EUROPEAN TELECOMMUNICATION STANDARD

ETS 300 304

November 1994

Source: ETSI TC-TM

Reference: DE/TM-02201

ICS: 33.080

Key words: SDH, NE

Transmission and Multiplexing (TM); Synchronous Digital Hierarchy (SDH) information model for the Network Element (NE) view

ETSI

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Contents

Foreword

This European Telecommunication Standard (ETS) was produced by the Transmission and Multiplexing (TM) Technical Committee of the European Telecommunications Standards Institute (ETSI).

This ETS describes the information model for Network Elements (NEs) which use the Synchronous Digital Hierarchy (SDH) multiplexing structure.

Transposition dates	
Date of latest announcement of this ETS (doa):	28 February 1995
Date of latest publication of new National Standard or endorsement of this ETS (dop/e):	31 August 1995
Date of withdrawal of any conflicting National Standard (dow):	31 August 1995

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1 Scope

This European Telecommunication Standard (ETS) defines the information model to be used at the interface between Network Elements (NEs) and management systems, for the management of Synchronous Digital Hierarchy (SDH) NEs.

This ETS defines the information model for SDH NEs.

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 NEs, 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 NE 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 and 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] CCITT Recommendation X.701 (1992): "Information technology - Open Systems Interconnection - Systems management overview".

[2] CCITT Recommendation X.710 (1991): "Common management information service definition for CCITT applications".

[3] CCITT Recommendation X.711 (1991): "Common management information protocol specification for CCITT applications".

[4] CCITT Recommendation X.731 (1992): "Information technology - Open Systems Interconnection - Systems management: State management function".

[5] CCITT Recommendation X.730 (1992): "Information technology - Open Systems Interconnection - Systems management: Object management function".

[6] CCITT Recommendation X.733 (1992): "Information technology - Open Systems Interconnection - Systems management: Alarm reporting function".

[7] CCITT Recommendation X.734 (1992): "Information technology - Open Systems Interconnection - System management: Event report management function".

[8] CCITT Recommendation X.735 (1992): "Information technology - Open Systems Interconnection - System management: Log control function".

[9] CCITT Recommendation X.720 (1992): "Information technology - Open Systems Interconnection - Structure management information - Part 1: Management information model".

[10] CCITT Recommendation X.721 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Definition of management information".

[11] CCITT Recommendation X.722 (1992): "Information technology - Open Systems Interconnection - Structure of management information: Guidelines for the definition of managed objects".

[12] CCITT Recommendation G.774 (1992): "Synchronous Digital Hierarchy management information model".

[13] Draft ITU-T Recommendation G.774.03: "Synchronous digital hierarchy (SDH) management of multiplex-section protection for the network element view".

[14] CCITT Recommendation M.3100 (1992): "Generic network information model".

3 Abbreviations

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

AIS	Alarm Indication Signal
AP	Access Point
ATM	Asynchronous Transfer Mode
AU	Administrative Unit
AUG	Administrative Unit Group
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CP	Connection Point
CTP	Connection Termination Point
GTP	Group Termination Point
HPA	Higher Order Path Adaptation
HPC	Higher Order Path Connection
HPT	Higher Order Path Termination
IA	Indirect Adaptor
IOS	Intra-Office Section
LOF	Loss Of Frame
LPA	Lower Order Path Adaptation
LPC	Lower Order Path Connection
LPT	Lower Order Path Termination
MS	Multiplexer Section
MSA	Multiplexer Section Adaptation
MST	Multiplexer Section Termination
MSTTP	Multiplexer Section Trail Termination Point
NE	Network Element
OS	Operation System
OSI	Open Systems Interconnection
PDH	Plesiochronous Digital Hierarchy
Pkg	Packages
POH	Path Overhead
PPI	Plesiochronous Physical Interface
RDN	Relative Distinguished Name
RS	Regenerator Section
RST	Regenerator Section Termination
RSTTP	Regenerator Section Trail Termination Point
SDH	Synchronous Digital Hierarchy
SDHNE	Synchronous Digital Hierarchy Network Element
Snk	Sink
Src	Source
SPI	Synchronous Physical Interface

STM-N	Synchronous Transport Module N
TMN	Telecommunication Management Network
TP	Termination Point
TTP	Trail Termination Point
TU	Tributary Unit
TUG	Tributary Unit Group
VC-n	Virtual Container n

4 Registration supporting Abstract Syntax Notation one (ASN.1)

```
ETS5 {ccitt(0) identified-organization(4) etsi(0) ets(304) informationModel(0)
asn1Module(2) eTS5(0)}
DEFINITIONS IMPLICIT TAGS ::= BEGIN
-- EXPORTS everything
eTS300304 OBJECT IDENTIFIER ::= {ccitt(0) identified-organization(4) etsi(0) ets(304)
informationModel(0)}
etsObjectClass OBJECT IDENTIFIER  ::= {eTS300304 managedObjectClass(3)}
etsNameBinding OBJECT IDENTIFIER  ::= {eTS300304 nameBinding(6)}
etsAttribute OBJECT IDENTIFIER    ::= {eTS300304 attribute(7)}
etsAction OBJECT IDENTIFIER       ::= {eTS300304 action(9)}
etsNotification OBJECT IDENTIFIER ::= {eTS300304 notification(10)}
END
```

5 Generic objects fragment

In this fragment, a working sub-set of standard and mature object classes have been adopted, mainly from the CCITT X.700 series of Recommendations.

5.1 Generic objects - object classes

In this context the IMPORTS section specifies the object classes which can be instantiated in the scope of this ETS. The IMPORTS section does not include uninstantiated superclasses.

```
BEGIN
IMPORTS
alarmRecord,
attributeValueChangeRecord,
eventForwardingDiscriminator,
log,
objectCreationRecord,
objectDeletionRecord,
stateChangeRecord
FROM {joint-iso-ccitt ms(9) smi(3) part2(2) managedObjectClass(3)}

alarmSeverityAssignmentProfile
FROM {ccitt(0) recommendation(0) m(13) m3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

5.2 Generic objects - packages, attributes, ASN.1, name-bindings

All packages, attributes, ASN.1 and name-bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

6 SDH TP fragment

6.1 SDH TP - object classes

In this context, the IMPORTS section specifies the object classes which can be instantiated in the scope of this ETS. The IMPORTS section does not include uninstantiated superclasses.

```
BEGIN
IMPORTS
au4CTPBidirectional,
au4CTPSink,
au4CTPSource,
augBidirectional,
augSink,
augSource,
electricalSPITTPBidirectional,
electricalSPITTPSink,
electricalSPITTPSource,
msCTPBidirectional,
msCTPSink,
msCTPSource,
msDatacomCTPBidirectional,
msDatacomCTPSink,
msDatacomCTPSource,
msOrderwireCTPBidirectional,
msOrderwireCTPSink,
msOrderwireCTPSource,
msTTPBidirectional,
msTTPSink,
msTTPSource,
opticalSPITTPBidirectional,
opticalSPITTPSink,
opticalSPITTPSource,
rsCTPBidirectional,
rsCTPSink,
rsCTPSource,
rsDatacomCTPBidirectional,
rsDatacomCTPSink,
rsDatacomCTPSource,
rsOrderwireCTPBidirectional,
rsOrderwireCTPSink,
rsOrderwireCTPSource,
rsTTPBidirectional,
rsTTPSink,
rsTTPSource,
rsUserChannelCTPBidirectional,
rsUserChannelCTPSink,
rsUserChannelCTPSource,
tu11CTPBidirectional,
tu11CTPSink,
tu11CTPSource,
tu12CTPBidirectional,
tu12CTPSink,
tu12CTPSource,
tu2CTPBidirectional,
tu2CTPSink,
tu2CTPSource,
tu3CTPBidirectional,
tu3CTPSink,
tu3CTPSource,
tug2Bidirectional,
tug2Sink,
tug2Source,
tug3Bidirectional,
tug3Sink,
tug3Source,
vc11TTPBidirectional,
vc11TTPSink,
vc11TTPSource,
vc12TTPBidirectional,
vc12TTPSink,
vc12TTPSource,
vc2TTPBidirectional,
vc2TTPSink,
vc2TTPSource,
vc3TTPBidirectional,
vc3TTPSink,
vc3TTPSource,
```

```
vc4TTPBidirectional,
vc4TTPSink,
vc4TTPSource,
vcnUserChannelCTPBidirectional,
vcnUserChannelCTPSink,
vcnUserChannelCTPSource
FROM {ccitt(0) recommendation(0) g(7) g774(774) informationModel(0)
managedObjectClass(3)}
;
END
```

6.2 SDH TP - packages

All packages associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

6.3 SDH TP - attributes

All attributes associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

supportedByObjectList

The value of the supportedByObjectList attribute points to the equipment and software objects which implement the TPs.

6.4 SDH TP - name bindings

```
BEGIN
IMPORTS
au4CTPBidirectional-augBidirectional,
au4CTPSink-augBidirectional,
au4CTPSink-augSink,
au4CTPSource-augBidirectional,
au4CTPSource-augSource,
augBidirectional-msTTPBidirectional,
augSink-msTTPSink,
augSource-msTTPSource,
electricalSPITTPBidirectional-sdhNE,
electricalSPITTPSink-sdhNE,
electricalSPITTPSource-sdhNE,
msCTPBidirectional-rsTTPBidirectional,
msCTPSink-rsTTPBidirectional,
msCTPSink-rsTTPSink,
msCTPSource-rsTTPBidirectional,
msCTPSource-rsTTPSource,
msDatacomCTPBidirectional-msTTPBidirectional,
msDatacomCTPSink-msTTPBidirectional,
msDatacomCTPSink-msTTPSink,
msDatacomCTPSource-msTTPBidirectional,
msDatacomCTPSource-msTTPSource,
msOrderwireCTPBidirectional-msTTPBidirectional,
msOrderwireCTPSink-msTTPBidirectional,
msOrderwireCTPSink-msTTPSink,
msOrderwireCTPSource-msTTPBidirectional,
msOrderwireCTPSource-msTTPSource,
msTTPBidirectional-sdhNE,
msTTPSink-sdhNE,
msTTPSource-sdhNE,
opticalSPITTPBidirectional-sdhNE,
opticalSPITTPSink-sdhNE,
opticalSPITTPSource-sdhNE,
rsCTPBidirectional-electricalSPITTPBidirectional,
rsCTPBidirectional-opticalSPITTPBidirectional,
rsCTPSink-electricalSPITTPBidirectional,
rsCTPSink-electricalSPITTPSink,
rsCTPSink-opticalSPITTPBidirectional,
rsCTPSink-opticalSPITTPSink,
rsCTPSource-electricalSPITTPBidirectional,
rsCTPSource-electricalSPITTPSource,
rsCTPSource-opticalSPITTPBidirectional,
rsCTPSource-opticalSPITTPSource,
rsDatacomCTPBidirectional-rsTTPBidirectional,
rsDatacomCTPSink-rsTTPBidirectional,
rsDatacomCTPSink-rsTTPSink,
```

```
rsDatacomCTPSource-rsTTPBidirectional,
rsDatacomCTPSource-rsTTPSource,
rsOrderwireCTPBidirectional-rsTTPBidirectional,
rsOrderwireCTPSink-rsTTPBidirectional,
rsOrderwireCTPSink-rsTTPSink,
rsOrderwireCTPSource-rsTTPBidirectional,
rsOrderwireCTPSource-rsTTPSource,
rsTTPBidirectional-sdhNE,
rsTTPSink-sdhNE,
rsTTPSource-sdhNE,
rsUserChannelCTPBidirectional-rsTTPBidirectional,
rsUserChannelCTPSink-rsTTPBidirectional,
rsUserChannelCTPSink-rsTTPSink,
rsUserChannelCTPSource-rsTTPBidirectional,
rsUserChannelCTPSource-rsTTPSource,
tu11CTPBidirectional-tug2Bidirectional,
tu11CTPSink-tug2Bidirectional,
tu11CTPSink-tug2Sink,
tu11CTPSource-tug2Bidirectional,
tu11CTPSource-tug2Source,
tu12CTPBidirectional-tug2Bidirectional,
tu12CTPSink-tug2Bidirectional,
tu12CTPSink-tug2Sink,
tu12CTPSource-tug2Bidirectional,
tu12CTPSource-tug2Source,
tu2CTPBidirectional-tug2Bidirectional,
tu2CTPSink-tug2Bidirectional,
tu2CTPSink-tug2Sink,
tu2CTPSource-tug2Bidirectional,
tu2CTPSource-tug2Source,
tu3CTPBidirectional-tug3Bidirectional,
tu3CTPSink-tug3Bidirectional,
tu3CTPSink-tug3Sink,
tu3CTPSource-tug3Bidirectional,
tu3CTPSource-tug3Source,
tug2Bidirectional-tug3Bidirectional,
tug2Sink-tug3Sink,
tug2Source-tug3Source,
tug3Bidirectional-vc4TTPBidirectional,
tug3Sink-vc4TTPSink,
tug3Source-vc4TTPSource,
vc11TTPBidirectional-sdhNE,
vc11TTPSink-sdhNE,
vc11TTPSource-sdhNE,
vc12TTPBidirectional-sdhNE,
vc12TTPSink-sdhNE,
vc12TTPSource-sdhNE,
vc2TTPBidirectional-sdhNE,
vc2TTPSink-sdhNE,
vc2TTPSource-sdhNE,
vc3TTPBidirectional-sdhNE,
vc3TTPSink-sdhNE,
vc3TTPSource-sdhNE,
vc4TTPBidirectional-sdhNE,
vc4TTPSink-sdhNE,
vc4TTPSource-sdhNE,
vcnUserChannelCTPBidirectional-vc3TTPBidirectional,
vcnUserChannelCTPBidirectional-vc4TTPBidirectional,
vcnUserChannelCTPSink-vc3TTPBidirectional,
vcnUserChannelCTPSink-vc3TTPSink,
vcnUserChannelCTPSink-vc4TTPBidirectional,
vcnUserChannelCTPSink-vc4TTPSink,
vcnUserChannelCTPSource-vc3TTPBidirectional,
vcnUserChannelCTPSource-vc3TTPSource,
vcnUserChannelCTPSource-vc4TTPBidirectional,
vcnUserChannelCTPSource-vc4TTPSource
FROM {ccitt(0) recommendation(0) g(7) g774(774) informationModel(0) nameBinding(6)}
;
END
```

6.5 SDH TP - subordination rules

