



**STI 14**

Edition 3/May 2002

**Interface Technical Specifications**  
*for France Telecom's network*

*As required by Directive 1999/5/EC*

**Multisite high rate service (SMHD) access interface  
characteristics**

**Summary:** This document describes the technical characteristics of the different interfaces used for accessing the SMHD service.

**Warning :**

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1. timer values are indicative and can be subject to modification,
2. due to various technical constraints, some services or service options may not be available on some interfaces,
3. the fact that a service not yet commercially open is described in this document can in no case be considered as a binding commitment on France Telecom part to actually open this service.

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## **1 OVERVIEW OF THE SMHD SERVICE**

France Telecom supplies a dedicated high bit rate metropolitan network to customers with  $n$  sites ( $n \geq 3$ ), located in a given geographical area, which meets all telecommunications needs between their sites. The sites are connected to the France Telecom network by an optical loop. This optical loop, designed to guarantee a aggregate transport capacity of 155 or 622 Mbit/s or 2.5 Gbit/s and duplicated to secure exchanges, supports the establishment of high rate links (2, 34, 45, 155 Mbit/s or 622 Mbit/s concatenated or unconcatenated) which use fibre optic and Synchronous Digital Hierarchy (SDH) transmission technologies.

An optional service for interconnecting two SMHD networks, called SMHD-DUO, allows high rate exchange links between two sites belonging to the two different SMHD networks to be established. This interconnection is either inter-urban or intra-urban.

The service provided between the customer sites is a point-to-point bidirectional digital transmission service accessible via the following types of interface:

### Electrical interfaces

- 2 Mbit/s
- 34 Mbit/s
- 45 Mbit/s
- 155 Mbit/s

### Optical interfaces

- 155 Mbit/s
- 622 Mbit/s concatenated or unconcatenated

Additional interfaces are available on customer request:

- X.24/V.11
- Ethernet 802.3/V2.0
- Fast Ethernet 802.3

These interfaces are supplied by way of a pair of adapter units connected to the ends of one or more 2, 45 or 155 Mbit/s permanent SMHD links.

The data transfer time from an incoming tributary to an outgoing tributary can reach a maximum of 3 ms. The transfer times for links on DUO are greater, and depend on the location of the two customer end sites and the link routing. In general, the transfer time for this type of link does not exceed 10 ms.

## **2 SYNCHRONISATION**

The service access equipment (EAS) is synchronised by a long-term, high stability clock frequency. This clock frequency, from the France Telecom network, comes from primary reference sources which comply with ITU-T Recommendation G.811.

The 2, 34 and 45 Mbit/s links routed on the SMHD network are not synchronised (phase-locked) to the clock frequency of the EAS on the optical loop. As a result, it is recommended that the clock frequency delivered by the customer terminal equipment interfaced with the SMHD network comply with Recommendation G.703.

### **3 TRIBUTARY INTERFACE CHARACTERISTICS**

This chapter defines the interworking between the customer terminal equipment and the EAS.

#### **3.1 2 MBIT/S ELECTRICAL INTERFACE**

The interface complies with Recommendation G.703.

It is an electrical interface with two 120 Ohm symmetrical pairs.

#### **3.2 34 OR 45 MBIT/S ELECTRICAL INTERFACE**

The interface complies with Recommendation G.703.

It is an electrical interface with two 75 Ohm coaxial pairs.

#### **3.3 155 MBIT/S ELECTRICAL INTERFACE**

The interface complies with Recommendation G.703 at hardware level and Recommendation G.707 at software level.

This interface is only available with the SMHD 622 Mbit/s and SMHD 2.5 Gbit/s services.

It is an electrical interface with two 75 Ohm coaxial pairs.

The interworking characteristics at 155 Mbit/s between the customer terminal equipment and the EAS are defined in § 4.1.

#### **3.4 155 MBIT/S OPTICAL INTERFACE**

The interface complies with Recommendations G.957 and G.958 at hardware level and Recommendation G.707 at software level.

The optical interface requires 2 single-mode Fibre Optic (FO) cables (incoming/outgoing).

This interface is only available with the SMHD 622 Mbit/s and SMHD 2.5 Gbit/s services.

The STM1 optical interface transmits at 1310 nm.

The optical levels must respect the following values:

EAS STM1 incoming optical levels	Maximum	-10 dBm
	Minimum	-28 dBm
EAS STM1 outgoing optical levels	Maximum	0 dBm
	Minimum	-15 dBm

The interworking characteristics at 155 Mbit/s between the customer terminal equipment and the EAS are defined in § 4.1.

