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

Digital sections and digital line system – Optical line systems for local and access networks

ONT management and control interface specifications for B-PON system with protection features

ITU-T Recommendation G.983.6

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ITU-T Recommendation G.983.6

ONT management and control interface specifications for B-PON system with protection features

Summary

This Recommendation describes the optical network terminal management and control interface (OMCI) specifications for broadband passive optical networks (B-PONs). In order to provide support for protected B-PON systems specified in ITU-T Rec. G.983.5 "A broadband optical access system with enhanced survivability," additional OMCI specifications are required. This Recommendation describes the enhanced OMCI specifications for a B-PON system with protection features. The enhancements described include the addition of protection-related attributes to existing managed entities, managed entity relations diagrams for protected systems, and detailed scenarios for OMCI start-up/tear-down/switch-over and for virtual path (VP) configuration/removal in protected B-PON systems.

Source

ITU-T Recommendation G.983.6 was prepared by ITU-T Study Group 15 (2001-2004) and approved under the WTSA Resolution 1 procedure on 13 June 2002.

FOREWORD

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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.

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As of the date of approval of this Recommendation, ITU had 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.983.6

ONT management and control interface specifications for B-PON system with protection features

1 Scope

This Recommendation focuses on the OMCI specifications related to B-PON systems with protection features as defined by ITU-T Rec. G.983.5. Though the OMCI specifications are based on ITU-T Rec. G.983.2, some enhancements are needed. The scope of this Recommendation is limited to the enhancements only.

This Recommendation describes the following:

– the ONT model and MIB relation diagrams;

– new attributes for some existing managed entities;

– OMCI start-up, tear-down, and switch-over scenarios and protected VP configuration and removal scenarios (Appendix I).

2 References

The following ITU-T Recommendations 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 currently valid ITU-T Recommendations is regularly published.

[1] ITU-T Recommendation G.983.1 (1998), *Broadband optical access systems based on Passive Optical Networks (PON)*. Also refer to Corrigendum 1 (1999).

[2] ITU-T Recommendation G.983.2 (2002), *ONT management and control interface specification for B-PON*.

[3] ITU-T Recommendation G.983.5 (2002), *A broadband optical access system with enhanced survivability*.

3 Abbreviations

This Recommendation uses the following abbreviations:

ANI	Access Node Interface
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
B-PON	Broadband Passive Optical Network
FTTB	Fibre to the Building
FTTBusiness	Fibre to the Business
FTTC	Fibre to the Curb
FTTCab	Fibre to the Cabinet
FTTH	Fibre to the Home
LT	Line Terminal

ME	Managed Entity
MIB	Management Information Base
OLT	Optical Line Terminal
OMCI	ONT Management and Control Interface
ONT	Optical Network Terminal
PON	Passive Optical Network
PPTP	Physical Path Termination Point
UNI	User Network Interface
VC	Virtual Channel
VP	Virtual Path

4 Reference model and terms

4.1 OMCI reference models for protected B-PON systems

The reference model for an unprotected B-PON system is described in 4.1/G.983.2 and Figure 1/G.983.2. This clause describes reference models for protected B-PON systems. Three reference logical models are possible. Models 1 and 2 correspond to protection architectures described in ITU-T Rec. G.983.5. Model 3 describes an additional protection scheme option.

1) **Reference model-1**

In this model, the termination point of the OMCI is common between the working side and the protection side (Figure 1). The OMCI specifications are described in this Recommendation.

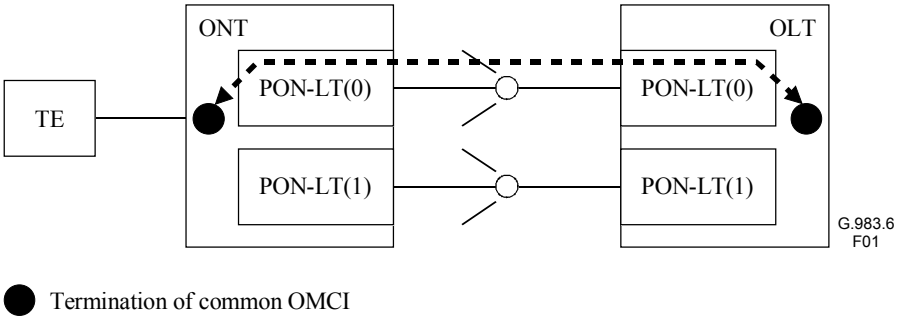

Figure 1/G.983.6 – Reference model-1

2) **Reference model-2**

In this model, the OMCI has two distinct termination points: one for the working side and one for the protection side (Figure 2). The OMCI specifications are the same as those described in ITU-T Rec. G.983.2.

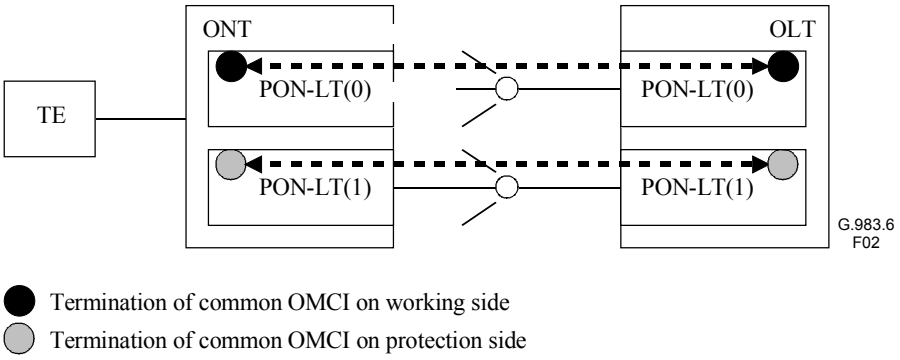

Figure 2/G.983.6 – Reference model-2

3) **Reference model-3**

In this model, the OMCI has two distinct termination points: one for the working side and one for the protection side. In addition, this model includes separate ONTs for the working side and the protection side (Figure 3). The OMCI specifications for this model are the same as those for reference model 2.

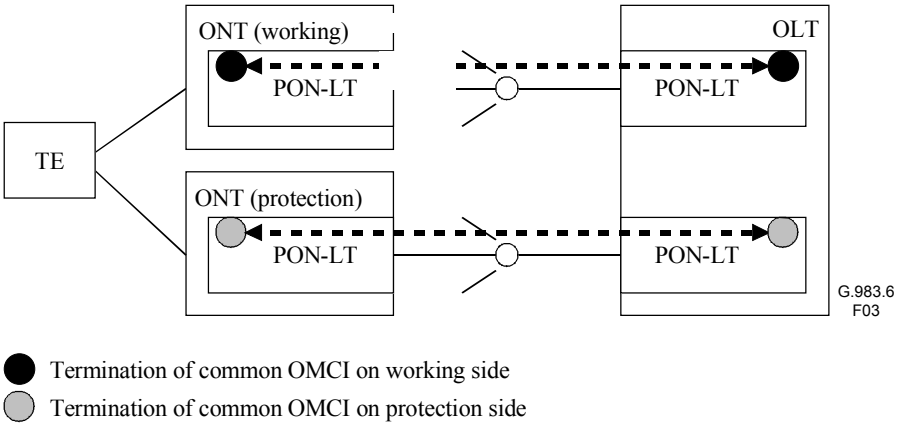

Figure 3/G.983.6 – Reference model-3

4.2 ONT functions

The functions in the whole ONT are described in 4.2/G.983.2 and Figure 2/G.983.2. This clause focuses on the ANI side in the ONT.