```
BEGIN
IMPORTS
augSinkSubordination,
augSourceSubordination,
augBidirectionalSubordination,
electricalSPITTPSinkSubordination,
electricalSPITTPSourceSubordination,
electricalSPITTPBidirectionalSubordination,
opticalSPITTPSinkSubordination,
opticalSPITTPSourceSubordination,
opticalSPITTPBidirectionalSubordination,
msTTPSinkSubordination,
msTTPSourceSubordination,
msTTPBidirectionalSubordination,
rsTTPSinkSubordination,
rsTTPSourceSubordination,
rsTTPBidirectionalSubordination,
sdhNESubordination,
tug2SinkSubordination,
tug2SourceSubordination,
tug2BidirectionalSubordination,
tug3SinkSubordination,
tug3SourceSubordination,
tug3BidirectionalSubordination,
vc3TTPSinkSubordination,
vc3TTPSourceSubordination,
vc3TTPBidirectionalSubordination,
vc4TTPSinkSubordination,
vc4TTPSourceSubordination,
vc4TTPBidirectionalSubordination
FROM {ccitt(0) recommendation(0) g(7) g774(774)}
;
END
```

6.6 SDH TP - constraints

```
BEGIN
IMPORTS
downstreamConnectivityPointer-au4CTPSink,
upstreamConnectivityPointer-au4CTPSource,
downstreamConnectivityPointer-msCTPSink,
upstreamConnectivityPointer-msCTPSource,
upstreamConnectivityPointer-msTTPSink,
downstreamConnectivityPointer-msTTPSource,
downstreamConnectivityPointer-rsCTPSink,
upstreamConnectivityPointer-rsCTPSource,
upstreamConnectivityPointer-rsTTPSink,
downstreamConnectivityPointer-rsTTPSource,
downstreamConnectivityPointer-tu11CTPSink,
upstreamConnectivityPointer-tu11CTPSource,
downstreamConnectivityPointer-tu12CTPSink,
upstreamConnectivityPointer-tu12CTPSource,
downstreamConnectivityPointer-tu2CTPSink,
upstreamConnectivityPointer-tu2CTPSource,
downstreamConnectivityPointer-tu3CTPSink,
upstreamConnectivityPointer-tu3CTPSource,
upstreamConnectivityPointer-vc11TTPSink,
downstreamConnectivityPointer-vc11TTPSource,
upstreamConnectivityPointer-vc12TTPSink,
downstreamConnectivityPointer-vc12TTPSource,
upstreamConnectivityPointer-vc2TTPSink,
downstreamConnectivityPointer-vc2TTPSource,
upstreamConnectivityPointer-vc3TTPSink,
downstreamConnectivityPointer-vc3TTPSource
FROM {ccitt(0) recommendation(0) g(7) g774(774)}
;
END

ets_upstreamConnectivityPointer-vc4TTPSink CONSTRAINT RULE
  OBJECT CLASS
     vc4TTPSink AND SUBCLASSES;
  IS RELATED TO
     vc4TTPSource, vc4TTPBidirectional,
     au4CTPSink, au4CTPBidirectional;
  USING ATTRIBUTE
     "CCITT Recommendation M.3100:1992":upstreamConnectivityPointer;
  ACCORDING TO RULE
     SET SIZE (1) OF CHOICE{
       vc4TTPSource, vc4TTPBidirectional,
       au4CTPSink, au4CTPBidirectional};
;

ets_downstreamConnectivityPointer-vc4TTPSource CONSTRAINT RULE
  OBJECT CLASS
     vc4TTPSource AND SUBCLASSES;
  IS RELATED TO
     vc4TTPSink, vc4TTPBidirectional,
     au4CTPSource, au4CTPBidirectional;
  USING ATTRIBUTE
     "CCITT Recommendation M.3100:1992":downstreamConnectivityPointer;
  CASE{
    single ACCORDING TO RULE
     SET SIZE (1) OF CHOICE{
     vc4TTPSink, vc4TTPBidirectional,
     au4CTPSource, au4CTPBidirectional},
    broadcast ACCORDING TO RULE
     SET SIZE (1..N) OF CHOICE{
     vc4TTPSink, vc4TTPBidirectional,
     au4CTPSource, au4CTPBidirectional}
      };
;
```

7 Plesiochronous Digital Hierarchy (PDH) fragment

This clause provides Managed Objects required to model PDH interfaces on SDH equipment.

7.1 Object classes definitions

CCITT Recommendation G.702 2 Mbit/s connection termination point

```
p12CTPSink  MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSink;
   CHARACTERIZED BY
       "CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
       "CCITT Recommendation M.3100:1992":operationalStatePackage,
       "CCITT Recommendation M.3100:1992":stateChangeNotificationPackage,
       "CCITT Recommendation M.3100:1992":tmnCommunicationsAlarmInformationPkg,
       p12CTPSinkPkg  PACKAGE
         BEHAVIOUR
            p12CTPSinkBehaviourPkg BEHAVIOUR
               DEFINED AS
                  "This managed object class terminates a CCITT Recommendation G.702 2
                   Mbit/s connection and
                  includes the lower order path adaptation function (LPA). For
                   asynchronous mappings there
                  are no communication alarms.
                  In SDH byte synchronous mapping, a communicationsAlarm notification
                   shall be issued if a
                  Loss Of Frame (LOF) is detected. The probable Cause parameter of the
                   notification shall
                  indicate LOF (Loss Of Frame)."
;;
        ATTRIBUTES
           p12CTPId                                    GET;
;;
   REGISTERED AS {etsObjectClass 1};


p12CTPSource MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSource;
   CHARACTERIZED BY
       "CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
       p12CTPSourcePkg  PACKAGE
        BEHAVIOUR
           p12CTPSourceBehaviourPkg BEHAVIOUR
              DEFINED AS
                 "This object class originates a CCITT Recommendation G.702 2 Mbit/s
                  connection"
;;
        ATTRIBUTES
           p12CTPId                                    GET;
;;
   REGISTERED AS {etsObjectClass 2};


p12CTPBidirectional MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation
M.3100:1992":connectionTerminationPointBidirectional,
                       p12CTPSink,
                       p12CTPSource;
  REGISTERED AS {etsObjectClass 3};
```

G.702 34 Mbit/s connection termination point

```
p31CTPSink  MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSink;
   CHARACTERIZED BY
       "CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
       "CCITT Recommendation M.3100:1992":operationalStatePackage,
       "CCITT Recommendation M.3100:1992":stateChangeNotificationPackage,
       p31CTPSinkPkg  PACKAGE
         BEHAVIOUR
            p31CTPSinkBehaviourPkg BEHAVIOUR
               DEFINED AS
                  "This managed object class terminates a CCITT Recommendation G.702
                  34 Mbit/s connection and includes the lower order path adaptation
                  function (LPA)."
```

```
;;
        ATTRIBUTES
           p31CTPId                                    GET;
;;
   REGISTERED AS {etsObjectClass 4};


p31CTPSource MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSource;
   CHARACTERIZED BY
       "CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
       p31CTPSourcePkg  PACKAGE
        BEHAVIOUR
           p31CTPSourceBehaviourPkg BEHAVIOUR
              DEFINED AS
                 "This object class originates a CCITT Recommendation G.702 34 Mbit/s
                 connection."
;;
        ATTRIBUTES
           p31CTPId                                    GET;
;;
   REGISTERED AS {etsObjectClass 5};


p31CTPBidirectional MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation
M.3100:1992":connectionTerminationPointBidirectional,
                        p31CTPSink,
                        p31CTPSource;
  REGISTERED AS {etsObjectClass 6};
```

G.702 140 Mbit/s connection termination point

```
p4CTPSink  MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSink;
   CHARACTERIZED BY
       "CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
       "CCITT Recommendation M.3100:1992":operationalStatePackage,
       "CCITT Recommendation M.3100:1992":stateChangeNotificationPackage,
       p4CTPSinkPkg  PACKAGE
         BEHAVIOUR
           p4CTPSinkBehaviourPkg BEHAVIOUR
              DEFINED AS
                 "This managed object class terminates a CCITT Recommendation G.702
                 140 Mbit/s connection and includes the lower order path adaptation
                 function (LPA)."
;;
        ATTRIBUTES
           p4CTPId                                    GET;
;;
   REGISTERED AS {etsObjectClass 7};


p4CTPSource MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation M.3100:1992":connectionTerminationPointSource;
   CHARACTERIZED BY
       "CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
       p4CTPSourcePkg  PACKAGE
        BEHAVIOUR
           p4CTPSourceBehaviourPkg BEHAVIOUR
              DEFINED AS
                 "This object class originates a CCITT Recommendation G.702 140
                 Mbit/s connection."
;;
        ATTRIBUTES
           p4CTPId                                    GET;
;;
   REGISTERED AS {etsObjectClass 8};


p4CTPBidirectional MANAGED OBJECT CLASS
  DERIVED FROM "CCITT Recommendation
M.3100:1992":connectionTerminationPointBidirectional,
                        p4CTPSink,
                        p4CTPSource;
  REGISTERED AS {etsObjectClass 9};
```

7.2 Attributes definitions

supportedByObjectList

The value of the supportedByObjectList attribute points to the equipment and software objects which implement the TPs.

G.702 2 Mbit/s connection termination point identification

```
p12CTPId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX       ETS8.NameType ;
   MATCHES FOR                 EQUALITY;
   BEHAVIOUR
    p12CTPIdBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used as an RDN for naming instances of the p12CTP object
         classes."
;;
REGISTERED AS {etsAttribute 1};
```

G.702 34 Mbit/s connection termination point identification

```
p31CTPId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX       ETS8.NameType ;
   MATCHES FOR                 EQUALITY;
   BEHAVIOUR
    p31CTPIdBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used as an RDN for naming instances of the p31CTP object
         classes."
;;
REGISTERED AS {etsAttribute 2};
```

G.702 140 Mbit/s connection termination point identification

```
p4CTPId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX       ETS8.NameType ;
   MATCHES FOR                 EQUALITY;
   BEHAVIOUR
      p4CTPIdBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used as an RDN for naming instances of the p4CTP object
         classes."
;;
REGISTERED AS {etsAttribute 3};
```

7.3 Name bindings definitions

```
p12CTPBidirectional-G774vc12TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p12CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc12TTPBidirectional;
   WITH ATTRIBUTE           p12CTPId;
   BEHAVIOUR
      p12CTPBidirectional-vc12TTPBidirectional  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};

p12CTPSink-G774vc12TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p12CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc12TTPBidirectional;
   WITH ATTRIBUTE           p12CTPId;
   BEHAVIOUR
      p12CTPSink-vc12TTPBidirectional  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};

p12CTPSource-G774vc12TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p12CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc12TTPBidirectional;
   WITH ATTRIBUTE           p12CTPId;

   BEHAVIOUR
      p12CTPSource-vc12TTPBidirectional  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};

p12CTPSource-G774vc12TTPSource NAME BINDING
   SUBORDINATE OBJECT CLASS p12CTPSource;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc12TTPSource;
   WITH ATTRIBUTE           p12CTPId;
   BEHAVIOUR
      p12CTPSource-vc12TTPSource  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};

p12CTPSink-G774vc12TTPSink NAME BINDING
   SUBORDINATE OBJECT CLASS p12CTPSink;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc12TTPSink;
   WITH ATTRIBUTE           p12CTPId;
   BEHAVIOUR
      p12CTPSink-vc12TTPSink  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 5};
```

```
p31CTPBidirectional-G774vc3TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p31CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc3TTPBidirectional;
   WITH ATTRIBUTE           p31CTPId;
   BEHAVIOUR
          p31CTPBidirectional-vc3TTPBidirectional  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 6};


p31CTPSink-G774vc3TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p31CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc3TTPBidirectional;
   WITH ATTRIBUTE           p31CTPId;
   BEHAVIOUR
        p31CTPSink-vc3TTPBidirectional  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 7};

p31CTPSource-G774vc3TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p31CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc3TTPBidirectional;
   WITH ATTRIBUTE           p31CTPId;
   BEHAVIOUR
        p31CTPSource-vc3TTPBidirectional  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 8};

p31CTPSource-G774vc3TTPSource NAME BINDING
   SUBORDINATE OBJECT CLASS p31CTPSource;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc3TTPSource;
   WITH ATTRIBUTE           p31CTPId;
   BEHAVIOUR
        p31CTPSource-vc3TTPSource 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 9};

p31CTPSink-G774vc3TTPSink NAME BINDING
   SUBORDINATE OBJECT CLASS p31CTPSink;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc3TTPSink;
   WITH ATTRIBUTE           p31CTPId;
   BEHAVIOUR
        p31CTPSink-vc3TTPSink  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 10};

p4CTPBidirectional-G774vc4TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p4CTPBidirectional;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc4TTPBidirectional;
   WITH ATTRIBUTE           p4CTPId;
   BEHAVIOUR
        p4CTPBidirectional-vc4TTPBidirectional  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 11};

p4CTPSink-G774vc4TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p4CTPSink;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc4TTPBidirectional;
   WITH ATTRIBUTE           p4CTPId;
   BEHAVIOUR
        p4CTPSink-vc4TTPBidirectional  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 12};

p4CTPSource-G774vc4TTPBidirectional NAME BINDING
   SUBORDINATE OBJECT CLASS p4CTPSource;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc4TTPBidirectional;
   WITH ATTRIBUTE           p4CTPId;
   BEHAVIOUR
        p4CTPSource-vc4TTPBidirectional  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 13};

p4CTPSource-G774vc4TTPSource NAME BINDING
   SUBORDINATE OBJECT CLASS p4CTPSource;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc4TTPSource;
   WITH ATTRIBUTE           p4CTPId;
   BEHAVIOUR
      p4CTPSource-vc4TTPSource  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 14};

p4CTPSink-G774vc4TTPSink NAME BINDING
   SUBORDINATE OBJECT CLASS p4CTPSink;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":vc4TTPSink;
   WITH ATTRIBUTE           p4CTPId;
   BEHAVIOUR
        p4CTPSink-vc4TTPSink  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 15};
```

7.4 ASN.1 definitions

```
ETS8 {ccitt(0) identified-organization(4) etsi(0) ets(304) informationModel(0)
asn1Module(2) eTS8(1)}
DEFINITIONS IMPLICIT TAGS ::=
BEGIN
-- EXPORTS everything
IMPORTS
NameType
FROM ASN1DefinedTypesModule {ccitt(0) recommendation(0) m(13) m3100(3100)
informationModel(0) asn1Module(2)
                             asn1DefinedTypesModule(0)};

END -- end of ASN1DefinedTypesModule
```

8 Cross-connection fragment

8.1 Cross-connection - object classes

In this context the IMPORTS section specifies the object classes which can be instantiated in the scope of this ETS. The IMPORTS section does not include uninstantiated superclasses.

