International Telecommunication Union

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.798
Amendment 1
(05/2014)

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

Digital terminal equipments – Other terminal equipment

Characteristics of optical transport network hierarchy equipment functional blocks

Amendment 1

Recommendation ITU-T G.798 (2012) – Amendment 1

ITU-T

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ACCESS NETWORKS	G.9000–G.9999

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Recommendation ITU-T G.798

Characteristics of optical transport network hierarchy equipment functional blocks

Amendment 1

Summary

Amendment 1 to Recommendation ITU-T G.798 (2012):

- completes the management interfaces of the optical modulation and wavelength multiplexing processes for support of WDM interfaces;
- adds an indication to refer to the HAO capable ODUk to MPLS-TP adaptation function in Recommendation ITU-T G.8121;
- adds adaptation of multilane 40 Gigabit/s SDH signals with parallel interfaces (STL256.4) for mapping into LO OPU3;
- adds CM-XGPON and the payload types for clients bit-synchronously mapped into ODUflex to the ODUkP to CBRx adaptation functions;
- adds the ODU2eP to FC-1200 signal adaptation functions;
- adds fibre channel clients to Annex A; and
- corrects the payload type for SBCON/ESCON clients and the frequency tolerance of ODUflex signals.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T G.798	2002-01-06	15	11.1002/1000/5604
1.1	ITU-T G.798 (2002) Amd. 1	2002-06-13	15	11.1002/1000/6057
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3.1	ITU-T G.798 (2006) Amd. 1	2008-12-12	15	11.1002/1000/9669
3.2	ITU-T G.798 (2006) Cor.1	2009-01-13	15	11.1002/1000/9647
4.0	ITU-T G.798	2010-10-22	15	11.1002/1000/10877
4.1	ITU-T G.798 (2010) Cor. 1	2011-04-13	15	11.1002/1000/11117
4.2	ITU-T G.798 (2010) Amd. 1	2011-07-22	15	11.1002/1000/11116
4.3	ITU-T G.798 (2010) Cor. 2	2012-02-13	15	11.1002/1000/11488
4.4	ITU-T G.798 (2010) Amd. 2	2012-04-06	15	11.1002/1000/11487
5.0	ITU-T G.798	2012-12-22	15	11.1002/1000/11778
5.1	ITU-T G.798 (2012) Amd. 1	2014-05-14	15	11.1002/1000/12179

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

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.

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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, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

Recommendation ITU-T G.798

Characteristics of optical transport network hierarchy equipment functional blocks

1 Scope

This amendment contains modified text to be added to complete Recommendation ITU-T G.798, by adding missing management information (MI) with respect to optical channel (OCh) optical interface application code and frequency/wavelength support of the wavelength assignment process for support of wave division multiplexing (WDM) interfaces and by completing content on ODUflex mapped signals, fibre channel client interfaces, and STM256 multilane interfaces.

2) Modifications to ITU-T G.798

2.1) Clause 2, References

In clause 2, add the following references:

[ITU-T G.694.2] Recommendation ITU-T G.694.2 (2003), *Spectral grids for WDM applications: CWDM wavelength grid*.

[ITU-T G.695] Recommendation ITU-T G.695 (2010), *Optical interfaces for coarse wavelength division multiplexing applications*.

[ITU-T G.696.1] Recommendation ITU-T G.696.1 (2010), *Longitudinally compatible intra-domain DWDM applications*.

[ITU-T G.698.1] Recommendation ITU-T G.698.1 (2009), *Multichannel DWDM applications with single-channel optical interfaces*.

[ITU-T G.698.2] Recommendation ITU-T G.698.2 (2009), *Amplified multichannel dense wavelength division multiplexing applications with single channel optical interfaces*.

[ITU-T G.8121] Recommendation ITU-T G.8121/Y.1381 (2013), *Characteristics of MPLS-TP equipment functional blocks*.

2.2) Clause 8.11.1, Optical modulation and wavelength multiplexing processes

Update clause 8.11.1 with the additional text:

8.11.1 Optical modulation and wavelength multiplexing processes

The processes listed below are mandatory when they are listed in atomic functions. Specific parameters of these processes depend on the interface type. Refer to [ITU-T G.959.1], [ITU-T G.694.2], [ITU-T G.696.1], [ITU-T G.695], [ITU-T G.698.1], [ITU-T G.698.2] and [ITU-T G.694.1] for the currently standardized OTN interfaces and central frequencies. The parameters are managed, if applicable, by the MI_nominalCentralFrequencyOrWavelength (both input and output), MI_selectedApplicationIdentifier, and MI_supportableApplicationIdentifierList management interfaces.

Optical carrier modulation (Mod): This process performs modulation of an optical carrier with the payload ~~signal~~ (PLD) signal by means of a defined modulation scheme. The modulation scheme and optical parameters (e.g., operating wavelength) depend on the specific interface type. This process is used for the generation of a non-coloured optical signal.

Optical carrier modulation and wavelength assignment (Mod/WA): This process performs modulation of an optical carrier of a specific wavelength with the ~~payload (~~PLD~~)~~ signal by means of a defined modulation scheme. The modulation scheme and optical parameters for the individual channels (e.g., central frequency) depend on the specific interface type. This process is used for the generation of a coloured optical signal.

Optical carrier demodulation (DMod): This process demodulates the ~~payload signal (~~PLD~~)~~ signal from the optical carrier. The modulation scheme depends on the specific interface type. This process is used for the termination of coloured and non-coloured optical signal.

Optical multiplexing (OM): This process performs optical channel multiplexing to form an optical multiplex signal.

Optical demultiplexing and wavelength selection (ODM/WS): This process performs the optical channel demultiplexing and provides access to the individual wavelength signals. The physical parameters (e.g. channel spacing) depend on the specific interface type.

2.3) Clause 12.2.1, OCh trail termination function (OCh_TT)

Update the text and figures in clause 12.2.1 as follows:

12.2.1 OCh trail termination function (OCh_TT)

The OCh_TT functions are responsible for the end-to-end supervision of the OCh trail. They provide full functionality based on the non-associated overhead information. Figure 12-7 shows the combination of the unidirectional sink and source functions to form a bidirectional function.

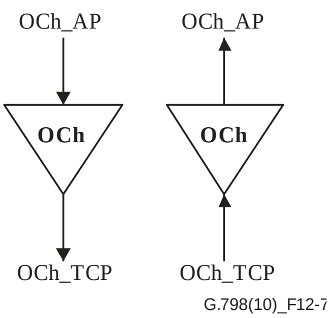


Figure 12-7 – OCh_TT

12.2.1.1 OCh trail termination source function (OCh_TT_So)

The OCh_TT_So function conditions the data for transmission over the optical medium and presents it at the OCh_TCP. The information flow and processing of the OCh_TT_So function is defined with reference to Figures 12-8 and 12-9.

Symbol

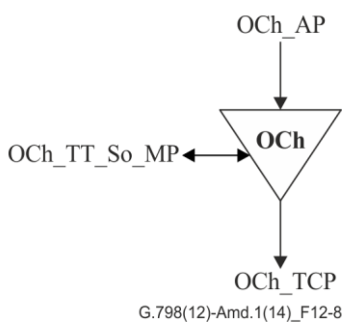


Figure 12-8 – OCh_TT_So function

Interfaces

Table 12-2 – OCh_TT_So inputs and outputs

Input(s)	Output(s)
OCh_AP: OCh_AI_D **OCh_TT_So_MP:** OCh_TT_So_MI_nominalCentralFrequencyOrWavelength OCh_TT_So_MI_selectedApplicationIdentifier	**OCh_TCP**: OCh_CI_PLD **OCh_TT_So_MP:** OCh_TT_So_MI_nominalCentralFrequencyOrWavelength OCh_TT_So_MI_supportableApplicationIdentifierList

Processes

The processes associated with the OCh_TT_So function are as depicted in Figure 12-9.

Payload generation: The function shall generate the OCh payload signal (baseband signal). The physical specifications of the signal are outside the scope of this Recommendation.

Optical carrier modulation and wavelength assignment (Mod/WA): See clause 8.11.1.

Optical signal pre-conditioning: Pre-conditioning of the single wavelength optical signal might be required. The specific conditioning processes depend on the OTM-n interface type and are outside the scope of this Recommendation. The processes OA, DAc, DAa and PMDC, as defined in clause 8.11.2, are possible.

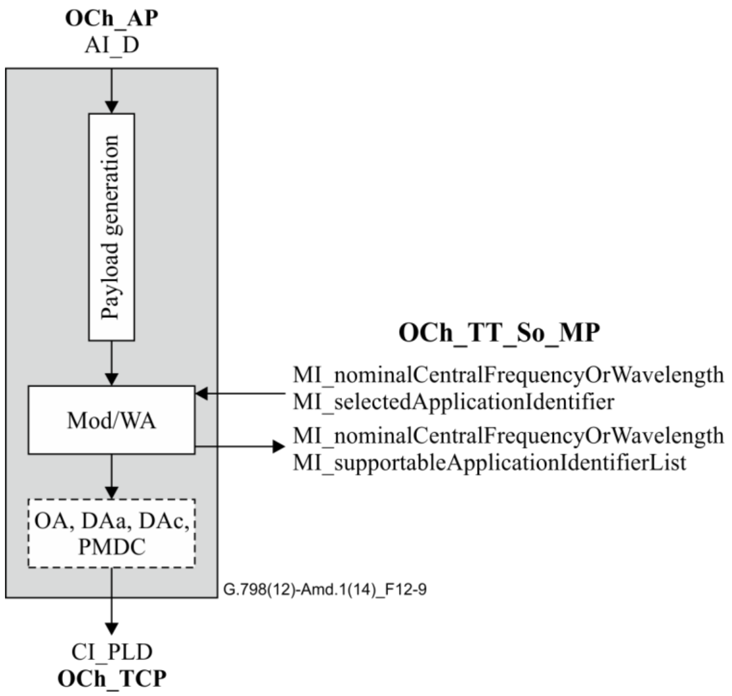


Figure 12-9 – OCh_TT_So processes

Defects: None.

Consequent actions: None.

Defect correlations: None.

Performance monitoring: None.

12.2.1.2 OCh trail termination sink function (OCh_TT_Sk)

The OCh_TT_Sk function recovers the OCh payload signal and reports the state of the OCh trail. It extracts the OCh overhead – including the FDI-P, FDI-O and OCI signals – from the OCh signal at its OCh_TCP, detects for LOS, OCI, FDI-P and FDI-O defects.

Symbol

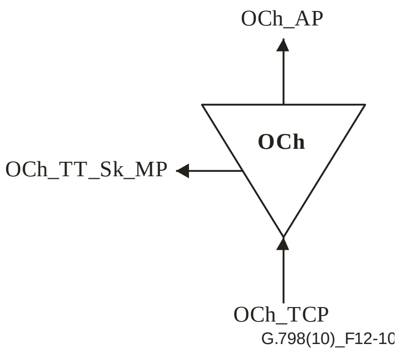


Figure 12-10 – OCh_TT_Sk function

Interfaces

Table 12-3 – OCh_TT_Sk inputs and outputs

Input(s)	Output(s)
OCh_TCP: OCh_CI_PLD OCh_CI_OH OCh_CI_SSF-P OCh_CI_SSF-O	**OCh_AP**: OCh_AI_D OCh_AI_TSF-P OCh_AI_TSF-O **OCh_TT_Sk_MP**: OCh_TT_Sk_MI_cLOS-P OCh_TT_Sk_MI_cOCI OCh_TT_Sk_MI_cSSF OCh_TT_Sk_MI_cSSF-P OCh_TT_Sk_MI_cSSF-O OCh_TT_Sk_MI_supportableApplicationIdentifierList

Processes

The processes associated with the OCh_TT_Sk function are as depicted in Figure 12-11.

Optical carrier demodulation (DMod): See clause 8.11.1.

