International Telecommunication Union

# ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

# G.783

**Amendment 1**

(07/2005)

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

Digital terminal equipments – Principal characteristics of multiplexing equipment for the synchronous digital hierarchy

---

# Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

## Amendment 1

ITU-T Recommendation G.783 (2004) – Amendment 1

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 |
| 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 |
| QUALITY OF SERVICE AND PERFORMANCE – GENERIC AND USER-RELATED ASPECTS | G.1000–G.1999 |
| TRANSMISSION MEDIA CHARACTERISTICS | G.6000–G.6999 |
| DATA OVER TRANSPORT – GENERIC ASPECTS | G.7000–G.7999 |
| ETHERNET OVER TRANSPORT ASPECTS | G.8000–G.8999 |
| ACCESS NETWORKS | G.9000–G.9999 |

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

# ITU-T Recommendation G.783

## Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

## Amendment 1

**Summary**

This amendment contains editorial and technical additions to the 02/2004 revision of ITU-T Rec. G.783 together with Erratum 1, 03/2005 and Corrigendum 1, 06/2004.

It contains the following changes to ITU-T Rec. G.783:

- Terms to be removed with reference G.870/Y.1352;
- Insertion of the new S4-X/ODUk_A functions clause 12.3.6.

**Source**

Amendment 1 to ITU-T Recommendation G.783 (2004) was approved on 14 July 2005 by ITU-T Study Group 15 (2005-2008) under the ITU-T Recommendation A.8 procedure.

## 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.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure e.g. interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

## 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.783

## Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks

## Amendment 1

### 1) Terms to be removed from ITU-T Rec. G.783

The following table identifies the target terms, with appropriate replacement definitions text for ITU-T Rec. G783.

| Original Term | Replacement text |
|---|---|
| **3.1 1 + 1 (protection) architecture**: A 1 + 1 protection architecture has one normal traffic signal, one working SNC/trail, one protection SNC/trail and a permanent bridge.<br>At the source end, the normal traffic signal is permanently bridged to both the working and protection SNC/trail. At the sink end, the normal traffic signal is selected from the better of the two SNCs/trails.<br>Due to the permanent bridging, the 1 + 1 architecture does not allow an extra unprotected traffic signal to be provided. | **3.1 1 + 1 (protection) architecture**: See ITU-T Rec. G.870/Y.1352. |
| **3.2 1:n (protection) architecture (n ≥ 1)**: A **1:n** protection architecture has n normal traffic signals, n working SNCs/trails and 1 protection SNC/trail. It may have 1 extra traffic signal.<br>The signals on the working SNCs/trails are the normal traffic signals.<br>The signal on the protection SNC/trail may either be one of the normal traffic signals, an extra traffic signal, or the null signal (e.g., an all-ONEs signal, a test signal, one of the normal traffic signals). At the source end, one of these signals is connected to the protection SNC/trail. At the sink end, the signals from the working SNCs/trails are selected as the normal signals. When a defect condition is detected on a working SNC/trail or under the influence of certain external commands, the transported signal is bridged to the protection SNC/trail. At the sink end, the signal from this protection SNC/trail is then selected instead. | **3.2 1:n (protection) architecture (n ≥ 1)**: See ITU-T Rec. G.870/Y.1352. |
| **3.3 access point (AP)**: See ITU-T Rec. G.805 [12]. | **3.3 access point (AP)**: See ITU-T Rec. G.805 [12]. |
| **3.4 access point identifier (APId)**: See ITU-T Rec. G.831 [18]. | **3.4 access point identifier (APId)**: See ITU-T Rec. G.831 [18]. |
| **3.5 active trail/path/section/SNC/NC**: The trail/path/section/SNC from which the signal is selected by the protection selector. | **3.5 active trail/path/section/SNC/NC**: See ITU-T Rec. G.780/Y.1351. |
| **3.6 adaptation function (A):** See ITU-T Rec. G.805. | **3.6 adaptation function (A):** See ITU-T Rec. G.805. |
| **3.7 adapted information (AI)**: The information passing across an AP. | **3.7 adapted information (AI)**: See ITU-T Rec. G.805 [12]. |