According to ITU-T Rec. G.983.5, there are two types of protection architecture: 1+1 architecture and 1:1 architecture. Thus, two models can be considered when describing the relationship between ONT features and protection features.

1) **1+1 model**

Figure 4 shows a 1+1 model ONT. In this model, the traffic in the working entity and the traffic in the protection entity are the same. The TC Adaptor provides the same traffic to the working PON-LT and the protection PON-LT.

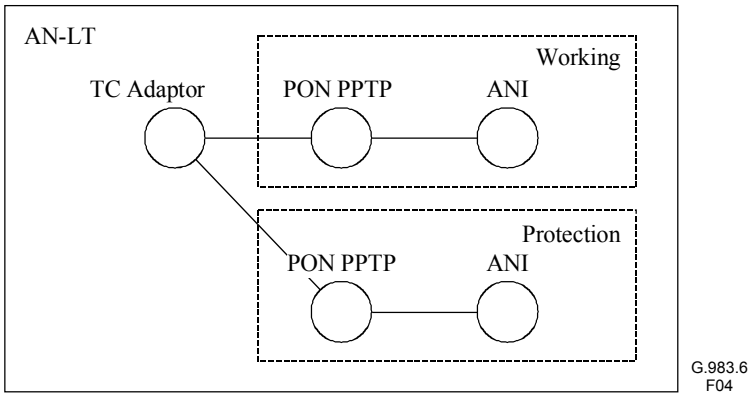

Figure 4/G.983.6 – 1+1 model ONT (ANI side)

2) **1:1 model**

Figure 5 shows a 1:1 model ONT. In this model, extra traffic can be supported. The working entity conveys the traffic in normal operation. If the working entity has failed or a forced switch/manual switch to the protection entity operation has been carried out, only the protection entity conveys the traffic. The TC Adaptor for normal traffic provides the traffic to the working PON-LT when the working PON-LT is enabled. The TC Adaptor for normal traffic provides the traffic to the protection entity when the working PON-LT is disabled. The TC Adaptor for extra traffic provides the extra traffic to the protection entity only when the working entity is enabled.

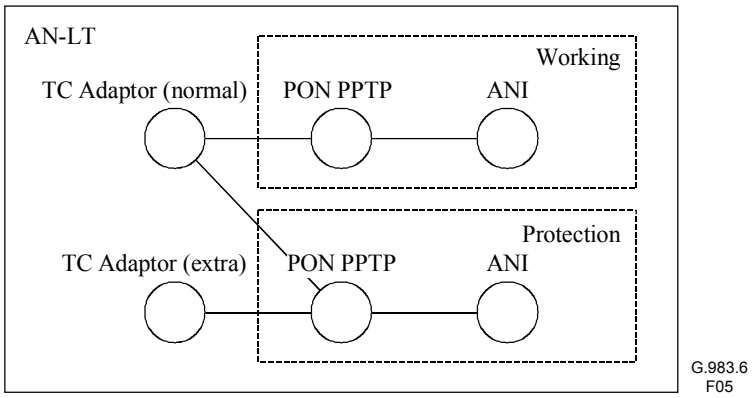

Figure 5/G.983.6 – 1:1 model ONT (ANI side)

4.3 VP Mux functionality in the ONT

See 4.3/G.983.2.

5 Requirements of the management interface specification

See clause 5/G.983.2.

5.1 Configuration management

See 5.1/G.983.2.

5.2 Fault management

See 5.2/G.983.2.

5.3 Performance management

See 5.3/G.983.2.

5.4 Security management

See 5.4/G.983.2.

6 Protocol-independent MIB for the OMCI

See clause 6/G.983.2.

6.1 Managed Entities

See 6.1/G.983.2.

6.2 Managed entity relation diagrams

Figures 6 and 7 show the managed entity relation diagrams related to B-PON systems with protection features as defined by ITU-T Rec. G.983.5. Figure 6 shows an ONT with cardholders on both UNI and ANI sides. Figure 7 shows the ATM VP cross connection function. The relationship between the "PON TC Adaptor" managed entity and the "PON Physical Path Termination Point" managed entity is modified from that given in Figures 3 and 4/G.983.2. The "PON TC Adaptor" managed entity is associated with one or two "PON Physical Path Termination Point" managed entities.

