INTERNATIONAL TELECOMMUNICATION UNION

ITU-T G.774.9

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(02/2001)

SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Digital terminal equipments – Operations, administration and maintenance features of transmission equipment

Synchronous digital hierarchy (SDH) – Configuration of linear multiplex-section protection for the network element view

ITU-T Recommendation G.774.9

(Formerly CCITT Recommendation)

ITU-T G-SERIES RECOMMENDATIONS

TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

INTERNATIONAL TELEPHONE CONNECTIONS AND CIRCUITS	G.100–G.199
GENERAL CHARACTERISTICS COMMON TO ALL ANALOGUE CARRIER-TRANSMISSION SYSTEMS	G.200–G.299
INDIVIDUAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON METALLIC LINES	G.300–G.399
GENERAL CHARACTERISTICS OF INTERNATIONAL CARRIER TELEPHONE SYSTEMS ON RADIO-RELAY OR SATELLITE LINKS AND INTERCONNECTION WITH METALLIC LINES	G.400–G.449
COORDINATION OF RADIOTELEPHONY AND LINE TELEPHONY	G.450–G.499
TESTING EQUIPMENTS	G.500–G.599
TRANSMISSION MEDIA CHARACTERISTICS	G.600–G.699
DIGITAL TERMINAL EQUIPMENTS	G.700–G.799
General	G.700–G.709
Coding of analogue signals by pulse code modulation	G.710–G.719
Coding of analogue signals by methods other than PCM	G.720–G.729
Principal characteristics of primary multiplex equipment	G.730–G.739
Principal characteristics of second order multiplex equipment	G.740–G.749
Principal characteristics of higher order multiplex equipment	G.750–G.759
Principal characteristics of transcoder and digital multiplication equipment	G.760–G.769
Operations, administration and maintenance features of transmission equipment	**G.770–G.779**
Principal characteristics of multiplexing equipment for the synchronous digital hierarchy	G.780–G.789
Other terminal equipment	G.790–G.799
DIGITAL NETWORKS	G.800–G.899
DIGITAL SECTIONS AND DIGITAL LINE SYSTEM	G.900–G.999

For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation G.774.9

Synchronous digital hierarchy (SDH) – Configuration of linear multiplex-section protection for the network element view

Summary

This Recommendation provides an information model for the Synchronous Digital Hierarchy (SDH) Network. This model describes the managed object classes and their properties for the configuration of the protection switching function, as defined in ITU-T G.805 and G.774.3 and as related to SDH transmission resources. These objects are useful to describe information exchanged across interfaces defined in M.3010 Telecommunications Management Network (TMN) architecture for the configuration of the protection function. The protection switching scheme of an SDH network element is usually set up autonomously by the network element according to its make-up and mode of operation. When this is not possible, the information model defined by this Recommendation will be used. Post-configuration management of the protection function is described in ITU-T G.774.3.

Document History	
Issue	**Notes**
2001	First revision incorporated the changes documented in the G.774 series Implementor Guide.
2/1998	Initial version of the Recommendation.

Source

ITU-T Recommendation G.774.9 was revised by ITU-T Study Group 15 (2001-2004) and approved under the WTSA Resolution 1 procedure on 9 February 2001.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

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

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

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

CONTENTS

ITU-T Recommendation G.774.9

Synchronous digital hierarchy (SDH) – Configuration of linear multiplex-section protection for the network element view

1 Scope

ITU-T G.774.3 defines an information model for management of fixed linear Multiplex Section Protection (MSP) groups. This Recommendation defines the object model that allows to configure flexible linear MSP groups in accordance with the requirements described in ITU-T G.784. This model can be used to establish, modify and remove MSP groups for Network Elements that require external provisioning to configure their protection switching schemes. The protection switching scheme of an SDH network element is usually set up autonomously by the network element according to its make-up and mode of operation. When this is not possible, the information model defined by this Recommendation will be used. Post-configuration control of the protection function is carried out by means of the object model defined in ITU-T G.774.3.