```
BEGIN
IMPORTS
crossConnection,
fabric,
gtp,
mpCrossConnection,
tpPool
FROM {ccitt(0) recommendation(0) m(13) m3100(3100) informationModel(0)
managedObjectClass(3)}
;
END
```

8.2 Cross-connection - packages

All packages associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

8.3 Cross-connection - attributes

All attributes associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

supportedByObjectList

The value of the supportedByObjectList attribute points to the equipment and software objects which implement the TPs.

8.4 Cross-connection - name bindings

```
BEGIN
IMPORTS
fabric-managedElement,
gtp-fabric,
mpCrossConnection-fabric,
tpPool-fabric
FROM {ccitt(0) recommendation(0) m(13) m3100(3100) informationModel(0) nameBinding(6)}
;
END

ets_crossConnection-fabric NAME BINDING
SUBORDINATE OBJECT CLASS "CCITT Recommendation M.3100:1992":crossConnection
  AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS    "CCITT Recommendation M.3100:1992":fabric
  AND SUBCLASSES;
WITH ATTRIBUTE           "CCITT Recommendation M.3100:1992":crossConnectionId;
BEHAVIOUR
  ets_crossConnection-fabricBehaviour BEHAVIOUR
      DEFINED AS
         "The value of the fromTermination attribute in the crossConnection object
         shall not be NULL. When an instance of crossConnection is deleted, the
         following attributes will be affected. The crossConnectionObjectPointer
         attributes in the termination points or in the gtp objects that were pointing
         to the deleted crossConnection instance shall be set to point to the Fabric
         responsible for the connection of the termination points. The counters in the
         appropriate TP Pool objects (if applicable) shall be updated. The
         connectivityPointer attributes in the disconnected termination points shall
         be set to NULL. Deleting a crossConnection object instance has no effect on
         the composition of any GTP"
;;
REGISTERED AS {etsNameBinding 16};
```

```
ets_crossConnection-mpCrossConnection NAME BINDING
SUBORDINATE OBJECT CLASS "CCITT Recommendation M.3100:1992":crossConnection
  AND SUBCLASSES;
NAMED BY
SUPERIOR OBJECT CLASS    "CCITT Recommendation M.3100:1992":mpCrossConnection
  AND SUBCLASSES;
WITH ATTRIBUTE           "CCITT Recommendation M.3100:1992":crossConnectionId;
BEHAVIOUR
  ets_crossConnection-mpCrossConnectionBehaviour BEHAVIOUR
      DEFINED AS
         "The value of the fromTermination attribute in the  crossConnection object
         must be NULL. When an instance of crossConnection is deleted, the following
         attributes will be affected. The crossConnectionObjectPointer attributes in
         the termination points or in the gtp objects that were pointing to the
         deleted crossConnection instance shall be set to point to the Fabric
         responsible for the connection of the termination points. The counters in the
         appropriate TP Pool objects (if applicable) shall be updated. The
         connectivityPointer attributes in the disconnected termination points shall
         be set to NULL. Deleting the last cross-Connection contained in a multipoint
         cross connection object has the effect of also deleting the multipoint cross
         connection object instance (and updating the appropriate pointers). Deleting
         a crossConnection object instance has no effect on the composition of any
         GTP"
;;
REGISTERED AS {etsNameBinding 17};
```

9 Protection fragment

The protection fragment information model is to be found in Draft ITU-T Recommendation G.774.03 [13].

9.1 Object classes

In this context the IMPORTS section specifies the object classes which can be instantiated in the scope of this ETS. The IMPORTS section does not include uninstantiated superclasses.

```
BEGIN
IMPORTS
protectedTTPBidirectional
protectedTTPSink
protectedTTPSource
protectionGroup
protectionUnit
sdhMSProtectionGroup
sdhMSProtectionUnit
unprotectedCTPBidirectional
unprotectedCTPSink
unprotectedCTPSource
FROM {ccitt(0) recommendation(0) g(7) g77403(x) informationModel(0)
managedObjectClass(3)}
;
END
```

9.2 Packages

All packages associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

9.3 Attributes

All attributes associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

supportedByObjectList

The value of the supportedByObjectList attribute points to the equipment and software objects which implement the TPs.

9.4 Name bindings

```
BEGIN
IMPORTS
protectedTTPBidirectional-sdhNE
protectedTTPSink-sdhNE
protectedTTPSource-sdhNE
augBidirectional-protectedTTPBidirectional
augSink-protectedTTPSink
augSource-protectedTTPSource
protectionGroup-managedElement
protectionUnit-protectionGroup
unprotectedCTPBidirectional-msTTPBidirectional
unprotectedCTPSink-msTTPSink
unprotectedCTPSource-msTTPSource
FROM {ccitt(0) recommendation(0) g(7) g77403(x) informationModel(0) nameBinding(6)}
;
END
```

10 Equipment fragment

10.1 Equipment fragment - object classes

In this context, the IMPORTS section specifies the object classes which can be instantiated in the scope of this ETS. The IMPORTS section does not include uninstantiated superclasses.

```
BEGIN
IMPORTS
sdhNE
FROM {ccitt(0) recommendation(0) g(7) g774(774) informationModel(0)
managedObjectClass(3)}
software
FROM M.3100ObjectClass {ccitt(0) recommendation(0) m(13) m3100(3100)
informationModel(0) managedObjectClass(3)}
;
END
```

The external TimePackage shall be supported by the sdhNE instance.

```
sdhEquipment MANAGED OBJECT CLASS
DERIVED FROM "CCITT Recommendation M.3100:1992":equipment;
CHARACTERIZED BY
"CCITT Recommendation M.3100:1992":administrativeOperationalStatesPackage,
"CCITT Recommendation M.3100:1992":affectedObjectListPackage,
"CCITT Recommendation M.3100:1992":attributeValueChangeNotificationPackage,
"CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
"CCITT Recommendation M.3100:1992":currentProblemListPackage,
"CCITT Recommendation M.3100:1992":locationNamePackage,
"CCITT Recommendation M.3100:1992":stateChangeNotificationPackage,
"CCITT Recommendation M.3100:1992":userLabelpackage,
"CCITT Recommendation M.3100:1992":vendorNamePackage,
"CCITT Recommendation M.3100:1992":equipmentsEquipmentAlarmPackage,
"CCITT Recommendation X.721:1992":availabilityStatusPackage,
sdhEquipmentPackage PACKAGE
BEHAVIOUR
sdhEquipmentBehaviour    BEHAVIOUR
      DEFINED AS
         "The equipment object may be instantiated or exist without the presence of
         the physical resources.  In this case the operational state shall be
         'disabled' and the availability status attribute shall contain the value
         'notInstalled'.
         When the resource is physically removed, the corresponding equipment object
         is not automatically deleted.
         The equipmentExpected attribute shall be provided at instantiation time. The
         create request shall fail if the value of this attribute is unacceptable to
         the NE, and the failure reason shall indicate this mismatch in the response.
         When there is a mismatch in the contents of the equipmentActual and the
         equipment Expected attribute, an equipmentAlarm notification with probable
         cause 'replaceableUnitTypeMismatch' shall be raised. This checking is only
         performed if the availabilityStatus does not contain the value
         'notInstalled'. The equipmentExpected value of 'NULL' (no type) does not
         match any other value than NULL for equipmentActual. Changes in the value of
         the equipmentExpected attribute can only be achieved by object deletion and
         creation.
         The 'CCITT Recommendation M.3100:1992':versionPackage package is not used."
;;
```

```
ATTRIBUTES
"CCITT Recommendation M.3100:1992":alarmStatus    GET,
"CCITT Recommendation M.3100:1992":version        GET,
equipmentExpected    GET,
equipmentActual    GET,
specificPhysicalInstance    GET,
physicalConnectorList    GET;
;;
REGISTERED AS {etsObjectClass 10};
```

10.2 Equipment - attributes

All packages and attributes associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

affectedObjectList

The value of the affectedObjectList attribute represents the functional objects implemented by the equipment or software object in which the attribute is applied. If the equipment or software object become disabled, all managed objects referred to by the affectedObjectList shall also be disabled.

```
equipmentActual                ATTRIBUTE
     WITH ATTRIBUTE SYNTAX    ETS12.EquipmentActual;
     BEHAVIOUR
     equipmentActualBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute contains the equipment type of the equipment actually
present. The 'EquipmentType'
         value is a vendor-specific identification of a particular set or class of
equipment, where all the
         set members have equivalent capability."
;;
REGISTERED AS {etsAttribute 4};

equipmentExpected               ATTRIBUTE
        WITH ATTRIBUTE SYNTAX    ETS12.EquipmentExpected;
        BEHAVIOUR
                equipmentExpectedBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute contains the equipment type requested at object creation. The
         'EquipmentType' value is a vendor-specific identification of a particular set
         or class of equipment, where all the set members have equivalent capability."
;;
REGISTERED AS {etsAttribute 5};

physicalConnectorList           ATTRIBUTE
    WITH ATTRIBUTE SYNTAX    ETS12.PhysicalConnectorList;
    BEHAVIOUR
        physicalConnectorListBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used to relate external cabling to the appropriate
         transport objects. There is an entry per connector".

;;
REGISTERED AS {etsAttribute 12};

specificPhysicalInstance               ATTRIBUTE
        WITH ATTRIBUTE SYNTAX                   ETS12.PhysicalInstance;
        BEHAVIOUR
                specificPhysicalInstanceBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute contains the unique identifier of the physical equipment
         (e.g. serial number). This may be a manufacturer dependent serial numbers or
         other unique identifier (or unknownInstance where the actual instance may not
         be determined from the actual equipment)"

;;
REGISTERED AS {etsAttribute 6};

-- [ for information only.
--   Version  ::=
--      Defined in CCITT Recommendation M.3100:1992, is used to present sufficient
--      information to uniquely identify the "equipmentActual" for the purpose of
--      repair or reordering.
-- ]
```

10.3 Equipment - name bindings

All name bindings associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

```
BEGIN
IMPORTS
equipment-managedElement,
equipment-equipment
FROM {ccitt(0) recommendation(0) m(13) m3100(3100) informationModel(0) nameBinding(6)}
;
END
```

10.4 Equipment - supporting ASN.1

All ASN.1 types associated with object classes are implicitly imported from CCITT Recommendations defining the appropriate object classes.

```
ETS12 {ccitt(0) identified-organization(4) etsi(0) ets(304) informationModel(0)
asn1Module(2) eTS12(3)}
DEFINITIONS IMPLICIT TAGS ::= BEGIN
-- EXPORTS everything
IMPORTS
Version
FROM ASN1DefinedTypesModule {ccitt(0) recommendation(0) m(13) m3100(3100)
informationModel(0) asn1Module(2)
                          asn1DefinedTypesModule(0)}
RDNSequence
FROM InformationFramework {joint-iso-ccitt ds(5) modules(1) informationFramework(1)};

Connector ::= SEQUENCE {
          connectorType              PrintableString,
          connectorLocation          PrintableString,
          supporting                 ListOfLocalDistinguishedName}

ListOfLocalDistinguishedName ::= SET OF RDNSequence

EquipmentType ::= PrintableString

EquipmentActual ::= CHOICE {
          noType                     NULL,
          type                       EquipmentType}


EquipmentExpected ::= CHOICE {
          noType                     NULL,
          type                       EquipmentType}


PhysicalConnectorList ::= SET OF Connector


PhysicalInstance ::= CHOICE {
          unknownInstance            NULL,
          instance                   PrintableString}


END
```

11 Support objects fragment

11.1 Support objects - object classes

```
powerSupply    MANAGED OBJECT CLASS
DERIVED FROM    "CCITT Recommendation X.721:1992":top;
CHARACTERIZED BY
"CCITT Recommendation M.3100:1992":createDeleteNotificationsPackage,
powerSupplyPackage    PACKAGE
      BEHAVIOUR
   powerSupplyBehaviourPkg BEHAVIOUR
      DEFINED AS
         "The power supply object class is used to control the power supply sources
within the SDHNE. There
         shall be one instance for each of the power supply sources."
;
;
```

```
ATTRIBUTES
    powerSupplyId                                          GET,
    powerSource                                            GET,
    poweredEquipmentPtrList                                GET,
    "CCITT Recommendation X.721:1992":operationalState              GET,
    "CCITT Recommendation M.3100:1992":supportedByObjectList        GET;
NOTIFICATIONS
    "CCITT Recommendation X.721:1992":attributeValueChange,
    "CCITT Recommendation X.721:1992":statechange;
;;
REGISTERED AS {etsObjectClass 11};


timingGenerator MANAGED OBJECT CLASS
   DERIVED FROM "CCITT Recommendation X.721:1992":top;
   CHARACTERIZED BY
timingGeneratorPackage    PACKAGE
      BEHAVIOUR
   timingGeneratorBehaviourPkg BEHAVIOUR
      DEFINED AS
         "For the selection of the timing sources a 1:n protection like mechanism is
         used. The relevant objects are defined in clause 11.
         Each protectionUnit in the protectionGroup has a pointer, the
         unreliableResourcePointer, which points to the related TP (see figure A.15).

         The currentTimingSourcePointer points to the timing source currently in use.
         A value of NULL of this attribute indicates the use of the internal
         oscillator. In that case, the unreliableResourcePointer of the corresponding
         protectionUnit also points to NULL.  The reliableResourcePointer of the
         protectionUnit related to the currently used timing source points to the
         timingGenerator. The reliableResourcePointers of the other protectionUnits
         related to timing sources which are not currently in use are pointing to
         NULL.
         To select a special instance of a possible timing source, the OS has to use
         the invokeProtection action of the protectionGroup.

   NOTE:   The possibility in the model to assign more than one clock source to each
           of the reference points T1-T3 of CCITT Recommendation G.783:1992 may be a
           new requirement and is therefore for further study, the additions will
           reflect the functionality described in ETS 300 417.