| Original Term | Replacement text |
|---|---|
| **3.8 administrative unit (AU)**: See ITU-T Rec. G.707/Y.1322 [6]. | **3.8 administrative unit (AU)**: See ITU-T Rec. G.780/Y.1351. |
| **3.9 administrative unit group (AUG)**: See ITU-T Rec. G.707/Y.1322. | **3.9 administrative unit group (AUG)**: See ITU-T Rec. G.780/Y.1351. |
| **3.10 alarm**: See ITU-T Rec. G.806 [13]. | **3.10 alarm**: See ITU-T Rec. G.806 [13]. |
| **3.11 All-ONEs**: See ITU-T Rec. G.806. | **3.11 All-ONEs**: See ITU-T Rec. G.806. |
| **3.12 anomaly**: See ITU-T Rec. G.806. | **3.12 anomaly**: See ITU-T Rec. G.806. |
| **3.13 atomic function**: See ITU-T Rec. G.806. | **3.13 atomic function**: See ITU-T Rec. G.806. |
| **3.14 AUn-AIS**: See ITU-T Rec. G.707/Y.1322. | **3.14 AUn-AIS**: See ITU-T Rec. G.707/Y.1322. |
| **3.15 automatic laser shutdown (ALS)**: See ITU-T Rec. G.664 [1]. | **3.15 automatic laser shutdown (ALS)**: See ITU-T Rec. G.664 [1]. |
| **3.16 automatic protection switching (APS)**: Autonomous switching of a signal between and including two MSn_TT, Sn_TT, or Sm_TT functions, from a failed working trail/SNC to a protection trail/SNC and subsequent restoration using control signals carried by the K-bytes in the MSOH, HO POH, or LO POH. | **3.16 automatic protection switching (APS)**: See ITU-T Rec. G.780/Y.1351. |
| **3.17 bidirectional trail/connection type**: See ITU-T Rec. G.806. | **3.17 bidirectional trail/connection type**: See ITU-T Rec. G.806. |
| **3.18 bidirectional (protection) switching**: See ITU-T Rec. G.841 [19]. | **3.18 bidirectional (protection) switching**: See ITU-T Rec. G.780/Y.1351. |
| **3.19 bit interleaved parity (BIP)**: See ITU-T Rec. G.707/Y.1322. | **3.19 bit interleaved parity (BIP)**: See ITU-T Rec. G.780/Y.1351 (*"BIP-X"*). |
| **3.20 broadcast connection type**: See ITU-T Rec. G.806. | **3.20 broadcast connection type**: See ITU-T Rec. G.806. |
| **3.21 characteristic information (CI)**: The information passing across a CP or TCP. See also ITU-T Rec. G.805. | **3.21 characteristic information (CI)**: See ITU-T Recs G.805 and G.806. |
| **3.22 client/server layer**: See ITU-T Rec. G.806. | **3.22 client/server layer**: See ITU-T Rec. G.806. |
| **3.23 connection**: See ITU-T Rec. G.805. | **3.23 connection**: See ITU-T Rec. G.805. |
| **3.24 connection function (C)**: See ITU-T Rec. G.806. | **3.24 connection function (C)**: See ITU-T Rec. G.806. |
| **3.25 connection matrix (CM)**: See ITU-T Rec. G.806. | **3.25 connection matrix (CM)**: See ITU-T Rec. G.806. |
| **3.26 connection point (CP)**: See ITU-T Rec. G.806. | **3.26 connection point (CP)**: See ITU-T Rec. G.806. |
| **3.27 consolidation**: See ITU-T Rec. G.806. | **3.27 consolidation**: See ITU-T Rec. G.806. |
| **3.28 common management information service element (CMISE)**: See ITU-T Rec. X.710 \| ISO/IEC 9595. | **3.28 common management information service element (CMISE)**: See ITU-T Rec. X.710 \| ISO/IEC 9595. |
| **3.29 compound function**: See ITU-T Rec. G.806. | **3.29 compound function**: See ITU-T Rec. G.806. |
| **3.30 data communications channel (DCC)**: See ITU-T Rec. G.784 [10]. | **3.30 data communications channel (DCC)**: See ITU-T Rec. G.780/Y.1351. |
| **3.31 defect**: See ITU-T Rec. G.806. | **3.31 defect**: See ITU-T Rec. G.806. |
| **3.32 desynchronizer**: The desynchronizer function smoothes out the timing gaps resulting from decoded pointer adjustments and VC payload de-mapping in the time domain. | **3.32 desynchronizer**: See ITU-T Rec. G.780/Y.1351. |
| **3.33 extra traffic signal**: See ITU-T Rec. G.841. | **3.33 extra traffic signal**: See ITU-T Rec. G.841. |
| **3.34 failure**: See ITU-T Rec. G.806. | **3.34 failure**: See ITU-T Rec. G.806. |
| **3.35 fault**: See ITU-T Rec. G.806. | **3.35 fault**: See ITU-T Rec. G.806. |
| **3.36 fault cause**: See ITU-T Rec. G.806. | **3.36 fault cause**: See ITU-T Rec. G.806. |