Structure of this Recommendation

Clause 5.1 provides an overview of the SDH protection configuration information model. Clauses 6-15 describe the information model using the notation mechanisms defined in ITU-T X.722 Guidelines for the Definition of Managed Objects. Clause 15 contains the syntax definitions of the information carried in the protocol using Abstract Syntax Notation One (ASN.1) defined in ITU-T X.680-X.683. Naming and Inheritance are illustrated in Appendix I.

2 References

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

- ITU-T G.707/Y.1322 (2000), *Network node interface for the synchronous digital hierarchy (SDH)*.
- ITU-T G.773 (1993), *Protocol suites for Q-interfaces for management of transmission systems*.
- ITU-T G.774 (2001), *Synchronous digital hierarchy (SDH) – Management information model for the network element view*.
- ITU-T G.783 (2000), *Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks*.
- ITU-T G.784 (1999), *Synchronous digital hierarchy (SDH) management*.
- ITU-T G.803 (2000), *Architecture of transport networks based on the synchronous digital hierarchy (SDH)*.
- ITU-T G.831 (2000), *Management capabilities of transport networks based on the synchronous digital hierarchy (SDH)*.
- ITU-T G.958 (1994), *Digital line systems based on the synchronous digital hierarchy for use on optical fibre cables*.

– ITU-T M.60 (1993), *Maintenance terminology and definitions*.

– ITU-T M.2120 (2000), *PDH path, section and transmission system and SDH path and multiplex section fault detection and localization procedures*.

– ITU-T M.3010 (2000), *Principles for a telecommunications management network*.

– ITU-T M.3013 (2000), *Considerations for a telecommunications management network*.

– ITU-T M.3100 (1995), *Generic network information model*.

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

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

– ITU-T Q.822 (1994), *Stage 1, Stage 2 and Stage 3 description for the Q3-interface – Performance management*.

– ITU-T X.680 to X.683 (1997), *Information technology – Abstract Syntax Notation One (ASN.1)*.

– ITU-T X.701 (1997), *Information technology – Open Systems Interconnection – Systems management overview*.

– ITU-T X.710 (1997), *Information technology – Open Systems Interconnection – Common management information service*.

– ITU-T X.711 (1997), *Information technology – Open Systems Interconnection – Common management information protocol: Specification*.

– ITU-T X.720 (1992), *Information technology – Open Systems Interconnection – Structure of Management Information: Management information model, plus* Amd.1 (1995) and Cor.1 (1994).

– ITU-T X.721 (1992), *Information technology – Open Systems Interconnection – Structure of management information: Definition of management information, plus* Cor.1 (1994), Cor.2 (1996), Cor.3 (1998) and Cor.4 (2000).

– ITU-T X.722 (1992), *Information technology – Open Systems Interconnection – Structure of management information: Guidelines for the definition of managed objects, plus* Amd.1 (1995), Amd.2 (1997) and Cor.1 (1996).

– ITU-T X.730 (1992), *Information technology – Open Systems Interconnection – Systems Management: Object management function, plus* Amd.1 (1995) and Amd.1/Cor.1 (1996).

– ITU-T X.731 (1992), *Information technology – Open Systems Interconnection – Systems Management: State management function, plus* Amd.1 (1995), Cor.1 (1995) and Amd.1/Cor.1 (1996).

– ITU-T X.733 (1992), *Information technology – Open Systems Interconnection – Systems Management: Alarm reporting function, plus* Cor.1 (1994), Amd.1 (1995), Amd.1/Cor.1 (1996) and Cor.2 (1999).

– ITU-T X.734 (1992), *Information technology – Open Systems Interconnection – Systems Management: Event report management function, plus* Cor.1 (1994), Amd.1 (1995), Amd.1/Cor.1 (1996) and Cor.2 (1999).