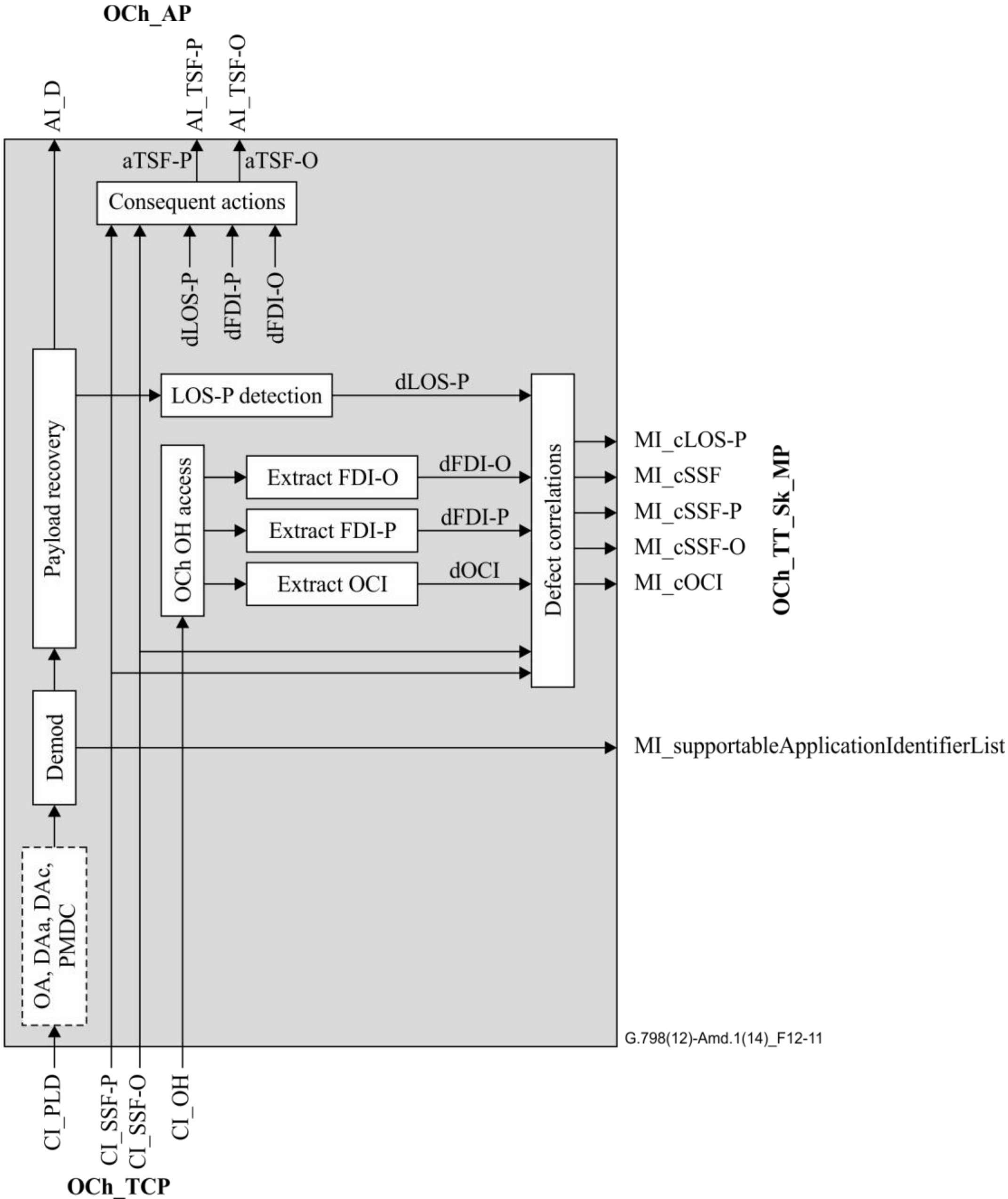
Optical signal post-conditioning: Post-conditioning of the single wavelength signal might be required. The specific conditioning processes depend on the OTM-nr/OTM-0 interface type (see [ITU-T G.959.1]) and are outside the scope of this Recommendation. The processes OA, DAc, DAa and PMDC, as defined in clause 8.11.2, are possible.

Payload recovery: This function shall recover the OCh payload signal. The physical specifications of the signal are outside the scope of this Recommendation.

FDI-P: The FDI-P information (OCh-FDI-P) shall be extracted from the OCh overhead of the OOS. It shall be used for FDI-P defect detection. The specific implementation for extracting FDI-P from the OOS and detecting its value is outside the scope of this Recommendation.

FDI-O: The FDI-O information (OCh-FDI-O) shall be extracted from the OCh overhead of the OOS. It shall be used for FDI-O defect detection. The specific implementation for extracting FDI-O from the OOS and detecting its value is outside the scope of this Recommendation.

OCI: The OCI information (OCh-OCI) shall be extracted from the OCh overhead of the OOS. It shall be used for OCI defect detection. The specific implementation for extracting OCI from the OOS and detecting its value is outside the scope of this Recommendation.


OCh_AP
AI_D
AI_TSF-P
AI_TSF-O
aTSF-P
aTSF-O
Consequent actions
dLOS-P
dFDI-P
dFDI-O
Payload recovery
LOS-P detection
dLOS-P
OCh OH access
Extract FDI-O
dFDI-O
Extract FDI-P
dFDI-P
Extract OCI
dOCI
Defect correlations
MI_cLOS-P
MI_cSSF
MI_cSSF-P
MI_cSSF-O
MI_cOCI
OCh_TT_Sk_MP
Demod
MI_supportableApplicationIdentifierList
OA, DAa, DAc, PMDC
G.798(12)-Amd.1(14)_F12-11
CI_PLD
CI_SSF-P
CI_SSF-O
CI_OH
OCh_TCP

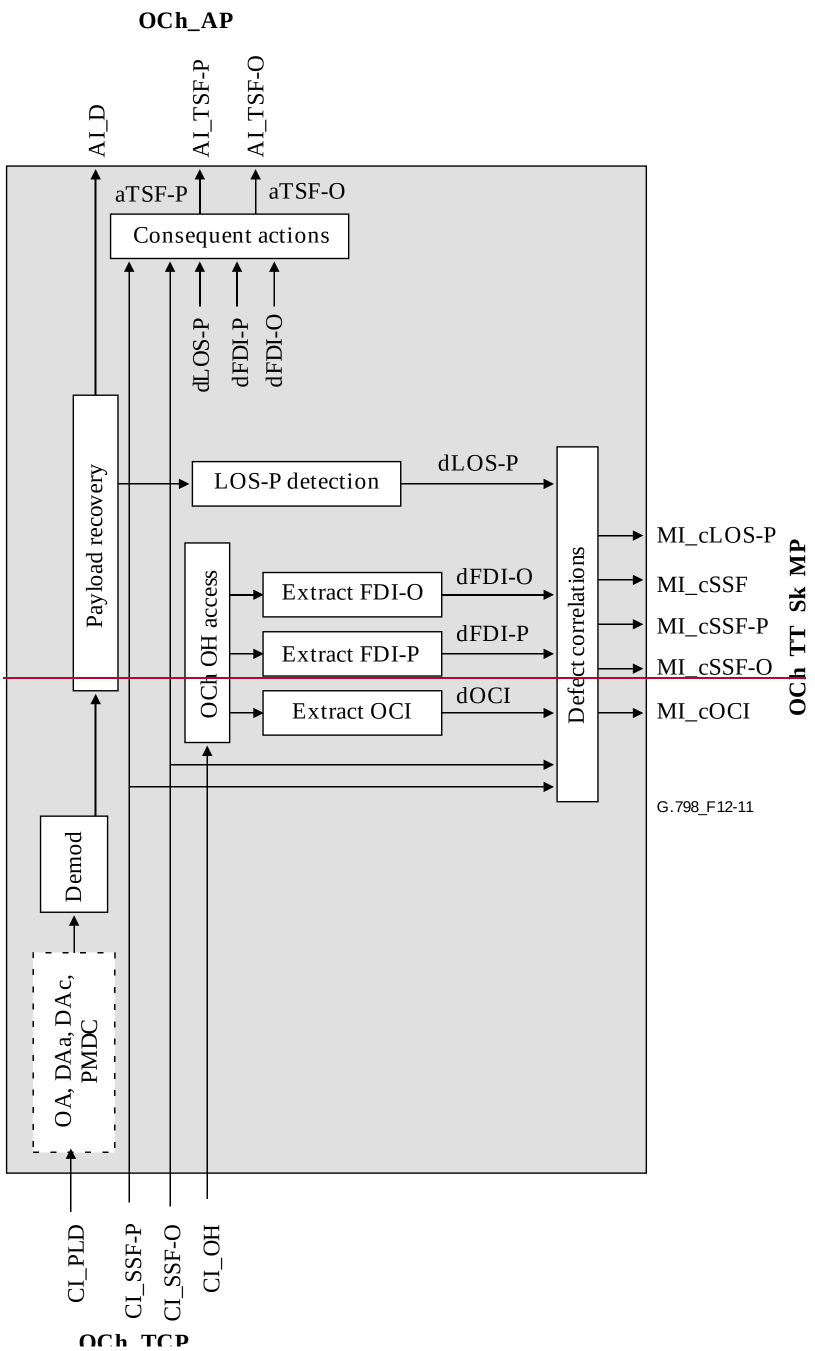


Figure 12-11 – OCh_TT_Sk processes

Defects

The function shall detect for dLOS-P, dFDI-P, dFDI-O and dOCI.

NOTE – Detection of additional OOS-related defects might be required (see clause 6.2.8). This depends on the specific OOS format and is outside the scope of this Recommendation.

dLOS-P: See clause 6.2.1.1.

dFDI-P: See clause 6.2.6.1.1.

dFDI-O: See clause 6.2.6.2.1.

dOCI: See clause 6.2.6.8.1; dOCI shall be set to false during CI_SSF-O and dFDI-O.

Consequent actions

The function shall perform the following consequent actions:

aTSF-P ← CI_SSF-P or dLOS-P or dOCI or dFDI-P

aTSF-O ← CI_SSF-O or dFDI-O

Defect correlations

The function shall perform the following defect correlations to determine the most probable fault cause. This fault cause shall be reported to the EMF.

cLOS-P ← dLOS-P and (not dOCI) and (not FDI-P) and (not CI_SSF-P)

cOCI ← dOCI and (not CI_SSF-P) and (not CI_SSF-O) and (not FDI-O) and (not FDI-P)

cSSF ← (CI_SSF-P or dFDI-P) and (CI_SSF-O or dFDI-O)

cSSF-P ← (CI_SSF-P or dFDI-P) and (not cSSF)

cSSF-O ← (CI_SSF-O or dFDI-O) and (not cSSF)

Performance monitoring

For further study.

2.4) Clause 12.2.2, OChr trail termination function (OChr_TT)

Update the text in clause 12.2.2 as follows:

12.2.2 OChr trail termination function (OChr_TT)

The OChr_TT functions are responsible for the end-to-end supervision of the OChr trail. They provide only reduced functionality as no non-associated overhead information is available. Figure 12-12 shows the combination of the unidirectional sink and source functions to form a bidirectional function.

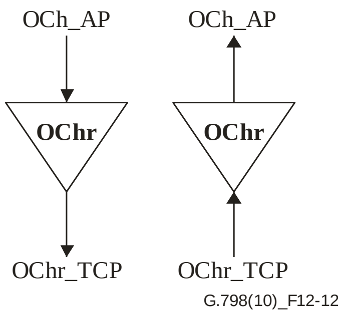


Figure 12-12 – OChr_TT

12.2.2.1 OChr trail termination source function (OChr_TT_So)

The OChr_TT_So function conditions the data for transmission over the optical medium and presents it at the OChr_TCP.

The information flow and processing of the OChr_TT_So function is defined with reference to Figures 12-13 and 12-14.