| Original Term | Replacement text |
|---|---|
| **3.37 function**: See ITU-T Rec. G.806. | **3.37 function**: See ITU-T Rec. G.806. |
| **3.38 grooming**: See ITU-T Rec. G.806.<br>Thus it is possible to groom Virtual Container, level 12 (VC-12) paths by service type, by destination, or by protection category into particular VC-4 paths which can then be managed accordingly. It is also possible to groom VC-4 paths according to similar criteria into Synchronous Transport Module (STM-N) sections. | **3.38 grooming**: See ITU-T Rec. G.806.<br>Thus it is possible to groom Virtual Container, level 12 (VC-12) paths by service type, by destination, or by protection category into particular VC-4 paths which can then be managed accordingly. It is also possible to groom VC-4 paths according to similar criteria into Synchronous Transport Module (STM-N) sections. |
| **3.39 holdoff time**: See ITU-T Rec. G.841. | **3.39 holdoff time**: See ITU-T Rec. G.870/Y.1352. |
| **3.40 layer**: A concept used to allow the transport network functionality to be described hierarchically as successive levels; each layer being solely concerned with the generation and transfer of its characteristic information. | **3.40 layer**: See ITU-T Rec. G.780/Y.1351. |
| **3.41 management information (MI)**: See ITU-T Rec. G.806. | **3.41 management information (MI)**: See ITU-T Rec. G.806. |
| **3.42 management point (MP)**: See ITU-T Rec. G.806. | **3.42 management point (MP)**: See ITU-T Rec. G.806. |
| **3.43 multiplex section (MS)**: A multiplex section is the trail between and including two multiplex section trail termination functions. | **3.43 multiplex section (MS)**: See ITU-T Rec. G.780/Y.1351. |
| **3.44 multiplex section alarm indication signal (MS-AIS)**: See ITU-T Rec. G.707/Y.1322. | **3.44 multiplex section alarm indication signal (MS-AIS)**: See ITU-T Rec. G.707/Y.1322. |
| **3.45 multiplex section remote defect indication (MS-RDI)**: See ITU-T Rec. G.707/Y.1322. | **3.45 multiplex section remote defect indication (MS-RDI)**: See ITU-T Rec. G.707/Y.1322. |
| **3.46 multiplex section overhead (MSOH)**: See ITU-T Rec. G.707/Y.1322. | **3.46 multiplex section overhead (MSOH)**: See ITU-T Rec. G.780/Y.1351. |
| **3.47 network connection (NC)**: See ITU-T Rec. G.805. | **3.47 network connection (NC)**: See ITU-T Rec. G.805. |
| **3.48 network element function (NEF)**: See ITU-T Rec. G.784. | **3.48 network element function (NEF)**: See ITU-T Rec. G.780/Y.1351. |
| **3.49 network node interface (NNI)**: See ITU-T Rec. G.707/Y.1322. | **3.49 network node interface (NNI)**: See ITU-T Rec. G.780/Y.1351. |
| **3.50 non-revertive (protection) operation**: See ITU-T Rec. G.841. | **3.50 non-revertive (protection) operation**: See ITU-T Rec. G.870/Y.1352. |
| **3.51 normal signal**: See ITU-T Rec. G.841. | **3.51 normal signal**: See ITU-T Rec. G.841. |
| **3.52 outgoing signal fail (OSF)**: A signal fail indication output at the AP of a tandem connection termination function. | **3.52 outgoing signal fail (OSF)**: See ITU-T Rec. G.870/Y.1352. |
| **3.53 overhead access (OHA)**: The OHA function provides access to transmission overhead functions. | **3.53 overhead access (OHA)**: See ITU-T Rec. G.870/Y.1352. |
| **3.54 path**: See ITU-T Rec. G.806. | **3.54 path**: See ITU-T Rec. G.806. |
| **3.55 path overhead (POH)**: See ITU-T Rec. G.707/Y.1322. | **3.55 path overhead (POH)**: See ITU-T Rec. G.780/Y.1351. |
| **3.56 pointer justification event (PJE)**: A PJE is an inversion of the I- or D-bits of the pointer, together with an increment or decrement of the pointer value to signify a frequency justification. | **3.56 pointer justification event (PJE)**: See ITU-T Rec. G.780/Y.1351. |
| **3.57 process**: See ITU-T Rec. G.806. | **3.57 process**: See ITU-T Rec. G.806. |
| **3.58 protection trail/path/section/SNC/NC**: See ITU-T Rec. G.841. | **3.58 protection trail/path/section/SNC/NC**: See ITU-T Rec. G.841. |
| **3.59 reference point**: The delimiter of a function. | **3.59 reference point**: See ITU-T Rec. G.780/Y.1351. |