         Only one instance of this object class shall be created."
;;
ATTRIBUTES
    timingGeneratorId                                  GET,
    currentTimingSourcePointer                         GET,
    "CCITT Recommendation X.721:1992":operationalState          GET,
    "CCITT Recommendation M.3100:1992":supportedByObjectList    GET;
NOTIFICATIONS
    "CCITT Recommendation X.721:1992":attributeValueChange,
    "CCITT Recommendation X.721:1992":statechange;
;;
REGISTERED AS {etsObjectClass 12};
```

11.2 Support objects - attributes

```
supportedByObjectList
The value of the supportedByObjectList attribute points to the equipment and software
objects which implement the TPs.

timingGeneratorId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX       ETS13.NameType ;
   MATCHES FOR                 EQUALITY;
   BEHAVIOUR
      timingGeneratorIdBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used as an RDN for naming instances of the timingGenerator
         object classes."
;;
REGISTERED AS {etsAttribute 7};

powerSupplyId ATTRIBUTE
   WITH ATTRIBUTE SYNTAX       ETS13.NameType ;
   MATCHES FOR                 EQUALITY;
   BEHAVIOUR
      powerSupplyIdBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used as an RDN for naming instances of the powerSupply
         object classes."
;;
```

```
REGISTERED AS {etsAttribute 8};

powerSource ATTRIBUTE
   WITH ATTRIBUTE SYNTAX       ETS13.PowerSource ;
   MATCHES FOR EQUALITY;
   BEHAVIOUR
      powerSourceBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used to display the voltage of a power source."
;;
REGISTERED AS {etsAttribute 9};


currentTimingSourcePointer   ATTRIBUTE
    WITH ATTRIBUTE SYNTAX   ETS13.CurrentTimingSourcePointer;
    MATCHES FOR EQUALITY;
REGISTERED AS {etsAttribute 10};


poweredEquipmentPtrList   ATTRIBUTE
    WITH ATTRIBUTE SYNTAX   ETS13.PoweredEquipmentPtrList;
    MATCHES FOR EQUALITY, SET-COMPARISON, SET-INTERSECTION;
   BEHAVIOUR
      poweredEquipmentPtrListBehaviour BEHAVIOUR
      DEFINED AS
         "This attribute is used to point to the equipment object instances which are
         powered by a
         powerSupply instance."
;;
REGISTERED AS {etsAttribute 11};
```

11.3 Support objects - name bindings

```
powerSupply-sdhNE NAME BINDING
   SUBORDINATE OBJECT CLASS powerSupply;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":sdhNE;
   WITH ATTRIBUTE           powerSupplyId;
   BEHAVIOUR
        powerSupply-sdhNEBehaviour   BEHAVIOUR
      DEFINED AS
         "The subordinate managed object is automatically instantiated when the
         superior managed object is instantiated, according to the make-up and mode of
         operation of the equipment."
;;
REGISTERED AS {etsNameBinding 18};

timingGenerator-sdhNE NAME BINDING
   SUBORDINATE OBJECT CLASS timingGenerator;
   NAMED BY
   SUPERIOR OBJECT CLASS    "CCITT Recommendation G.774:1992":sdhNE;
   WITH ATTRIBUTE           timingGeneratorId;
   BEHAVIOUR
      timingGenerator-sdhNEBehaviour   BEHAVIOUR
      DEFINED AS
         "The subordinate managed object is automatically instantiated when the
         superior managed object is instantiated, according to the make-up and mode of
         operation of the equipment."
;;
REGISTERED AS {etsNameBinding 19};
```

11.4 Support objects - supporting ASN.1

```
ETS13 {ccitt(0) identified-organization(4) etsi(0) ets(304) informationModel(0)
asn1Module(2) eTS13(4)}

DEFINITIONS IMPLICIT TAGS ::=
BEGIN
-- EXPORTS everything
IMPORTS
NameType
FROM ASN1DefinedTypesModule {ccitt(0) recommendation(0) m(13) m3100(3100)
informationModel(0) asn1Module(2) asn1DefinedTypesModule(0)}

ObjectInstance
FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)};
```

```
CurrentTimingSourcePointer ::= CHOICE {
                                    pointer              [0]    ObjectInstance,
                                    internalOscillator   [1]    NULL
                                   }

