines the tandem connection end-point which terminates a multiplex section trail. An instance of this object class is pointed to by a reliableResourcePointer attribute in a instance of the sdhRadioProtectionUnit object class.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer attribute pointing back to the instance of this object class.

The upStreamConnectivityPointer in an instance of this object class points to either null or its associated msTcCTP object instance representing the unprotected tandem connection. It indicates the actual signal flow and when a signal is switched to another unit, the pointer is updated.

If the attributeValueChangeNotification package is present, then a change in the value of supportedByObjectList shall cause an attributeValueChangeNotification. " ;

msTcTTPSource MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : msTTPSource ;
CHARACTERIZED BY
" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,
msTcTTPSourcePkg PACKAGE
BEHAVIOUR msTcTTPSourceBeh ;;
REGISTERED AS {etsObjectClass 11 } ;

msTcTTPSourceBeh BEHAVIOUR
DEFINED AS

" The msTcTTPSource object class is a class of objects that represents the protected resources in a tandem connection made up of one or more link connections at multiplex section layer. An instance of this object class defines the tandem connection end-point which originates a multiplex section trail. An instance of this object class is pointed to by a reliableResourcePointer attribute in a instance of the sdhRadioProtectionUnit object class.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer attribute pointing back to the instance of this object class.

The downStreamConnectivityPointer in an instance of this object class points to either null or its associated msTcCTP object instance(s) representing the unprotected tandem connection(s). It indicates the actual signal flow and when a signal is switched to another unit, the pointer is updated.

If the attributeValueChangeNotification package is present, then a change in the value of supportedByObjectList shall cause an attributeValueChangeNotification. " ;

6.1.3 High Order Path Connection Protection Object definitions

This section provides the object classes required to model the High Order Path Connection Protection.

6.1.3.1 High Order Path Connection CTP

au4HopcCTPBidirectional MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : au4CTPBidirectional,
au4HopcCTPSource,
au4HopcCTPSink ;
CHARACTERIZED BY
au4HopcCTPBidirectionalIPkg PACKAGE
BEHAVIOUR au4HopcCTPBidirectionalBeh ;;
REGISTERED AS {etsObjectClass 12 } ;

au4HopcCTPBidirectionalBeh BEHAVIOUR

DEFINED AS

" The au4HopcCTPBidirectional object class is a class of objects that represents either the bidirectional protected resources or the bidirectional unprotected resources in a High Order Path Connection protected by an RPS function.

If a bidirectional SDH Radio Protection Switching function, acting as high order path connection protection, is present, this object class shall be supported." ;

au4HopcCTPSink MANAGED OBJECT CLASS

DERIVED FROM " Rec. G.774 : 1992 " : au4CTPSink ;

CHARACTERIZED BY

" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,

au4HopcCTPSinkPkg PACKAGE

BEHAVIOUR au4HopcCTPSinkBeh ;;;

REGISTERED AS {etsObjectClass 13 } ;

au4HopcCTPSinkBeh BEHAVIOUR

DEFINED AS

" The au4HopcCTPSink object class is a class of objects that represents either the protected or the unprotected resources in a High Order Path Connection protected by an RPS function. An instance of this object class defines the path connection end-point which terminates a High Order Path Connection.

An instance of this object class is pointed to by a reliableResourcePointer attribute or by an unreliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class according if it represents a protected or an unprotected path connection respectively.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer or unreliableResourcePointer attribute pointing back to the instance of this object class.

If an instance of this object class represents a protected path connection then the downstreamConnectivityPointer points to either null or to its associated au4HopcCTP object instance(s) representing the unprotected path connection(s).

If an instance of this object class represents an unprotected path connection then the downstreamConnectivityPointer points to either null or to its associated au4HopcCTP or to the vc4HopcTTP object instance representing the protected path connection.

When a signal is switched to another unit, the value of the downstreamConnectivityPointer is updated. " ;

au4HopcCTPSource MANAGED OBJECT CLASS

DERIVED FROM " Rec. G.774 : 1992 " : au4CTPSource ;

CHARACTERIZED BY

" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,

au4HopcCTPSourcePkg PACKAGE

BEHAVIOUR au4HopcCTPSourceBeh ;;;

REGISTERED AS {etsObjectClass 14 } ;

au4HopcCTPSourceBeh BEHAVIOUR
DEFINED AS

" The au4HopcCTPSource object class is a class of objects that represents either the protected resources or the unprotected resources in a High Order Path Connection protected by an RPS function. An instance of this object class defines the path connection end-point which originates a High Order Path Connection.

An instance of this object class is pointed to by a reliableResourcePointer attribute or by an unreliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class according if it represents a protected or an unprotected path connection respectively.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer or unreliableResourcePointer attribute pointing back to the instance of this object class.

If an instance of this object class represents a protected path connection then the upStreamConnectivityPointer points to either null or to its associated au4HopcCTP object instance representing the unprotected path connection.

If an instance of this object class represents an unprotected path connection then the upStreamConnectivityPointer points to either null or to its associated au4HopcCTP or to the vc4HopcTTP object instance representing the protected path connection.

When a signal is switched to another unit, the value of the upStreamConnectivityPointer is updated. " ;

6.1.3.2 Protected High Order Path Connection TTP

vc4HopcTTPBidirectional MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : vc4TTPBidirectional,
vc4HopcTTPSource,
vc4HopcTTPSink ;
CHARACTERIZED BY
vc4HopcTTPBidirectionalPkg PACKAGE
BEHAVIOUR vc4HopcTTPBidirectionalBeh ;;;
REGISTERED AS {etsObjectClass 15 } ;

vc4HopcTTPBidirectionalBeh BEHAVIOUR
DEFINED AS

" The vc4HopcTTPBidirectional object class is a class of objects that represents the bidirectional protected resources in a High Order Path Connection protected by an RPS function.

If a bidirectional SDH Radio Protection Switching function, acting as high order path connection protection, is present, this object class shall be supported." ;

vc4HopcTTPSink MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : vc4TTPSink ;
CHARACTERIZED BY
" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,
vc4HopcTTPSinkPkg PACKAGE
BEHAVIOUR vc4HopcTTPSinkBeh ;;;
REGISTERED AS {etsObjectClass 16 } ;

vc4HopcTTPSinkBeh BEHAVIOUR
DEFINED AS

" The vc4HopcTTPSink object class is a class of objects that represents the protected resources in a High Order Path Connection protected by an RPS function. An instance of this object class defines the path end-point which terminates a High Order trail. An instance of this object class is pointed to by a reliableResourcePointer attribute in a instance of the sdhRadioProtectionUnit object class.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer attribute pointing back to the instance of this object class.

The upStreamConnectivityPointer in an instance of this object class points to either null or to its associated au4HopcCTP object instance representing the unprotected path connection. It indicates the actual signal flow and, when a signal is switched to another unit, it is updated.