| Original Term | Replacement text |
|---|---|
| **3.60 regenerator section (RS)**: A regenerator section is the trail between and including two regenerator section terminations. | **3.60 regenerator section (RS)**: See ITU-T Rec. G.780/Y.1351. |
| **3.61 regenerator section overhead (RSOH)**: See ITU-T Rec. G.707/Y.1322. | **3.61 regenerator section overhead (RSOH)**: See ITU-T Rec. G.780/Y.1351. |
| **3.62 remote defect indication (RDI)**: See ITU-T Rec. G.806. | **3.62 remote defect indication (RDI)**: See ITU-T Rec. G.806. |
| **3.63 remote error indication (REI)**: See ITU-T Rec. G.806. | **3.63 remote error indication (REI)**: See ITU-T Rec. G.806. |
| **3.64 remote information (RI)**: See ITU-T Rec. G.806. | **3.64 remote information (RI)**: See ITU-T Rec. G.806. |
| **3.65 remote point (RP)**: See ITU-T Rec. G.806. | **3.65 remote point (RP)**: See ITU-T Rec. G.806. |
| **3.66 revertive (protection) operation**: See ITU-T Rec. G.841. | **3.66 revertive (protection) operation**: See ITU-T Rec. G.870/Y.1352. |
| **3.67 section**: A trail in a section layer. | **3.67 section**: See ITU-T Rec. G.780/Y.1351. |
| **3.68 server signal degrade (SSD)**: See ITU-T Rec. G.806. | **3.68 server signal degrade (SSD)**: See ITU-T Rec. G.806. |
| **3.69 server signal fail (SSF)**: See ITU-T Rec. G.806. | **3.69 server signal fail (SSF)**: See ITU-T Rec. G.806. |
| **3.70 signal degrade (SD)**: See ITU-T Rec. G.806. | **3.70 signal degrade (SD)**: See ITU-T Rec. G.806. |
| **3.71 signal fail (SF)**: See ITU-T Rec. G.806. | **3.71 signal fail (SF)**: See ITU-T Rec. G.806. |
| **3.72 standby trail/path/section/SNC**: See ITU-T Rec. G.841. | **3.72 standby trail/path/section/SNC**: See ITU-T Rec. G.841. |
| **3.73 sub-network connection (SNC)**: See ITU-T Rec. G.805. | **3.73 sub-network connection (SNC)**: See ITU-T Rec. G.805. |
| **3.74 supervisory-unequipped VC**: See ITU-T Rec. G.707/Y.1322. | **3.74 supervisory-unequipped VC**: See ITU-T Rec. G.707/Y.1322. |
| **3.75 synchronous transport module (STM)**: See ITU-T Rec. G.707/Y.1322. | **3.75 synchronous transport module (STM)**: See ITU-T Rec. G.780/Y.1351. |
| **3.76 telecommunications management network (TMN)**: See ITU-T Rec. M.3010 [22]. | **3.76 telecommunications management network (TMN)**: See ITU-T Rec. M.3010 [22]. |
| **3.77 termination connection point (TCP)**: See ITU-T Rec. G.806. | **3.77 termination connection point (TCP)**: See ITU-T Rec. G.806. |
| **3.78 timing information (TI)**: See ITU-T Rec. G.806. | **3.78 timing information (TI)**: See ITU-T Rec. G.806. |
| **3.79 timing point (TP)**: See ITU-T Rec. G.806. | **3.79 timing point (TP)**: See ITU-T Rec. G.806. |
| **3.80 trail**: See ITU-T Rec. G.805. | **3.80 trail**: See ITU-T Rec. G.805. |
| **3.81 trail signal degrade (TSD)**: See ITU-T Rec. G.806. | **3.81 trail signal degrade (TSD)**: See ITU-T Rec. G.806. |
| **3.82 trail signal fail (TSF)**: See ITU-T Rec. G.806. | **3.82 trail signal fail (TSF)**: See ITU-T Rec. G.806. |
| **3.83 trail termination function (TT)**: See ITU-T Rec. G.806. | **3.83 trail termination function (TT)**: See ITU-T Rec. G.806. |
| **3.84 trail trace identifier (TTI)**: See ITU-T Rec. G.707/Y.1322. | **3.84 trail trace identifier (TTI)**: See ITU-T Rec. G.707/Y.1322. |
| **3.85 transit delay**: See ITU-T Rec. G.806. | **3.85 transit delay**: See ITU-T Rec. G.806. |
| **3.86 tributary unit (TU-m)**: See ITU-T Rec. G.707/Y.1322. | **3.86 tributary unit (TU-m)**: See ITU-T Rec. G.780/Y.1351. |
| **3.87 TUm-AIS**: See ITU-T Rec. G.707/Y.1322. | **3.87 TUm-AIS**: See ITU-T Rec. G.707/Y.1322. |
| **3.88 unprotected**: See ITU-T Rec. G.841. | **3.88 unprotected**: See ITU-T Rec. G.841. |
| **3.89 virtual container (VC-n)**: See ITU-T Rec. G.707/Y.1322. | **3.89 virtual container (VC-n)**: See ITU-T Rec. G.780/Y.1351. |

| Original Term | Replacement text |
|---|---|
| **3.90 working trail/path/section/SNC/NC**: See ITU-T Rec. G.841. | **3.90 working trail/path/section/SNC/NC**: See ITU-T Rec. G.841. |
| **3.91 unequipped VC**: See ITU-T Rec. G.707/Y.1322. | **3.91 unequipped VC**: See ITU-T Rec. G.707/Y.1322. |
| **3.92 undefined bit**: V. | **3.92 undefined bit**: See ITU-T Rec. G.780/Y.1351. |
| **3.93 undefined byte**: V. | **3.93 undefined byte**: See ITU-T Rec. G.780/Y.1351. |
| **3.94 unidirectional trail/connection type**: See ITU-T Rec. G.806. | **3.94 unidirectional trail/connection type**: See ITU-T Rec. G.806. |
| **3.95 unidirectional (protection) switching**: See ITU-T Rec. G.841. | **3.95 unidirectional (protection) switching**: See ITU-T Rec. G.780/Y.1351. |
| **3.96 wait-to-restore time**: See ITU-T Rec. G.841. | **3.96 wait-to-restore time**: See ITU-T Rec. G.870/Y.1352. |