PoweredEquipmentPtrList ::= SET OF ObjectInstance

PowerSource ::= INTEGER

END
```

Annex A (informative): Figures

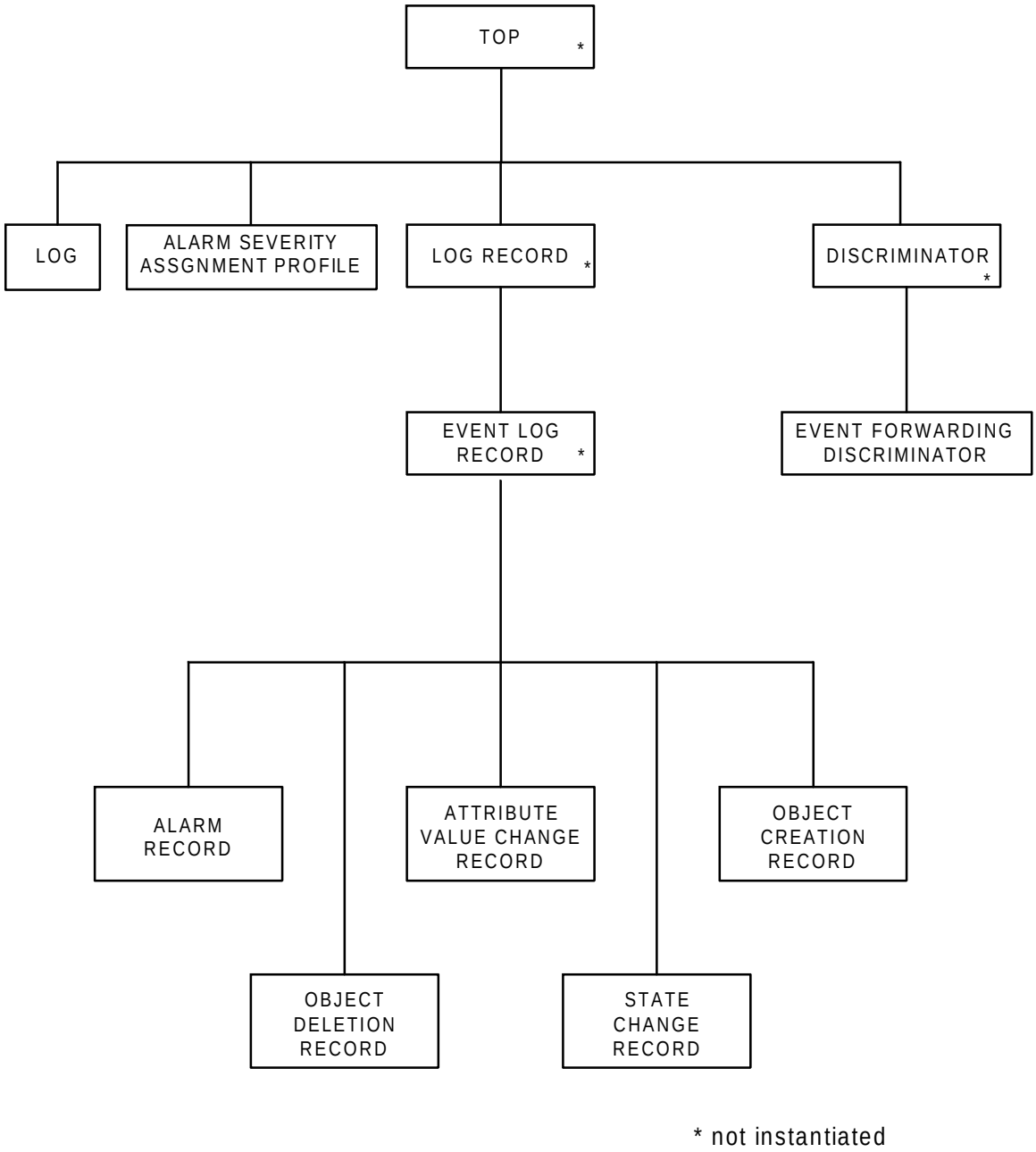


Figure A.1: Generic objects inheritance

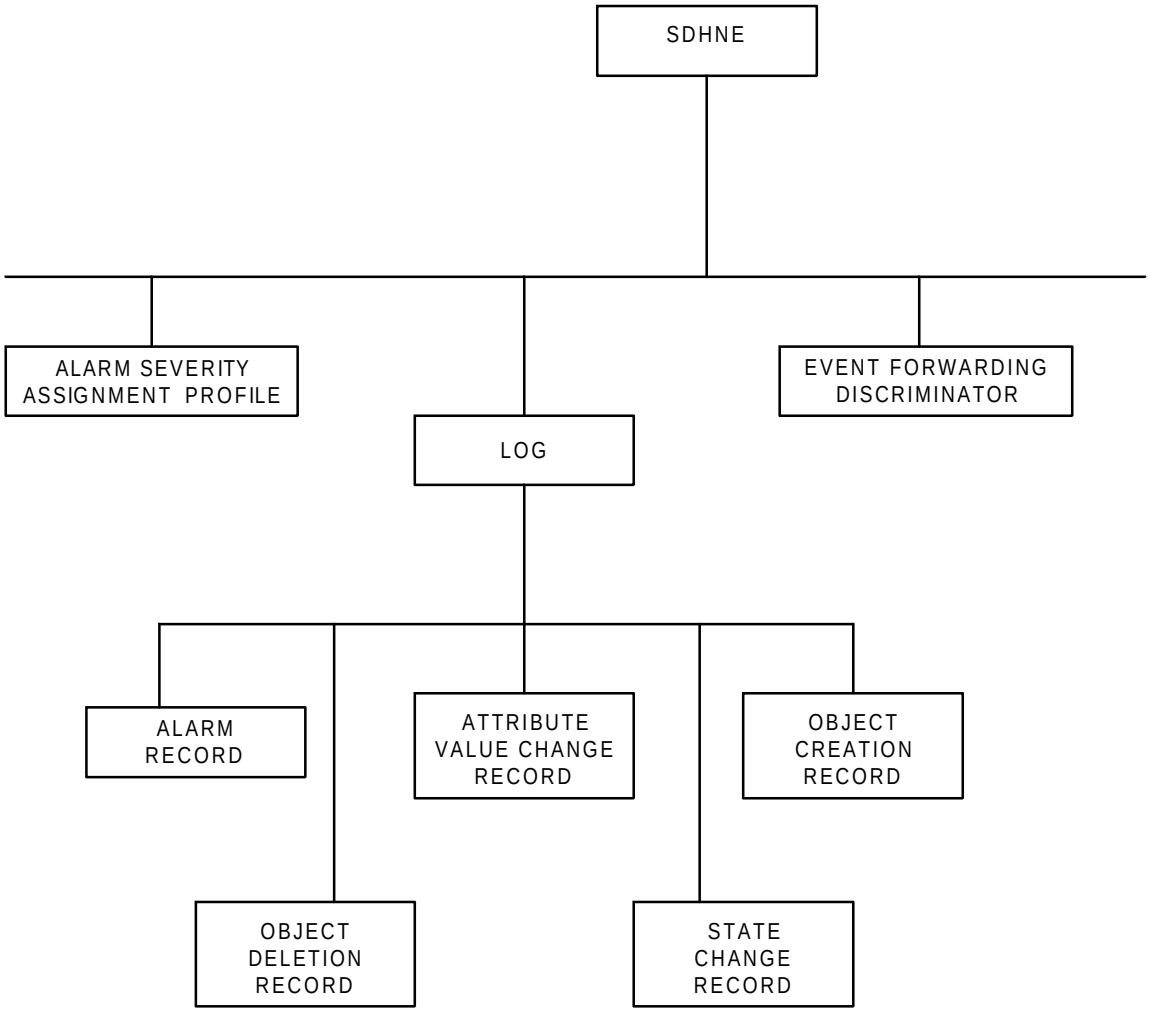


Figure A.2: Generic object naming

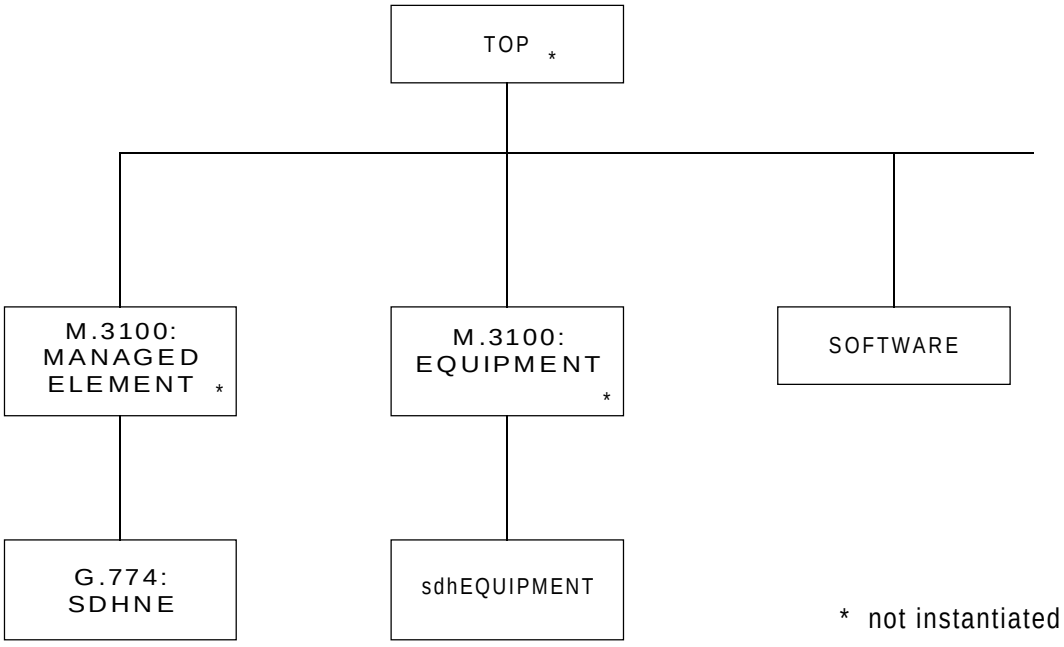


Figure A.3: Equipment objects inheritance

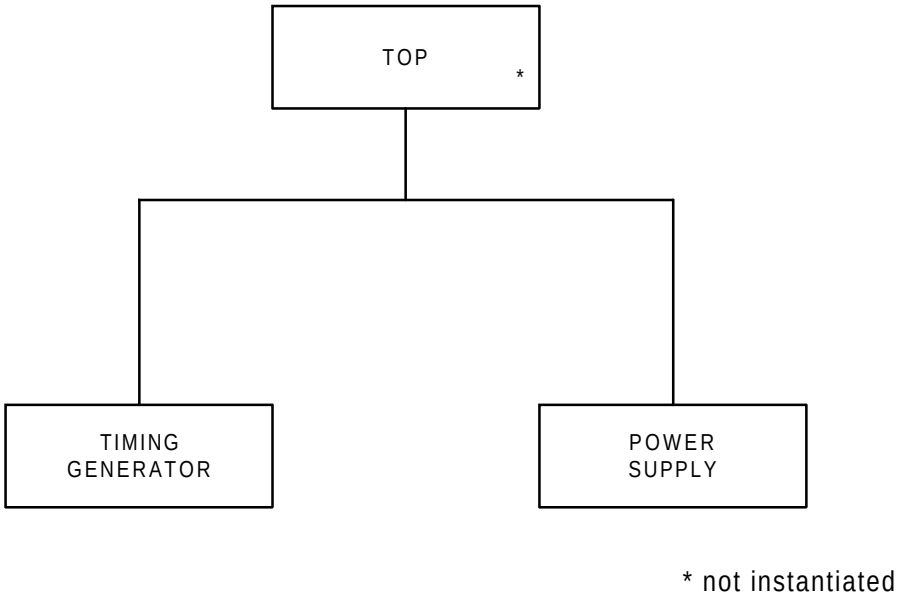


Figure A.4: Support objects inheritance

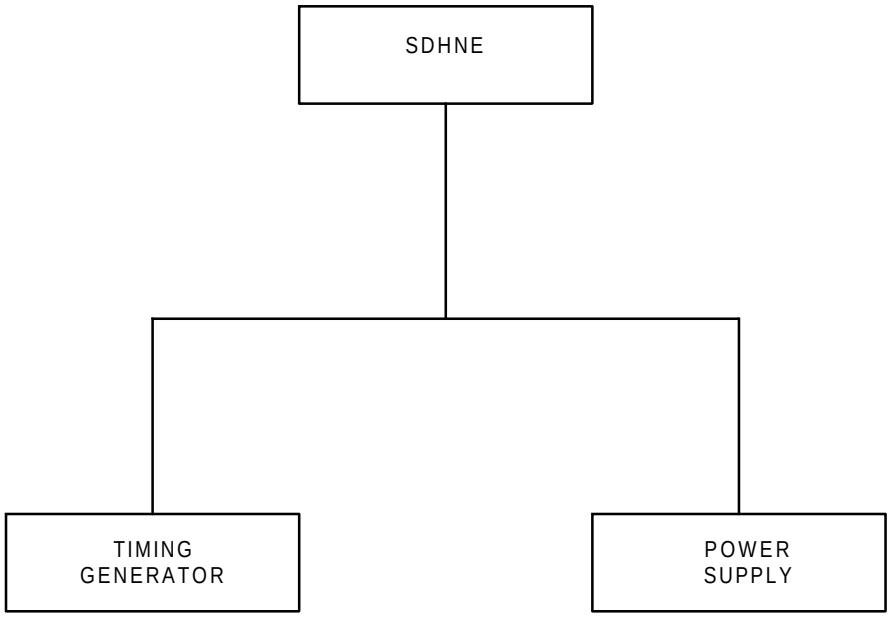
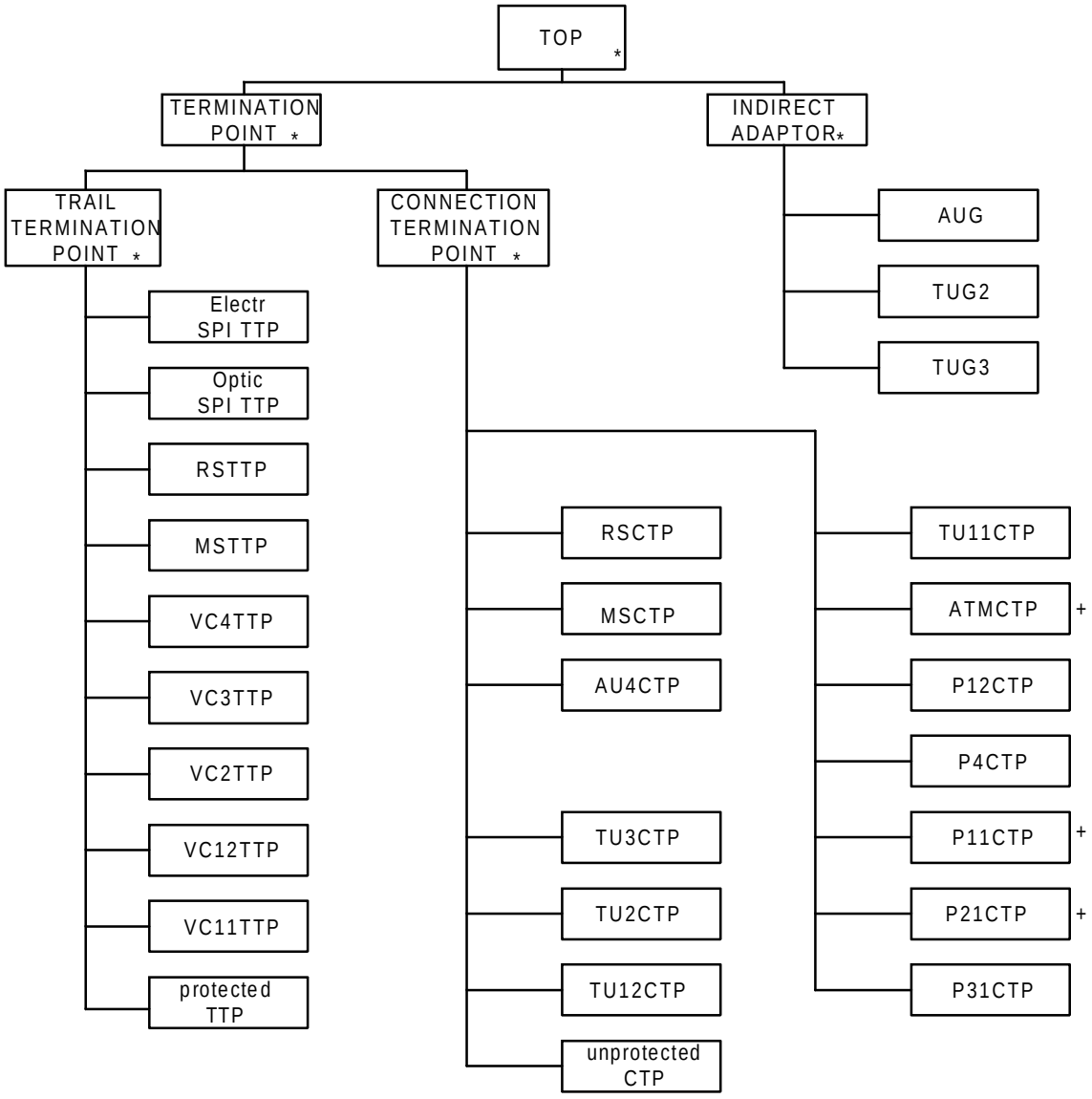


Figure A.5: Support objects naming

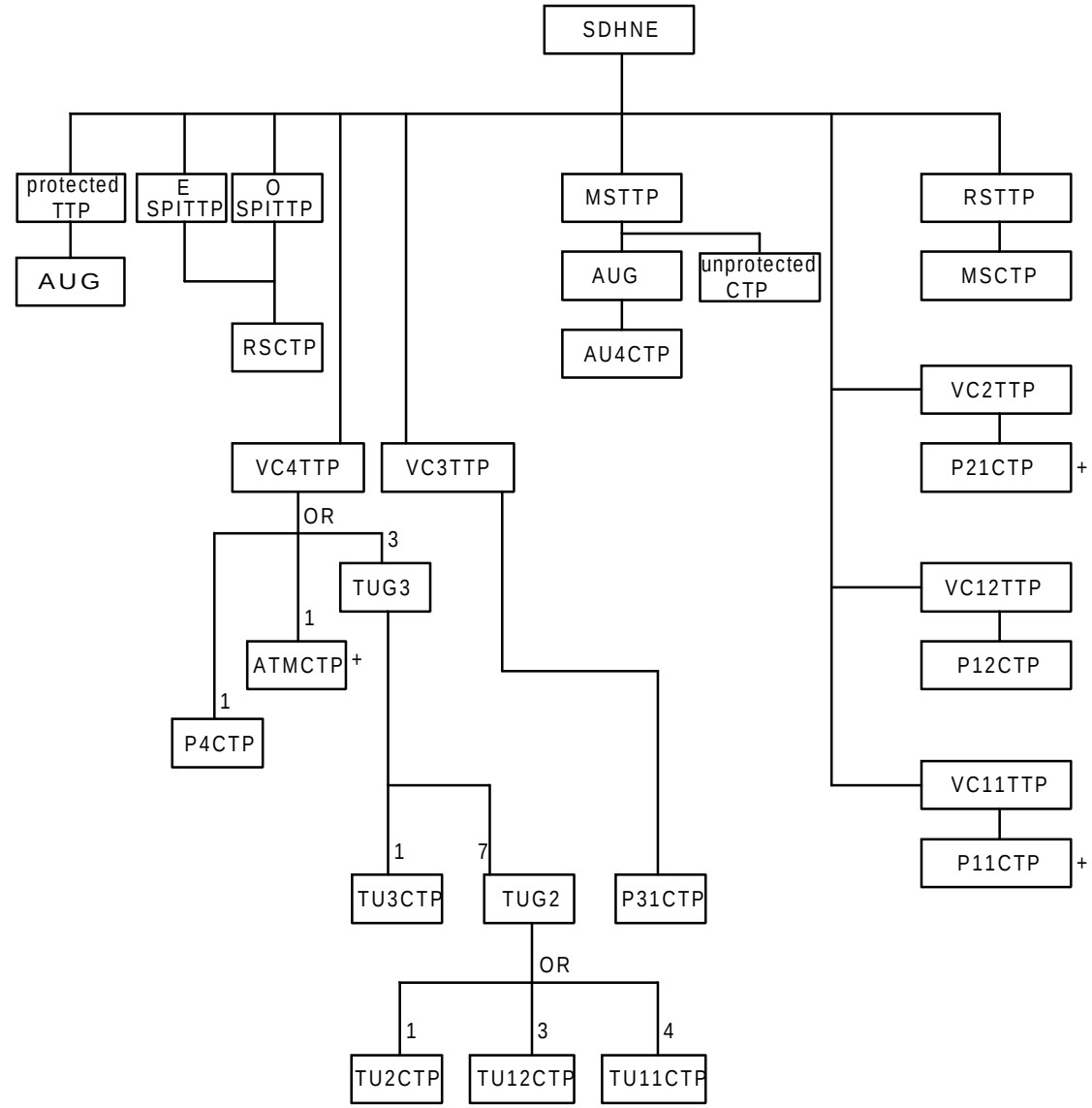


(All objects may be source, sink or bidirectional)

* not instantiated

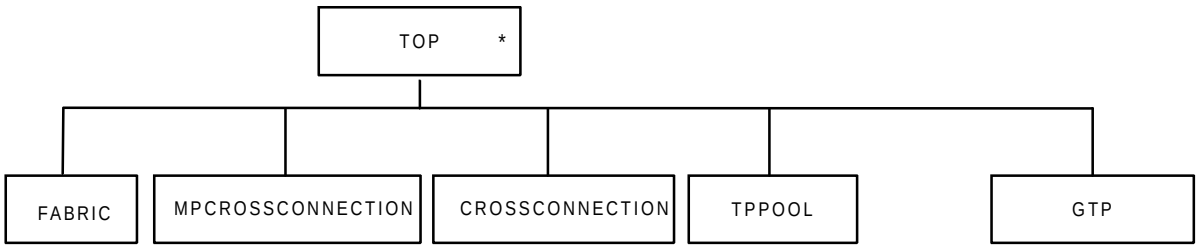
\+ not defined

Figure A.6: Transport objects inheritance



(All objects may be source, sink or bidirectional)
+ not defined

Figure A.7: Transport objects naming



* not instantiated

Figure A.8: Cross-connection objects inheritance

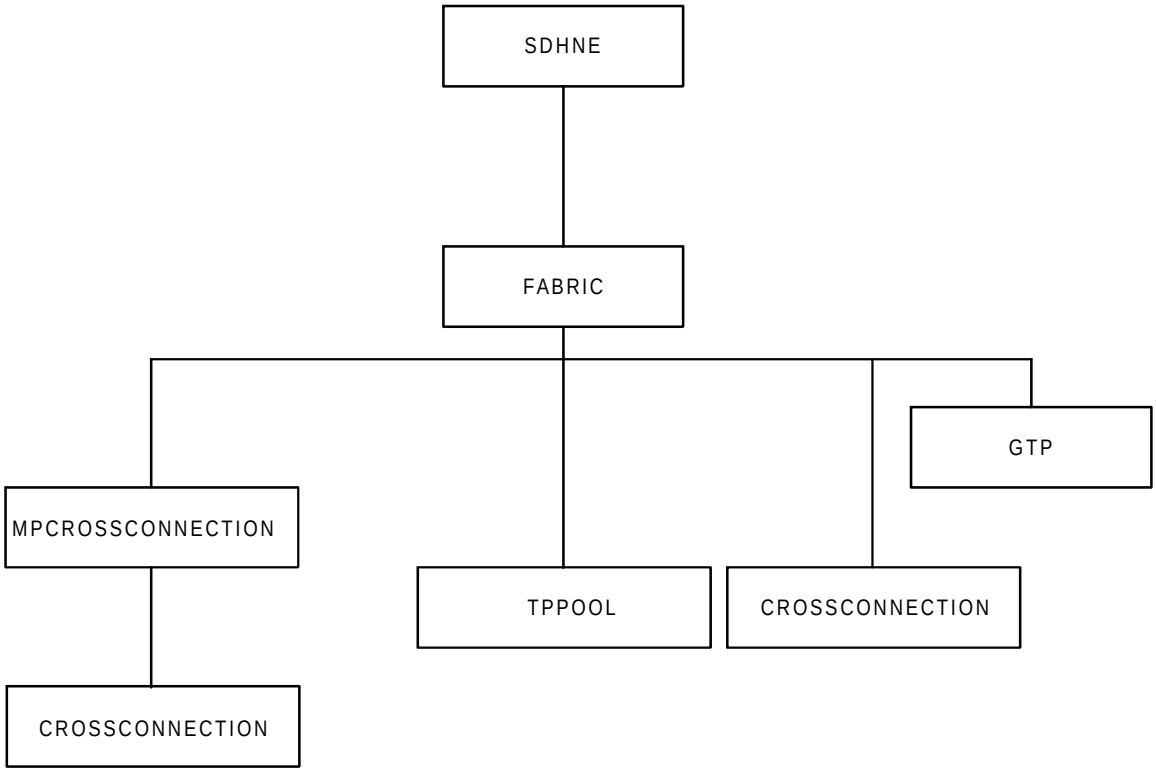


Figure A.9: Cross-connection objects naming

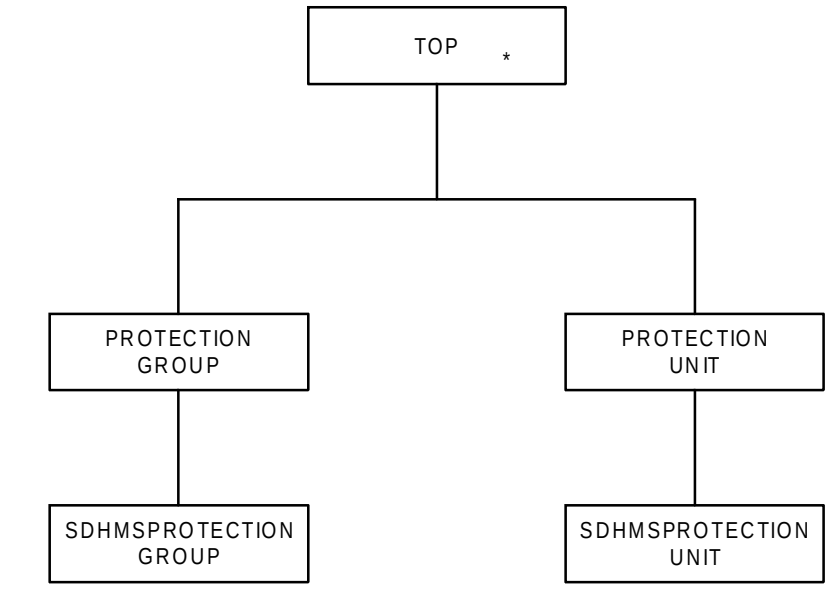


Figure A.10: Protection objects inheritance

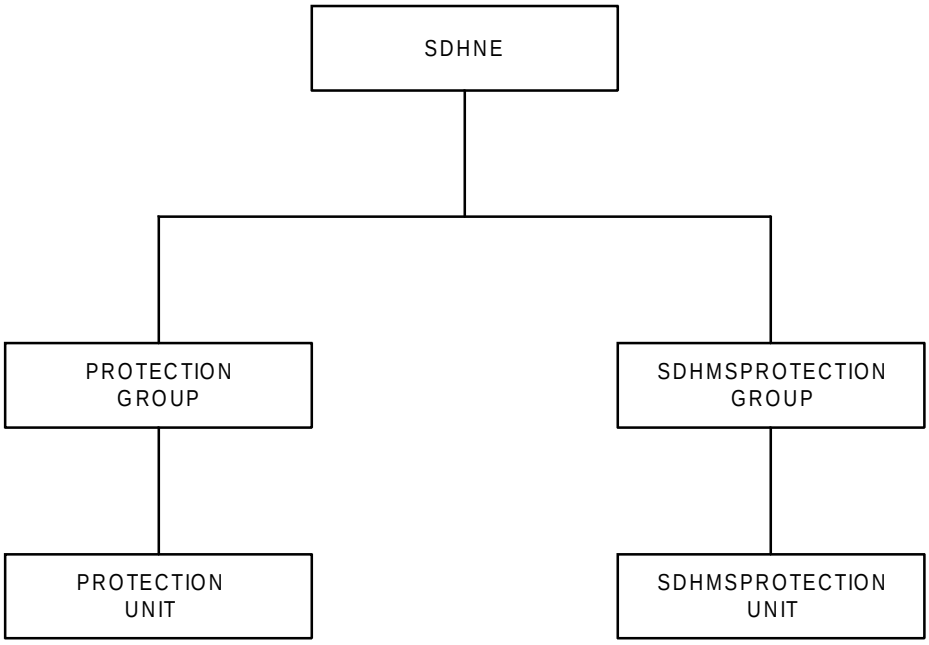


Figure A.11: Protection objects naming

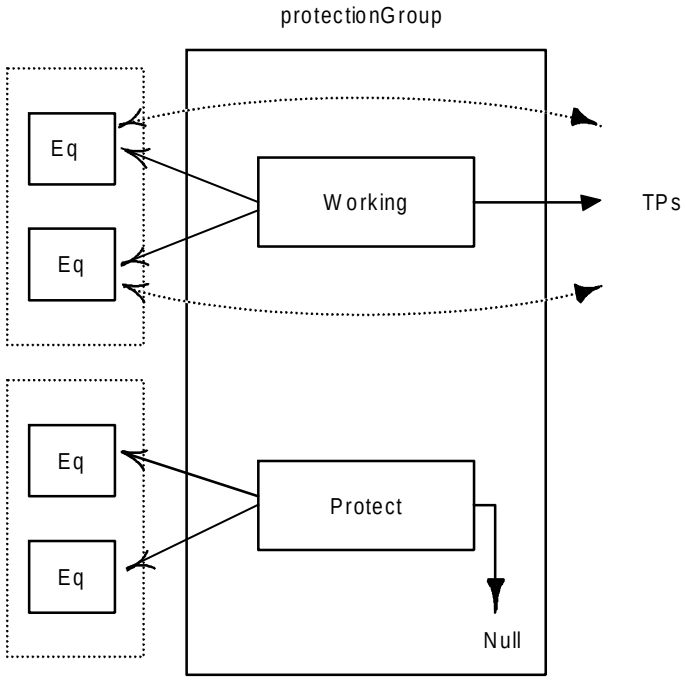


Figure A.12: Equipment protection

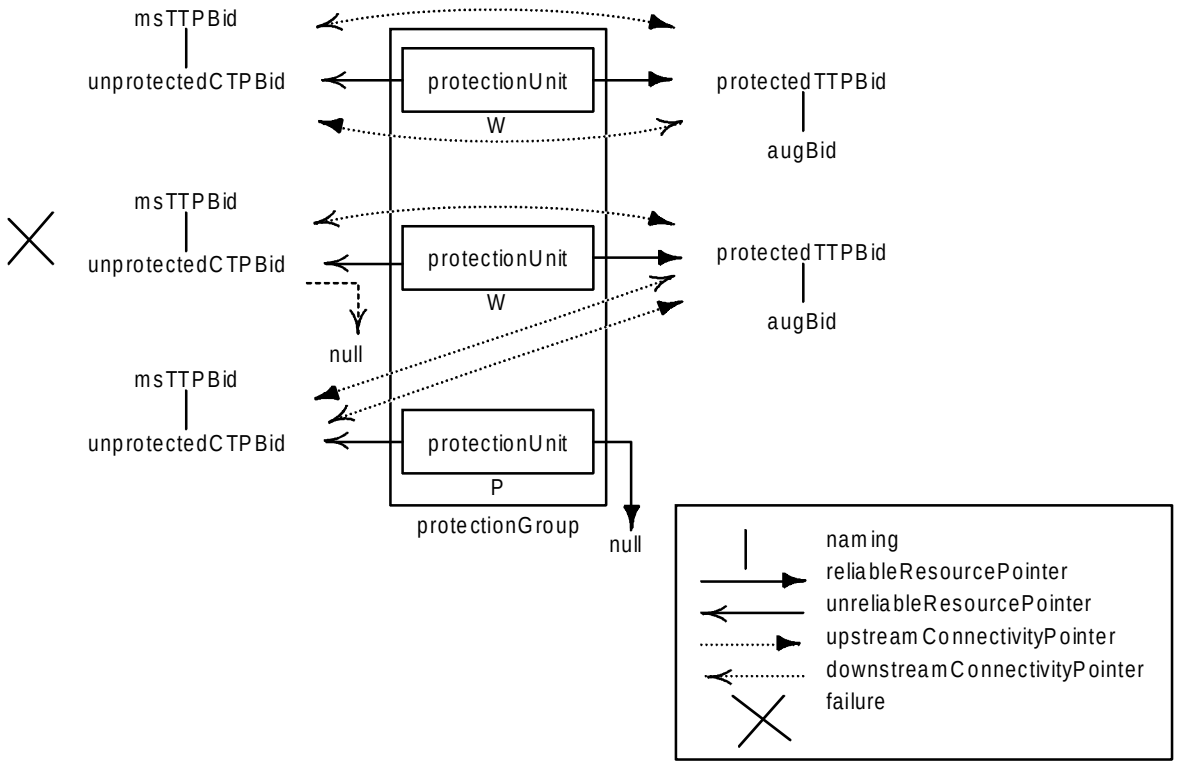


Figure A.13: Bidirectional 1:2 Protection model example

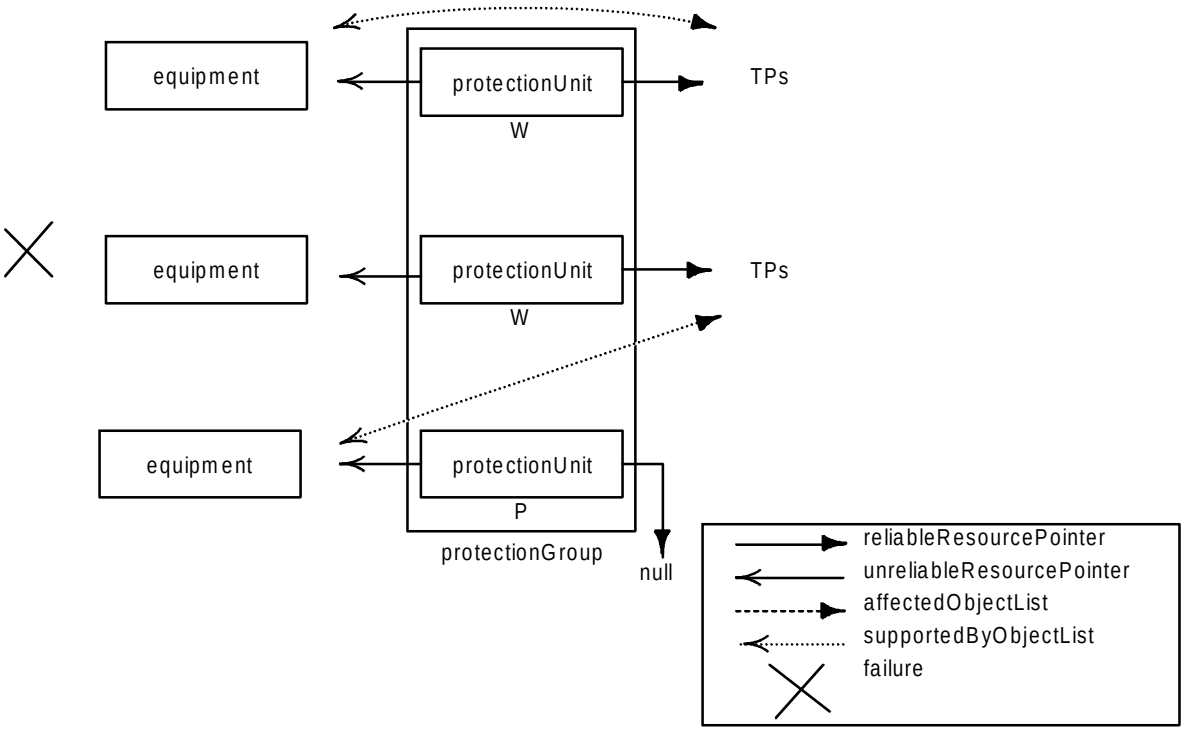


Figure A.14: Equipment protection 2:1 protection

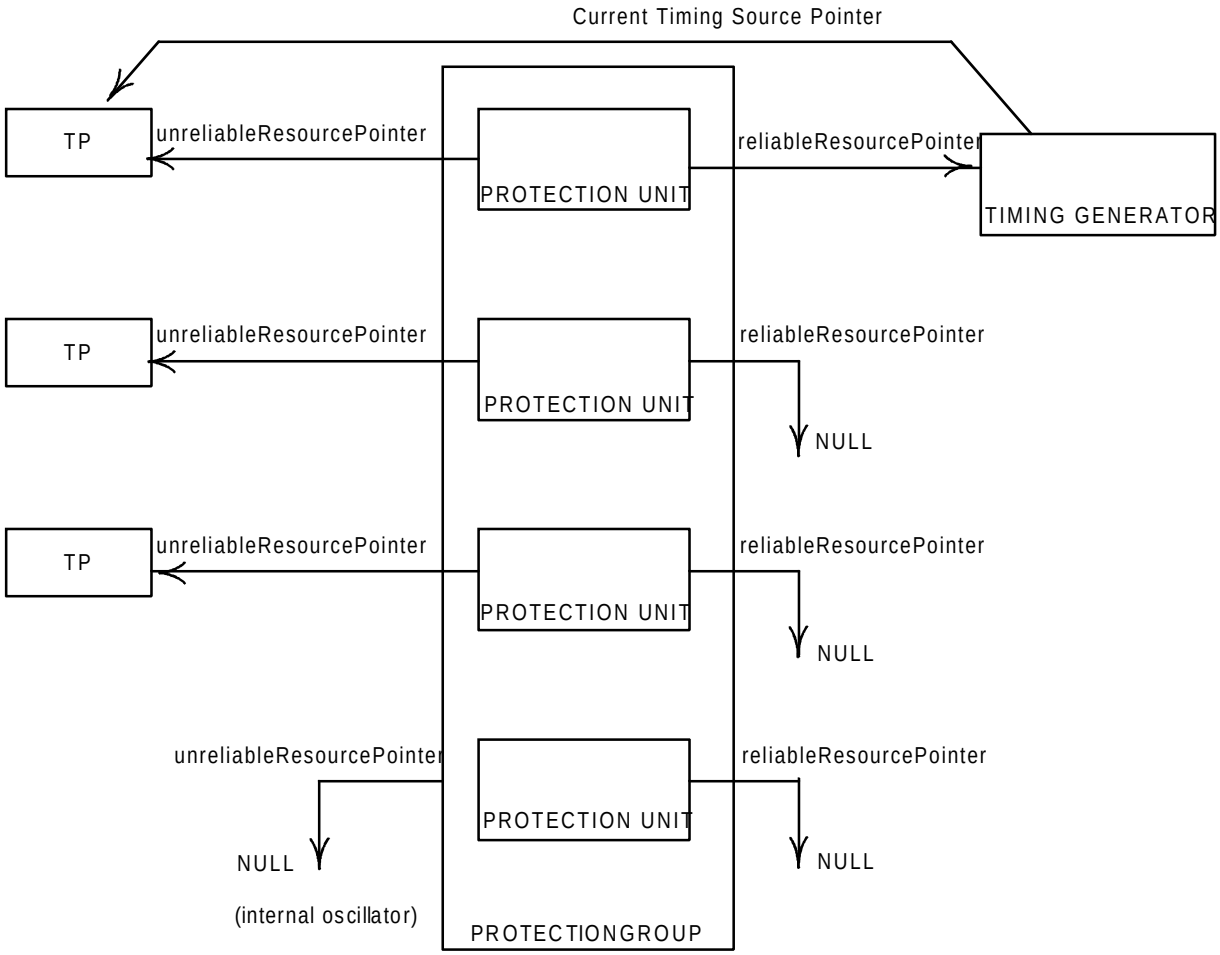
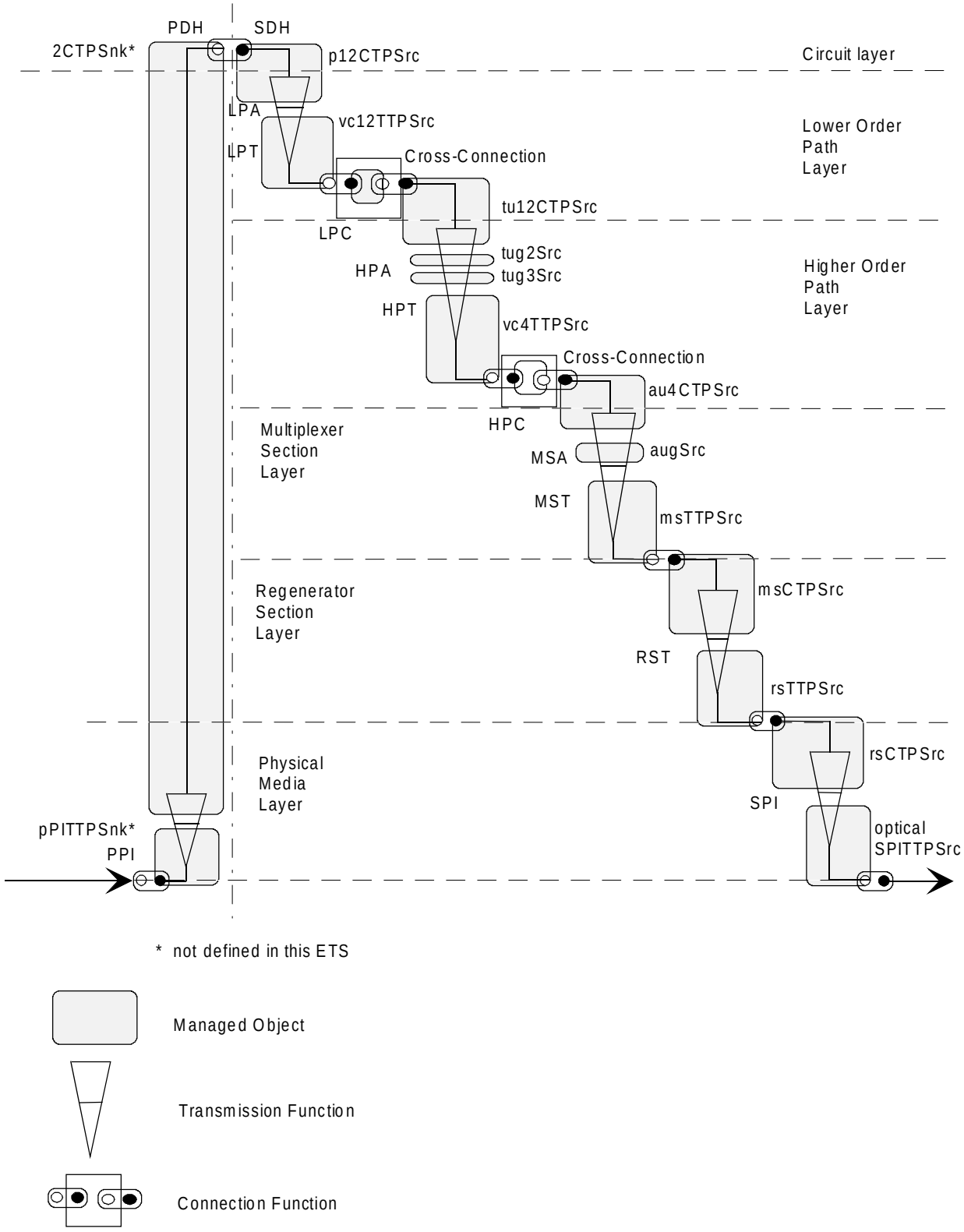