If the attributeValueChangeNotification package is present, then a change in the value of supportedByObjectList shall cause an attributeValueChangeNotification. " ;

vc4HopcTTPSource MANAGED OBJECT CLASS
DERIVED FROM " Rec. G.774 : 1992 " : vc4TTPSource ;
CHARACTERIZED BY
" Recommendation M.3100 :1992 " : crossConnectionPointerPackage,
vc4HopcTTPSourcePkg PACKAGE
BEHAVIOUR vc4HopcTTPSourceBeh ;;
REGISTERED AS {etsObjectClass 17 } ;

vc4HopcTTPSourceBeh BEHAVIOUR
DEFINED AS

" The vc4HopcTTPSource object class is a class of objects that represents the protected resources in a High Order Path Connection protected by an RPS function. An instance of this object class defines the path end-point which originates a high order trail. An instance of this object class is pointed to by a reliableResourcePointer attribute in a instance of the sdhRadioProtectionUnit object class.

The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer attribute pointing back to the instance of this object class.

The downStreamConnectivityPointer in an instance of this object class points to either null or to its associated au4HopcCTP object instance(s) representing the unprotected tandem connection(s). It indicates the actual signal flow and when a signal is switched to another unit, it is updated.

If the attributeValueChangeNotification package is present, then a change in the value of supportedByObjectList shall cause an attributeValueChangeNotification. " ;

6.1.4 Multiplex Section Trail Protection (by means of RPS) Object definitions

6.1.4.1 Radio Unprotected CTP

radioUnprotectedCTPBidirectional MANAGED OBJECT CLASS
DERIVED FROM "Recommendation M.3100:1992":connectionTerminationPointBidirectional,
radioUnprotectedCTPSource,
radioUnprotectedCTPSink;
CHARACTERIZED BY
radioUnprotectedCTPBidirectionalPkg PACKAGE
BEHAVIOUR radioUnprotectedCTPBidirectionalBeh;;
REGISTERED AS {etsObjectClass 18};

radioUnprotectedCTPBidirectionalBeh BEHAVIOUR
DEFINED AS

" The radioUnprotectedCTPBidirectional object class is a class of objects that represents the bidirectional unprotected resources in a protection scheme involving RPS function. ";

radioUnprotectedCTPSink MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100 : 1992":connectionTerminationPointSink;
CHARACTERIZED BY

"Recommendation M.3100 : 1992":crossConnectionPointerPackage,
radioUnprotectedCTPSinkPkg PACKAGE

BEHAVIOUR radioUnprotectedCTPSinkBeh;
ATTRIBUTES

radioUnprotectedCTPId GET;;;

REGISTERED AS {etsObjectClass 19};

radioUnprotectedCTPSinkBeh BEHAVIOUR

DEFINED AS

" The radioUnprotectedCTPSink object class is a class of objects that represents the unprotected resources in a protection scheme involving RPS function. An instance of this object class is pointed to by the unreliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class. The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit object instance which has the unreliableResourcePointer attribute pointing back to the instance of this object class. ";

radioUnprotectedCTPSource MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100 : 1992":connectionTerminationPointSink;
CHARACTERIZED BY

"Recommendation M.3100 : 1992":crossConnectionPointerPackage,
radioUnprotectedCTPSourcePkg PACKAGE

BEHAVIOUR radioUnprotectedCTPSourceBeh;
ATTRIBUTES

radioUnprotectedCTPId GET;;;

REGISTERED AS {etsObjectClass 20};

radioUnprotectedCTPSourceBeh BEHAVIOUR

DEFINED AS

" The radioUnprotectedCTPSource object class is a class of objects that represents the unprotected resources in a protection scheme involving RPS function. An instance of this object class is pointed to by the unreliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class. The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit object instance which has the reliableResourcePointer attribute pointing back to the instance of this object class. ";

6.1.4.2 Radio Protected TTP

radioProtectedTTPBidirectional MANAGED OBJECT CLASS

DERIVED FROM "Recommendation M.3100 : 1992":trailTerminationPointBidirectional,
radioProtectedTTPSource,
radioProtectedTTPSink;

CHARACTERIZED BY

radioProtectedTTPBidirectionalPkg PACKAGE

BEHAVIOUR radioProtectedTTPBidirectionalBeh;;;

REGISTERED AS {etsObjectClass 21};

radioProtectedTTPBidirectionalBeh BEHAVIOUR

DEFINED AS

" The radioProtectedTTPBidirectional object class is a class of objects that represents the bidirectional protected resources in a protection scheme involving RPS function. ";

```

radioProtectedTTPSink MANAGED OBJECT CLASS
  DERIVED FROM "Recommendation M.3100 : 1992":trailTerminationPointSink;
  CHARACTERIZED BY
    "Recommendation M.3100 : 1992":crossConnectionPointerPackage,
    radioProtectedTTPSinkPkg PACKAGE
  BEHAVIOUR radioProtectedTTPSinkBeh;
  ATTRIBUTES
    radioProtectedTTPIId GET;;;
REGISTERED AS {etsObjectClass 22};

```

```

radioProtectedTTPSinkBeh BEHAVIOUR
DEFINED AS

```

" The radioProtectedTTPSink object class is a class of objects that represents the protected resources in a protection scheme involving RPS function. An instance of this object class is pointed to by the reliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class. The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit instance which has the reliableResourcePointer attribute pointing back to the instance of this object class. The upstreamConnectivityPointer in an instance of this object class points to either null or its associated unprotected CTP object instance; it indicates the actual signal flow, and when a signal is switched to another unit, the value of the upstreamConnectivityPointer is updated. If the attributeValueChangeNotification package is present, then a change in the value of the supportedByObjectList shall cause an attributeValueChange notification. ";

```

radioProtectedTTPSource MANAGED OBJECT CLASS
  DERIVED FROM "Recommendation M.3100 : 1992":trailTerminationPointSource;
  CHARACTERIZED BY
    "Recommendation M.3100 : 1992":crossConnectionPointerPackage,
    radioProtectedTTPSourcePkg PACKAGE
  BEHAVIOUR radioProtectedTTPSourceBeh;
  ATTRIBUTES
    radioProtectedTTPIId GET;;;
REGISTERED AS {etsObjectClass 23};

```

```

radioProtectedTTPSourceBeh BEHAVIOUR
DEFINED AS

```

" The radioProtectedTTPSource object class is a class of objects that represents the protected resources in a protection scheme involving RPS function. An instance of this object class is pointed to by the reliableResourcePointer attribute in an instance of the sdhRadioProtectionUnit object class. The crossConnectionObjectPointer attribute in an instance of this object class points to its associated sdhRadioProtectionUnit object instance which has the reliableResourcePointer attribute pointing back to the instance of this object class. The downstreamConnectivityPointer in an instance of this object class points to either null or its associated unprotected CTP object instance(s); it indicates the actual signal flow, and when a signal is switched to another unit, the pointer is updated. If the attributeValueChangeNotification package is present, then a change in the value of the supportedByObjectList shall cause an attributeValueChange notification. ";