#### **3.5 622 MBIT/S OPTICAL INTERFACE**

The interface complies with Recommendations G.957 and G.958 at hardware level and Recommendation G.707 at software level.

The equipment used allows you to deliver a concatenated STM4 tributary (VC4-4c) or an unconcatenated STM4 tributary (the optical path is made up of 4 monolithic VC4s with different routing and different transfer times).

The optical interface requires 2 single-mode Fibre Optic (FO) cables (incoming/outgoing).

This interface is only available with 2.5 Gbit/s SMHD services.

The concatenated or unconcatenated STM-4 optical interface transmits at 1310 nm.

The optical levels must respect the following values:

EAS STM4 incoming optical levels	Maximum	-8 dBm
	Minimum	-28 dBm
EAS STM4 outgoing optical levels	Maximum	+2 dBm
	Minimum	-15 dBm

The interworking characteristics at 622 Mbit/s, unconcatenated between the customer terminal equipment and the EAS are defined in § 4.2.

The interworking characteristics at 622 Mbit/s, concatenated between the customer terminal equipment and the EAS are defined in § 4.3.

### 3.6 **ADDITIONAL INTERFACES**

The choice of SMHD link rate, implementation of the option and the mode of operation for the additional Fast Ethernet interface (half-duplex or full-duplex) is made by the customer when ordering the service.

The interface is transparent to Virtual Local Access Networks (VLAN).

The interfaces are available on the connectors situated on the adapter units.

<b>Technical characteristics of the additional interfaces</b>			
<b>Customer interface</b>	<b>Wanted bit rate</b>	<b>Connector technology</b>	<b>Range</b>
X.24/V.11-a (1)	64 kbit/s to 1920 kbit/s	15-pin female ISO 4903 connector	40m
Ethernet 802.3 or V2.0	N x 1724 kbit/s (N = 1 to 4)	RJ-45 (10 Base-T)	100m regardless of N
100 Base-TX Fast Ethernet 802.3	<ul style="list-style-type: none"> <li>• 40 Mbit/s using a 45 Mbit/s SMHD link</li> <li>• 100 Mbit/s using a 155 Mbit/s SMHD link</li> </ul>	RJ-45 (100 Base-T)	100m

Note (1): The retransmission of circuits C on I, 105 on 109 and TA on CA is not end-to-end.

## 4 SDH INTERWORKING

### 4.1 155 MBIT/S INTERWORKING

The interworking characteristics at 155 Mbit/s (STM1) described below apply to both electrical and optical interfaces.

***The Multiplexing Section Protection (MSP) function on tributary accesses is not offered in this service.***

The tables below defines the EAS SDH/STM1 frame octets.

*Note 1: All values are given in hexadecimal notation.*

*Note 2: Definition:*

- *EAS incoming = signal received by the EAS*
- *EAS outgoing = signal transmitted by the EAS*

#### 4.1.1 REPEATING SERVICE OVERHEAD (RSOH) OCTETS

A1	A1	A1	A2	A2	A2	C1/J0	NU	NU
B1			E1			F1	NU	NU
D1			D2			D3		

NU: National Use

Octet	EAS STM1 outgoing value	EAS STM1 incoming requirements
A1	F6	F6
A2	28	28
C1/J0	C1 operation	Any
B1	Algorithm complies with G.707	Algorithm complies with G.707
D1-3	Do not use Data Communications Channels (DCC)	Any
Others	Values not standard as not defined by the ITU-T	Any

#### 4.1.2 MULTIPLEXER SECTION OVERHEAD (MSOH) OCTETS

B2	B2	B2	K1			K2		
D4			D5			D6		
D7			D8			D9		
D10			D11			D12		
S1					M1	E2	NU	NU

NU: National Use

Octet	EAS STM1 outgoing value	EAS STM1 incoming requirements
B2	Algorithm complies with G.707	Algorithm complies with G.707
K1	00	Any
K2 (1-5)	Values not standard (11111 or 00000)	Any
K2 (6-8)	Values not standard (000 or 001) 110: Multiplex Section Remote Defect Indication (MS-RDI)	No alarm if ≠ 110 or 111 110: MS-RDI 111: Multiplex Section Alarm Indication Signal (MS-AIS)
S1	Do not use octet S1 The values are not standard and depend on the interconnected equipment	Any
M1	Multiplex Section Remote Error Indication (MS-REI) function not supported The values are standard and depend on the interconnected equipment	Any
D4-12	Do not use DCCs	Any
Others	Values not standard as not defined by the ITU-T	Any