Symbol

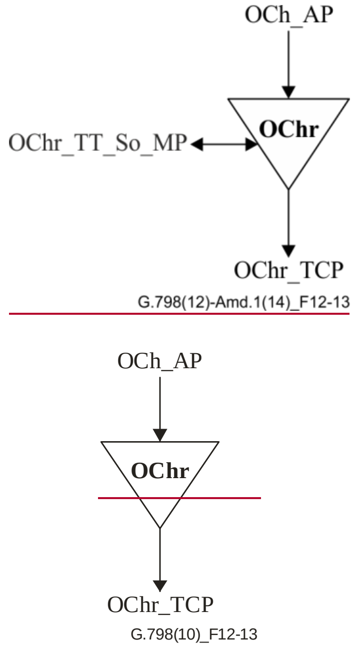


Figure 12-13 – OChr_TT_So function

Interfaces

Table 12-4 – OChr_TT_So inputs and outputs

Input(s)	Output(s)
OCh_AP: OCh_AI_D **OChr_TT_So_MP:** OChr_TT_So_MI_nominalCentralFrequencyOrWavelength OChr_TT_So_MI_selectedApplicationIdentifier	**OChr_TCP**: OChr_CI_PLD **OChr_TT_So_MP:** OChr_TT_So_MI_nominalCentralFrequencyOrWavelength OChr_TT_So_MI_supportableApplicationIdentifierList

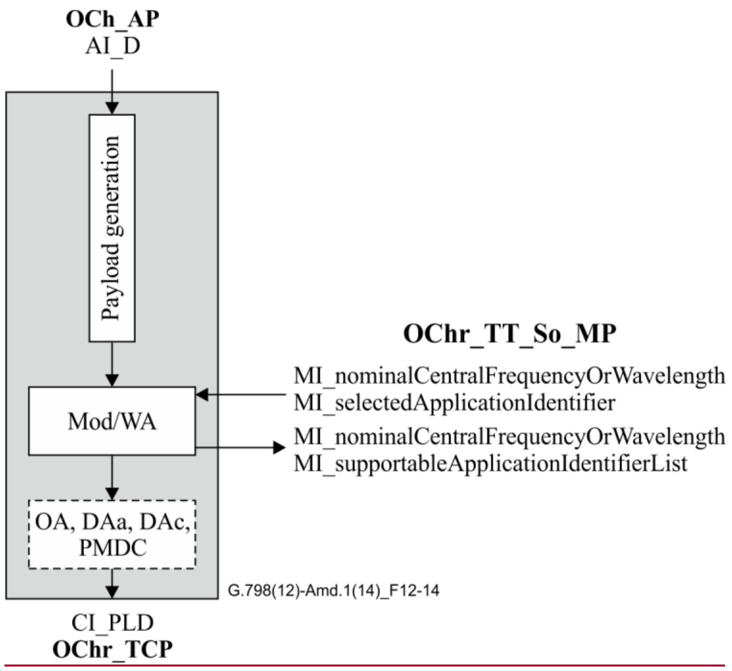
Processes

The processes associated with the OChr_TT_So function are as depicted in Figure 12-14.

Payload generation: The function shall generate the OChr payload signal (baseband signal). The physical specifications of the signal are defined in [ITU-T G.959.1].

Optical carrier modulation (Mod): See clause 8.11.1. For the parameters, see [ITU-T G.959.1].

Optical signal pre-conditioning: Pre-conditioning of the single wavelength optical signal might be required. The specific conditioning processes depend on the OTM-0 interface type (see [ITU-T G.959.1]). The processes OA, DAc, DAa and PMDC, as defined in clause 8.11.2, are possible.



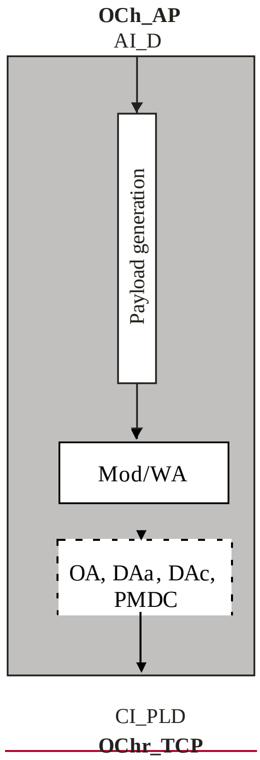


Figure 12-14 – OChr_TT_So processes

Defects: None.

Consequent actions: None.

Defect correlations: None.

Performance monitoring: None.

12.2.2.2 OChr trail termination sink function (OChr_TT_Sk)

The OChr_TT_Sk function recovers the OCh payload signal and reports the state of the OChr trail. It detects for LOS of the payload signal.

The information flow and processing of the OChr_TT_Sk function is defined with reference to Figures 12-15 and 12-16.

Symbol

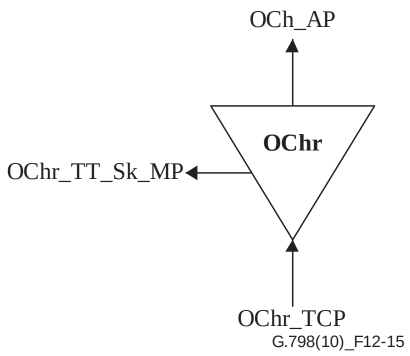


Figure 12-15 – OChr_TT_Sk function

Interfaces

Table 12-5 – OChr_TT_Sk inputs and outputs

Input(s)	Output(s)
OChr_TCP: OChr_CI_PLD OChr_CI_SSF-P	**OCh_AP**: OCh_AI_D OCh_AI_TSF-P **OChr_TT_Sk_MP**: OChr_TT_Sk_MI_cLOS OChr_TT_Sk_MI_cSSF-P OChr_TT_Sk_MI_supportableApplicationIdentifierList

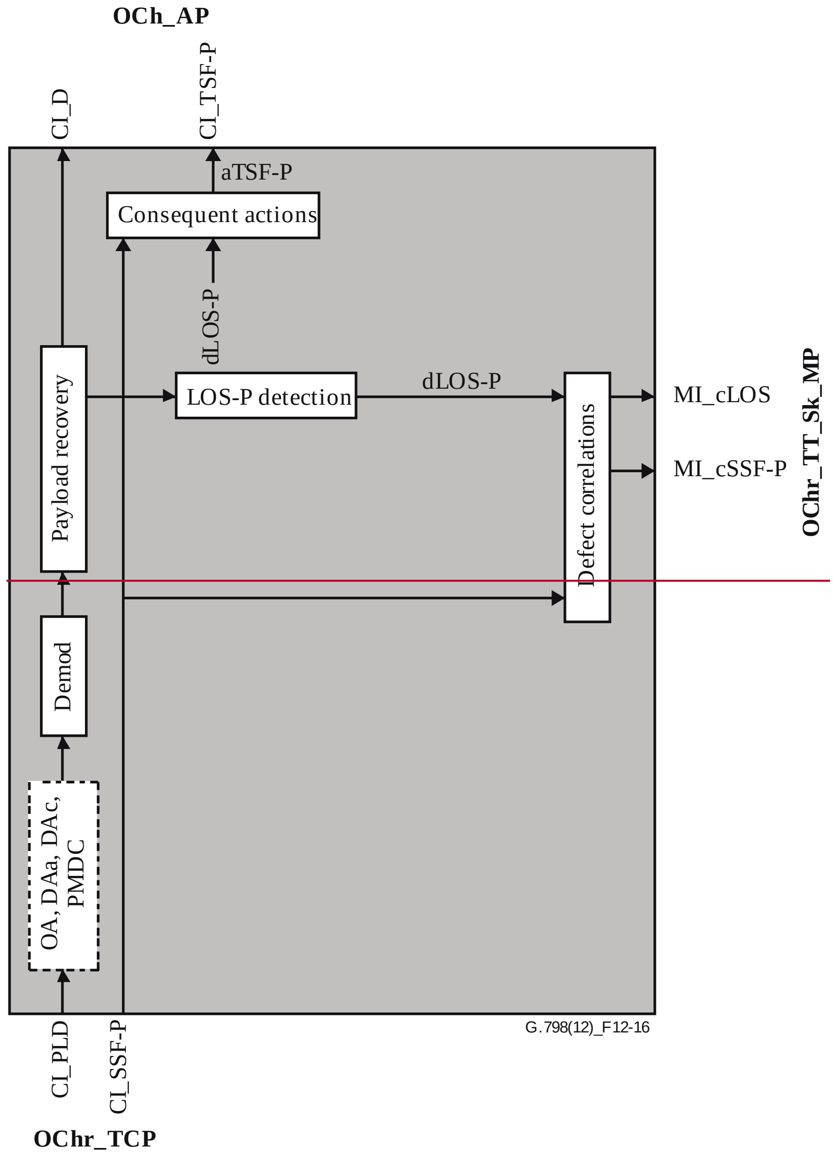
Processes

The processes associated with the OChr_TT_Sk function are as depicted in Figure 12-16.

Payload recovery: This function shall recover the OChr payload signal. The physical characteristics of the signal are defined in [ITU-T G.959.1].

Optical signal post-conditioning: Post-conditioning of the single wavelength signal might be required. The specific conditioning processes depend on the OTM-0 interface type (see [ITU-T G.959.1]). The processes OA, DAc, DAa and PMDC, as defined in clause 8.11.2, are possible.

Optical carrier demodulation (DMod): See clause 8.11.1. For the parameters, see [ITU-T G.959.1].


OCh_AP
CI_D
CI_TSF-P
aTSF-P
Consequent actions
dLOS-P
Payload recovery
LOS-P detection
dLOS-P
Defect correlations
MI_cLOS
MI_cSSF-P
OChr_TT_Sk_MP
Demod
OA, DAa, DAc, PMDC
CI_PLD
CI_SSF-P
OChr_TCP
G.798(12)_F12-16

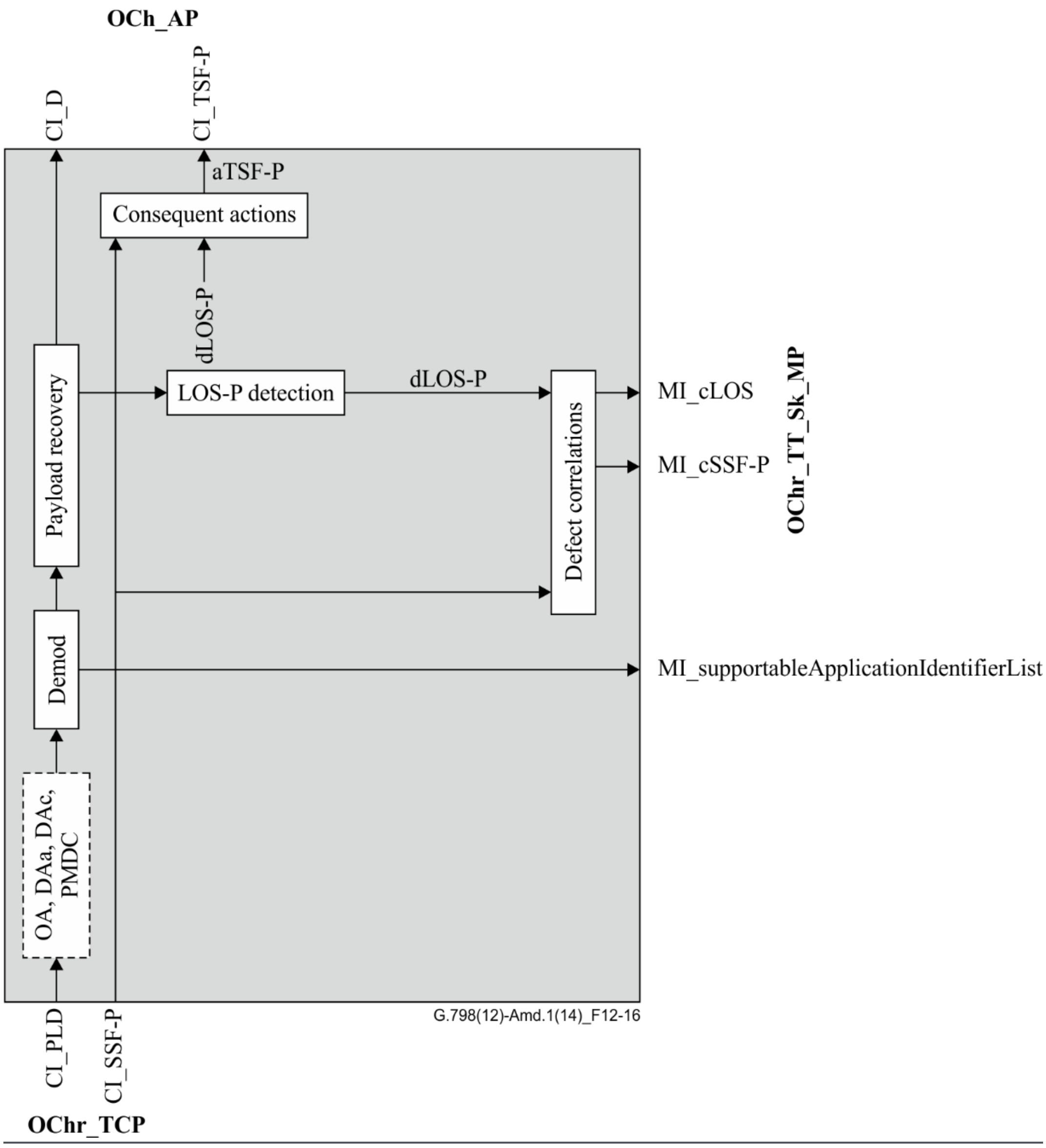


Figure 12-16 – OChr_TT_Sk processes

Defects

The function shall detect for dLOS-P.