6.2 Packages definitions

```

exerciseOnOffPkg PACKAGE
  BEHAVIOUR exerciseOnOffPkgBeh;
  ATTRIBUTES
    exerciseOn GET-REPLACE;

REGISTERED AS {etsPackage 7};

```

```

exerciseOnOffPkgBeh BEHAVIOUR
DEFINED AS "This package is used to start or stop a continuous testing of the RPS functionality.";

```

```

singleExercisePkg PACKAGE

```


BEHAVIOUR singleExercisePkgBeh
ACTIONS
 invokeRadioExercise;
REGISTERED AS {etsPackage 8};

singleExercisePkgBeh BEHAVIOUR
DEFINED AS "This package is used to perform a single test operation of the RPS functionality.";

privilegedChannelPkg PACKAGE
ATTRIBUTES
 privilegedChannel GET-REPLACE;
REGISTERED AS {etsPackage 9};

radioHoldOffTimePkg PACKAGE
ATTRIBUTES
 radioHoldOffTime GET-REPLACE;
REGISTERED AS {etsPackage 10};

6.3 Attributes definitions

6.3.1 hitless

hitless ATTRIBUTE
 WITH ATTRIBUTE SYNTAX SDHRadioProtASN1.Boolean;
 MATCHES FOR EQUALITY ;
 BEHAVIOUR hitlessBehaviour ;
REGISTERED AS {etsAttribute 5 } ;

hitlessBehaviour BEHAVIOUR
DEFINED AS
 "This attribute specifies whether the hitless capability is present or not. A value of TRUE indicates that the hitless capability is present in the protection system. A value of FALSE indicates that the hitless capability is not present. ";

6.3.2 radioHoldOffTime

radioHoldOffTime ATTRIBUTE
 WITH ATTRIBUTE SYNTAX SDHRadioProtASN1.Integer ;
 MATCHES FOR EQUALITY, ORDERING ;
 BEHAVIOR radioHoldOffTimeBeh ;
REGISTERED AS { etsAttribute 6 } ;

radioHoldOffTimeBeh BEHAVIOR
DEFINED AS
 " This attribute specifies the amount of 10 msec. periods, within a valid range of 0... 10 sec., which represents the time to wait before performing a protection switch after detection of an automatic switching initiation defect on either the protecting or protected protectionUnit.

 The switch is performed only if the defect is still present after the holdOffTime has expired. ";

6.3.3 rpsSummaryStatus

rpsSummaryStatus ATTRIBUTE

 WITH ATTRIBUTE SYNTAX SDHRadioProtASN1.RPSSummaryStatus;

 MATCHES FOR EQUALITY;

 BEHAVIOUR rpsSummaryStatusBeh;

REGISTERED AS {etsAttribute 7 };

rpsSummaryStatusBeh

BEHAVIOUR

DEFINED AS

"This single structured attribute represents the whole status of the RPS function.

The statusOfRxProtectionSwitches sub-field allows to know the whole status of the bridges in the Rx side. This is achieved by listing all the protecting protection units which are carrying an extra traffic or traffic from a protected unit. If a protecting unit is not listed, it is intended to be free.

The channelStatus sub-field allows to know information about the highest priority automatic switch request currently active on this protection unit instance together with the last operator switch command accepted (if any) for each protection unit. This is achieved by listing all the protection units which have the value of the channelASRequest sub-field different from 'noOne' and the value of radioSwitchStatus sub-field different from noRequest. If a protection unit is not listed, the status shall be considered (noOne, noRequest).";

6.3.4 exerciseOn

exerciseOn ATTRIBUTE
 WITH ATTRIBUTE SYNTAX SDHRadioProtASN1.Boolean;
 MATCHES FOR EQUALITY;
 BEHAVIOUR exerciseOnBeh;
 REGISTERED AS {etsAttribute 8 };

exerciseOnBeh BEHAVIOUR
 DEFINED AS

"This attribute is used to start/stop the exercise procedure on a RPS function. If the value is TRUE the procedure is activated, otherwise it is deactivated.";

6.3.5 privilegedChannel

privilegedChannel ATTRIBUTE
 WITH ATTRIBUTE SYNTAX SDHRadioProtASN1.Privileged;
 MATCHES FOR EQUALITY;
 BEHAVIOUR privilegedChannelBeh;
 REGISTERED AS {etsAttribute 9 };

privilegedChannelBeh BEHAVIOUR
 DEFINED AS

" This attribute is used to indicate if the protected channel defined in the value of the attribute is permanently bridged in the TX side (in absence of any switching requests) to this protecting channel. A NULL value indicates that there is no bridge active.";

6.3.6 radioProtectionStatus

radioProtectionStatus ATTRIBUTE
 WITH ATTRIBUTE SYNTAX SDHRadioProtASN1.RadioProtectionStatus;
 MATCHES FOR EQUALITY;
 BEHAVIOUR radioProtectionsStatusBeh;
 REGISTERED AS {etsAttribute 10 };

radioProtectionStatusBeh BEHAVIOUR
 DEFINED AS

" This attribute is used to indicate the status of the radio protection switching in a protectionUnit instance.

The protectionUnitStatus sub-field contains information about the highest priority automatic switch request currently active on this protection unit instance together with the last operator switch command accepted (if any).

The associatedChannel sub-field indicates with the value 'itself' that there is no switch performed. In case of switch presence, the fromPU value is used for a protecting unit to indicate the protected unit which has been switched from; the toPU value is used for a protected unit to indicate the protecting unit which has been switched to.

The requestSource sub-field, when present, indicates if the switch request has been forwarded locally or remotely. ";

6.4 Actions definitions

```
invokeRadioExercise ACTION
  BEHAVIOUR invokeRadioExerciseBeh ;
  MODE CONFIRMED ;
  WITH INFORMATION SYNTAX SDHRRadioProtASN1.InvokeRadioExerciseArg ;
  WITH REPLY SYNTAX SDHRRadioProtASN1.InvokeRadioExerciseReply ;
REGISTERED AS { etsAction 1 } ;
```

```
invokeRadioExerciseBeh BEHAVIOUR
  DEFINED AS
```

" The invokeRadioExercise action can be used to request a protection exercise routine to be performed on one or more protectionUnit instances contained in the protectionGroup object.

The action argument contains indications of the protected and protecting protectionUnits to which the request applies.

If a protecting protectionUnit is identified in the protectedUnit field or if a protected protectionUnit is identified in the protectingUnit field, the action fails.

The protectionEntity field may be absent, indicating that the request applies to all contained protectionUnits.

A single exercise consists in initiating a switching process without actually switching and, therefore, involves one protected and one protecting protectionUnit.

For an exercised protected protectionUnit the exercise result contains the list of each protecting protectionUnit to which the switching process has been applied together with the respective obtained result.