### 4.1.3 AU-4 POINTER OCTETS

H1	Y	Y	H2	1*	1*	H3#1	H3#2	H3#3
----	---	---	----	----	----	------	------	------

1\* = 11111111

Octet	EAS STM1 outgoing value	EAS STM1 incoming requirements
H1	Bits 1 to 4 = New Data Flag, complies with G.707 and G.783 SS bits (bits 5 and 6) = 10 Bits 7 and 8 comply with G.707	Bits 1 to 4 = New Data Flag, complies with G.707 and G.783 SS bits (bits 5 and 6) = 10 Bits 7 and 8 comply with G.707
H2	Complies with G.707	Complies with G.707
1*	11111111	11111111
Y	1001SS11 SS bits (bits 5 and 6) = 10 or 00	1001SS11 SS bits (bits 5 and 6) = Any

**Caution:** In reception, an H1 octet SS bit value other than 10 results in a Loss Of Pointer (LOP) alarm: transmission of VC4 impossible.

### 4.1.4 VC4 POH OCTETS

VC4 is transmitted transparently in the France Telecom network, therefore it does not modify the Path OverHead (POH). However, octet B3 and bits 1 to 4 of the VC4 POH G1 octet, transmitted by the customer terminal equipment, are produced in compliance with the ITU-T G.707 algorithm.

## 4.2 UNCONCATENATED 622 MBIT/S INTERWORKING

The interworking characteristics at 622 Mbit/s (STM-4) described below apply to optical interfaces.

***The MSP function on tributary accesses is not offered in this service.***

The table below defines the EAS SDH/STM-4 frame octets established on the customer site.

*Note 1: All values are given in hexadecimal notation.*

*Note 2: Definition:*

- *EAS incoming = signal received by the EAS*
- *EAS outgoing = signal transmitted by the EAS*

#### 4.2.1 RSOH OCTETS

A1#1	A1#2		A1#12	A2#1	A2#2		A2#12	C1/J0	Z0	Z0	Z0	NU	NU		NU
B1				E1				F1	NU	NU	NU	NU	NU		NU
D1				D2				D3							

Octet	EAS outgoing STM4 value	EAS incoming STM4 requirements
A1	F6	F6
A2	28	28
C1/J0	C1 operation C1 = 01	Any
Z0	02, 03, 04 or CC	Any
NU 1 <sup>st</sup> line	AA or FF or CC	Any
NU 2 <sup>nd</sup> line	FF or 00	
B1	Algorithm complies with G.707	Algorithm complies with G.707
D1-3	Do not use DCCs	Any
Others	00 or FF	Any

#### 4.2.2 MSOH OCTETS

B2#1	B2#2		B2#12	K1				K2							
D4				D5				D6							
D7				D8				D9							
D10				D11				D12							
S1						M1		E2							

Octet	EAS outgoing STM4 value	EAS incoming STM4 requirements
B2	Algorithm complies with G.707	Algorithm complies with G.707
K1	00	Any
K2 (1-5)	00000	Any
K2 (6-8)	000 or 00 if no alarm 110 if MS-RDI	≠ 110 or 111 if no alarm = 110 if MS-RDI = 111 if MS-AIS
S1	Complies with G.707	Any: This STM4 link is not a sync reference for France Telecom
M1	MS-REI function not supported on some interconnected equipment	Any
D4-12	Do not use DCCs	Any
Others	00 or FF or 01	Any

#### 4.2.3 AU-4 POINTER OCTETS

H1	Y	Y	H2	1*	1*	H3#1	H3#2	H3#3
----	---	---	----	----	----	------	------	------

Octet	EAS outgoing STM4 value	EAS incoming STM4 requirements
H1	Bits 1 to 4 = New Data Flag, complies with G.707 and G.783 SS bits (bits 5 and 6) = 10 Bits 7 and 8 comply with G.707	Bits 1 to 4 = New Data Flag, complies with G.707 and G.783 SS bits (bits 5 and 6) = 10 Bits 7 and 8 comply with G.707
H2	Complies with G.707	Complies with G.707
Y	1001SS11 SS bits (bits 5 and 6) = 00 or 10	Any SS bits (bits 5 and 6) = Any
1*	11111111	Any

**Caution:** In reception, an H1 octet SS bit value other than 10 results in an LOP alarm: transmission of VC4 impossible.