dLOS-P: See clause 6.2.1.1.

Consequent actions

The function shall perform the following consequent actions:

aTSF-P ← CI_SSF-P or dLOS-P

Defect correlations

The function shall perform the following defect correlations to determine the most probable fault cause:

cLOS ← dLOS and (not CI_SSF-P)

cSSF-P ← CI_SSF-P

Performance monitoring

For further study.

2.5) Clause 14.1.1, ODUk connection function (ODU_C)

Delete Table 14-2 and update the text in clause 14.1.1 to replace references to Table 14-2 with references to Table 7-2 of [ITU-T G.709].

. . .

Open connection indication (OCI): If an output of the connection function is not connected to an input, an ODU-OCI signal as defined in clause 16.5 of [ITU-T G.709] is generated for this output. The clock of the OCI signal has to be within the minimum and maximum clock frequencies specified for the ODU signals that are given in Table 7-2 of [ITU-T G.709]~~14-2~~. The jitter and wander requirements as defined in Annex A of [ITU-T G.8251] (ODCa clock) apply. CI_SSF is false. CI_RP is is to be set to the default value "0" and CI_TSCC is to be set to the default value "0" for indicating no resize operation active.

Alarm indication signal (AIS): If in a protection switch operation as defined in [ITU-T G.873.1] or [ITU-T G.873.1] Extra traffic is preemped and to be squelched or ODU Squeching to prevent misconnection is to be executed, an ODU-AIS signal as defined in clause 16.5 of [ITU-T G.709] is generated for this output. The clock of the AIS signal has to be within the minimum and maximum clock frequencies specified for the ODU signals that are given in Table 7-2 of [ITU-T G.709]~~14-2~~. The jitter and wander requirements as defined in Annex A of [ITU-T G.8251] (ODCa clock) apply. CI_SSF is true. CI_RP is to be set to the default value "0" and CI_TSCC is to be set to the default value "0" for indicating no resize operation active.

Table 14-2 – Table left intentionally blank

~~Table 14-2 – ODU types and frequency~~

~~ODU type~~	~~ODU frequency~~	~~ODU frequency tolerance~~
~~ODU0~~	~~1 244 160 kHz~~	~~±20 ppm~~
~~ODU1~~	~~2 498 775 kHz~~	
~~ODU2~~	~~10 037 274 kHz~~	
~~ODU3~~	~~40 319 219 kHz~~	
~~ODU4~~	~~104 794 446 kHz~~	
~~ODU2e~~	~~10 399 525 kHz~~	~~±100 ppm~~
~~ODUflex (CBR)~~	~~239/238 × client signal clock frequency~~	~~Client signal clock frequency tolerance, with a maximum of ±100 ppm~~
~~ODUflex (GFP)~~	~~Frequency configured according to clause 12.2.5 of [ITU-T G.709]~~	~~±20 ppm~~
~~NOTE – The nominal ODUk clock frequencies are approximately: 239/(239 – k) * $4^{(k-1)}$ * 2 488 320 kHz ± 20 ppm for ODUk (k = 1, 2, 3), 1 244 160 kHz ± 20 ppm for ODU0 and (239/238 × client bit rate ± client tolerance (k = flex), 104 794 445.815 kHz (ODU4) and 10 399 525.316 kHz (ODU2e). See Table 7-2 of [ITU-T G.709].~~		

. . .

14.1.1.1 Subnetwork connection protection process

Replace references to Table 14-2 with references to Table 7-2 of [ITU-T G.709].

A permanent bridge, as defined in [ITU-T G.808.1], shall be used for the 1+1 protection. A broadcast bridge, as defined in [ITU-T G.808.1], shall be used for the 1:N protection. It permanently connects the normal traffic signal to the working transport entity. In case no normal or extra traffic signal is connected to the protection transport entity, an ODUk-OCI signal, as defined in clause 16.5 of [ITU-T G.709], is generated for the protection transport entity. The clock of the OCI signal has to be within the minimum and maximum frequencies of the specified ODU signal in Table 7-2 of [ITU-T G.709]~~14-2~~. The jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply. CI_SSF is false. In the case that the extra traffic signal of a 1:N protection configuration carried by the protection entity is pre-empted by a protection switch, an ODU-AIS signal is to be connected to the extra traffic ODU_CP output. The clock of the ODU-AIS signal has to be within the minimum and maximum frequencies of the specified ODU signal in Table 7-2 of [ITU-T G.709]~~14-2~~. The jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

2.6) Clause 14.3.1, ODUkP to CBRx adaptation function using AMP and BMP (ODUkP/CBRx_A)

Modify Table 14-5B as follows:

Table 14-5B – Defined values for x for asynchronous mapping

x	Bit rate	Clock range
2G5	2 488 320 kbit/s ± 20 ppm	2 488 320 kHz ± 20 ppm
2G5 (Note)	2 488 320 kbit/s ± 32 ppm	2 488 320 kHz ± 32 ppm
10G	9 953 280 kbit/s ± 20 ppm	9 953 280 kHz ± 20 ppm
10G (Note)	9 953 280 kbit/s ± 32 ppm	9 953 280 kHz ± 32 ppm
40G	39 813 120 kbit/s ± 20 ppm	39 813 120 kHz ± 20 ppm
NOTE – The 2G5 and 10G signals with 32 ppm tolerance represent~~s~~ the CM-GPON and CM-XGPON signals.		

2.7) Clause 14.3.1.2, ODUkP to CBRx bit synchronous mapping adaptation source function (ODUkP/CBRx-b_A_So)

Extend the inserted PT to include bit synchronous CBRx mapping into ODUflex as follows:

- **PT**: The function shall insert the appropriate payload type code ~~code "0000 0011"~~ into the PT byte position of the PSI overhead as defined in clause 15.9.2.1 of [ITU-T G.709].

2.8) Clause 14.3.1.3, ODUkP to CBRx adaptation sink function (ODUkP/CBRx_A_Sk)

Extend the expected PT to include bit synchronous CBRx mapping into ODUflex as follows:

Defects

The function shall detect for dPLM and dCSF defects.

– **dPLM**: See clause 6.2.4.1. The expected payload type values are defined in clause 15.9.2.1 of [ITU-T G.709]; "0000 0010" is used for ~~(~~asynchronous CBRx mapping, other applicable values~~) and "0000 0011" (~~ are used for bit synchronous CBRx mapping~~), as defined in [ITU-T G.709]~~.

– **dCSF**: See clause 6.2.10.

2.9) Clause 14.3.4.1, ODUkP to NULL adaptation source function (ODUkP/NULL_A_So)

Replace the reference to Table 14-2 with a reference to Table 7-2 of [ITU-T G.709].

Clock and (multi)frame start signal generation: The function shall generate a local ODUk clock (ODUkP_AI_CK) with a clock frequency within the minimum to maximum values of the specified ODU signal as given in Table 7-2 of [ITU-T G.709]~~14-2~~ and provisioned by the MI_Nominal_Bitrate_and_Tolerance from a free-running oscillator. The jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

2.10) Clause 14.3.5.1, ODUkP to PRBS adaptation source function (ODUkP/PRBS_A_So)

Replace the reference to Table 14-2 with a reference to Table 7-2 of [ITU-T G.709].

Clock and (multi)frame start signal generation: The function shall generate a local ODUk clock with a clock frequency within the minimum to maximum values of the specified ODU signal as given in Table 7-2 of [ITU-T G.709]~~14-2~~ provisioned by the MI_Nominal_Bitrate_and_Tolerance from a free-running oscillator. The jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

2.11) Clause 14.3.7, ODU0P to client adaptation function (ODU0P/CBRx_A) (0 ≤ x ≤ 1.25G)

Correct the header for the Payload Type column and correct the Payload Type for SBCON/ESCON in Table 14-20.

Table 14-20 – Defined values for x for ODU0 clients

x	PT~~I~~	Maximum buffer hysteresis	Bit rate	Clock range
155M	Hex code 0A	1 byte	155 520 kbit/s ± 20 ppm	155 520 kHz ± 20 ppm
622M	Hex code 0B	1 byte	622 080 kbit/s ± 20 ppm	622 080 kHz ± 20 ppm
1G25 (Note) ETC3	Hex code 07	1 byte	1 171 875 kbit/s ± 100 ppm	1 171 875 kHz ± 100 ppm
FC100	Hex code 0C	1 byte	1 062 500 kbit/s ± 100 ppm	1 062 500 kHz ± 100 ppm
SBCON/ ESCON	Hex code ~~18~~1A	1 byte	200 000 kbits ± 200 ppm	200 000 kHz ± 200 ppm
DVB-ASI	Hex code 1B	1 byte	270 000 kbit/s ± 100 ppm	270 000 kHz ± 100 ppm
NOTE – The original bit rate and clock range of the associated 1000BASE-X Ethernet client signal is 1 250 000 kbit/s ± 100 ppm. The bit rate and clock range in this table are for the CBR stream that is produced after mapping the client signal into a GFP-T.				

2.12) Clause 14.3.7.2, ODU0P to CBRx adaptation sink function (ODU0P/CBRx_A_Sk) (0 ≤ x ≤ 1.25G)

Correct the header for the Payload Type column, the Payload Type for SBCON/ESCON and the FC-100 replacement signal in Table 14-22.

Table 14-22 – Defined replacement signals and jitter specification references for ODU0 clients

Client	PTI	Replacement signal	Bit rate	Jitter standard
155M CBR	Hex code 0A	Generic-AIS	155 520 kbit/s ± 20 ppm	[ITU-T G.825]
622MCBR	Hex code 0B	Generic-AIS	622 080 kbit/s ± 20 ppm	[ITU-T G.825]
1G25 ETC3	Hex code 07	Link fault	1 250 000 kbit/s ± 100 ppm	[IEEE 802.3]
FC-100	Hex code 0C	~~Link fault~~NOS	1 062 500 kbit/s ± 100 ppm	[b-ANSI INCITS 352]
SBCON	Hex code ~~18~~1A	NOS	200 000 kbits ± 200 ppm	[b-INCITS 296] SBCON
DVB-ASI	Hex code 1B	Generic-AIS	270 000 kbit/s ± 100 ppm	ETSI TR 101 891, ETSI TR 101 290

2.13) Clause 14.3.8.1, ODUkP to CBRx adaptation source function using GMP (ODUkP/CBRx-g_A_So)

Replace the reference to Table 14-2 with a reference to Table 7-2 of [ITU-T G.709].