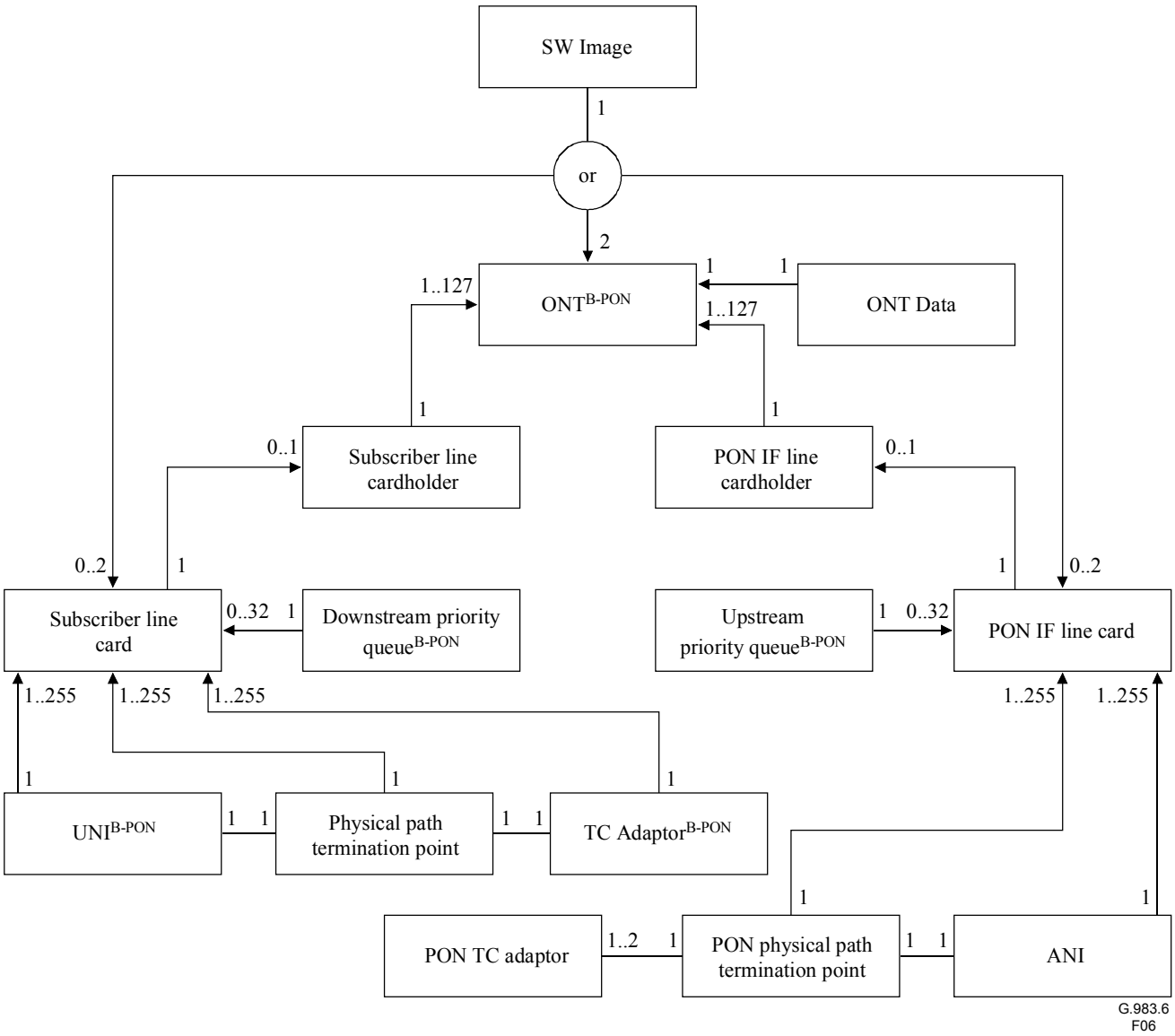

Figure 6/G.983.6 – Managed entity relation diagram for non-integrated interfaces

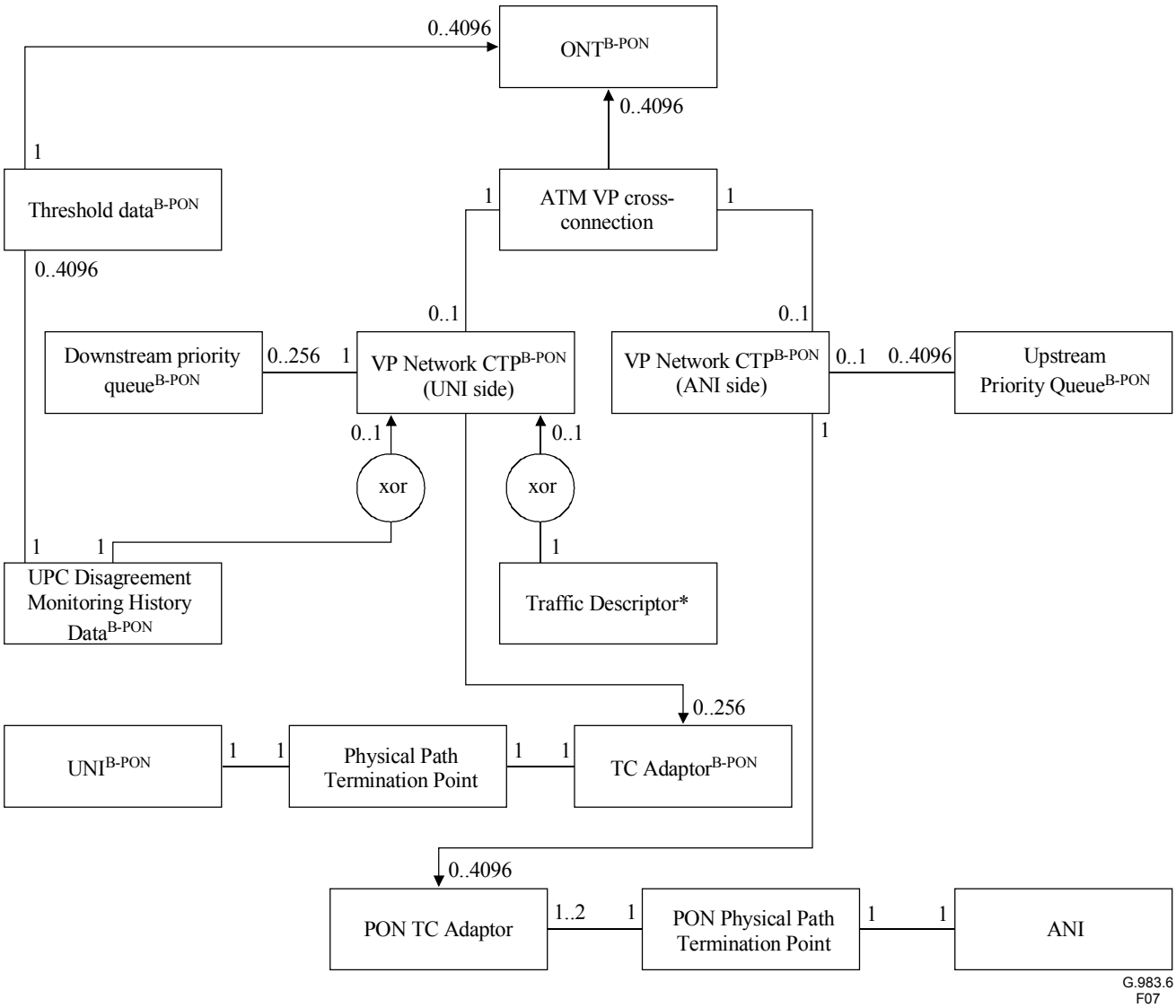

Figure 7/G.983.6 – Managed entity relation diagram, ATM service

The "*" in Figure 7 indicates that the Traffic Descriptor can be one of the specific Traffic Descriptor managed entities defined in 7.5.2/G.983.2.

7 MIB description

Use of protection features causes the modification of some managed entities from ITU-T Rec. G.983.2. In this clause, only modified managed entities are described. Other managed entities are referred to in ITU-T Rec. G.983.2.

7.1 ANI Management

Note that this clause corresponds to 7.2/G.983.2.

7.1.1 PON TC Adapter

Note that this clause corresponds to 7.2.3/G.983.2.

An instance of this managed entity represents a point in the ONT where the adaptation of the ATM layer to the underlying physical infrastructure (i.e., the PON) takes place. One instance of this managed entity shall exist for each ONT.

An instance of this managed entity is automatically created by the ONT after initialization. However, this instance will not be reported during an MIB upload.

New attributes for protection features are included in this management entity.

Relationships

One instance of this managed entity is associated with one or two instances of the PON Physical Path Termination Point managed entity.