### 2) New clause 12.3.6 for S4-X/ODUk_A functions

*Add new clause 12.3.6 as follows:*

### 12.3.6 VC-4-X to ODUk adaptation function (S4-X/ODUk_A) (X=17, k=1 or X=68, k=2)

The VC-4-X to ODUk adaptation functions perform the adaptation between the concatenated S4-X layer adapted information and the characteristic information of ODUk signals. The following pairs of X and k are supported:

**Table 12-A/G.783 – Relationship between SDH concatenated VC-4 and OTN ODUs**

| SDH signal | OTN signal | Adaptation function |
|---|---|---|
| VC-4-17 | ODU1 | S4-17/ODU1_A |
| VC-4-68 | ODU2 | S4-68/ODU2_A |

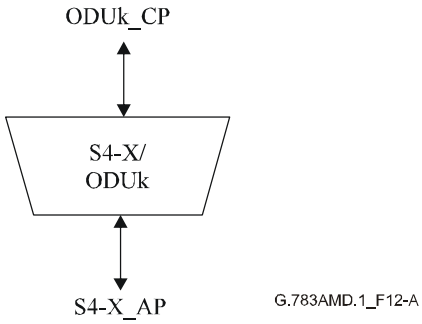


**Figure 12-A/G.783 – S4-X/ODUk_A function**

#### 12.3.6.1 VC-4-X to ODUk adaptation source function (S4-X/ODUk_A_So) (X=17, k=1 or X=68, k=2)

The S4-X/ODUk_A_So function adds frame and multiframe start signals to the ODUk, scrambles the signal asynchronously, maps it into the concatenated C-4-X signal including the justification control information and adds the payload specific VC-4-X overhead (C2 byte).

The information flow and processing of the S4-X/ODUk_A_So function is defined with reference to Figures 12-B and 12-C.

**Symbol**

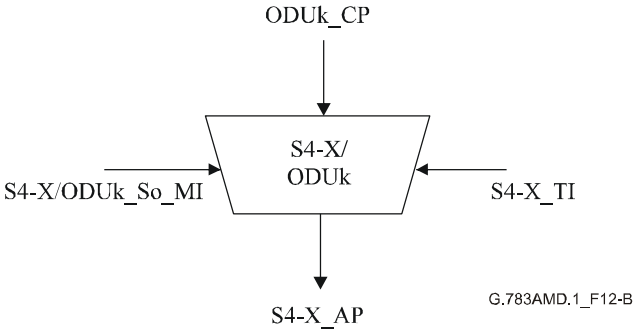


**Figure 12-B/G.783 – S4-X/ODUk_A_So function**

**Interfaces**

**Table 12-B/G.783 – S4-X/ODUk_A_So inputs and outputs**

| Input(s) | Output(s) |
|---|---|
| ODUk_CP: | S4-X_AP: |
| ODUk_CI_CK<br>ODUk_CI_D<br>ODUk_CI_FS<br>ODUk_CI_MFS | S4-X_AI_ClocK<br>S4-X_AI_Data<br>S4-X_AI_FrameStart |
| S4-X_TP: | |
| S4-X_TI_ClocK<br>S4-X_TI_FrameStart | |
| S4-X/ODUk_A_So _MP: | |
| S4-X/ODUk_A_So _MI_Active | |

**Processes**

*Activation*

The S4-X/ODUk_A_So function shall access the access point when it is activated (MI_Active is true). Otherwise, it shall not access the access point.