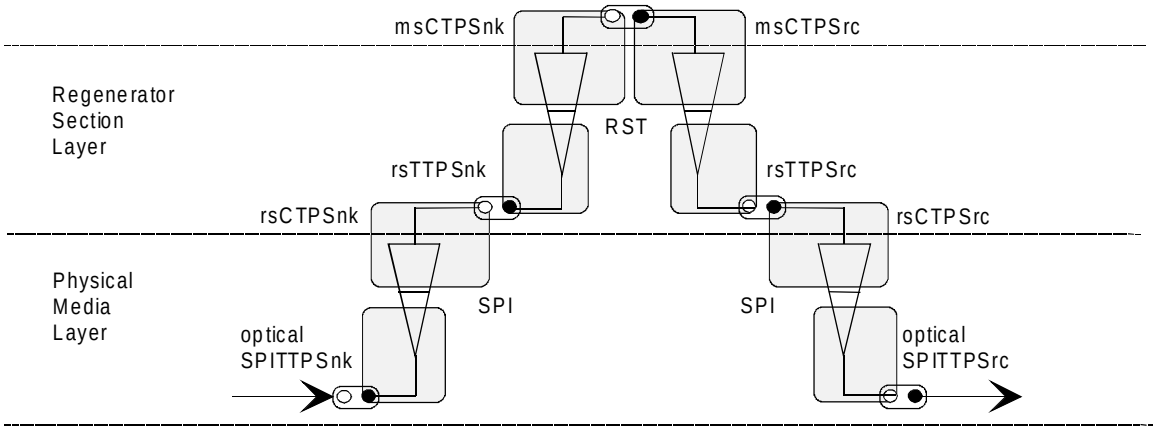


Figure A.15: Timing source selection using protection fragment

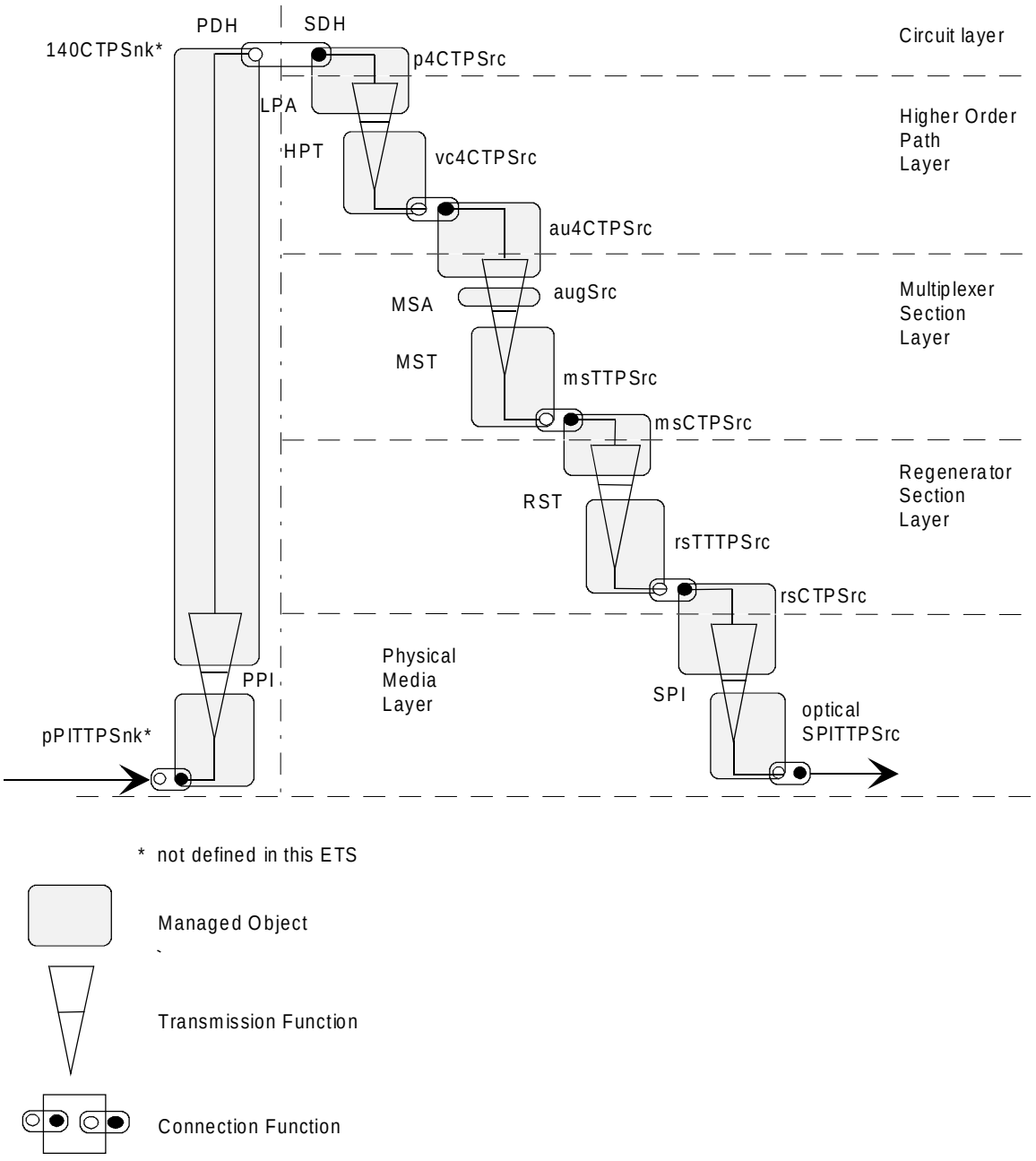


EXAMPLE 1: 2 Mbit/s signals multiplexed to STM-N signal.

Figure A.16 (sheet 1 of 3): Examples for the relationship between object classes and transmission

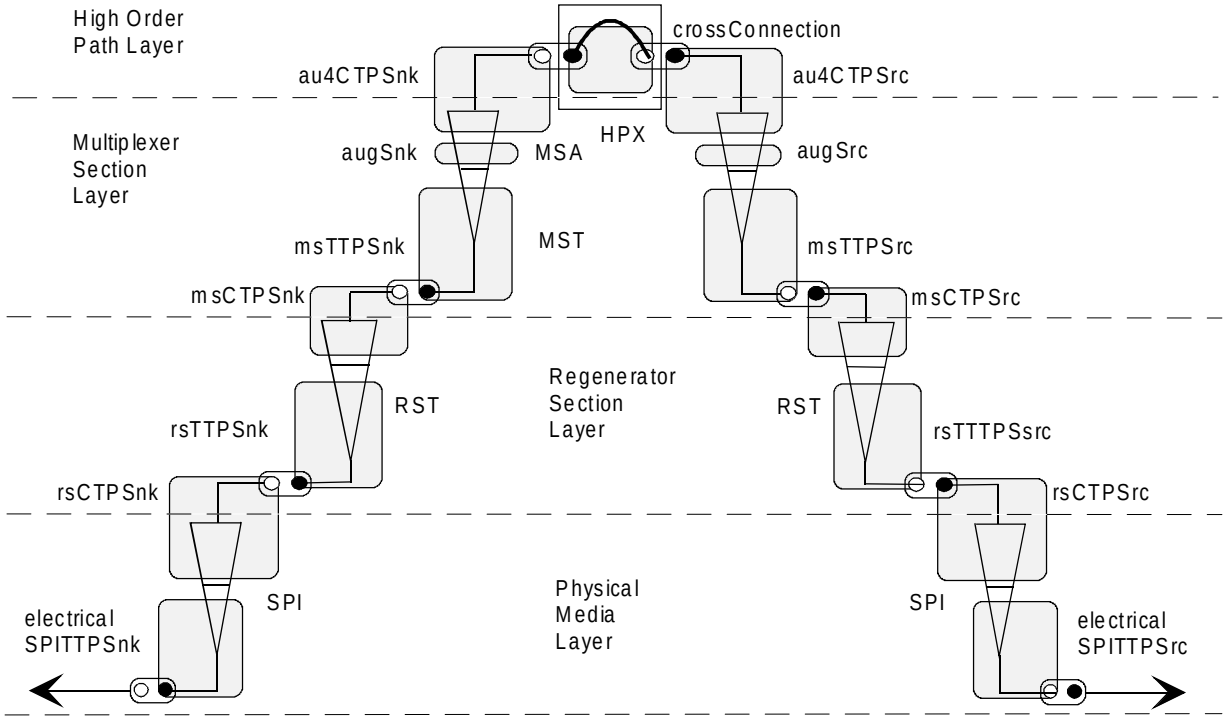


EXAMPLE 2: STM-N unidirectional repeater.



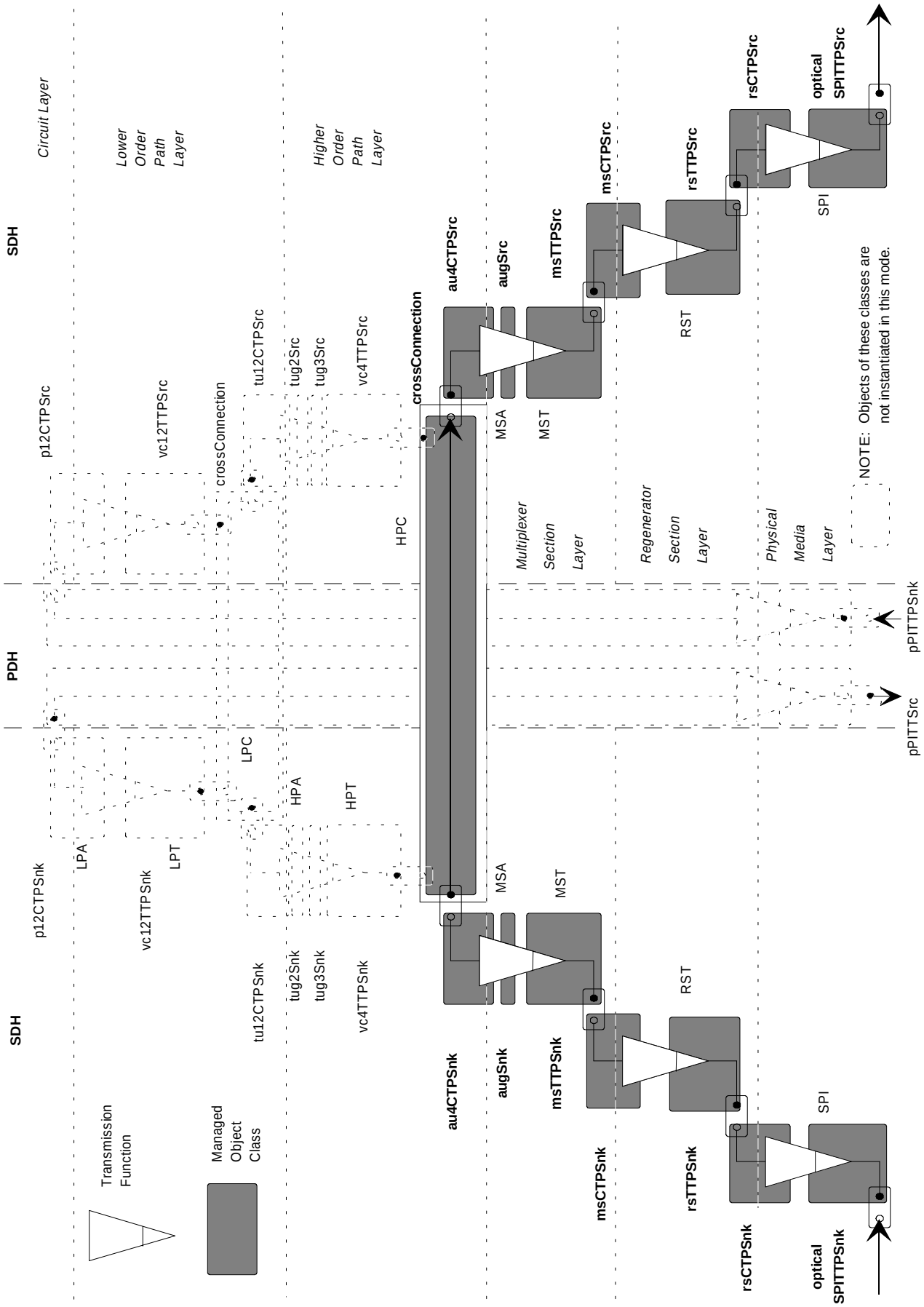
EXAMPLE 3: 140 Mbit/s signals multiplexed to STM-N signal.

Figure A.16 (sheet 2 of 3): Examples for the relationship between object classes and transmission



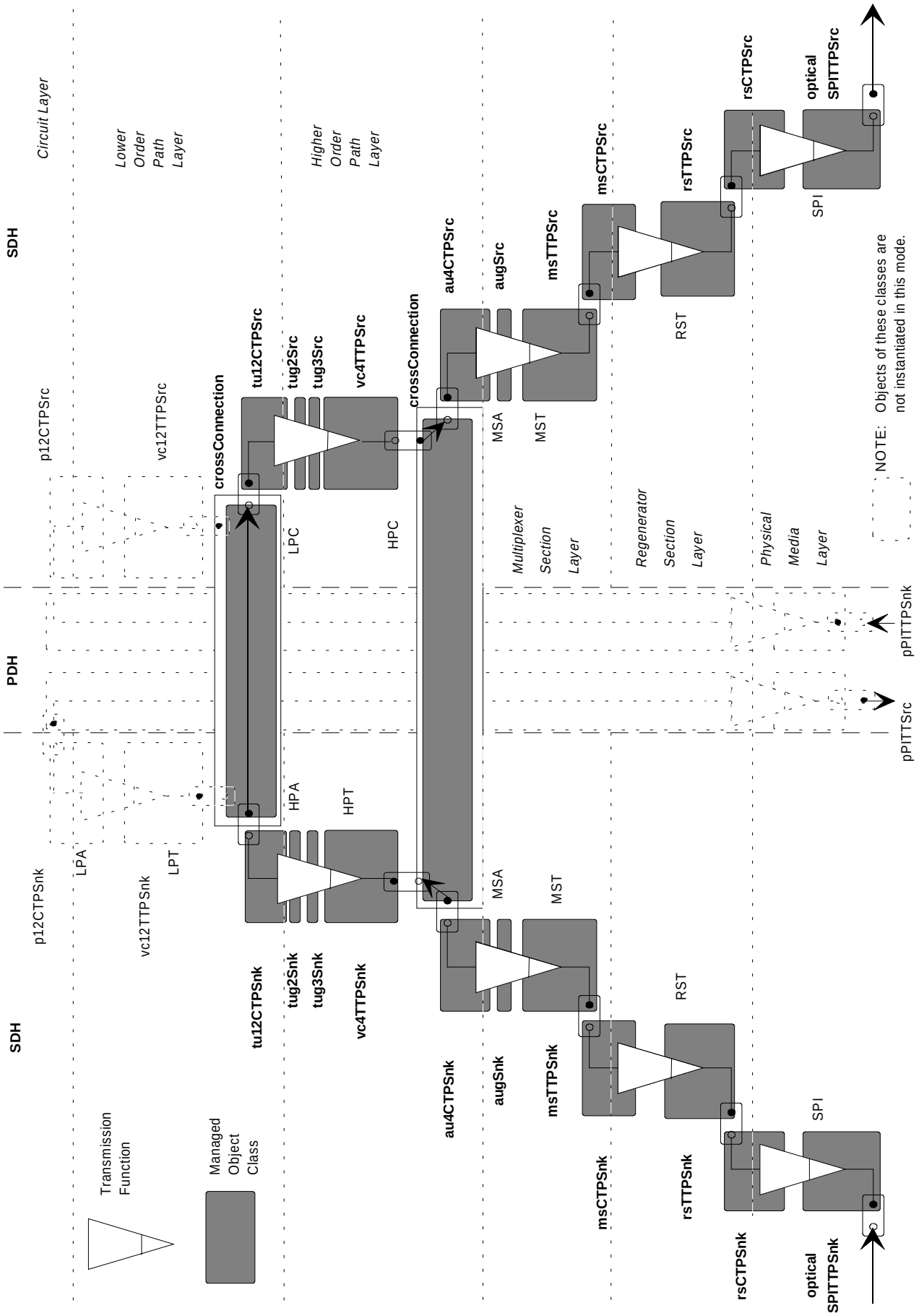
EXAMPLE 4: SDXC4/4 Higher order cross-connect.

Figure A.16 (sheet 3 of 3): Examples for the relationship between object classes and transmission



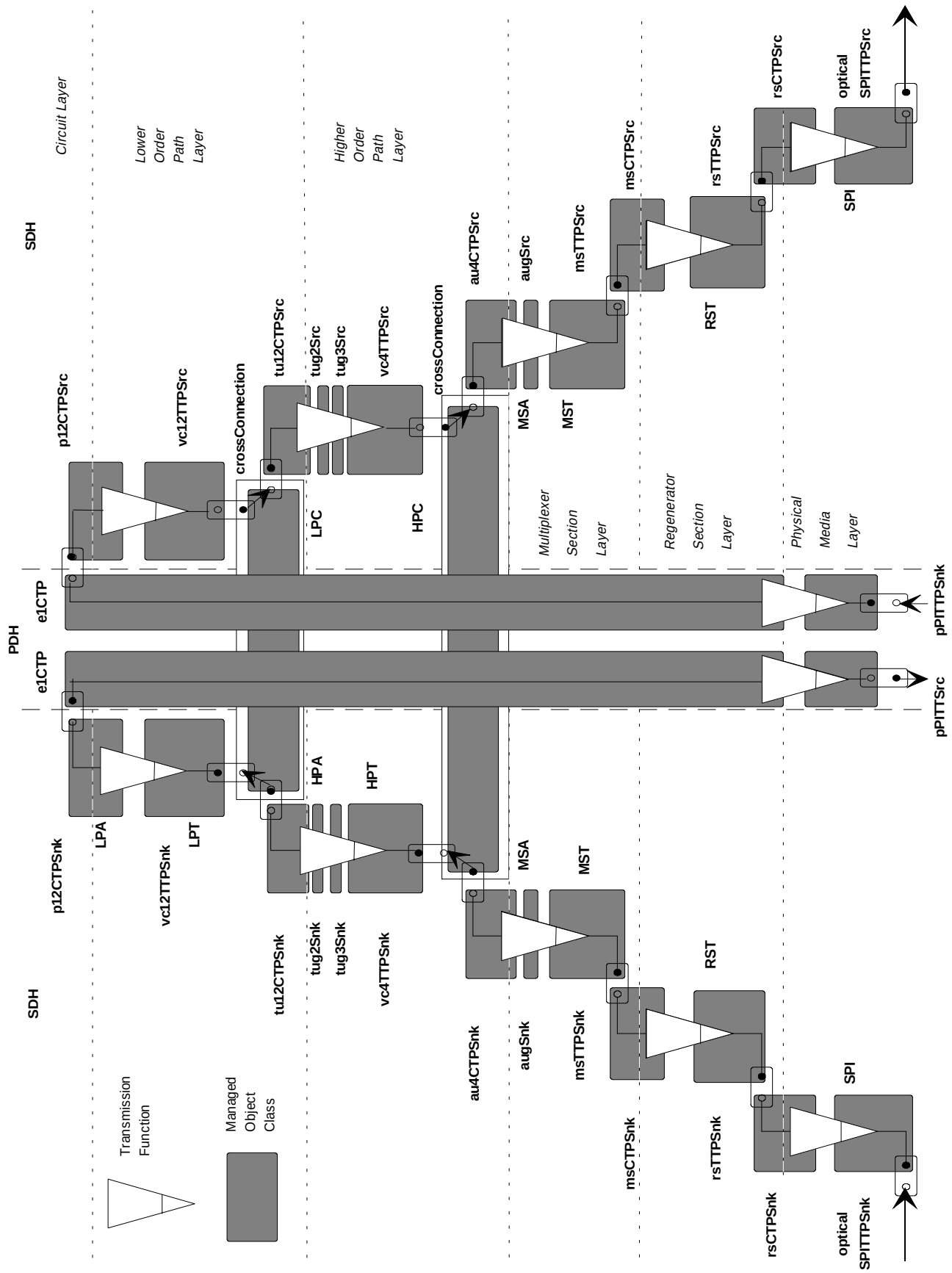
EXAMPLE 1: Add-Drop-Mux or SDXC4/1 with Au-4 cross-connection active.

Figure A.17 (sheet 1 of 3)



EXAMPLE 2: Add-Drop-Mux or SDXC4/1 with TU-12 cross-connection active.

Figure A.17 (sheet 2 of 3)



EXAMPLE 3: Add-Drop-Mux or SDXC4/1 with TU-12 cross-connection active.

Figure A.17 (sheet 3 of 3)

Annex B (informative): Mapping of G.783 defects on M.3100 or X.721 probable causes

Table B.1

Block in G.783		G.783 defect	G.774 probable cause	M.3100 probable cause
4-1	SPI	Receive loss of signal	LOS	lossOfSignal
4-1	SPI	Transmit fail	-	- Use transmitFailure from X.721
4-2	RST	Loss of frame	LOF	lossOfFrame
4-3	MST	Multiplex section AIS	AIS	aIS
4-3	MST	Excessive errors	excessive BER	transmissionError
4-3	MST	Signal degrade	signal degrade	degradedSignal