Attributes

Managed Entity id:	This attribute provides a unique number for each instance of this managed entity. The assigned number is the same as the id of the PON Physical Path Termination Point with which this PON TC Adapter is associated. For the 1+1 model, the PON TC Adapter is associated with the PON Physical Path Termination Point of the working entity. For the 1:1 model, the PON TC Adapter is associated with the PON Physical Path Termination Point of the working entity for normal traffic and of the protection entity for extra traffic. (R) (mandatory) (2 bytes)
TC Adapter type:	This attribute represents PON TC Adapter type. Valid values are provided below. 0x0: protection function is not available; 0x1: 1+1 architecture is available; 0x2: 1:1 architecture is available and normal traffic shall be adapted; 0x3: 1:1 architecture is available and extra traffic shall be adapted. (R) (mandatory) (1 byte)
Protection pointer:	This attribute provides the instance id of the PON Physical Path Termination Point that serves as the protection entity. This attribute is valid only when TC adapter type is 0x1 or 0x2. (R) (mandatory) (2 bytes)
Revertive Ind:	This attribute indicates whether the protection scheme uses revertive mode (= TRUE, value 0x01) or non-revertive mode (= FALSE, value 0x00). (R) (mandatory) (1 byte)
Wait To Restore Time:	This attribute specifies the amount of time, in seconds, to wait after a fault clears before restoring traffic to the protected trail/connection/line that initiated the switching. (R, W) (mandatory) (2 bytes)
Switching Guard Time:	This attribute specifies the amount of time, in milliseconds, that must elapse after detection of a fault before a protection trail/connection/line can be used to transport the normal traffic signal and/ or to select the normal traffic signal. (R, W) (optional) (2 bytes)

Actions

Get:	Get one or more attributes.
Set:	Set one or more attributes.

Notifications

None.

Appendix I

Start-up sequence

I.1 OMCC establishment – protection side ranged after start-up of working side

Figure I.1 shows the OMCI start-up sequence when only the working-side PON-LT is ranged during the initial phase. In the given figure, the assumption is made that the OLT and the ONT are both available for PON protection.

NOTE – When the OLT and the ONT do not support a common protection scenario (i.e. 1+1, 1:1 and extra traffic), the protection side is not used.

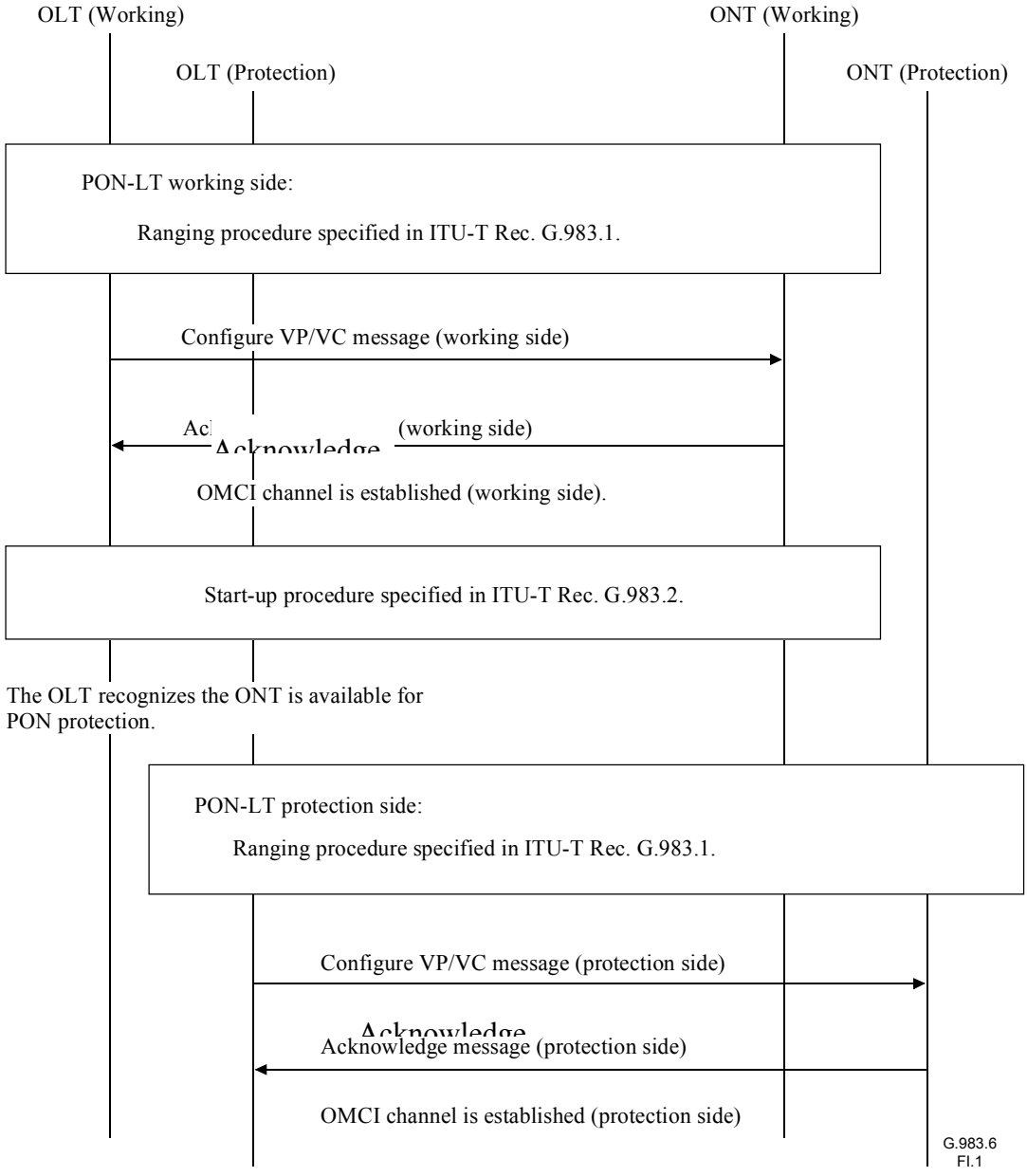

Figure I.1/G.983.6 – Start-up scenario for sequential ranging of working and protection sides

I.2 OMCC establishment for simultaneous ranging of working and protection PON-LTs

Figure I.2 shows the OMCI start-up sequence when both working-side PON-LT and protection-side PON-LT are ranged simultaneously during the initial phase. In the given figure, the assumption is made that the OLT and the ONT are both available for PON protection.

NOTE – When the OLT and the ONT do not support a common protection scenario (i.e. 1+1, 1:1 and extra traffic), the protection side is not used.