For an exercised protecting protectionUnit the exercise result contains the list of each protected protectionUnit to which the switching process has been applied together with the respective obtained result.

While an exercise is in progress the value of the radioProtectionStatus attribute for both the involved protected and protecting units shall indicate No Request, on the contrary the exercise result will indicate a denied value. ";

6.5 Parameters definitions

6.5.1 Radio Protection Status Parameter

```
radioProtectionStatusParameter PARAMETER
  CONTEXT-EVENT-INFO;
  WITH SYNTAX SDHRRadioProtASN1.RadioProtectionStatusParameter;
  BEHAVIOUR radioProtectionStatusParameterBeh;
REGISTERED AS {etsParameter 1 } ;
```

```
radioProtectionStatusParameterBeh BEHAVIOUR
  DEFINED AS
```

" This parameter is included in the additional info parameters of the protection switching reporting notification.

The protectionSwitchReporting notification is emitted from the sdhRadioProtectionGroup object only in the following cases:

- a) when a failed protection switch request (an automatic request that can not be satisfied) occurs and the severity of the alarm causing the request is highBER or signalFail.
- b) as a consequence of invoked or released switch requests sent by operator commands and successfully accepted.
- c) when a hardware forcing is performed or released locally on the NE.
- d) when a previously invoked manual switch is released by an automatic switch request. ";

6.6 Name bindings definitions

6.6.1 augSink

augSink-msTcTTPSink NAME BINDING

SUBORDINATE OBJECT CLASS augSink AND SUBCLASSES;

NAMED BY

SUPERIOR OBJECT CLASS msTcTTPSink AND SUBCLASSES;

WITH ATTRIBUTE " Rec. G.774 : 1992" :augId ;

BEHAVIOUR augSink-msTcTTPSinkBeh;

REGISTERED AS {etsNameBinding 5 } ;

augSink-msTcTTPSinkBeh BEHAVIOUR

DEFINED AS

" The subordinate managed objects are instantiated when the radio protection switching function is present.";

6.6.2 augSource

augSource-msTcTTPSource NAME BINDING

SUBORDINATE OBJECT CLASS augSource AND SUBCLASSES;

NAMED BY

SUPERIOR OBJECT CLASS msTcTTPSource AND SUBCLASSES;

WITH ATTRIBUTE " Rec. G.774 : 1992" : augId ;

BEHAVIOUR augSource-msTcTTPSourceBeh;

REGISTERED AS {etsNameBinding 6 } ;

augSource-msTcTTPSourceBeh BEHAVIOUR

DEFINED AS

" The subordinate managed objects are instantiated when the radio protection switching function is present.";

6.6.3 msTcCTPSink

msTcCTPSink-rsTTPSink NAME BINDING

SUBORDINATE OBJECT CLASS msTcCTPSink AND SUBCLASSES;

NAMED BY SUPERIOR OBJECT CLASS "Rec.G.774:1992":rsTTPSink AND SUBCLASSES;

WITH ATTRIBUTE " Rec. G.774 : 1992" : msCTPIId ;

BEHAVIOUR msTcCTPSink-rsTTPSinkBeh;

REGISTERED AS {etsNameBinding 7 } ;

msTcCTPSink-rsTTPSinkBeh BEHAVIOUR

DEFINED AS

" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.4 msTcCTP Source

msTcCTPSource-rsTTPSource NAME BINDING
SUBORDINATE OBJECT CLASS msTcCTPSource AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "Rec. G.774 :1992" :rsTTPSource AND SUBCLASSES;
WITH ATTRIBUTE " Rec. G.774 : 1992" : msCTPId ;
BEHAVIOUR msTcCTPSource-rsTTPSourceBeh;
REGISTERED AS {etsNameBinding 8 } ;

msTcCTPSource-rsTTPSourceBeh BEHAVIOUR
DEFINED AS
" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.5 msTcTTP Sink

msTcTTPSink-sdhNE NAME BINDING
SUBORDINATE OBJECT CLASS msTcTTPSink AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "Rec. G.774 :1992" :sdhNE;
WITH ATTRIBUTE " Rec. G.774 : 1992" : msTTPId ;
BEHAVIOUR msTcTTPSink-sdhNEBeh;
REGISTERED AS {etsNameBinding 9 } ;

msTcTTPSink-sdhNEBeh BEHAVIOUR
DEFINED AS
" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.6 msTcTTP Source

msTcTTPSource-sdhNE NAME BINDING
SUBORDINATE OBJECT CLASS msTcTTPSource AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "Rec. G.774 :1992" :sdhNE;
WITH ATTRIBUTE " Rec. G.774 : 1992" : msTTPId ;
BEHAVIOUR msTcTTPSource-sdhNEBeh;
REGISTERED AS {etsNameBinding 10 } ;

msTcTTPSource-sdhNEBeh BEHAVIOUR
DEFINED AS
" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.7 vc4HopcTTP Sink

vc4HopcTTPSink-sdhNE NAME BINDING
SUBORDINATE OBJECT CLASS vc4HopcTTPSink AND SUBCLASSES;
NAMED BY SUPERIOR OBJECT CLASS "Rec. G.774 :1992" :sdhNE;
WITH ATTRIBUTE " Rec. G.774 : 1992" : vc4TTPId ;
BEHAVIOUR vc4HopcTTPSink-sdhNEBeh;
REGISTERED AS {etsNameBinding 11 } ;

vc4HopcTTPSink-sdhNEBeh BEHAVIOUR
DEFINED AS
" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.8 vc4HopcTTP Source

vc4HopcTTPSource-sdhNE NAME BINDING
 SUBORDINATE OBJECT CLASS vc4HopcTTPSource AND SUBCLASSES;
 NAMED BY SUPERIOR OBJECT CLASS "Rec. G.774 :1992" :sdhNE;
 WITH ATTRIBUTE " Rec. G.774 : 1992" : vc4TTPIId ;
 BEHAVIOUR vc4HopcTTPSource-sdhNEBeh;
 REGISTERED AS {etsNameBinding 12 } ;

vc4HopcTTPSource-sdhNEBeh BEHAVIOUR
 DEFINED AS

" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.9 au4HopcCTPSink

au4HopcCTPSink-augSink NAME BINDING
 SUBORDINATE OBJECT CLASS au4HopcCTPSink AND SUBCLASSES;
 NAMED BY SUPERIOR OBJECT CLASS "Rec.G.774:1992":augSink AND SUBCLASSES;
 WITH ATTRIBUTE " Rec. G.774 : 1992" : au4CTPIId ;
 BEHAVIOUR au4HopcCTPSink-augSinkBeh;
 REGISTERED AS {etsNameBinding 13 } ;

au4HopcCTPSink-augSinkBeh BEHAVIOUR
 DEFINED AS

" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.6.10 au4HopcCTP Source

au4HopcCTPSource-augSource NAME BINDING
 SUBORDINATE OBJECT CLASS au4HopcCTPSource AND SUBCLASSES;
 NAMED BY SUPERIOR OBJECT CLASS "Rec. G.774 :1992" :augSource AND SUBCLASSES;
 WITH ATTRIBUTE " Rec. G.774 : 1992" : au4CTPIId ;
 BEHAVIOUR au4HopcCTPSource-augSourceBeh;
 REGISTERED AS {etsNameBinding 14 } ;

au4HopcCTPSource-augSourceBeh BEHAVIOUR
 DEFINED AS

" The subordinate managed objects are instantiated when the radio protection switching function is present. Instances of this object may also be instantiated when other types of tandem connection protections in multiplex section layer are present. ";