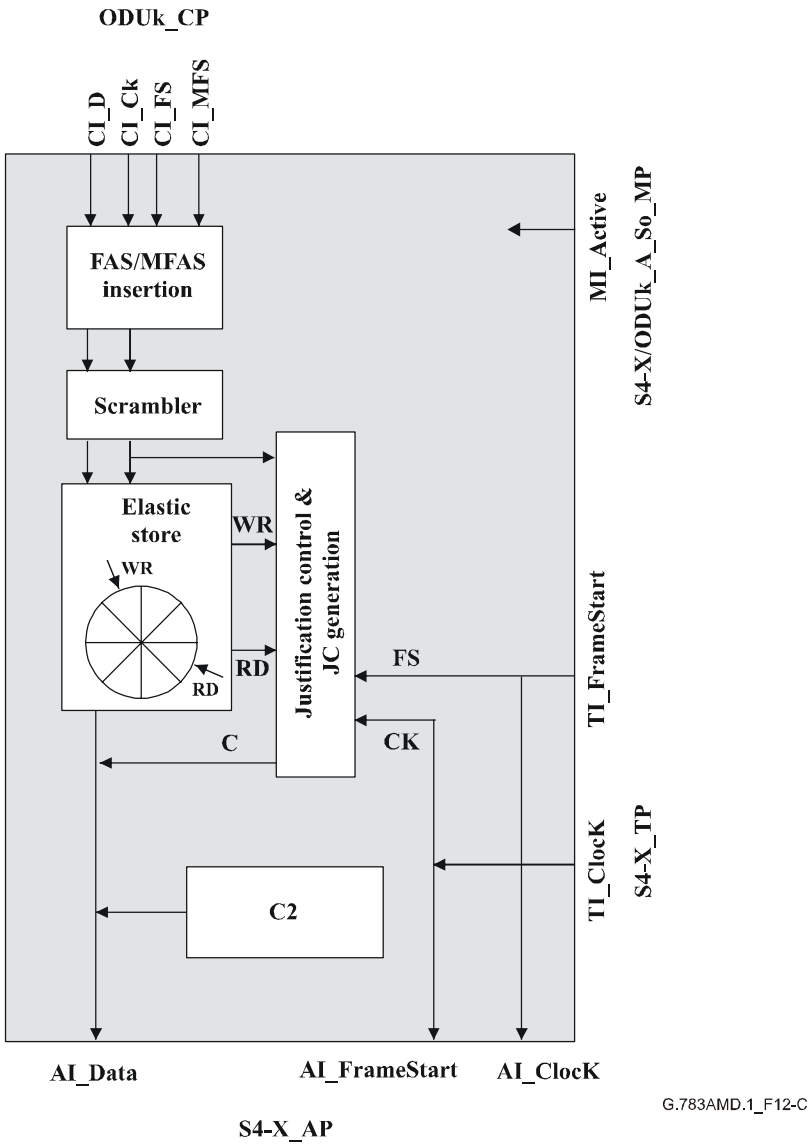


**Figure 12-C/G.783 – S4-X/ODUk_A_So processes**

**Processes**

**FAS/MFAS insertion**: The function shall extend the ODUk with the frame alignment overhead (FAS and MFAS) in row 1 bytes 1 to 7 as described in 10.7/G.707/Y.1322 and 15.6.2/G.709/Y.1331. Bytes 8 to 14 of row 1 are set to all-0's.

**Scrambler**: The function shall scramble the signal with a self-synchronizing scrambler with polynomial $x^{43}+1$ as defined in 10.7/G.707/Y.1322.

**Mapping, frequency justification and bit rate adaptation**: The function shall provide an elastic store (buffer) process for the ODUk client signal. The data signal ODUk_CI_D shall be written into the buffer under control of the associated input clock. The data shall be read out of the buffer and written onto the D and S bytes of the C4-X frame under control of the S4-X clock and justification decisions as defined in 10.7.1/G.707/Y.1322 for the ODU1 mapping and as defined in 10.7.2/G.707/Y.1322 for the ODU2 mapping.

A justification decision shall be performed every subblock. Each justification decision results in a corresponding negative or no justification action. Upon a negative justification action, 1 extra data byte shall be read once out of the buffer. ODUk data shall be written onto the S byte. If no justification action is to be performed, no ODUk data shall be written onto the S byte.

The justification decisions determine the phase error introduced by the function.

**Buffer size**: In the presence of jitter as specified by ITU-T Rec. G.8251 and a frequency within the range 239/(239 – k) * $4^{(k-1)}$ * 2 488 320 kHz ± 20 ppm, this mapping process shall not introduce any errors. The maximum buffer hysteresis, and therefore the maximum phase error introduced, shall be as listed in Table 12-C.

**Table 12-C/G.783 – Maximum buffer hysteresis**

| Mapping | Maximum buffer hysteresis |
|---|---|
| ODU1 → VC-4-17v | 1 byte |
| ODU2 → VC-4-68v | 1 byte |

**C:** The function shall generate the justification control bits as defined in 10.7.1/G.707/Y.1322 for ODU1 and 10.7.2/G.707/Y.1322 for ODU2 based on the justification decision (negative, none) of the subblock. It shall insert the justification control information in bit 8 of all five J bytes of the subblock in which the justification is performed. The remaining (R) bits of the J byte shall be set to all-0's. All five J bytes of a subblock shall have the same value.

**C2:** The function shall insert code "0010 0000" (asynchronous mapping of ODU) into the C2 byte position of the VC-4-X overhead as defined in 9.3.1.3/G.707/Y.1322.

**Defects**

None.

**Consequent Actions**

None.

**Defect Correlations**

None.

**Performance Monitoring**

None.

#### 12.3.6.2 VC-4-X to ODUk adaptation sink function (S4-X/ODUk_A_Sk) (X=17, k=1 or X=68, k=2)

The S4-X/ODUk_A_Sk function extracts the payload specific S4-X Overhead (C2) and monitors the reception of the correct payload type. It demaps the ODUk signals from the C4-X using the justification control information (C overhead). It descrambles the ODUk and determines the frame and multiframe structure.

The information flow and processing of the S4-X/ODUk_A_Sk function is defined with reference to Figures 12-D and 12-E.