Clock and (multi)frame start signal generation: The function shall generate a local ODUk clock (ODUkP_AI_CK) as given in Table 7-2 of [ITU-T G.709]~~14-2~~ from a free-running oscillator. The clock parameters, including jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

2.14) Clause 14.3.8.2, ODUkP to CBRx adaptation sink function using GMP (ODUkP/CBRx-g_A_Sk)

Correct the FC-200 replacement signal in Table 14-26.

Table 14-26 – Defined replacement signals for ODUk clients

Client	PTI	Replacement signal	Bit rate	Jitter standard
ETC5	Hex code 07	Link fault	40 117 188 (kbit/s) ± 100	[IEEE 802.3ba]
ETC6	Hex code 07	Link fault	103 125 000 (kbit/s) ± 100	[IEEE 802.3ba]
FC-200	Hex code 0D	~~Link fault~~NOS	2 125 000 (kbit/s) ± 100	[b-ANSI INCITS 352]

2.15) Clause 14.3.10.1, ODUkP to ODUj payload type 21 adaptation source function (ODUkP/ODUj-21_A_So)

Replace the reference to Table 14-2 with a reference to Table 7-2 of [ITU-T G.709].

Buffer size: In the presence of jitter as specified by [ITU-T G.8251] and a frequency within the range specified in Table 7-2 of [ITU-T G.709]~~14-2~~, 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 14-35.

2.16) Clause 14.3.10.2, ODUkP to ODUj payload type 21 adaptation sink function (ODUkP/ODUj-21_A_Sk)

Replace the references to Table 14-2 with references to Table 7-2 of [ITU-T G.709].

Buffer size: In the presence of jitter as specified by [ITU-T G.8251] and a frequency within the tolerance range specified for the ODUj signal in Table 7-2 of [ITU-T G.709]~~14-2~~, this justification process shall not introduce any errors.

…

ODUj-LCK, ODUj-AIS: The function shall generate the ODUj-LCK and ODUj-AIS signals as defined in [ITU-T G.709]. The clock, frame start and multiframes start shall be independent from the incoming clock. The clock has to be within the ODUj frequency tolerance range as specified in Table 7-2 of [ITU-T G.709]~~14-2~~ provisioned by the MI_Nominal_Bitrate_and_Tolerance from a free-running oscillator. Jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

…

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, with 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 clock has to be within the ODUj frequency tolerance range as specified in Table 7-2 of [ITU-T G.709]~~14-2~~ provisioned by the MI_Nominal_Bitrate_and_Tolerance from a free-running oscillator. Jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

2.17) Clause 14.3.12.1, HAO capable ODUk to ETH adaptation source function (ODUkP-h/ETH_A_So)

Replace the reference to Table 14-2 with a reference to Table 7-2 of [ITU-T G.709].

Adjustable Clock and (Multi)Frame Start signal generation:

The function shall generate a local ODUk clock (ODUkP_AI_CK) with a clock rate within the minimum to maximum clock rate of the ~~specified ODU~~ ODUflex signal as given in Table 7-2 of [ITU-T G.709]~~14-2/G.798~~. The jitter and wander requirements as defined in Annex A of [ITU-T G.8251] (ODCa clock) apply.

2.18) Clause 14.3.13.1, HAO capable ODUkP to ODUj payload type 21 adaptation source function (ODUkP-h/ODUj_A_So)

Replace the reference to Table 14-2 with a reference to Table 7-2 of [ITU-T G.709].

Buffer size: In the presence of jitter as specified by [ITU-T G.8251] and a frequency within the range specified in Table 7-2 of [ITU-T G.709]~~14-2~~, 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 14-34hao.

2.19) Clause 14.3.13.2, HAO capable ODUkP to ODUj payload type 21 adaptation sink function (HAO capable ODUkP-h/ODUj-21_A_Sk)

Replace the references to Table 14-2 with references to Table 7-2 of [ITU-T G.709].

Buffer size: In the presence of jitter as specified by [ITU-T G.8251] and a frequency within the tolerance range specified for the ODUj signal in Table 7-2 of [ITU-T G.709]~~14-2~~, this justification process shall not introduce any errors.

…

ODUj-LCK, ODUj-AIS: The function shall generate the ODUj-LCK and ODUj-AIS signals as defined in [ITU-T G.709]. The clock, frame start and multiframes start shall be independent from the incoming clock. The clock has to be within the ODUj frequency tolerance range as specified in Table 7-2 of [ITU-T G.709]~~14-2~~ provisioned by the MI_Nominal_Bitrate_and_Tolerance from a free-running oscillator. Jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

…

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, with 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 clock has to be within the ODUj frequency tolerance range as specified in Table 7-2 of [ITU-T G.709]~~14-2~~ provisioned by the MI_Nominal_Bitrate_and_Tolerance from a free-running oscillator. Jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCa clock), apply.

2.20) Clause Annex A, Introduction

Update Table A.1 to include multilane 40 Gigabit/s SDH signals and add Tables A.1A and A.1B for fibre channel signals as follows:

The parameter x defines the supported bit rate or bit-rate range. The values x = 2G5, 10G and 40G are defined for client signals that comply to the SDH bit rates as defined in Table A.1. The values x = FC-100, FC-200, FC-400, FC-800, FC-1200 and FC-1600 are defined for client signals that comply to the Fibre Channel bit rates as defined in Table A.1A. Support for other bit rates and bit-rate ranges is for further study.

Table A.1 – Defined values for x (SDH)

OS type	x	Bit rate	Clock range
OS16	2G5	2 488 320 kbit/s ± 20 ppm	2 488 320 kHz ± 20 ppm
OS64	10G	9 953 280 kbit/s ± 20 ppm	9 953 280 kHz ± 20 ppm
OS256 or OSM256.4	40G	39 813 120 kbit/s ± 20 ppm	39 813 120 kHz ± 20 ppm

Table A.1A – Defined values for x (fibre channel)

x	Bit rate	Clock range	Jitter standard
FC-100	1 062 500 kbit/s ± 100 ppm	1 062 500 kbit/s ± 100 ppm	[b-ANSI INCITS 352]
FC-200	2 125 000 kbit/s ± 100 ppm	2 125 000 kbit/s ± 100 ppm	[b-ANSI INCITS 352]
FC-400	4 250 000 kbit/s ± 100 ppm	4 250 000 kbit/s ± 100 ppm	[b-ANSI INCITS 352]
FC-800	8 500 000 kbit/s ± 100 ppm	8 500 000 kbit/s ± 100 ppm	[b-ANSI INCITS 352]
FC-1200	10 518 750 kbit/s ± 100 ppm	10 518 750 kbit/s ± 100 ppm	[b-ANSI INCITS 364]
FC-1600	14 025 000 kbit/s ± 100 ppm	14 025 000 kbit/s ± 100 ppm	[b-ANSI INCITS 352]

Table A.1B – Jitter standard and replacement signals (fibre channel)

x	Jitter standard	Replacement signal
FC-100	[b-ANSI INCITS 352]	17.7.1.2 of [ITU-T 709]
FC-200	[b-ANSI INCITS 352]	17.7.2.1 of [ITU-T 709]
FC-400	[b-ANSI INCITS 352]	17.9.1 of [ITU-T 709]
FC-800	[b-ANSI INCITS 352]	17.9.1 of [ITU-T 709]
FC-1200	[b-ANSI INCITS 364]	17.8.2 of [ITU-T 709]
FC-1600	[b-ANSI INCITS 352]	17.9.2 of [ITU-T 709]

NOTE – FC-y is used throughout this clause as shorthand for the defined values for x for fibre channel type interfaces.

2.21) Clause A.2.1, OSx trail termination function (OSx_TT) (x = 2G5, 10G, 40G)

Update header and text as follows:

A.2.1 OSx trail termination function (OSx_TT) (x = 2G5, 10G, 40G, FC-y)

The OSx_TT functions are responsible for the end-to-end supervision of the OSx trail. Figure A.2 shows the combination of the unidirectional sink and source functions to form a bidirectional function.

NOTE – For the case where an STM-N signal is to be transported as a CBR signal, the OSx_TT functions are equivalent to the OSn_TT or OSMn.m_TT functions specified in [ITU-T G.783].

2.22) Clause A.2.1.1, OS trail termination source function (OSx_TT_So) (x = 2G5, 10G, 40G)

Update header and text as follows:

A.2.1.1 OS trail termination source function (OSx_TT_So) (x = 2G5, 10G, 40G, FC-y)

The information flow and processing of the OSx_TT_So function is defined with reference to Figures A.3 and A.4. The OSx_TT_So generates an optical signal. The physical parameters of the signal depend on the application. For SDH OSn type interfaces, the specifications in [ITU-T G.957] or [ITU-T G.691] apply. For SDH OSM256.4 type interfaces, [ITU-T G.783] clause 9.2.3 and the specifications in [ITU-T G.695] apply.

2.23) Clause A.2.1.2, OSx trail termination sink function (OSx_TT_Sk) (x = 2G5, 10G, 40G)

Update header and text as follows:

A.2.1.2 OSx trail termination sink function (OSx_TT_Sk) (x = 2G5, 10G, 40G, FC-y)

The information flow and processing of the OSx_TT_Sk function is defined with reference to Figures A.5 and A.6. The OSx_TT_Sk reports the state of the OSx trail. The OSx_TT_Sk accepts an optical signal. The physical parameters of the signal depend on the application. For SDH OSn type interfaces, the specifications in [ITU-T G.957] or [ITU-T G.691] apply. For SDH OSM256.4 type interfaces, [ITU-T G.783] clause 9.2.3 and the specifications in [ITU-T G.695] apply.

2.24) Clause A.3.1, OSx to CBRx adaptation (OSx/CBRx_A) (x = 2G5, 10G, 40G)

Update header as follows:

A.3.1 OSx to CBRx adaptation (OSx/CBRx_A) (x = 2G5, 10G, 40G, FC-y)

2.25) Clause A.3.1.1, OSx to CBRx adaptation source function (OSx/CBRx_A_So) (x = 2G5, 10G, 40G)

Update header and text as follows:

A.3.1.1 OSx to CBRx adaptation source function (OSx/CBRx_A_So) (x = 2G5, 10G, 40G, FC-y)

For SDH OSn type interfaces and fibre channel type interfaces, the information flow and processing of the OSx/CBRx_A_So function is defined with reference to Figures A.7 and A.8.

NOTE – For SDH OSM256.4 type interfaces, please see A.3.1.1.3.

…

For ~~the defined values of x~~SDH type interfaces, the jitter and wander requirements, as defined in clause 9.3.1.1 of [ITU-T G.783], apply. For fibre channel type interfaces, the input clock ranges are defined in Table A.1A and the jitter and wander requirements, as defined in the specifications referenced in Table A.1B, apply.

2.26) Clause A.3.1.2, OSx to CBRx adaptation sink function (OSx/CBRx_A_Sk) (x = 2G5, 10G, 40G)

Update header and text as follows:

A.3.1.2 OSx to CBRx adaptation sink function (OSx/CBRx_A_Sk) (x = 2G5, 10G, 40G, FC-y)

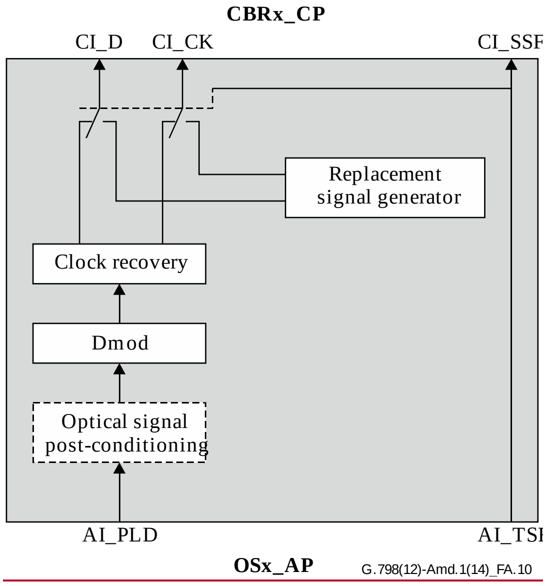
For SDH OSn type interfaces and fibre channel type interfaces, the information flow and processing of the OSx/CBRx_A_Sk function is defined with reference to Figures A.9 and A.10.