6.7 Supporting ASN.1

SDHRadioProtASN1 {prETSdetm2218 asn1Module(2) sdhRadioProtASN1(1)}

DEFINITIONS IMPLICIT TAGS ::=

BEGIN

-- EXPORTS everything

IMPORTS

RelativeDistinguishedName

FROM

InformationFramework {joint-iso-itu ds(5) modules(1) informationFramework(1)}

ProtectionEntity,
 ResourcePointer,

```
RequestSource,
InvokeExerciseArg
FROM SDHProtASN1 { itu(0) recommendation(0) g(7) g774(774) hyphen(127) prot(03)
informationModel(0) asn1Module(2) sdhmsp(0) };

-- supporting productions

Boolean ::= BOOLEAN

Integer ::= INTEGER

InvokeRadioExerciseArg ::= InvokeExerciseArg

InvokeRadioExerciseReply ::= SET OF SEQUENCE {
    exercisedPU          RelativeDistinguishedName,
    exerciseResult      SEQUENCE OF SingleExerciseResult}

SingleExerciseResult ::= SEQUENCE {
    protectionUnit RelativeDistinguishedName,
    result          Result }

Result ::= ENUMERATED { success (0), denied (1), failed (2) }

Privileged ::= CHOICE {
    noBridge      [0] NULL,
    privilegedUnit [1] RelativeDistinguishedName
}

RadioProtectionStatusParameter ::= RPSSummaryStatus

SDHRRadioResourcePointer ::= ResourcePointer (SIZE(1))

RPSSummaryStatus ::= SEQUENCE {
    statusOfRxProtectionSwitches StatusOfRxProtectionSwitches,
    channelStatus                ChannelStatus
}

StatusOfRxProtectionSwitches ::= SET OF SEQUENCE {
    protectingSectionId RelativeDistinguishedName,
    protectingSectionStatus ProtectingSectionStatus
}

ProtectingSectionStatus ::= CHOICE {
    extraTraffic [0] NULL,
    protectedUnit [1] RelativeDistinguishedName
}

ChannelStatus ::= SET OF SEQUENCE {
    protUnitId RelativeDistinguishedName,
    protUnitStatus ProtUnitStatus
}

ProtUnitStatus ::= SEQUENCE {
    channelASRequest ChannelASRequest,
    radioSwitchStatus RadioSwitchStatus
}

ChannelASRequest ::= ENUMERATED {noOne(0), waitToRestore(1), earlyWarning(2), lowBER(3),
highBER(4), signalFail(5)}
```

RadioSwitchStatus ::= ENUMERATED { noRequest(0), manualSwitch(1), forcedSwitch(2), lockout(3), hwForcing(4) }

RadioProtectionStatus ::= SEQUENCE {
 protectionUnitStatus [0] ProtUnitStatus,
 associatedChannel [1] AssociatedChannel,
 requestSource [2] RequestSource OPTIONAL
}

AssociatedChannel ::= CHOICE {
 itself [0] NULL,
 fromPU [1] RelativeDistinguishedName,
 toPU [2] RelativeDistinguishedName
}
END