– ITU-T X.735 (1992), *Information technology – Open Systems Interconnection – Systems Management: Log control function, plus* Amd.1 (1995) and Amd.1/Cor.1 (1996).

3 Terms and definitions

This Recommendation uses the terms and definitions defined in ITU-T G.774, ITU-T G.784 and ITU-T M.3100.

4 Abbreviations

This Recommendation uses the following abbreviations:

APDU	Application Protocol Data Unit
APS	Automatic Protection Switching
CMIP	Common Management Information Protocol
CMIS	Common Management Information Service
CTP	Connection Termination Point
ISO	International Organization for Standardization
ITU	International Telecommunication Union
LOS	Loss Of Signal
MS	Multiplex Section
MSP	Multiplex Section Protection
NE	Network Element
OS	Operations System
OSI	Open Systems Interconnection
Pkg	Package
RDN	Relative Distinguished Name
SDH	Synchronous Digital Hierarchy
SF	Signal Fail
STM-N	Synchronous Transport Module N
TMN	Telecommunications Management Network
TP	Termination Point
TTP	Trail Termination Point
WTR	Wait-To-Restore

5 Multiplex-section protection configuration management model

5.1 Overview

ITU-T G.774.3 defines a generic model for protection schemes and the specific model for SDH MS protection. The model defined in ITU-T G.774.3 allows full operation and control of the MS protection function for Network Elements that set up autonomously their protection switching schemes, according to their make-up and mode of operation.

Some Network Elements, due to equipment flexibility, require external provisioning to determine the configuration of their MS protection schemes, particularly as to the definition of the lines participating in the protection.

This clause provides Managed Objects to support configuration of MS protection groups in SDH Network Elements.

This model is a compatible extension that supports external creation and deletion of SDH MS protection groups and units to the model defined in ITU-T G.774.3.

5.2 Requirements

The information model defined in this Recommendation is based on the same approach as used in ITU-T G.774.3 that identifies generic objects to support general protection functional requirements plus specific subclasses for the particular purposes of Multiplex Section Protection.

The functional requirements for configuration management of Multiplex Section Protection groups may be found in ITU-T G.784.

5.2.1 Generic protection configuration requirements

The general functional requirements for the configuration of protection schemes are:

– the ability for a managing system to establish a protection scheme, indicating the protection mode (revertive/non revertive), the entities participating in the protection, their role (protecting/protected), and possibly their priority;[1]

– the ability for a managing system to modify a protection scheme, adding or removing entities and/or modifying their protection characteristics (role and priority);

– the ability for a managing system to suppress a protection scheme.

5.2.2 Specific SDH MS linear protection configuration requirements

The specific functional requirements for the configuration of SDH MS protection schemes are:

– the ability for a managing system to specify the type of protection (unidirectional/bidirectional) and to enable or disable the K1, K2 protocol when establishing a protection scheme;[1]

– the ability for a managing system to specify the channel number and priority (high/low) associated to each protection line and optionally control extra-traffic on each protection line when establishing or modifying a protection scheme.[1]

5.3 Model overview

The information model specified in this Recommendation defines a generic object (protectionCoordinator) that includes the actions (namely establishProtection, modifyProtection, dismissProtection), necessary to configure a generic protection scheme.

A subclass of protectionCoordinator (sdhMSProtectionCoordinator) is then defined for the specific purposes of SDH MS Protection configuration. Such object class inherits all of the actions and behavior defined in the protectionCoordinator superclass and specifies the additional information needed to establish or modify a protection scheme in the particular case of SDH MSP.

---

[1] These parameters can be configured when establishing the protection scheme. Subsequent modifications may be achieved by using ITU-T G.774.3.