**Symbol**

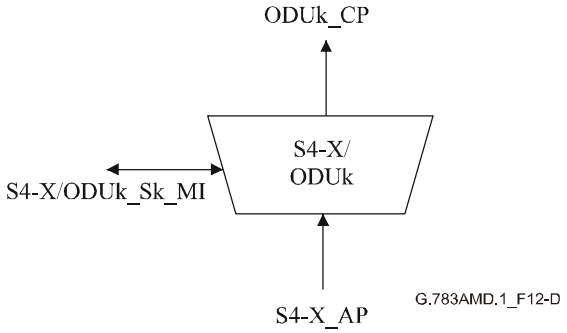


**Figure 12-D/G.783 – S4-X/ODUk_A_Sk function**

**Interfaces**

**Table 12-D/G.783 – S4-X/ODUk_A_Sk inputs and outputs**

| Input(s) | Output(s) |
|---|---|
| S4-X_AP: | ODUk_CP: |
| S4-X_AI_ClocK<br>S4-X_AI_Data<br>S4-X_AI_FrameStart<br>S4-X_AI_TSF | ODUk_CI_CK<br>ODUk_CI_D<br>ODUk_CI_FS<br>ODUk_CI_MFS<br>ODUk_CI_SSF |
| S4-X/ODUk_A_Sk_MP: | |
| S4-X/ODUk_A_Sk_MI_Active | S4-X/ODUk_A_Sk_MP:<br>S4-X/ODUk_A_Sk_MI_cPLM<br>S4-X/ODUk_A_Sk_MI_AcSL<br>S4-X/ODUk_A_Sk_MI_cLOFLOM |

**Processes**

*Activation*

The S4-X/ODUk_A_Sk function shall access the access point when it is activated (MI_Active is true). Otherwise, it shall not access the access point.

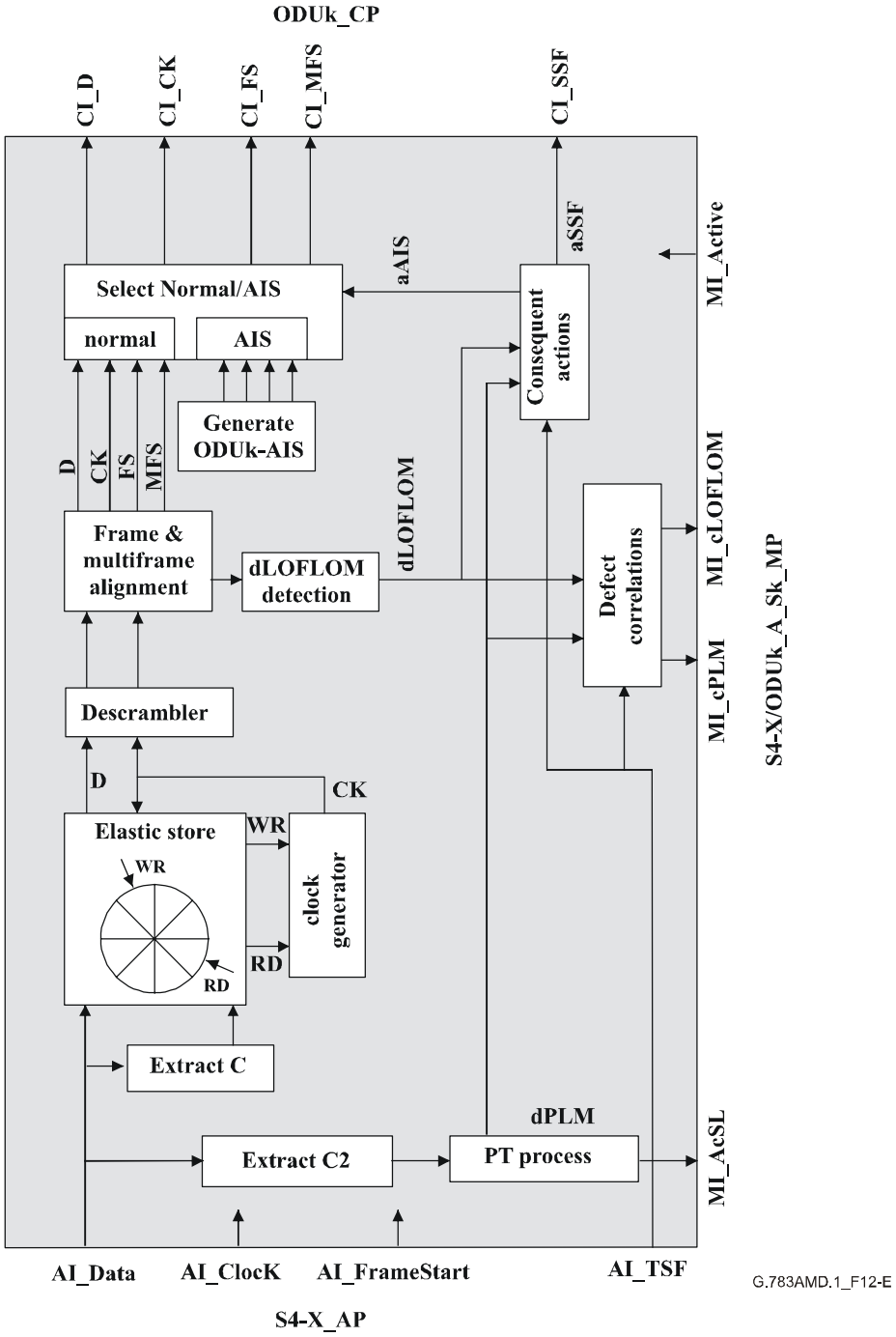


**Figure 12-E/G.783 – S4-X/ODUk_A_Sk processes**

## Processes

**C2/PT**: The function shall extract the signal label from the C2 overhead of the VC-4-X as defined in 6.2.4.2/G.806. The accepted signal label value is available at the MP (MI_AcSL) and is used for PLM defect detection.