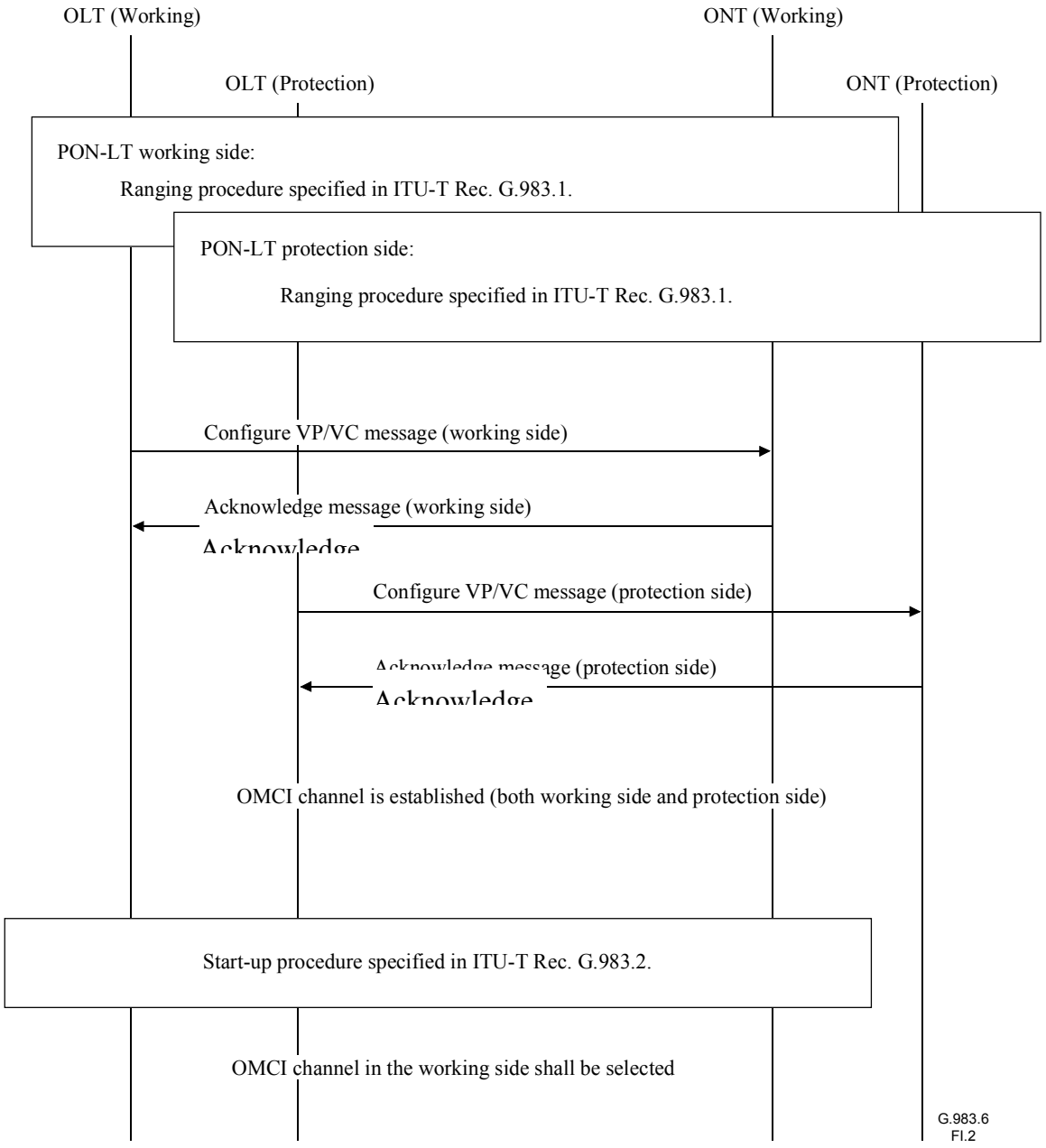

Figure I.2/G.983.6 – Start-up scenario for simultaneous ranging of working and protection sides

I.3 VP configuration for the ONT defined as 1+1 model

Figure I.3 shows the VP configuration sequence for the 1+1 protection architecture.

NOTE – The same VPI/VCI for the OMCC should be used for both working and protection sides.

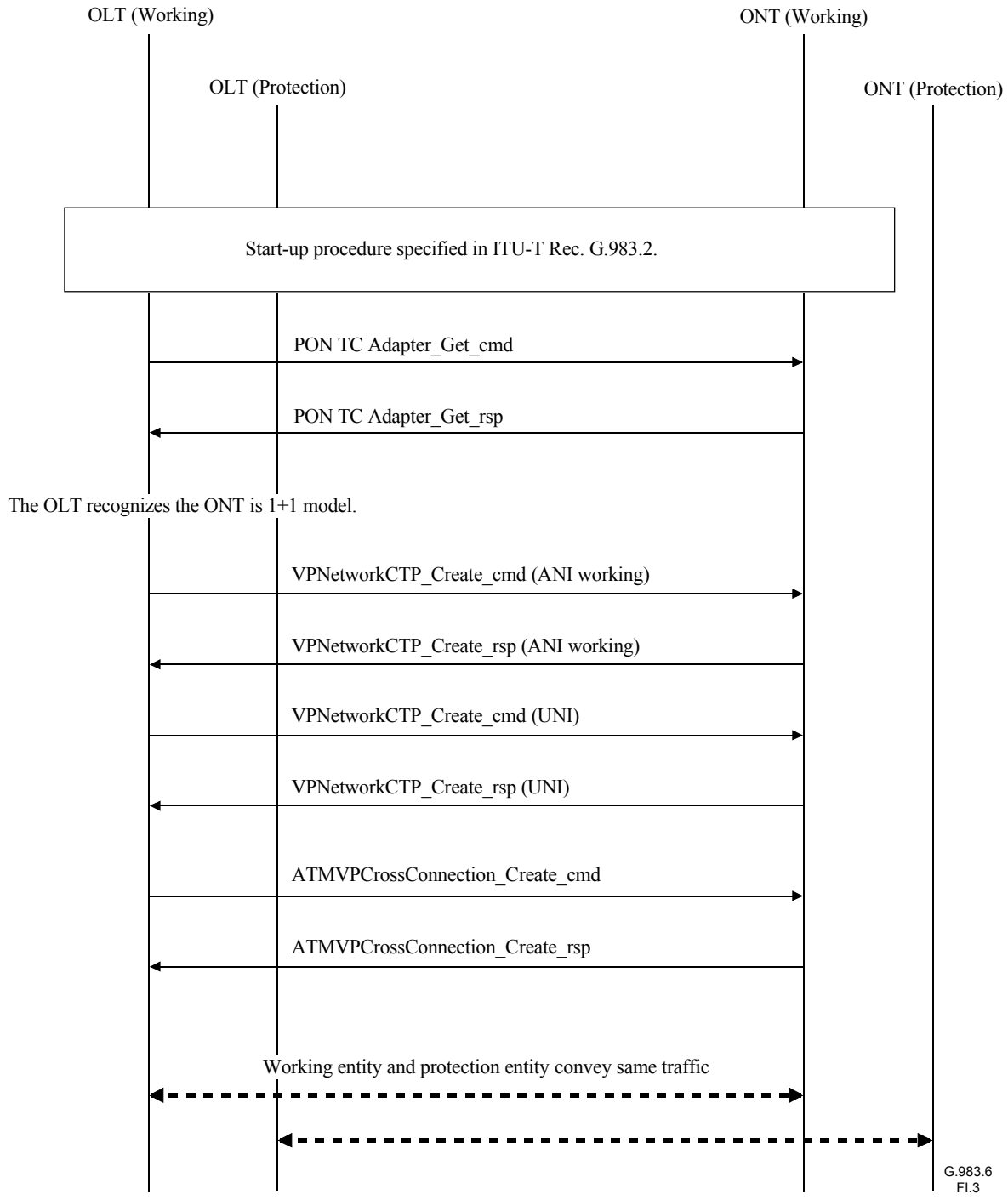

Figure I.3/G.983.6 – VP configuration for 1+1 ONT

I.4 VP configuration for the ONT defined as 1:1 model

Figure I.4 shows the VP configuration sequence for the 1:1 protection architecture.