NOTE – For SDH OSM256.4 type interfaces, please see clause A.3.1.1.4.

…

Clock recovery: The function shall recover the clock signal from the incoming data. For ~~the defined values of x~~SDH type interfaces, the input clock ranges are defined in Table A.1 and the jitter and wander requirements, as defined in clause 9.3.1.2 of [ITU-T G.783], apply. For fibre channel type interfaces, the input clock ranges are defined in Table A.1A and the jitter and wander requirements, as defined in the specifications referenced in Table A.1B, apply.

To ensure adequate immunity against the presence of consecutive identical digits (CID) in the signal, the function shall comply with the specification in clause 15.1.4 of [ITU-T G.783] for SDH type interfaces.



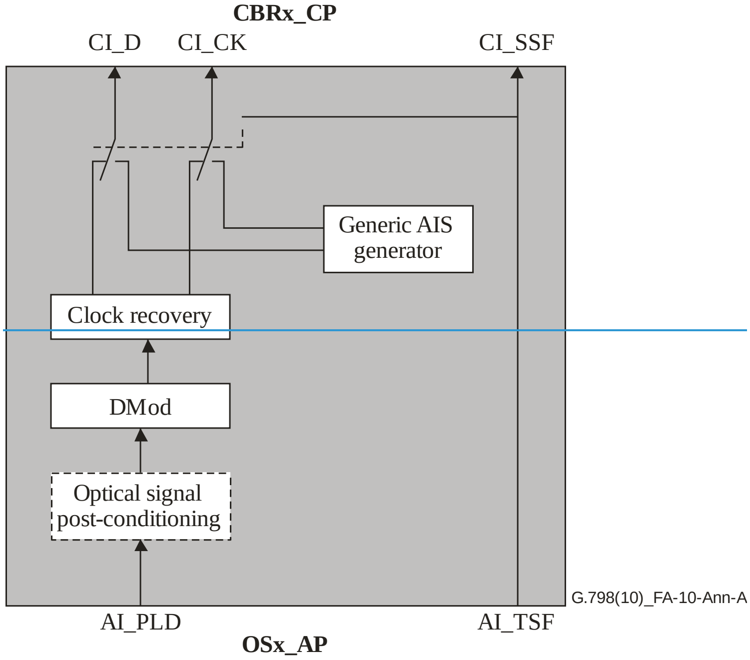


Figure A.10 – OSx/CBRx_A_Sk processes

Defects: None.

Consequent actions

The OSx/CBRx_A_Sk function performs the following consequent actions.

aSSF ← AI_TSF

aAIS ← AI_TSF

~~On declaration of aAIS, the function shall output a GenericAIS pattern/signal~~replacement signal as defined in clause 16.6 of [ITU-T G.709] for SDH type interfaces and in Table A.1B for fibre channel type interfaces within X ms. On clearing of aAIS, the ~~GenericAIS pattern/signal~~replacement signal shall be removed within Y ms, with normal data being output. The values for X and Y are for further study.

The ~~GenericAIS~~ replacement signal clock start shall be independent from the incoming clock. For the defined values of x, the ~~GenericAIS~~ replacement signal clock has to be within the range defined in Table A.1 for SDH type interfaces and Table A.1A for fibre channel type interfaces.

2.27) Clause I.1, Transparent CBRx tributary interface port with optional SDH RS non-intrusive monitor on OTN equipment

Update text as follows:

NOTE – A generic, bit rate non-specific model is presented. Actual interface ports will be bit rate specific; e.g. 10 Gbit/s (n = 64, x = 10G).

Figure I.1 shows the equipment functions for this application. The processing down to the ODUk layer, in the direction of the line interface, is shown.

The following operations are performed:

– termination of the [ITU-T G.957]/[ITU-T G.691] or [ITU-T G.695] optical signal;

– optional RSn non-intrusive monitoring in ingress and egress directions;

– mapping of CBR signal into the ODUk;

– termination of ODUk path overhead;

– termination of up to three levels of ODUk TCM overhead in line port direction (for TCM applications, see Appendix II).

Update Figure I.1 as follows to include OSMn.m interfaces and [ITU-T G.695] optics (changes in red).

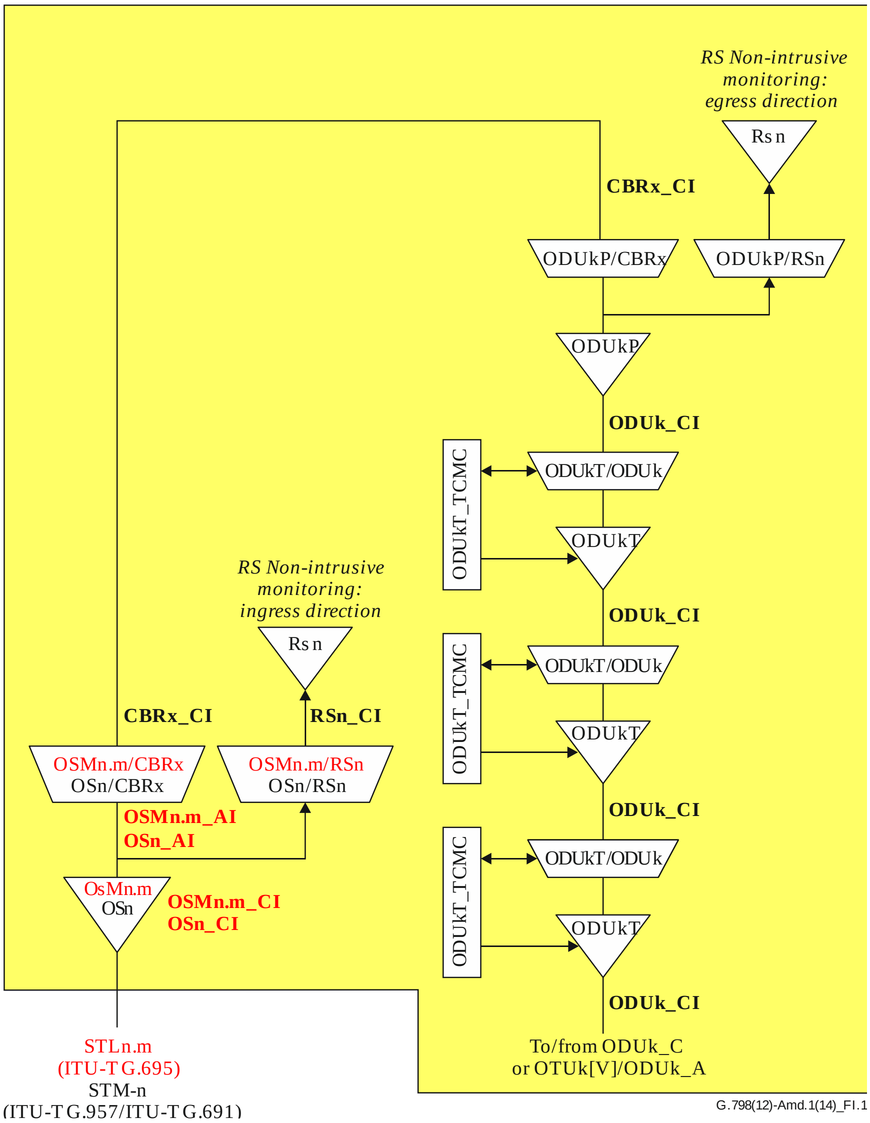


Figure I.1 – Transparent CBRx tributary interface port with optional SDH RS non-intrusive monitor on OTN equipment

2.28) Clause 14.3.14, Transparent CBRx tributary interface port with optional SDH RS non-intrusive monitor on OTN equipment

Add new clause 14.3.14:

14.3.14 HAO capable ODUk to MPLS-TP Adaptation functions (ODUkP-h/MT_A; k=ODUflex)

See [ITU-T G.8121] for this adaptation function.

2.29) Clause 14.3.15, ODU2eP to FC-1200 client adaptation function (ODU2eP/FC-1200_A)

Add new clause 14.3.15 describing the new ODU2eP/FC-1200 adaptation function:

14.3.15 ODU2eP to FC-1200 client adaptation function (ODU2eP/FC-1200_A)

The ODU2eP to FC-1200 adaptation functions perform the adaptation between the ODU2eP layer adapted information and the characteristic information of a FC-1200 signal. As described in clause 17.8.2 of [ITU-T G.709], a timing transparent adaptation with compression factor 50/51 is used to produce a signal with a rate of approximately 10 312 500 kbit/s that is mapped into the OPU2e.

14.3.15.1 ODU2eP to FC-1200 client adaptation source function (ODU2eP/FC-1200_A_So)

The ODU2eP/FC-1200_A_So function creates the ODU2e signal from a clock, derived from the incoming FC-1200_CI clock. It byte synchronously maps the transcoded constant bit-rate client signal from the FC-1200_CP into the payload area of the OPU2e as defined in clause 17.8.2 of [ITU-T G.709], and adds OPU2e overhead (RES, PT) and default ODU2e overhead.

The information flow of the ODU2eP/FC-1200_A_So function is defined with reference to Figure 14-FC1 and the processing of the ODU2eP/FC-1200_A_So function is defined with reference to Figure 14-FC2.

Symbol

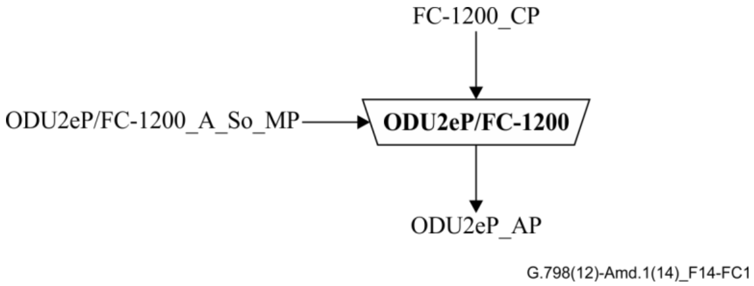


Figure 14-FC1 – ODU2eP/FC-1200_A_So function

Interfaces

Table 14-FC1 – ODU2eP/FC-1200_A_So inputs and outputs

Input(s)	Output(s)
FC-1200_CP: FC-1200_CI_CK FC-1200_CI_D FC-1200_CI_SF **ODU2eP/FC-1200_A_So_MP**: ODU2eP/FC-1200_A_So_MI_Active	**ODU2eP_AP**: ODU2eP_AI_CK ODU2eP_AI_D ODU2eP_AI_FS ODU2eP_AI_MFS

Processes

Activation

– The ODU2eP/FC-1200_A_So function shall access the access point when it is activated (MI_Active is true). Otherwise, it shall not access the access point.

Clock and (multi)frame start signal generation: The function shall generate a local ODU2e clock (ODU2eP_AI_CK) by multiplying the incoming FC-1200 clock (CI_CK) by a factor of $239/237 \times 50/51$. The clock parameters, including jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCb clock), apply.

During failure conditions of the incoming CBR clock signal (CI_CK), the ODU2e clock shall stay within its limits as defined in [ITU-T G.8251] and no frame phase discontinuity shall be introduced.

The function shall generate the (multi)frame start reference signals AI_FS and AI_MFS for the ODU2e signal. The AI_FS signal shall be active once per 122 368 clock cycles. AI_MFS shall be active once every 256 frames.