**C**: The function shall interpret the justification control information C in bit 8 of the J bytes as defined in 10.7.1/G.707/Y.1322 for ODU1 and 10.7.2/G.707/Y.1322 for ODU2 in order to determine the justification action (negative, none) for the subblock. A 3 out of 5 majority decision is used. R bits in the J bytes shall be ignored.

**Demapping, CBR clock generation**: The function shall provide an elastic store (buffer) process. The ODUk data shall be written into the buffer from the D and S bytes in the C-4-X frame as

defined in 10.7.1/G.707//Y.1322 for ODU1 and in 10.7.2/G.707/Y.1322 for ODU2. The information extraction of the S byte per subblock shall be under control of the justification control information of this subblock. The ODUk data (CI_D) shall be read out of the buffer under control of the ODUk clock (CI_CK).

Upon a negative justification action, 1 extra data byte shall be written into the buffer once. ODUk data shall be read from the S byte. If no justification action is to be performed, no ODUk data shall be read from the S byte.

**Smoothing & jitter limiting process**: The function shall provide for a clock smoothing and elastic store (buffer) process. The $239/(239 - k) * 4^{(k-1)} * 2\ 488\ 320$ kbit/s (k = 1,2) data signal shall be written into the buffer under control of the associated (gapped) input clock (with a frequency accuracy within ± 4.6 ppm). The data signal shall be read out of the buffer under control of a smoothed (equally spaced) $239/(239 - k) * 4^{(k-1)} * 2\ 488\ 320$ kbit/s ± 20 ppm clock (the rate is determined by the ODUk signal at the input of the remote S4-X/ODUk_A_So). The desynchronizer has a bandwidth of about 5 Hz.

The clock parameters, including jitter and wander requirements, as defined in Annex A/G.8251 (ODCp clock) apply.

**Buffer size**: In the presence of jitter, as specified by ITU-T Rec. G.8251, and a frequency within the range $239/(239 - k) * 4^{(k-1)} * 2\ 488\ 320$ kbit/s ± 20 ppm, this desynchronization process shall not introduce any errors.

Following a step in frequency of the $239/(239 - k) * 4^{(k-1)} * 2\ 488\ 320$ kbit/s signal transported (for example due to reception of ODUk_CI from a new ODUk_TT_So at the far end or removal of a ODU AIS signal with a frequency offset), there will be a maximum recovery time of 1 ms after which this process shall not generate any bit errors.

**Descrambler**: The function shall descrambler the ODUk signal with a self-synchronizing descrambler with polynomial $x^{43}+1$ as defined in 10.7/G.707//Y.1322.

**Frame & Multiframe alignment**: The function shall perform frame and multiframe alignment as described in 8.2.3/G.798.

**ODUk-AIS**: The function shall generate the ODUk-AIS signals as defined in 16.5.1/G.709/Y.1331. The clock, frame start and multiframe start shall be independent from the incoming clock. The clock has to be within $239/(239 - k) * 4^{(k-1)} * 2\ 488\ 320$ kHz ± 20 ppm. Jitter and wander requirements as defined in Annex A/G.8251 (ODCa clock) apply.

**Selector**: The normal signal may be replaced by the ODUk-AIS. ODUk-AIS is selected if aAIS is true.

**Defects**

The function shall detect for dPLM and dLOFLOM.

**dPLM**: see 6.2.4.2/G.806. The expected payload type is "0010 0000" (asynchronous mapping of ODU) as defined in 9.3.1.3/G.707/Y.1322.

**dLOFLOM**: see 6.2.5.3/G.798.

**Consequent Actions**

aSSF ← AI_TSF or dPLM or dLOFLOM or (not MI_Active)

aAIS ← AI_TSF or dPLM or dLOFLOM or (not MI_Active)

On declaration of aAIS, the function shall output an All-ONEs pattern/signal within 2 frames. On clearing of aAIS, the All-ONEs pattern/signal shall be removed within 2 frames and normal data being output. The AIS clock, frame start and multiframe start shall be independent from the incoming clock, frame start and multiframe start. The AIS clock has to be within 239/(239 – k) * $4^{(k-1)}$ * 2 488 320 kHz ± 20 ppm. Jitter and wander requirements as defined in Annex A/G.8251 (ODCa clock) apply.

**Defect Correlations**

| | | |
|---|---|---|
| cPLM | ← | dPLM and (not AI_TSF) |
| cLOFLOM | ← | dLOFLOM and (not dPLM) and (not AI_TSF) |

**Performance monitoring**

None.

## SERIES OF ITU-T RECOMMENDATIONS

| | |
|---|---|
| Series A | Organization of the work of ITU-T |
| 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 | Telecommunication management, including TMN and network maintenance |
| 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, open system communications and security |
| Series Y | Global information infrastructure, Internet protocol aspects and next-generation networks |
| Series Z | Languages and general software aspects for telecommunication systems |

Printed in Switzerland
Geneva, 2005