NOTE – The same VPI/VCI for the OMCC should be used for both working and protection sides.

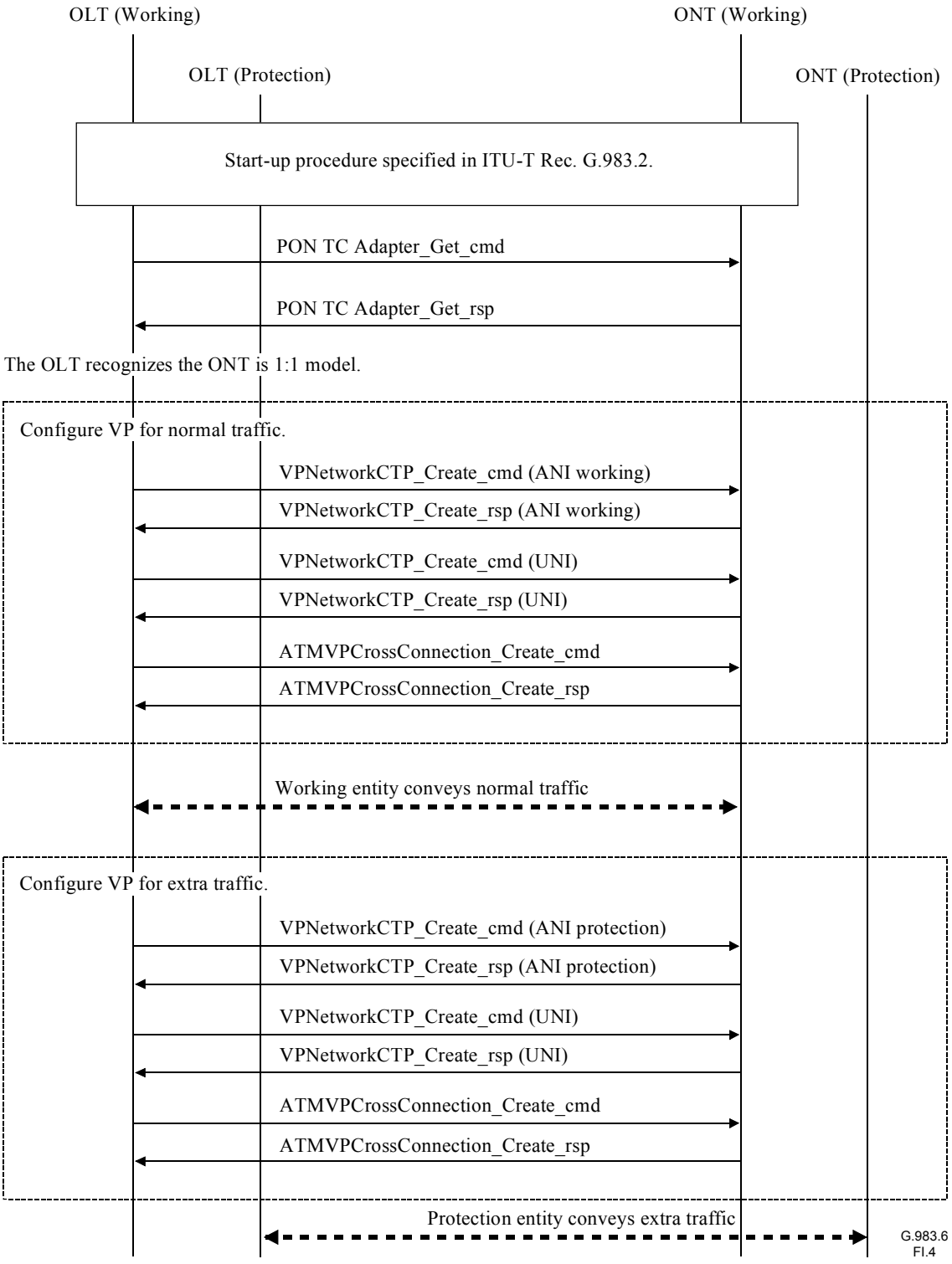

Figure I.4/G.983.6 – VP configuration for 1:1 ONT

I.5 VP removal for 1+1 model ONT

Figure I.5 shows the VP removal sequence for the 1+1 protection architecture.