6 Managed object class definitions

6.1 Protection coordinator

```
protectionCoordinator MANAGED OBJECT CLASS
     DERIVED FROM   "Recommendation X.721":top;
     CHARACTERIZED BY
          protectionCoordinatorPkg PACKAGE
               BEHAVIOUR protectionCoordinatorBeh;
               ATTRIBUTES
                    protectionCoordinatorId GET;
               ACTIONS
                    establishProtection          protectionConfigurationError,
                    dismissProtection            removeProtectionError,
                    modifyProtection             protectionConfigurationError
                                                 removeProtectionError;;;
REGISTERED AS {g774-09MObjectClass 1};
protectionCoordinatorBeh BEHAVIOUR
     DEFINED AS
     *This object class allows the management system to configure the protection
     schemes of a network element. Instances of this class or of its subclasses
     are created at system start-up and can never be deleted.*;
```

6.2 SDH MS protection coordinator

```
sdhMSProtectionCoordinator MANAGED OBJECT CLASS
     DERIVED FROM       protectionCoordinator;
     CHARACTERIZED BY
          sdhMSProtectionCoordinatorPkg PACKAGE
               BEHAVIOUR sdhMSProtectionCoordinatorBeh;
               ACTIONS
                    establishProtection          mSPGroupConfigurationParameter
                                                 mSPUnitConfigurationParameter
                                                 mSPConfigurationError,
                    modifyProtection             mSPUnitConfigurationParameter
                                                 mSPConfigurationError;;;
REGISTERED AS {g774-09MObjectClass 2};
sdhMSProtectionCoordinatorBeh BEHAVIOUR
     DEFINED AS
     *This object class is used specifically to configure SDH MS protection
     schemes. Only one instance can be created in one NE.
     When the establishProtection action is successfully performed one
     sdhMSProtectionGroup instance and as many sdhMSProtectionUnit instances are
     created as specified by the action information. The
     unreliableResourcePointer of each sdhMSProtectionUnit will point to the
     unprotectedCTP indicated by the unreliableObjects field of the action
     information. The reliableResourcePointer will point to the protectedTTP
     connected to the unprotectedCTP, unless the protectionUnit is protecting and
     extra-traffic is not required or not supported. In this case the
     reliableResourcePointer is NULL.
     UnprotectedCTPs and protectedTTPs are anyhow instantiated for sections which
     can potentially be included in a protection group irrespective whether
     protection is actually present or not. When a section is not part of a
     protection group, the crossConnectionObjectPointer of the unprotectedCTP and
     protectedTTP point to the sdhMSProtectionCoordinator object instance. When
     protection is established the crossConnectionObjectPointer points to the
     associated sdhMSprotectionUnit. When it is possible, unprotectedCTPs and
     protectedTTPs may be created/deleted as a result of the
     establish/modify/dismiss actions.*;
```

7 Packages

None.

8 Attributes

8.1 Protection coordinator Id

```
protectionCoordinatorId          ATTRIBUTE
     WITH ATTRIBUTE SYNTAX       SDHProtCoordASN1.NameType;
     MATCHES FOR        EQUALITY;
     BEHAVIOUR     protectionCoordinatorIdBeh;
REGISTERED AS {g774-09Attribute 1};
protectionCoordinatorIdBeh BEHAVIOUR
     DEFINED AS
     *The protectionCoordinatorId attribute is an attribute type whose
     distinguished value can be used as an RDN when naming an instance of the
     protectionCoordinator object class.*;
```

9 Actions

9.1 Dismiss protection

```
dismissProtection           ACTION
     BEHAVIOUR dismissProtectionBeh;
     MODE CONFIRMED;
     WITH INFORMATION SYNTAX     SDHProtCoordASN1.DismissProtectionInfo;
     REGISTERED AS {g774-09Action 1};
     dismissProtectionBeh BEHAVIOUR DEFINED AS
     *This action is used to dismiss a protection scheme. The protectionGroup
     object instance indicated in the action argument and all the contained
     protectionUnits are deleted. After the execution of this action all the
     resources previously participating in the protection scheme will operate in
     an unprotected mode. Yet, protectedTTPs and unprotectedCTPs will remain to
     allow for future participation in other protection groups.
     The action fails if manual or forced switch commands are active on any of
     the protection units.
     Automatic switches present before the deletion are implicitly released as a
     side effect. No notification is sent to report the release of automatic
     switches.*;
```