Timing transparent transcoding: The function shall compress the FC-1200 signal by a factor 50/51 through timing transparent transcoding. The result is a stream of equal length GFP data frames without GFP idle frames.

66B block synchronization: The function shall recover 66B block synchronization.

66B to 513B transcoding: The function shall transcode the 66B symbols to 513B symbols as specified in Annex B of [ITU-T G.709].

Superblock construction and CRC-24 generation: The process constructs a superblock from eight received 513B data words as defined in clause 17.8.2 of [ITU-T G.709]. A CRC-24 is calculated over the 65 bytes of "control" information located in the superblock and inserted at the end of the superblock as defined in clause 17.8.2 of [ITU-T G.709].

Superblock mapping: Seventeen superblocks are grouped together and prepended with 16 bytes of fixed stuff bytes into the payload information field of the GFP frame.

pFCS generation: The FCS is calculated over the payload information field of a frame and inserted into the pFCS fields of the frame as defined in clause 6.1.2.2.1 of [ITU-T G.7041].

Type header generation: The type header of the GFP data frame is generated by setting the PTI field to "000", the PFI field to "1", the EXI field to "0000" and the UPI field to 0001 0101" (Transparent transcoded FC-1200) as defined in Table 6-3 of [ITU-T G.7041]. The tHEC of the payload header is generated as defined in clause 6.1.2.1.2 of [ITU-T G.7041].

Payload scrambler: The GFP payload area is scrambled as defined in clause 6.1.2.3 of [ITU-T G.7041].

Core header generation: The core header of the GFP data frame is generated as specified in clause 8.5.3.1 of [ITU-T G.806]. The length of the GFP payload area is always 8800 bytes.

Mapping: The function shall provide an elastic store (buffer) process. The transcoded FC-1200 signal consists of a stream of GFP data frames. The data bytes of the GFP stream shall be written into the buffer under control of the associated input clock. The data bytes of the GFP stream shall be read out of the buffer and written byte-synchronously onto the D bytes in the OPU2e frame under control of the ODU2e clock as defined in clause 17.8.2 of [ITU-T G.709].

Buffer size: In the presence of jitter as specified by [b-ANSI INCITS 364], this mapping process shall not introduce any errors.

Following a step in frequency of the CI_CK signal (for example, due to removal of the ingress replacement signal), there will be a maximum recovery time of X seconds after which this process shall not generate any bit errors. The value of X is for further study; a value of 1 second has been proposed.

PT: The function shall insert payload type code "0000 1000" (FC-1200 into OPU2e mapping) into the PT byte position of the PSI overhead as defined in clause 15.9.2.1 of [ITU-T G.709].

Client signal fail: The function shall signal the failure of the client signal to the far end by use of the Bit 1 of the PSI[2] byte of the payload structure identifier, as defined in clause 17.1 of [ITU-T G.709].

NOTE – Equipment developed prior to the 2010 version of this Recommendation will not support the CSF processing.

RES: The function shall insert all-0's into the RES bytes and reserved bits within the JC bytes.

All other bits of the ODU2e overhead should be sourced as "0"s, except the ODU2e-PM STAT field which should be set to the value "normal path signal" (001).

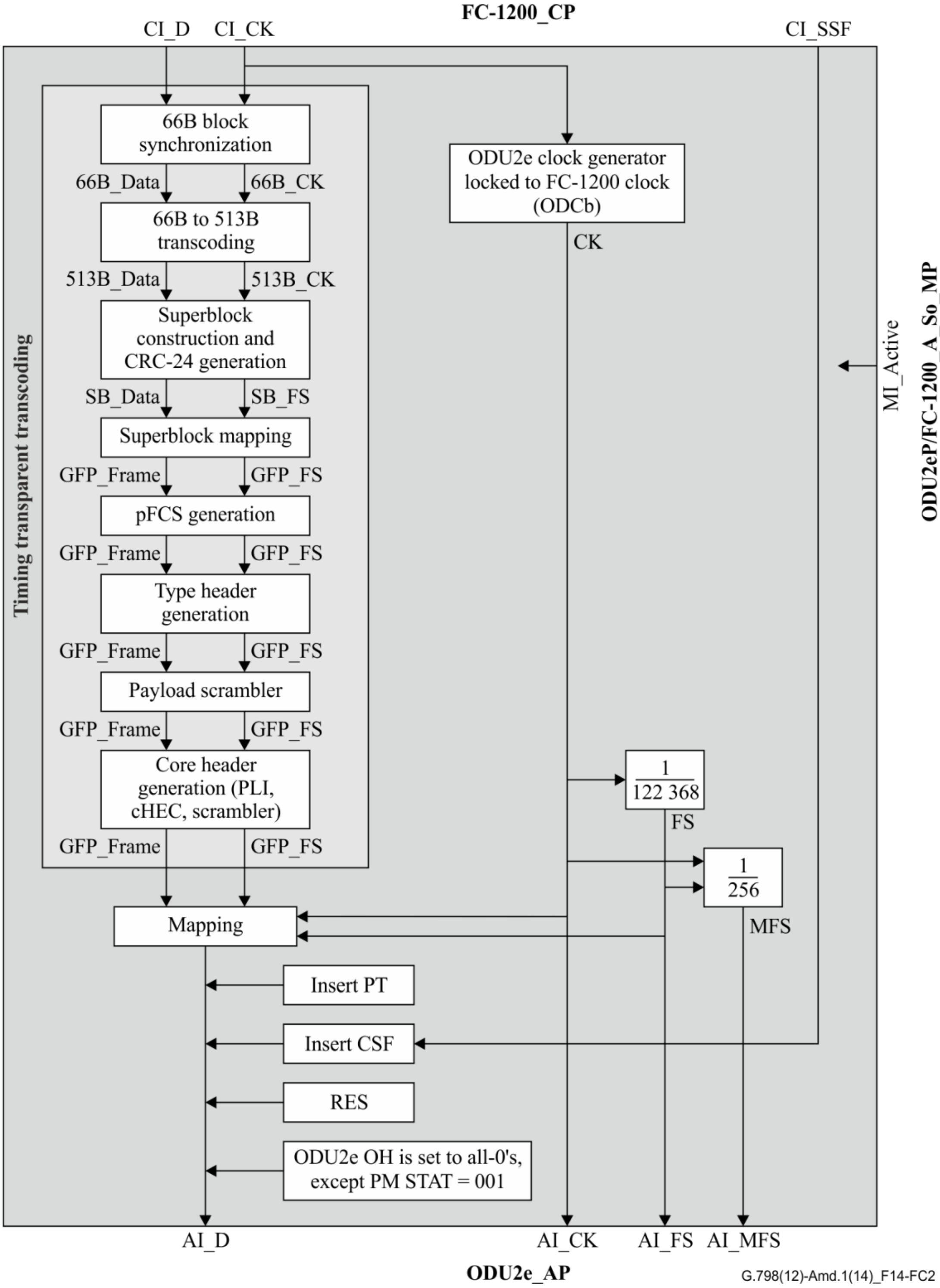


Figure 14-FC2 – ODU2eP/Client_A_So function

Defects: None.

Consequent actions: None.

Defect correlations: None.

Performance monitoring: None.

14.3.15.2 ODU2eP to FC-1200 client adaptation sink function (ODU2eP/FC-1200_A_Sk)

The ODU2eP/FC-1200_A_Sk recovers the FC-1200 client signal from the OPU2e payload. It extracts the OPU2e overhead (PT and RES) and monitors the reception of the correct payload type. Under signal fail condition the replacement signal as defined in clause 17.8.2 of [ITU-T G.709] shall be inserted.

The information flow of the ODU2eP/FC-1200_A_Sk function is defined with reference to Figure 14-FC3 and the processing of the ODU2eP/FC-1200_A_Sk function is defined with reference to Figure 14-FC4.

Symbol

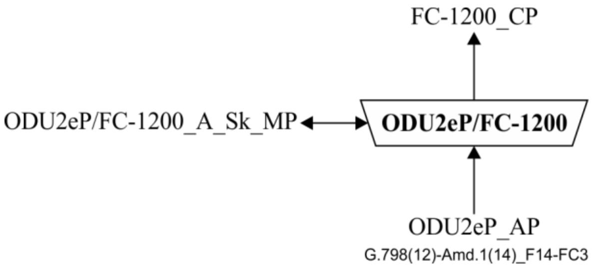


Figure 14-FC3 – ODU2eP/Client_A_Sk function

Interfaces

Table 14-23 – ODU2eP/Client_A_Sk inputs and outputs

Input(s)	Output(s)
ODU2eP_AP: ODU2eP_AI_CK ODU2eP_AI_D ODU2eP_AI_FS ODU2eP_AI_MFS ODU2eP_AI_TSF **ODU2eP/FC-1200_A_Sk_MP**: ODU2eP/FC-1200_A_Sk_MI_Active	**FC-1200_CP**: FC-1200_CI_CK FC-1200_CI_D FC-1200_CI_SSF **ODU2eP/FC-1200_A_Sk_MP**: ODU2eP/FC-1200_A_Sk_MI_cPLM ODU2eP/FC-1200_A_Sk_MI_cCSF ODU2eP/FC-1200_A_Sk_MI_cLFD ODU2eP/FC-1200_A_Sk_MI_AcPT

Processes

Activation

– The ODU2eP/FC-1200_A_Sk function shall access the access point and perform the common and specific processes operation specified below when it is activated (MI_Active is true). Otherwise, it shall activate the SSF signals and generate the FC-1200 replacement signal at its output (CP) and not report its status via the management point.

PT: The function shall extract the PT byte from the PSI overhead as defined in clause 8.7.1. The accepted PT value is available at the MP (MI_AcPT) and is used for PLM defect detection.

RES: The value in the RES bytes shall be ignored.

Client signal fail: The function shall extract the CSF signal indicating the failure of the client signal out of bit 1 of the PSI[2] byte of the payload structure identifier, as defined in clause 17.1 of [ITU-T G.709].

NOTE – Equipment developed prior to the 2010 version of this Recommendation will not support the CSF processing.

Timing transparent transcoding: The function shall uncompress the FC-1200 signal by a factor 51/50 through timing transparent transcoding. The result is a stream of 66B symbols.

GFP frame delineation: The function shall delineate the GFP data frame as specified in clause 8.5.2.2 of [ITU-T G.806].

Payload descrambler: The GFP payload area is descrambled as defined in clause 6.1.2.3 of [ITU-T G.7041].

tHEC check: The tHEC of the payload header shall be processed as defined in clause 8.5.3.2 of [ITU-T G.806].

PTI and UPI: The function shall ignore the PTI and UPI fields.

pFCS supervision: The function shall ignore the FCS field.

Superblock demapping: The prepended 16 bytes of fixed stuff are stripped and the 17 superblocks are extracted from the payload information field of the GFP frame.

CRC-24 supervision and superblock destruction: This process checks the CRC-24 of a received superblock for errors. If an error is detected all 66B symbols of the superblock are replaced by 66B error control blocks.

513B to 66B transcoding: The function shall transcode the 513B symbols to 66B symbols as specified in Annex B of [ITU-T G.709].

CBR clock generation: The function shall provide an elastic store (buffer) process. The 66B symbols resulting from the timing transparent transcoding shall be written into the buffer. The FC-1200 data (CI_D) shall be read out of the buffer under control of the FC-1200 clock (CI_CK).

Smoothing and jitter limiting process: The function shall provide for a clock smoothing and elastic store (buffer) process. The data bytes shall be written into the buffer under control of the associated (gapped) input clock. The data signal shall be read out of the buffer under control of a smoothed (equally spaced) clock at a rate and frequency accuracy determined by the client signal rate at the input of the remote ODU2eP/FC-1200_a_So.

The clock parameters, including jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCp clock), apply.

Buffer size: In the presence of jitter as specified by the relevant standard as listed in Table 14-22 and an ODU2e frequency within the range 10 399 525.316 kbit/s ± 100 ppm, this justification process shall not introduce any errors.