#### 4.2.4 VC4 POH OCTETS

The four VC4s are transmitted transparently in the France Telecom network, therefore do not modify the POH. However, octet B3 and bits 1 to 4 of the G1 octet of each VC4 POH, transmitted by the customer terminal equipment, are produced in compliance with the ITU-T G.707 algorithm.

### 4.3 CONCATENATED 622 MBIT/S INTERWORKING

The interworking characteristics at 622 Mbit/s (STM4C) described below apply to optical interfaces.

***The MSP function on tributary accesses is not offered in this service.***

The table below defines the EAS SDH/STM-4C frame octets established on the customer site.

*Note 1: All values are given in hexadecimal notation.*

*Note 2: Definition:*

- *EAS incoming = signal received by the EAS*
- *EAS outgoing = signal transmitted by the EAS*

#### 4.3.1 RSOH OCTETS

A1#1	A1#2		A1#12	A2#1	A2#2		A2#12	C1/J0	Z0	Z0	Z0	NU	NU		NU
B1				E1				F1	NU	NU	NU	NU	NU		NU
D1				D2				D3							

Octet	EAS outgoing STM4C value	EAS incoming STM4C requirements
A1	F6	F6
A2	28	28
C1/J0	C1 operation: C1 = 01	Any
Z0	02, 03, 04 or CC	Any
NU	1 <sup>st</sup> line = AA or FF or CC 2 <sup>nd</sup> line = FF or 00	Any
B1	Algorithm complies with G.707	Algorithm complies with G.707
D1-3	Do not use DCCs	Any
Others	FF or 00	Any

#### 4.3.2 MSOH OCTETS

B2#1	B2#2		B2#12	K1				K2							
D4				D5				D6							
D7				D8				D9							
D10				D11				D12							
S1						M1		E2	NU	NU	NU	NU	NU		NU

Octet	EAS outgoing STM4C value	EAS incoming STM4C requirements
B2	Algorithm complies with G.707	Algorithm complies with G.707
K1	00	Any
K2 (1-5)	00000	Any
K2 (6-8)	000 if no alarm 110 if MS-RDI	≠ 110 or 111 if no alarm = 110 if MS-RDI = 111 if MS-AIS
S1	Complies with G.707	Any: This STM4 link is not a sync reference for France Telecom
M1	Complies with G.707	Complies with G.707
D4-12	Do not use DCCs	Any
Others	FF or 00	Any

### 4.3.3 AU-4 POINTER OCTETS

H1	Y	Y	H2	1*	1*	H3#1	H3#2	H3#3
----	---	---	----	----	----	------	------	------

#### 4.3.3.1 1<sup>st</sup> AU-4 pointer

Octet	EAS outgoing STM4C value	EAS incoming STM4C requirements
H1	Bits 1 to 4 = New Data Flag, complies G.707 and G.783 SS bits (bits 5 and 6) = 10 Bits 7 and 8 comply with G.707	Bits 1 to 4 = New Data Flag, complies with G.707 and G.783 SS bits (bits 5 and 6) = 10 Bits 7 and 8 comply with G.707
H2	Complies with G.707	Complies with G.707
Y	1001SS11 SS bits (bits 5 and 6) = 00	Any SS bits (bits 5 and 6) = Any
1*	11111111	Any

### 4.3.3.2 Other AU-4 pointers

Octet	EAS outgoing STM-4C value	EAS incoming STM-4C requirements
H1	Bits 1 to 4 = 1001 SS bits (bits 5 and 6) = 10 or 00 Bits 7 and 8 = 11	Bits 1 to 4 = 1001 SS bits = any 5 and 6 bits Bits 7 and 8 = 11
H2	11111111	11111111
Y	1001SS11 SS bits (bits 5 and 6) = 00	Any SS bits (bits 5 and 6) = Any
1*	11111111	Any

### 4.3.4 VC4-4C POH OCTETS

VC4-4c is transmitted transparently in the France Telecom network, therefore it does not modify the POH. However, octet B3 and bits 1 to 4 of the VC4-4c POH G1 octet, transmitted by the customer terminal equipment, are produced in compliance with the ITU-T G.707 algorithm.

## 5 HISTORY

Edition	Date	Comments
1	March 2000	First version
2	October 2000	Title changed, interfaces which are no longer marketed (supported only) removed, new interfaces added (see section 2.2)
3	May 2002	Modifications by BE/MSE/STD/DT in compliance with the STAS's