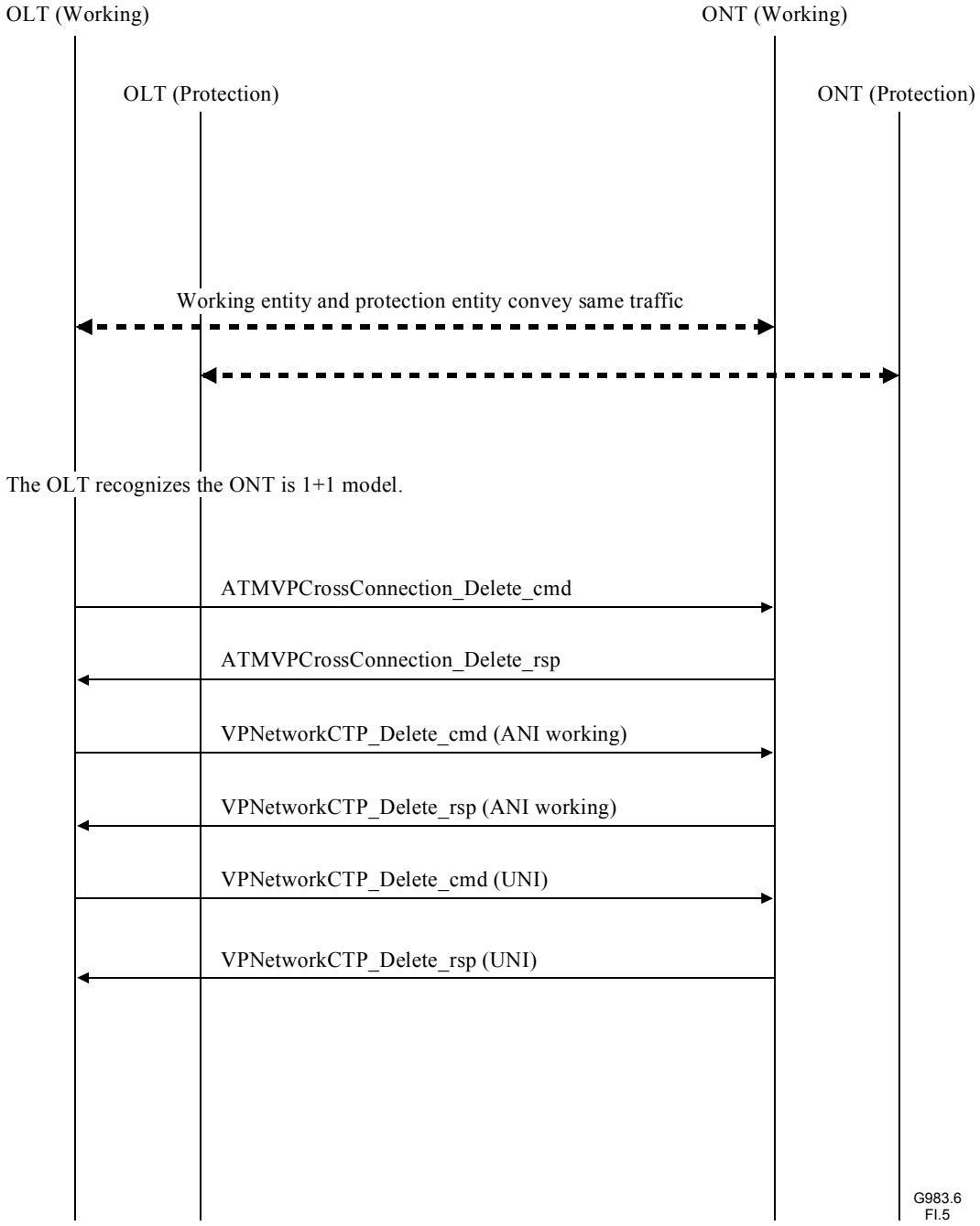

Figure I.5/G.983.6 – VP removal for 1+1 ONT

I.6 VP removal for a 1:1 model ONT

Figure I.6 shows the VP removal sequence for the 1:1 protection architecture.

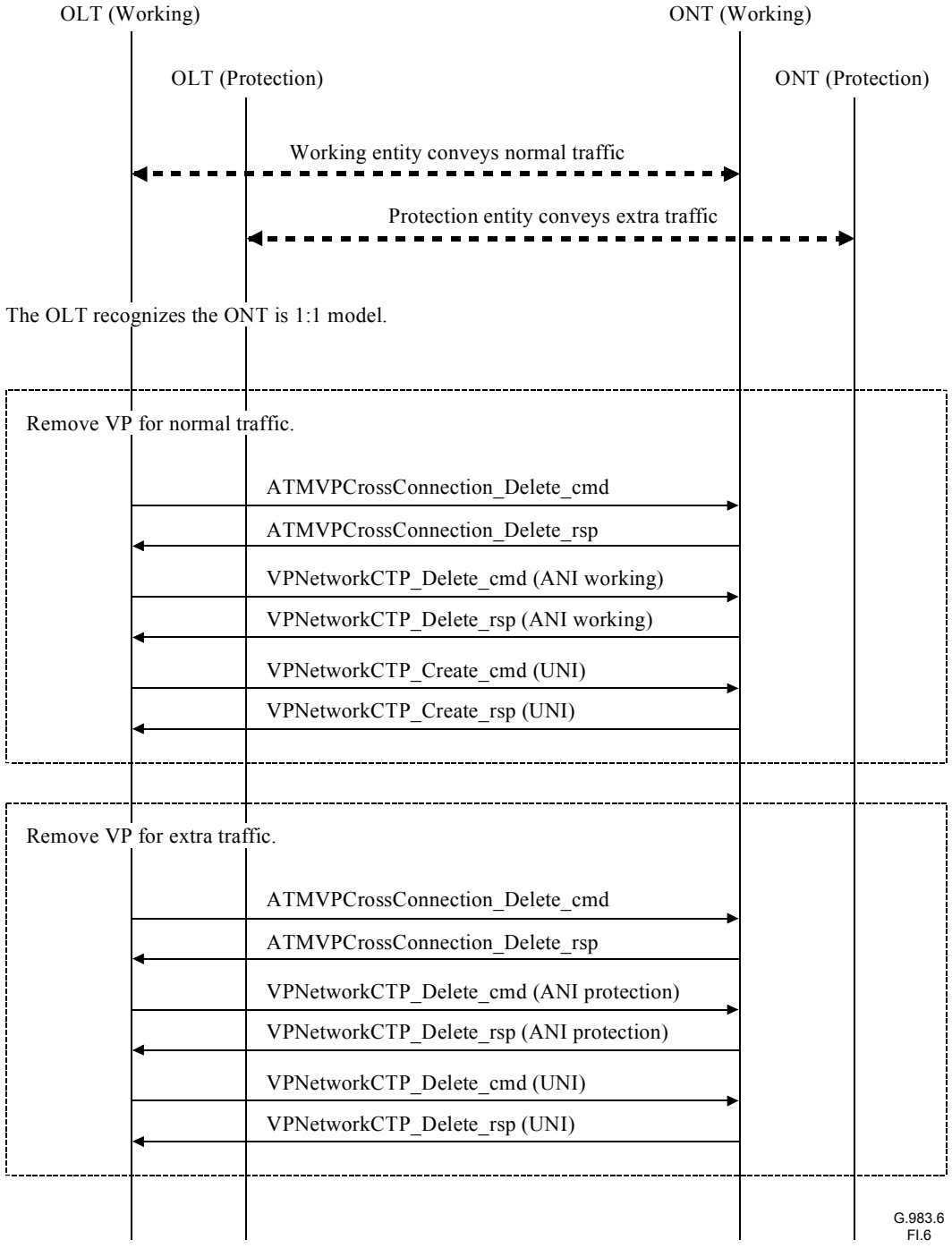

Figure I.6/G.983.6 – VP removal for 1:1 ONT

I.7 Switch-over sequence for a 1+1 model ONT

Figure I.7 shows the switch-over sequence for the 1+1 protection architecture. In the given figure, the assumption is made that the working side's PON-LT detects Signal Fail (SF) or Signal Degrade (SD).