4-3	MST	Far end receive failure	FERF	farEndReceiverFailure
4-5	MSA	Loss of AU pointer	LOP	lossOfPointer
4-5	MSA	AU AIS	AIS	aIS
4-7	HPT	Mismatch of HO path trace ID	path trace mismatch	pathTraceMismatch
4-7	HPT	Mismatch of HO path signal label	signal label mismatch	payloadTypeMismatch
4-7	HPT	HO path FERF	FERF	farEndReceiverFailure
4-8	HPA	Loss of TU pointer	LOP	lossOfPointer
4-8	HPA	TU AIS	AIS	aIS
4-8	HPA	Loss of TU multiframe	loss of TU multiframe	lossOfFrame
4-10	LPT	*Mismatch of LO path trace ID (note 2)*	*path trace mismatch*	pathTraceMismatch
4-10	LPT	Mismatch of LO path signal label	signal label mismatch	payloadTypeMismatch
4-10	LPT	LO path FERF	FERF	farEndReceiverFailure
4-11	*LPA (note 1)*	*Frame alignment loss*	*LOF*	lossOfFrame
4-12	*PPI (note 1)*	*Loss of incoming tributary signal*	*LOS*	lossOfSignal
4-14	*HPOM (note 2)*	*Mismatch of HP path trace ID*	*path trace mismatch*	pathTraceMismatch
4-14	*HPOM (note 2)*	*Mismatch of HP path signal label*	*signal label mismatch*	*payloadTypeMismatch*
4-14	*HPOM (note 2)*	*HO path FERF*	*FERF*	*farEndReceiverFailure*
4-15	*LPOM (note 2)*	*Mismatch of LO path trace ID*	*path trace mismatch*	*pathTraceMismatch*
4-15	*LPOM (note 2)*	*Mismatch of LO path signal label*	*signal label mismatch*	*payloadTypeMismatch*
4-15	*LPOM (note 2)*	*LO path FERF*	*FERF*	*farEndReceiverFailure*

NOTE 1: Not currently expressed in CCITT Recommendation G.774 [12].
NOTE 2: Due to CCITT Recommendations G.709 or G.783 revision.

G.709: CCITT Recommendation G.709
G.774: CCITT Recommendation G.774 [12]
G.783: CCITT Recommendation G.783