Annex A (informative): Figures

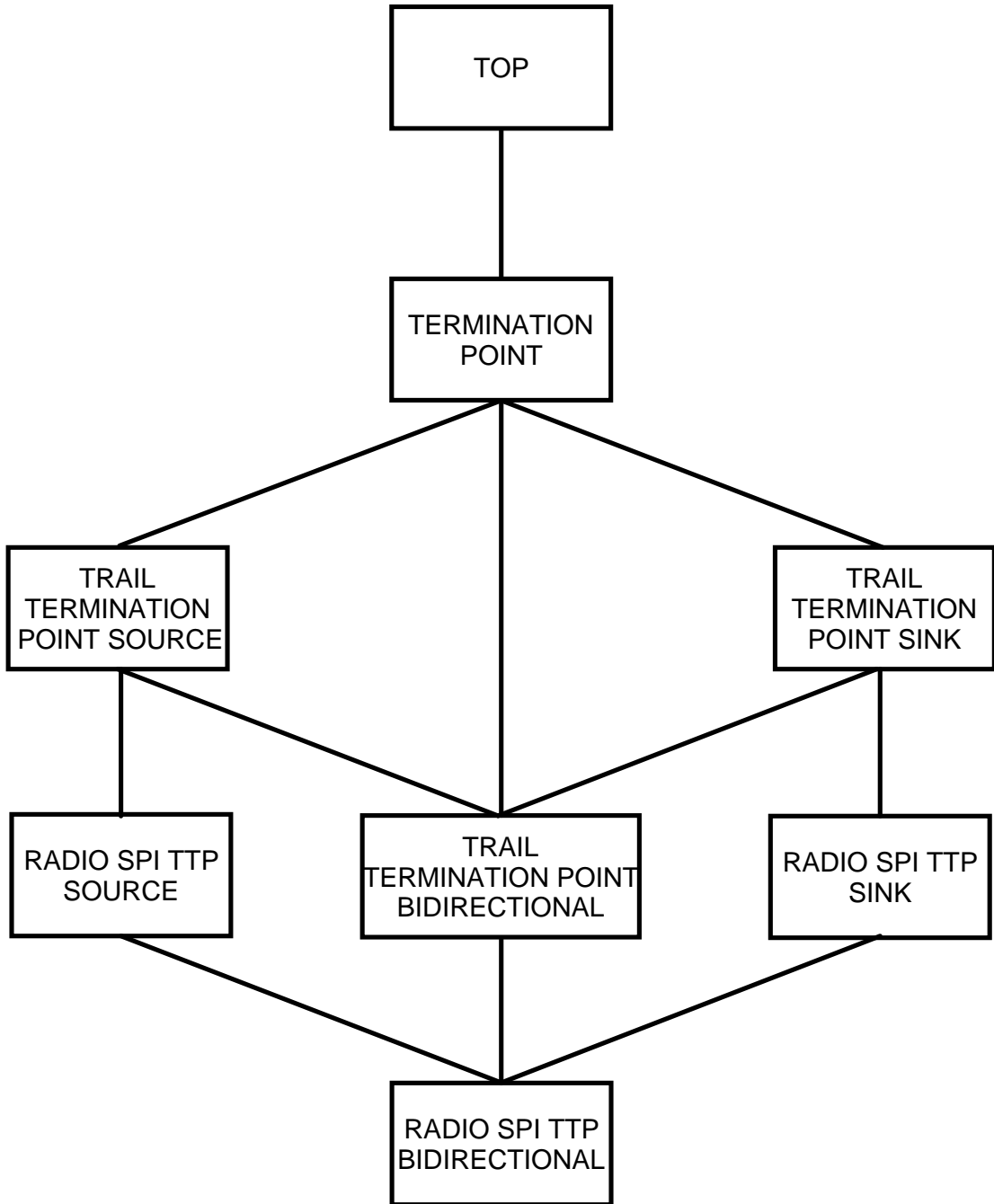


Figure A.1: Radio fragment objects inheritance

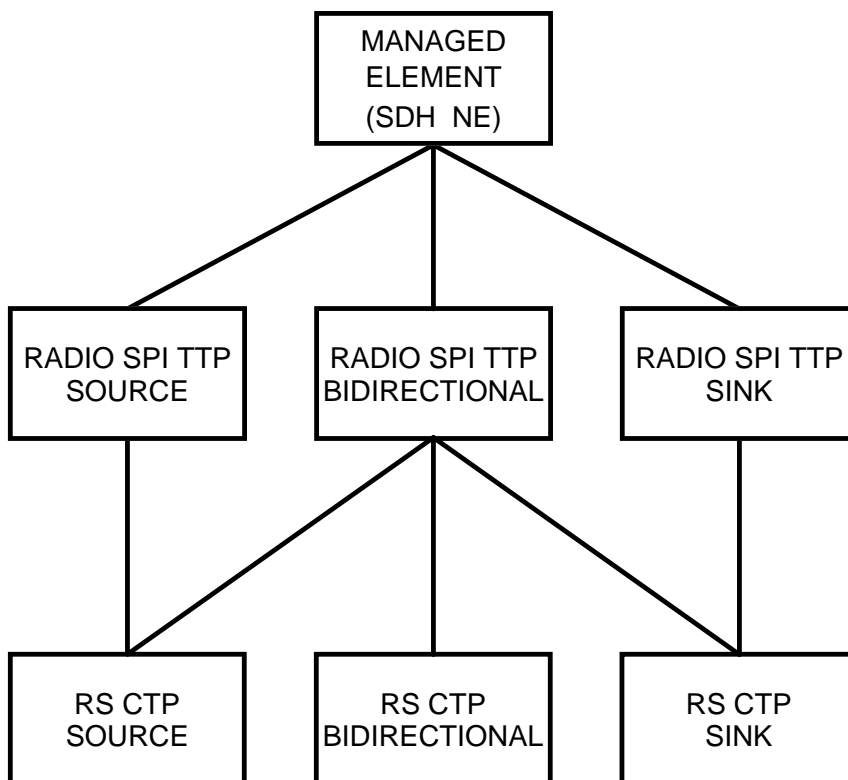


Figure A.2: Radio fragment objects naming

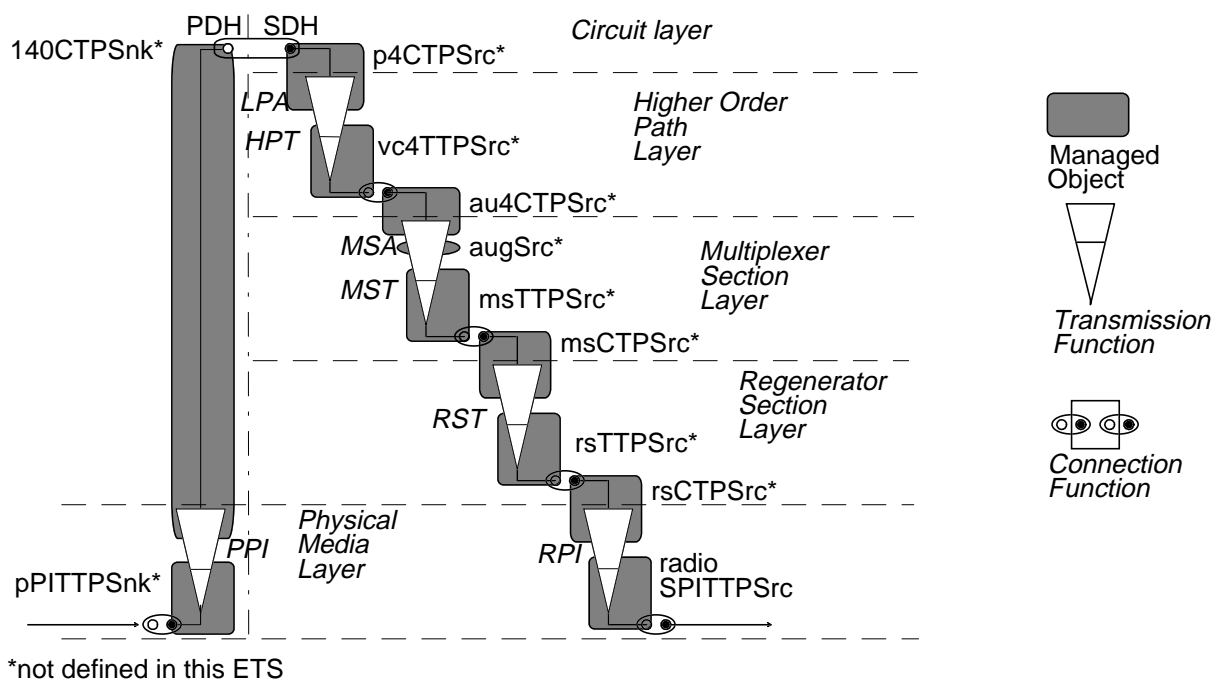


Figure A.3: Example: 140Mbit/s signals multiplexed to STM-1 signal

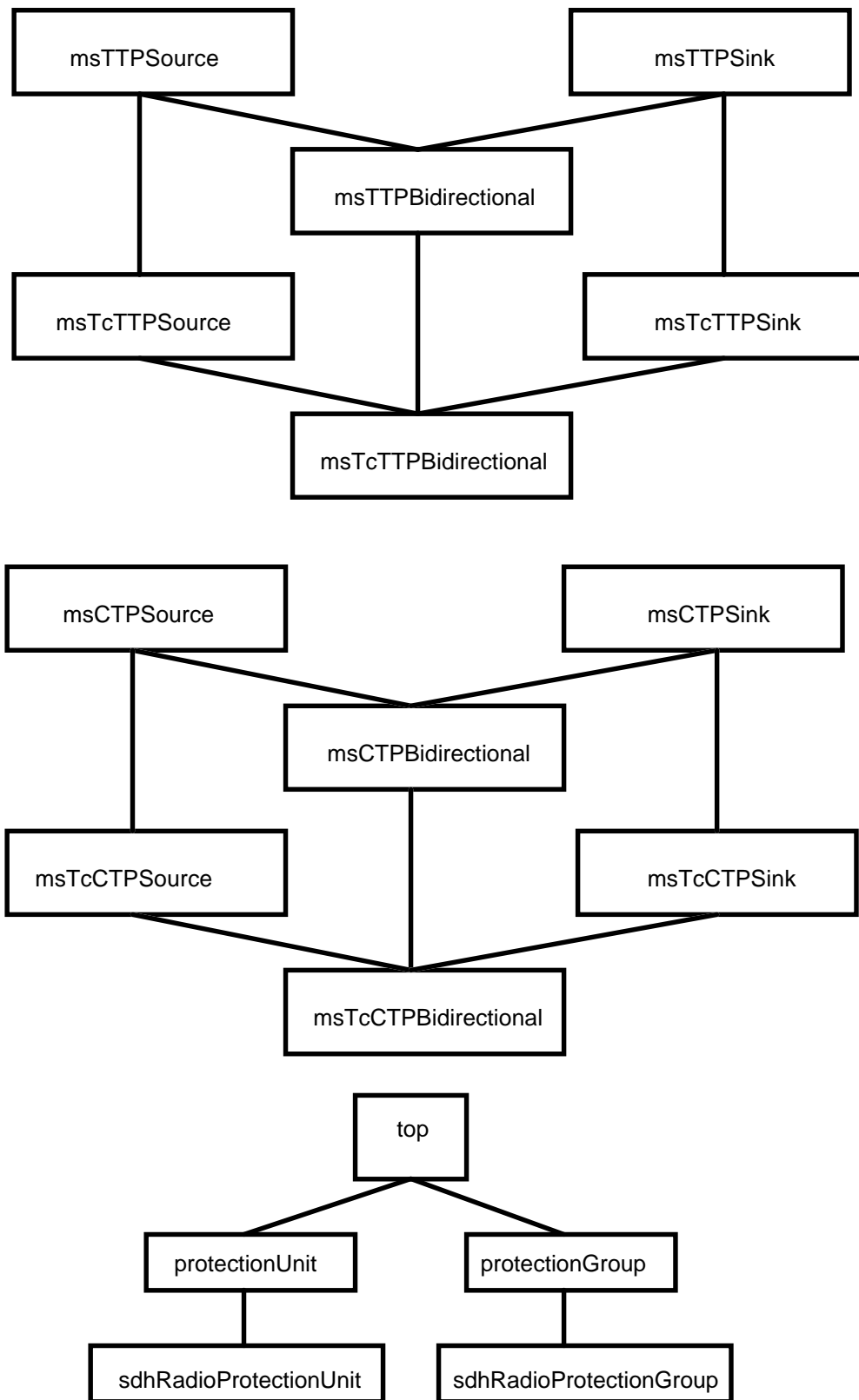


Figure A.4: SDH radio protection inheritance diagram

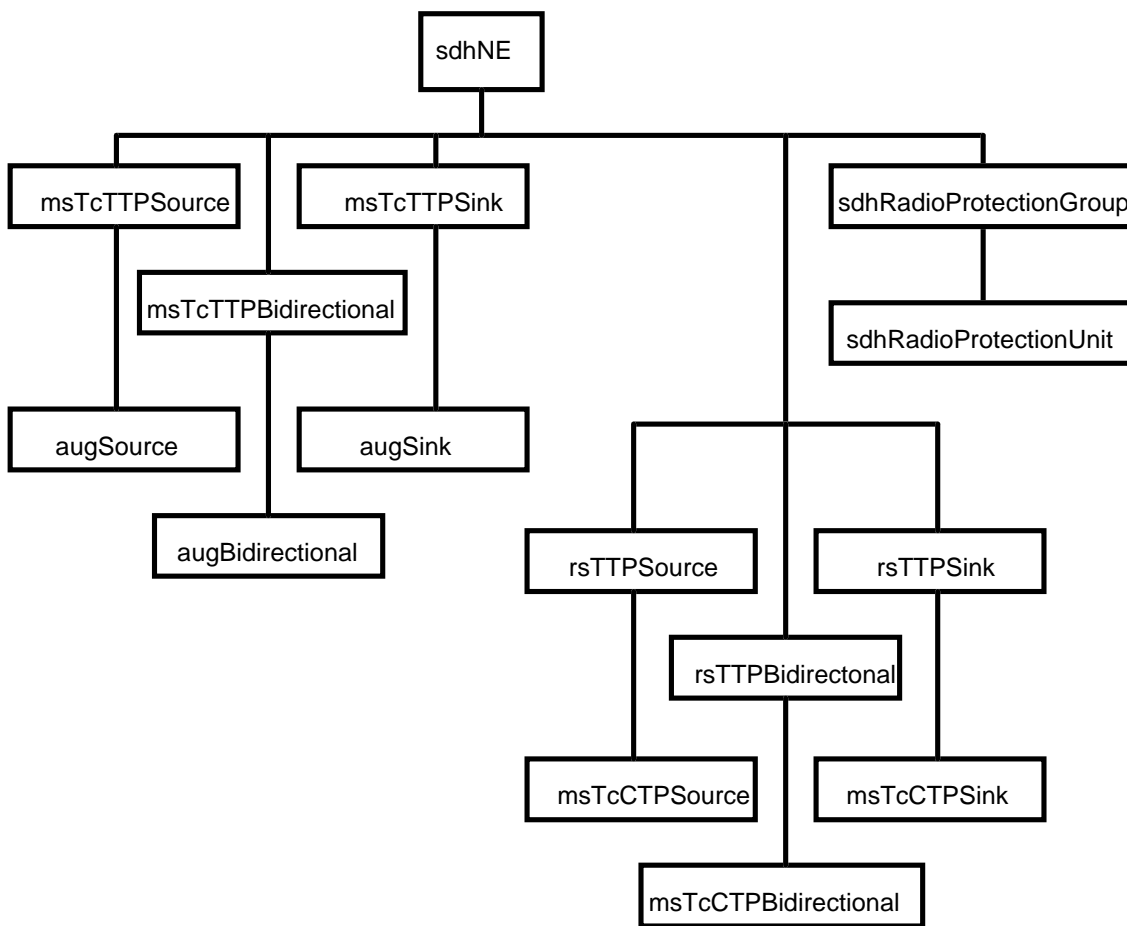


Figure A.5: SDH radio protection naming diagram

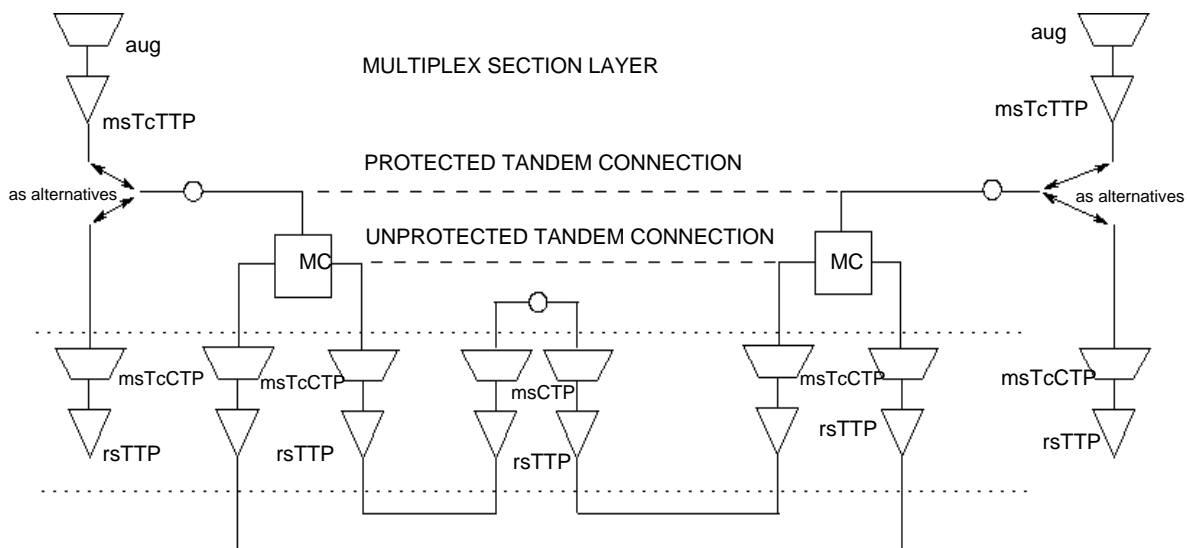


Figure A.6: RPS applications for MS-tandem connection protection

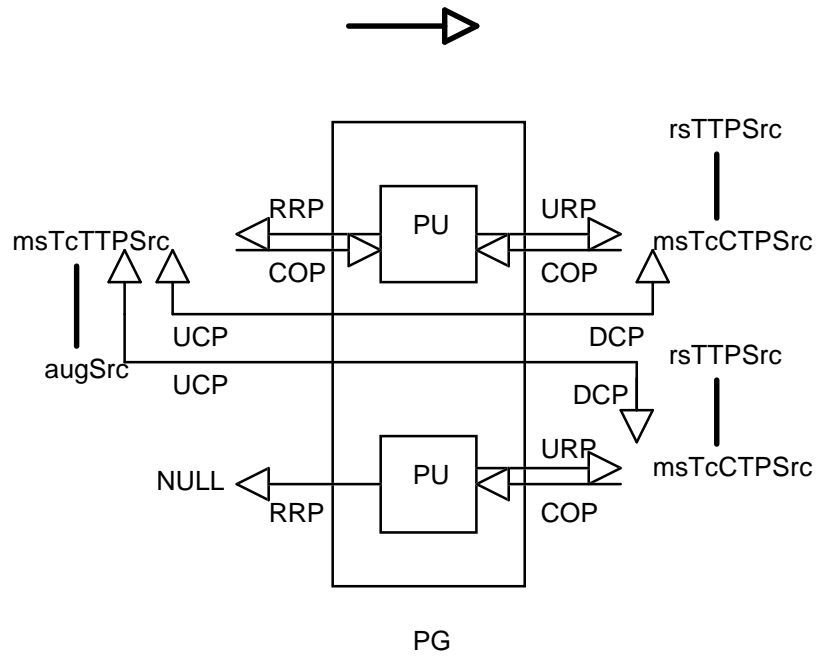


Figure A.7: Example: radio section = multiplex section - 1+1 protection - source side

Legend :Sk = Sink
 Src = Source