9.2 Establish protection

```
establishProtection              ACTION
     BEHAVIOUR establishProtectionBeh;
     MODE CONFIRMED;
     WITH INFORMATION SYNTAX     SDHProtCoordASN1.EstablishProtectionInfo;
     REGISTERED AS {g774-09Action 2};
establishProtectionBeh BEHAVIOUR DEFINED AS
     *This action is used to create a protection scheme within a network element.
     When applied, one protectionGroup object instance is created.
     The protectionUnits field indicates the protection resources which will
     participate in the protection scheme and their role (protected/protecting).
     One protectionUnit instance is created for each element of the
     protectionUnits field. The unreliableResourcePointer, the protecting and the
     priority attributes of each protectionUnit are initialized with the value
     provided by the ProtectionResource sequence (priority optional). The
     priority must be assigned either to all protected (or protecting) units or
     to none. At least one protected and one protecting protection units must be
     provided by the managing system. The specificPUConfiguration field allows to
```

define additional protection unit attributes for specific subclasses of the **protectionUnit** class. The specific parameter to be used is defined in **protectionCoordinator** subclasses.
The optional **protectionGroupType** field is used to discriminate whether the protection type is 1+1 (plus) or M:N (colon). The **protectionGroupType** attribute of the **protectionGroup** object instance will be set accordingly. This field can be present only when the managing system indicated one protected and one protecting resource; if, in this case, it is absent the NE will set the **protectionGroupType** attribute according to its own capabilities.
The optional **revertiveInformation** field allows the managing system to ask for a revertive/non-revertive protection scheme and, only if revertive is set to TRUE, to assign the wait-to-restore time. If the **revertiveInformation** is not present the NE will set the revertive and **waitToRestoreTime** attributes according to its own capabilities.
The **specificPGConfiguration** field allows to define additional protection group attributes for specific subclasses of the **protectionGroup** class. The specific parameter to be used is defined in **protectionCoordinator** subclasses.*;

9.3 Modify protection

```
modifyProtection            ACTION
     BEHAVIOUR modifyProtectionBeh;
     MODE CONFIRMED;
     WITH INFORMATION SYNTAX     SDHProtCoordASN1.ModifyProtectionInfo;
     REGISTERED AS {g774-09Action 3};
modifyProtectionBeh BEHAVIOUR DEFINED AS
     *This action is used to add and/or remove one or more resources from a
     protectionGroup. Action requests that would reduce to zero the number of
     protected or protecting units will be rejected.
     If the protectionGroupType was 1+1 (plus) and one or more protection units
     are added, it automatically switches to M:N (colon).
     The action fails if manual or forced switch commands are active on any of
     the protection units under removal.
     Automatic switches present before the deletion of a protectionUnit are
     implicitly released as a side effect.*;
```

10 Notifications

None.

11 Parameters

11.1 MSP configuration error

```
mSPConfigurationError       PARAMETER
     CONTEXT SPECIFIC-ERROR;
     WITH SYNTAX   SDHProtCoordASN1.MSPConfigurationError;
     BEHAVIOUR mSPConfigurationErrorBeh;
     REGISTERED AS {g774-09Parameter 1};
mSPConfigurationErrorBeh    BEHAVIOUR DEFINED AS
     *This parameter is included in the error parameter of the CMIP APDU when the
     establishProtection or modifyProtection action received by the
     sdhMSPProtectionCoordinator fails for specific MSP configuration
     inconsistencies.*;
```