M.3100: CCITT Recommendation M.3100 [14]

Annex C (informative): Bibliography

The following references are given for information.

1) CCITT Recommendation G.707: "Synchronous digital hierarchy bit rates".

2) CCITT Recommendation G.708: "Network node interface for the synchronous digital hierarchy".

3) CCITT Recommendation G.709: "Synchronous multiplexing structure".

4) CCITT Recommendation G.773: "Protocol suites for Q-interfaces for management of transmission systems".

5) CCITT Recommendation G.781: "Structure of Recommendations on multiplexing equipment for the synchronous digital hierarchy (SDH)".

6) CCITT Recommendation G.782: "Types and general characteristics of synchronous digital hierarchy (SDH) multiplexing equipment".

7) CCITT Recommendation G.783: "Characteristics of synchronous digital hierarchy (SDH) multiplexing equipment functional blocks".

8) CCITT Recommendation G.784: "Synchronous digital hierarchy (SDH) management".

9) CCITT Recommendation G.803: "SDH Architecture".

10) CCITT Recommendation G.831: "SDH Architecture".

11) CCITT Recommendation M.60: "TMN Terminology".

12) CCITT Recommendation M.3010: "TMN Definitions".

13) CCITT Recommendation Q.811: "Q3 Lower layers Protocols".

14) CCITT Recommendation Q.812: "Q3 Higher layers Protocols".

15) ETS 300 417: "Transmission and Multiplexing (TM); Generic functional requirements for Synchronous Digital Hierarchy (SDH) transmission equipment".

History

Document history	
November 1994	First Edition
December 1995	Converted into Adobe Acrobat Portable Document Format (PDF)