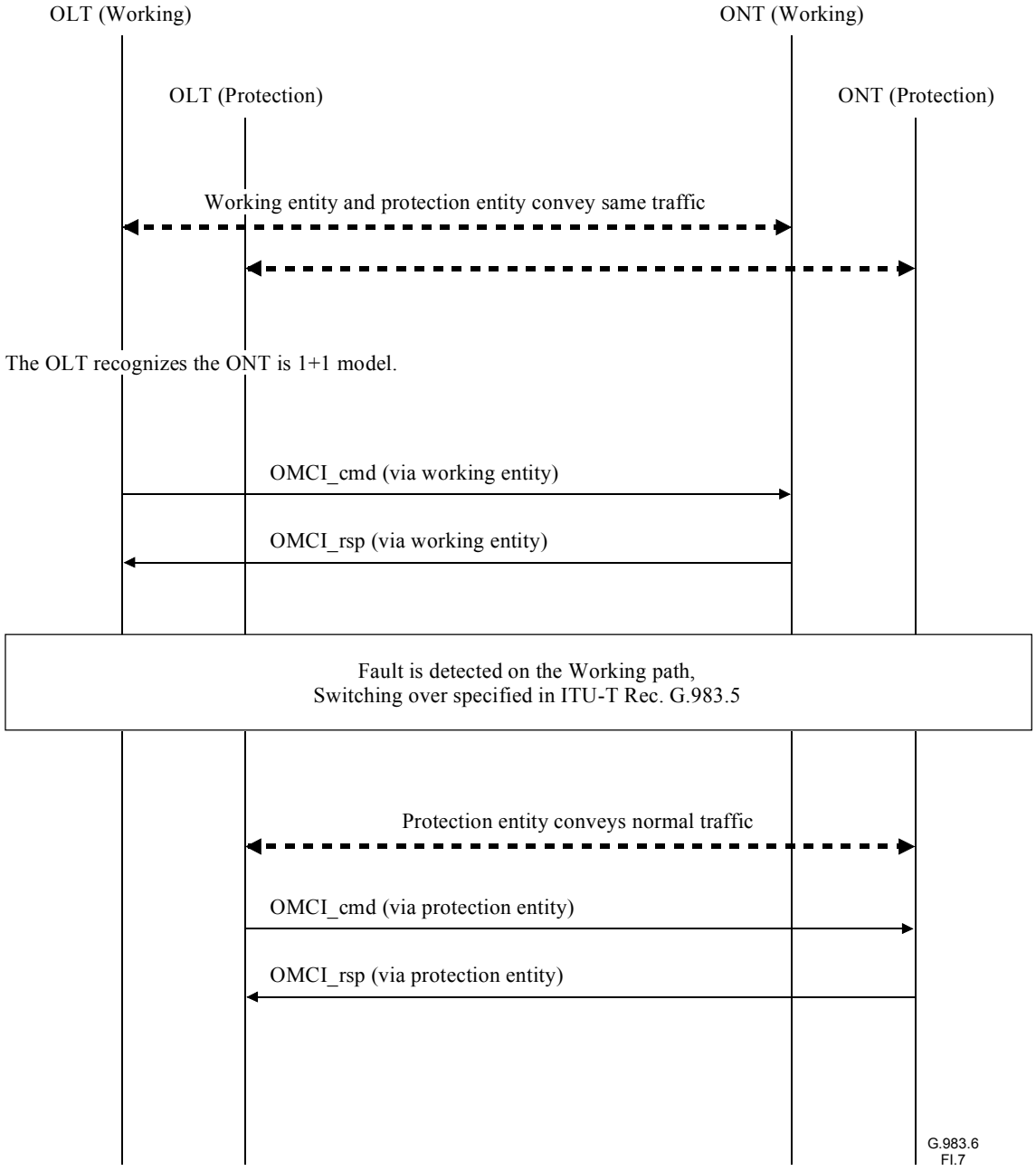

Figure I.7/G.983.6 – Switch-over sequence for 1+1 ONT

I.8 Switch-over sequence for a 1:1 model ONT

Figure I.8 shows the switch-over sequence for the 1:1 protection architecture. In the given figure, the assumption is made that the working side's PON-LT detects Signal Fail (SF) or Signal Degrade (SD).

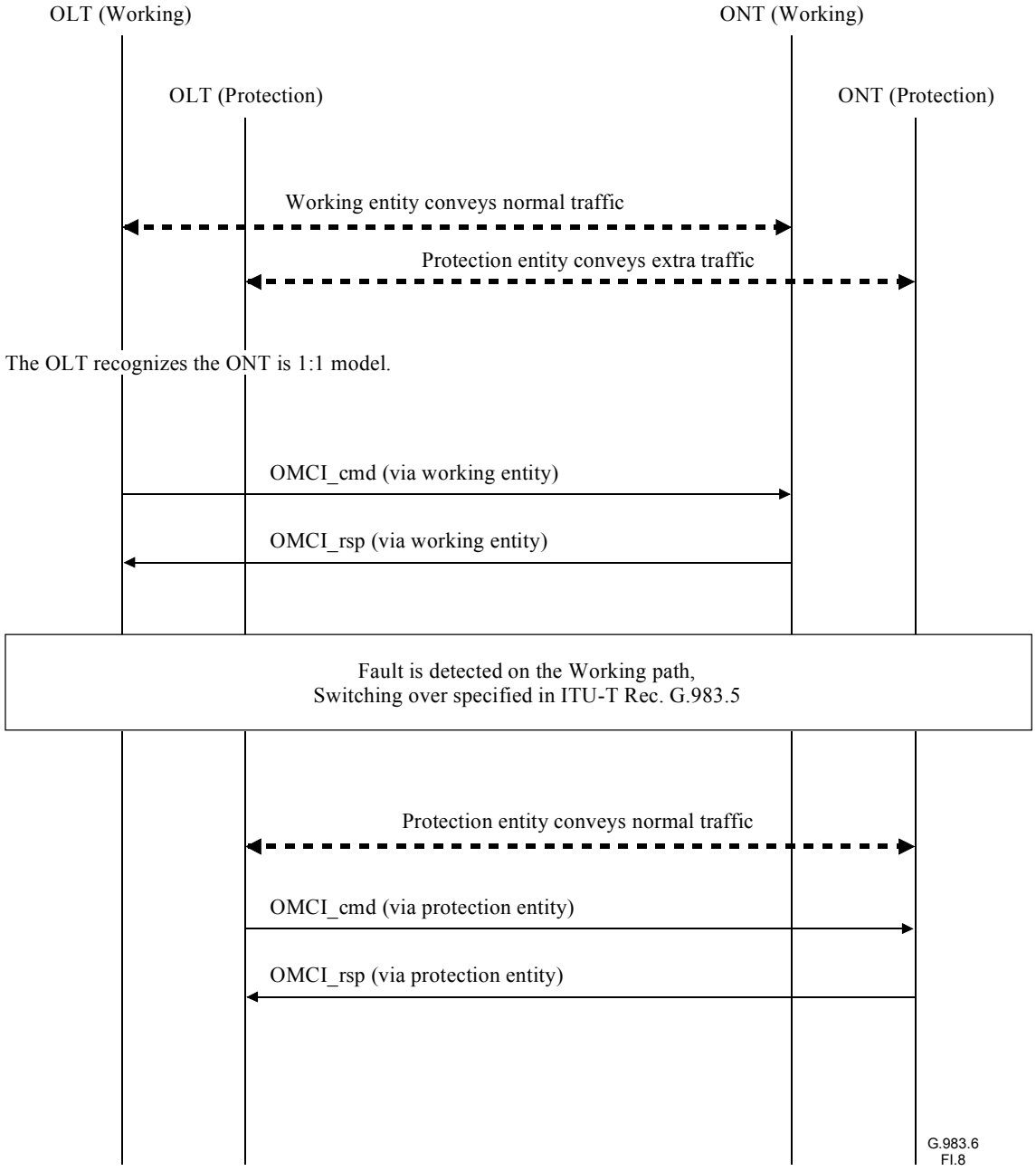

Figure I.8/G.983.6 – Switch-over sequence for 1:1 ONT

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