11.2 MSP group configuration parameter

```
mSPGroupConfigurationParameter   PARAMETER
     CONTEXT ACTION-INFO;
     WITH SYNTAX   SDHProtCoordASN1.MSPGroupConfigurationParameter;
     BEHAVIOUR     mSPGroupConfigurationParameterBeh;
     REGISTERED AS {g774-09Parameter 2};
mSPGroupConfigurationParameterBehBEHAVIOUR DEFINED AS
     *This parameter is used in the specificPGConfiguration field of the
     establishProtection action received by the sdhMSPProtectionCoordinator, when
     the establishment of a sdhMSProtectionGroup is requested by the management
     system.
     The protectionSwitchMode field indicates whether protection switching is
     done on a unidirectional or bidirectional basis.
     The aPSProtocolPresent boolean field indicates whether the K1/K2 protocol is
     used. The protectionMismatchStatusPkg conditional package of the
     sdhMSProtectionGroup object is instantiated if aPSProtocolPresent value is
     TRUE.*;
```

11.3 MSP unit configuration parameter

```
mSPUnitConfigurationParameter         PARAMETER
     CONTEXT ACTION-INFO;
     WITH SYNTAX   SDHProtCoordASN1.MSPUnitConfigurationParameter;
     BEHAVIOUR mSPUnitConfigurationParameterBeh;
     REGISTERED AS {g774-09Parameter 3};
mSPUnitConfigurationParameterBeh BEHAVIOUR DEFINED AS
     *This parameter is used in the specificPUConfiguration field of the
     establishProtection or modifyProtection action received by the
     sdhMSPProtectionCoordinator, when the establishment or modification of a
     sdhMSProtectionGroup is requested by the management system.
     The channelNumber field indicates the channel number associated with the
     protection unit.
     The sdhPriority field indicated the priority (High/Low) of the protected
     protection unit. For protecting protection units this field is not present.
     If the extraTrafficControl field is present the extraTrafficControlPkg is
     instantiated in the protectionUnit object instance. The administrativeState
     is initialized with the value provided by this field. This field can only be
     present if the aPSProtocolPresent value is set to true and if the protection
     unit is protecting.*;
```

11.4 Protection configuration error

```
protectionConfigurationError     PARAMETER
     CONTEXT SPECIFIC-ERROR;
     WITH SYNTAX   SDHProtCoordASN1.ProtectionConfigurationError;
     BEHAVIOUR protectionConfigurationErrorBeh;
     REGISTERED AS {g774-09Parameter 4};
protectionConfigurationErrorBeh       BEHAVIOUR DEFINED AS
     *This parameter is included in the error parameter of the CMIP APDU when the
     establishProtection or modifyProtection action received by a subclass of the
     protectionCoordinator fails for generic configuration inconsistencies.*;
```

11.5 Remove protection error

```
removeProtectionError        PARAMETER
     CONTEXT SPECIFIC-ERROR;
     WITH SYNTAX   SDHProtCoordASN1.RemoveProtectionError;
     BEHAVIOUR removeProtectionErrorBeh;
     REGISTERED AS {g774-09Parameter 5};
removeProtectionErrorBeh          BEHAVIOUR DEFINED AS
```

```
    *This parameter is included in the error parameter of the CMIP APDU when the
    dismissProtection or modifyProtection action received by a subclass of the
    protectionCoordinator fails.
    The operatorCommandPresent result is returned when a manual or forced switch
    is present in the protection group. It shall indicate the involved
    protection units.*;
```

12 Name binding definitions

12.1 Protection coordinator

```
protectionCoordinator-sdhNE           NAME BINDING
    SUBORDINATE OBJECT CLASS    protectionCoordinator AND SUBCLASSES;
    NAMED BY
    SUPERIOR OBJECT CLASS       "Recommendation G.774":sdhNE AND SUBCLASSES;
    WITH ATTRIBUTE     protectionCoordinatorId;
    BEHAVIOUR          protectionCoordinator-sdhNEBeh;
    REGISTERED AS {g774-09NameBinding 1};
protectionCoordinator-sdhNEBeh   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.*;
```

13 Subordination rules

None.

14 Pointer constraints

None.