 COP = Cross connection Object Pointer
 RRP = Reliable Resource Pointer

PU = Protection Unit
 PG = Protection Group
 URP = Unreliable Resource Pointer
 UCP/DCP = Up/Down Stream Connectivity Pointer

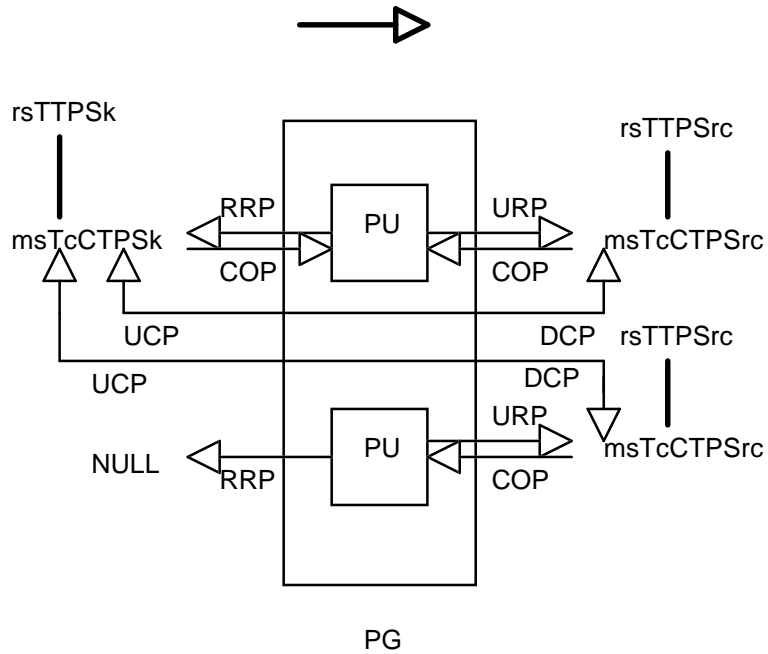


Figure A.8: Example: radio section = tandem connection of regenerator sections 1+1 protection - source side

Annex B (informative): Bibliography

- ITU-T Recommendation G.781: "Structure of Recommendations on equipment for the synchronous digital hierarchy (SDH)".
- ITU-T Recommendation G.782: "Types and general characteristics of synchronous digital hierarchy (SDH) equipment".
- ITU-T Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks".
- ITU-T Recommendation G.784: "Synchronous digital hierarchy (SDH) management".
- ITU-R Recommendation 750: "Architectural and Functional Aspects of Radio-Relay Systems for SDH based Networks".
- ITU-T Recommendation G.803: "Architectures of transport networks based on the synchronous digital hierarchy (SDH)".
- ITU-T Recommendation G.831: "Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)".
- ITU-T Recommendation G.773: "Protocol suites for Q-interfaces for management of transmission systems".
- ITU-T Recommendation Q.811: "Lower layer protocol profiles for the Q3 interface".
- ITU-T Recommendation Q.812: "Upper layer protocol profiles for the Q3 interface".
- ITU-T Recommendation M.3010: "Principles for a telecommunications management network".
- ITU-T Recommendation M.60: "Maintenance terminology and definitions".

History

Document history	
April 1996	Public Enquiry PE 105: 1996-04-08 to 1996-08-30