Following a step in frequency of the signal transported by the ODU2eP_AI (for example, due to reception of FC-1200_CI from a new CBR_TT_So at the far end or removal of the replacement signal with a frequency offset), there will be a maximum recovery time of X seconds after which this process shall not generate any bit errors. The value of X is for further study; a value of 1 second has been proposed.

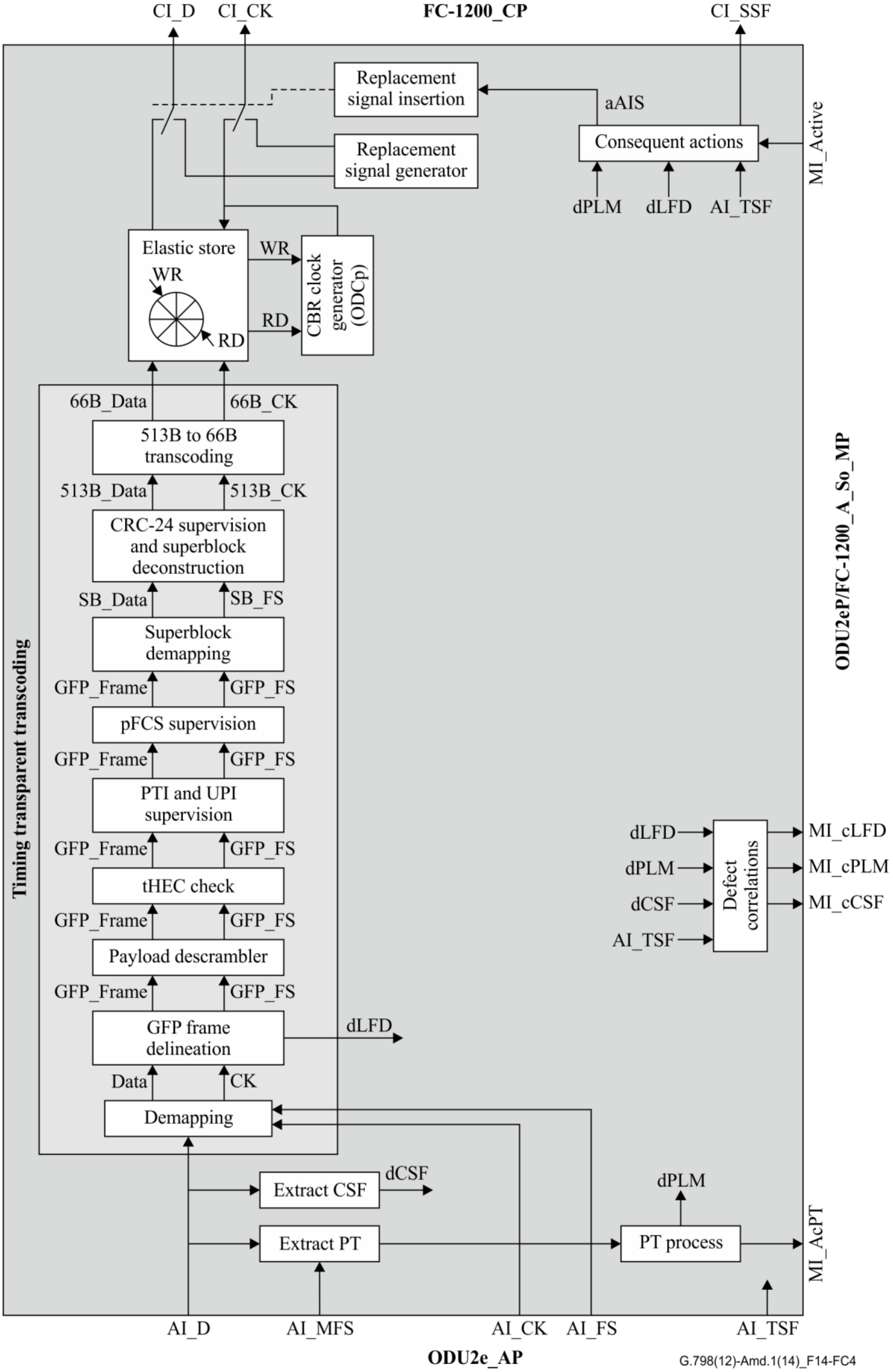


Figure 14-FC4 – ODU2eP/Client_A_Sk processes

Defects

The function shall detect for dPLM, dLFD, and dCSF defects.

dPLM: See clause 6.2.4.1. The expected payload type is "0000 1000" (FC-1200 into OPU2e mapping) as defined in clause 15.9.2.1 of [ITU-T G.709].

dCSF: See clause 6.2.10.

dLFD: See clause 6.2.5.2 of [ITU-T G.806].

Consequent actions

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

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

On declaration of aAIS the function shall output a replacement signal as defined in clause 17.8.2 of [ITU-T G.709] within two frames. On clearing of aAIS the replacement signal shall be removed within two frames and normal data being output. The replacement signal clock shall be independent from the incoming clock. The replacement signal clock has to be within the frequency, jitter, and wander tolerance specifications of the FC-1200 client signal as defined in [b-ANSI INCITS 364].

Defect correlations

cPLM ← dPLM and (not AI_TSF)

cLFD ← dLFD and (not dPLM) and (not AI_TSF)

cCSF ← dCSF and (not dPLM) and (not AI_TSF)

Performance monitoring: None.

2.30) Clause A.3.1.3, OSM256.4 to CBRx adaptation source function

Add new clause A.3.1.3 describing the new OSM256.4/CBRx adaptation source function:

A.3.1.3 OSM256.4 to CBRx adaptation source function

The information flow and processing of the OSM256.4/CBRx_So function is defined with reference to Figures A.11 and A12. This is a null function connecting the CBRx_CP output signals to the corresponding OSM256.4_AP input signals.

Symbol

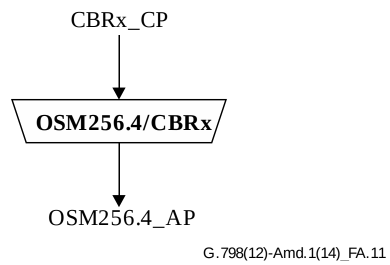


Figure A.11 – OSM256.4/CBRx_So function

Interfaces

Table A.6 – OSM256.4/CBRx_So inputs and outputs

Input(s)	Output(s)
CBRx_CP: CBRx_CI_D CBRx_CI_CK OSM256.4/CBRx_So_MI_Active	**OSM256.4_AP**: OSM256.4_AI_D OSM256.4_AI_CK OSM256.4_AI_FS OSM256.4/CBRx_A_So_MI_cLOF

Processes

The processes associated with the OSM256.4/CBRx_So function are depicted in Figure A.12.

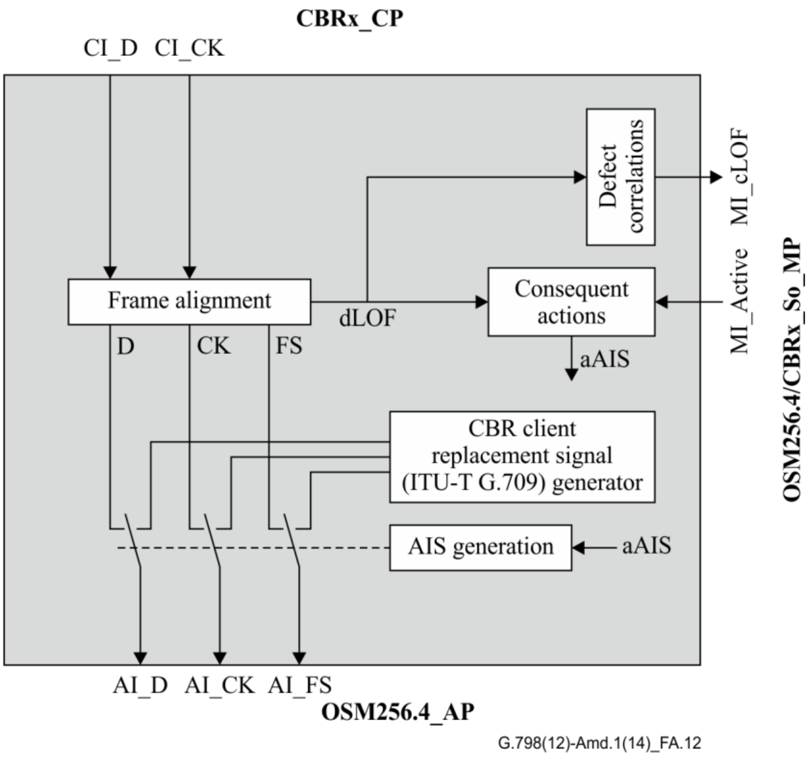


Figure A.12 – OSM256.4/CBRx_So processes

– Frame Alignment: The function shall perform frame alignment on the STM-N frame as described in clause 8.2.1 of [ITU-T G.783]. The function is required before the signal can be output in a multi-lane, OSM256.4 format.

– Activation: The OSM256.4/CBRx_So function shall access the access point and perform the common and specific processes operation specified below when it is activated MI_Active is true). Otherwise, it shall generate AIS at its output (AP) and not report its status via the management point.

Defects

The function shall detect dLOF.

dLOF: See clause 6.2.5.1 of [ITU-T G.783].

Consequent actions

aAIS ← dLOF or (not MI_Active)

On declaration of aAIS, the function shall output a replacement signal as defined in clauses 17.2 and 17.9 of [ITU-T G.709] within two frames. On clearing of aAIS the replacement pattern/signal shall be removed within two frames and normal data being output. The replacement signal clock shall be independent from the incoming clock. The replacement signal clock has to be within the range specified by Table 14-9. Jitter and wander requirements, as defined in Annex A of [ITU-T G.8251] (ODCp clock), apply.

Defect correlations

cLOF ← dLOF

Performance monitoring: None.

2.31) Clause A.3.1.4, OSM256.4 to CBRx adaptation sink function

Add new clause A.3.1.4 describing the new OSM256.4/CBRx adaptation sink function:

A.3.1.4 OSM256.4 to CBRx adaptation sink function

The information flow and processing of the OSM256.4/CBRx_A_Sk function is defined with reference to Figures A.13 and A.14.

Symbol

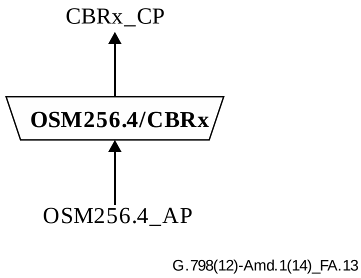


Figure A.13 – OSM256.4/CBRx_A_Sk function

Interfaces

Table A.7 – OSM256.4/CBRx_A_Sk inputs and outputs

Input(s)	Output(s)
OSM256.4_AP: OSM256.4_AI_D OSM256.4_AI_CK OSM256.4_AI_TSF	**CBRx_CP**: CBRx_CI_D CBRx_CI_CK CBRx_CI_SSF

Processes

The processes associated with the OSM256.4/CBRx_A_Sk function are depicted in Figure A.14.

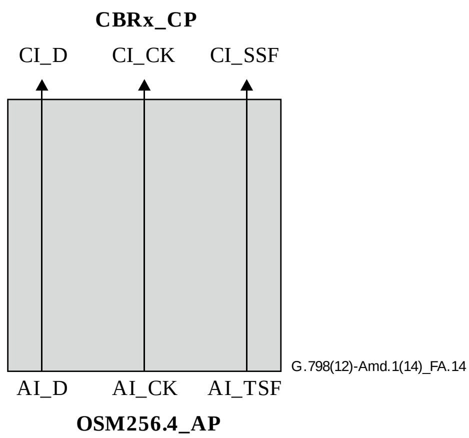


Figure A.14 – OSM256.4/CBRx_A_Sk processes

Defects: None.

Consequent actions: None.

Defect correlations: None.

Performance monitoring: None.

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