15 Supporting ASN.1 productions

```
SDHProtCoordASN1 {itu-t(0) recommendation(0) g(7) g774(774) hyphen(127)
protCoord(9) informationModel(0) asn1Module(2) sdhmspcoord(0)}
DEFINITIONS IMPLICIT TAGS ::=
BEGIN


-- EXPORTS everything
IMPORTS
AdditionalInformation, AdministrativeState FROM Attribute-ASN1Module {joint-iso-
ccitt ms(9) smi(3) part2(2) asn1Module(2) 1}
ObjectInstance FROM CMIP-1 {joint-iso-ccitt ms(9) cmip(1) modules(0) protocol(3)}
NameType FROM ASN1DefinedTypesModule {itu-t(0) recommendation(0) m(13) gnm(3100)
informationModel(0) asn1Modules(2) asn1DefinedTypesModule(0)}
ProtectionGroupType, ProtectionSwitchMode, ResourcePointer, SDHMSPriority FROM
SDHProtASN1 {itu-t(0) recommendation(0) g(7) g774(774) hyphen(127) prot(03)
informationModel(0) asn1Module(2) sdhmsp(0)};
sdhProtCoord OBJECT IDENTIFIER ::= {itu-t(0) recommendation(0) g(7) g774(774)
hyphen(127) protCoord(9) informationModel(0)}
g774-09MObjectClass OBJECT IDENTIFIER ::= {sdhProtCoord managedObjectClass(3)}
g774-09NameBinding OBJECT IDENTIFIER ::= {sdhProtCoord nameBinding(6)}
g774-09Attribute OBJECT IDENTIFIER ::= {sdhProtCoord attribute(7)}
g774-09Action OBJECT IDENTIFIER ::= {sdhProtCoord action(9)}
g774-09Parameter OBJECT IDENTIFIER ::= {sdhProtCoord parameter(5)}
AddedProtectionUnits ::= ProtectionUnits
DismissedProtectionGroup ::= ObjectInstance
DismissProtectionInfo ::= DismissedProtectionGroup
```

```
EstablishProtectionInfo ::= SEQUENCE {
                        protectionUnits             ProtectionUnits,
                        protectionGroupType         ProtectionGroupType OPTIONAL,
                        revertiveInformation        RevertiveInformation OPTIONAL,
                        specificPGConfiguration     AdditionalInformation OPTIONAL
                            }
IncompatibleWithNEConfig ::= CHOICE {
                            alreadyProtected          [0] ObjectInstance,
                            otherIncompatibility      [1] NULL
                                }
InconsistentData ::= ENUMERATED {
                        exceedingProtectingUnits                  (0),
                        exceedingUnitsFor1Plus1                   (1),
                        duplicateUnreliable                       (2),
                        nonRevertiveIncompatibleWith1ToN          (3),
                        incompletePriorityAssignment              (4),
                        otherError                                (5)
                            }
ModifiedProtectionGroup ::= ObjectInstance
ModifyProtectionInfo ::= SEQUENCE {
                         modifiedProtectionGroup ModifiedProtectionGroup,
                         addedProtectionUnits   [0] AddedProtectionUnits OPTIONAL,
                         removedProtectionUnits [1] RemovedProtectionUnits OPTIONAL
                            }
MSPConfigurationError ::= ENUMERATED {
                                protectionSwitchModeNotSupported       (0),
                                aPSProtocolNotSupported                (1),
                                invalidChannelNumber                   (2),
                                notSupportedSDHPriority                (3),
                                extraTrafficControlNotSupported        (4),
                                otherError                             (5)
                                }
MSPGroupConfigurationParameter ::= SEQUENCE {
                                protectionSwitchMode       ProtectionSwitchMode,
                                aPSProtocolPresent         BOOLEAN
                                }
MSPUnitConfigurationParameter ::= SEQUENCE {
                                channelNumber        INTEGER,
                                sdhPriority          SDHMSPriority OPTIONAL,
                                extraTrafficControl  AdministrativeState
OPTIONAL
                                }
OperatorCommandPresent ::= SET OF ResourcePointer
ProtectionConfigurationError ::= CHOICE {
                    inconsistentData             [0] InconsistentData,
                    unsupportedProtConfiguration [1] UnsupportedProtConfiguration,
                    incompatibleWithNEConfig     [2] IncompatibleWithNEConfig
                            }

ProtectionResource ::= SEQUENCE  {
                            unreliableObjects       ResourcePointer,
                            protecting              BOOLEAN,
                            priority                INTEGER OPTIONAL,
                            specificPUConfiguration AdditionalInformation OPTIONAL
                            }
ProtectionUnits ::= SET OF ProtectionResource
RemoveProtectionError ::= OperatorCommandPresent
RemovedProtectionUnits ::= SET OF ObjectInstance
RevertiveInformation ::= SEQUENCE {
                            revertive              BOOLEAN,
                            waitToRestoreTime      INTEGER OPTIONAL
                            }
```

```
UnsupportedProtConfiguration ::= ENUMERATED {
                        notSupportedProtConfig        (0),
                        notSupportedPGType            (1),
                        notSupportedRevertiveMode     (2),
                        invalidWTRTime                (3),
                        invalidPriority               (4),
                        otherError                    (5)
                        }
END -- end of SDHProtCoordASN1
```

APPENDIX I

Naming and inheritance diagrams

The naming and inheritance trees cover only the managed object classes of this Recommendation. See Figures I.1 and I.2.

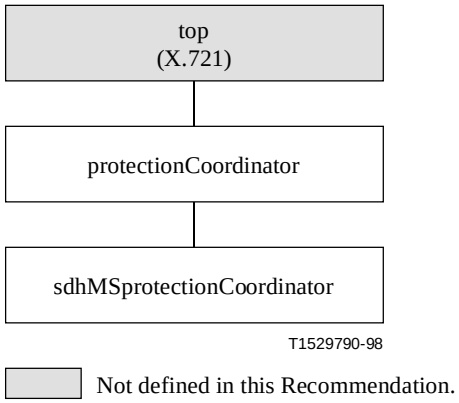

Figure I.1/G.774.9 – SDH MS configuration inheritance diagram

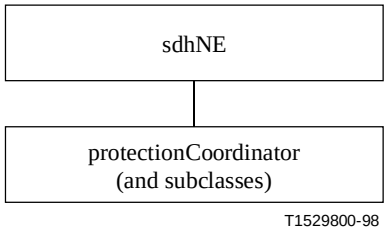

Figure I.2/G.774.9 – SDH MS configuration naming diagram

SERIES OF ITU-T RECOMMENDATIONS

Series A	Organization of the work of ITU-T
Series B	Means of expression: definitions, symbols, classification
Series C	General telecommunication statistics
Series D	General tariff principles
Series E	Overall network operation, telephone service, service operation and human factors
Series F	Non-telephone telecommunication services
Series G	**Transmission systems and media, digital systems and networks**
Series H	Audiovisual and multimedia systems
Series I	Integrated services digital network
Series J	Cable networks and transmission of television, sound programme and other multimedia signals
Series K	Protection against interference
Series L	Construction, installation and protection of cables and other elements of outside plant
Series M	TMN and network maintenance: international transmission systems, telephone circuits, telegraphy, facsimile and leased circuits
Series N	Maintenance: international sound programme and television transmission circuits
Series O	Specifications of measuring equipment
Series P	Telephone transmission quality, telephone installations, local line networks
Series Q	Switching and signalling
Series R	Telegraph transmission
Series S	Telegraph services terminal equipment
Series T	Terminals for telematic services
Series U	Telegraph switching
Series V	Data communication over the telephone network
Series X	Data networks and open system communications
Series Y	Global information infrastructure and Internet protocol aspects
Series Z	Languages and general software aspects for telecommunication systems

Geneva, 2001