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

Digital sections and digital line system – Access networks

## Handshake procedures for digital subscriber line (DSL) transceivers

ITU-T Recommendation G.994.1

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**ITU-T Recommendation G.994.1**

# Handshake procedures for digital subscriber line (DSL) transceivers


## Summary

This Recommendation provides a flexible mechanism for Digital Subscriber Line (DSL) transceivers to exchange capabilities and to select a common mode of operation. It includes parameters relating to service and application requirements as well as parameters pertinent to various DSL transceivers. This Recommendation is currently an integral part of the start-up procedure for Recommendations G.991.2, G.992.1 and G.992.2. It is anticipated that future DSL Recommendations will also be able to make use of this Recommendation. Provisions are also included for exchanging non-standard information.



## Source

ITU-T Recommendation G.994.1 was revised by ITU-T Study Group 15 (2001-2004) and approved under the WTSA Resolution 1 procedure on 9 February 2001.

## FOREWORD

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

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

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

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

## NOTE

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

## INTELLECTUAL PROPERTY RIGHTS

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

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**ITU-T Recommendation G.994.1**

# Handshake procedures for digital subscriber line (DSL) transceivers

## 1 Scope

This Recommendation defines signals, messages, and procedures for exchanging these between Digital Subscriber Line (DSL) equipment, when the modes of operation of the equipment need to be automatically established and selected, but before signals are exchanged which are specific to a particular DSL Recommendation.

For interrelationships of this Recommendation with other G.99x-series Recommendations, see ITU-T G.995.1 (informative).

The principal characteristics of this Recommendation are as follows:

a) use over metallic local loops;

b) provisions to exchange capabilities information between DSL equipment to identify common modes of operation;

c) provisions for DSL equipment at either end of the loop to select a common mode of operation or to request the other end to select the mode;

d) provisions for exchanging non-standard information between DSL equipment;

e) provisions to exchange and request service and application related information;

f) support for both duplex and half-duplex transmission modes;

g) support for multi-pair operation;

h) provisions for DSL equipment at the remote end of the loop (xTU-R) to propose a common mode of operation (new in this Version 2 of the Recommendation through the use of new message type MP and its associated transactions).

## 2 References

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

– ITU-T G.991.2 (2001), *Single-pair high-speed digital subscriber line (SHDSL) transceivers*.

– ITU-T G.992.1 (1999), *Asymmetrical digital subscriber line (ADSL) transceivers*.

– ITU-T G.992.2 (1999), *Splitterless asymmetrical digital subscriber line (ADSL) transceivers*.

– ITU-T G.997.1 (1999), *Physical layer management for digital subscriber line (DSL) transceivers*.

– ITU-T T.35 (1991), *Procedure for the allocation of ITU-T defined codes for non-standard facilities*.

– ISO/IEC 3309:1993, *Information technology – Telecommunications and information exchange between systems – High-level data link control (HDLC) procedures – Frame structure*.

## 3 Definitions

This Recommendation defines the following terms:

**3.1 carrier set**: A set of one or more frequencies associated with the PSD mask of a particular xDSL Recommendation.

**3.2 downstream**: The direction of transmission from the xTU-C to the xTU-R.

**3.3 errored frame**: A frame that contains a frame check sequence (FCS) error.

**3.4 Galf**: An octet of value $81_{16}$, i.e. the ones complement of an HDLC flag.

**3.5 initiating signal**: A signal that initiates the start-up procedure of a G.994.1 session.

**3.6 initiating station**: The station that initiates the start-up procedure of a G.994.1 session.

**3.7 invalid frame**: A frame that has fewer than four octets between flags, excluding transparency octets.

**3.8 message**: Framed information conveyed via modulated transmission.

**3.9 responding signal**: A signal that is sent in response to an initiating signal.

**3.10 responding station**: The station that responds to the initiation of the start-up procedure of a G.994.1 session.

**3.11 session**: A G.994.1 session comprises a start-up procedure, one or more transactions, and a cleardown procedure (except as noted in clause 12).

**3.12 signalling family**: A group of carrier sets which are integral multiples of a given carrier spacing frequency.

**3.13 transaction**: A sequence of G.994.1 messages, ending with either a positive acknowledgement [ACK(1) (except as noted in 7.6)], a negative acknowledgement (NAK), or a time-out (see clause 12).

**3.14 upstream**: The direction of transmission from the xTU-R to the xTU-C.

## 4 Abbreviations

This Recommendation uses the following abbreviations:

| | |
|---|---|
| ACK | Acknowledge Message |
| ADSL | Asymmetric Digital Subscriber Line |
| CL | Capabilities List |
| CLR | Capabilities List Request |
| FCS | Frame Check Sequence |
| HSTU | Handshake Transceiver Unit |
| ISO | International Organization for Standardization |
| ITU-T | International Telecommunication Union – Telecommunication Standardization Sector |
| LSB | Least Significant Bit |
| MP | Mode Proposal Message |
| MR | Mode Request Message |
| MS | Mode Select Message |
| MSB | Most Significant Bit |

NAK Negative Acknowledge Message

PSTN Public Switched Telephone Network

REQ Request Message Type Message

xDSL Any of the various types of Digital Subscriber Lines (DSL)

xTU-C xDSL central site terminal unit

xTU-R xDSL remote terminal unit

## 5 System reference diagram

Figure 1 illustrates the system reference model for this Recommendation.

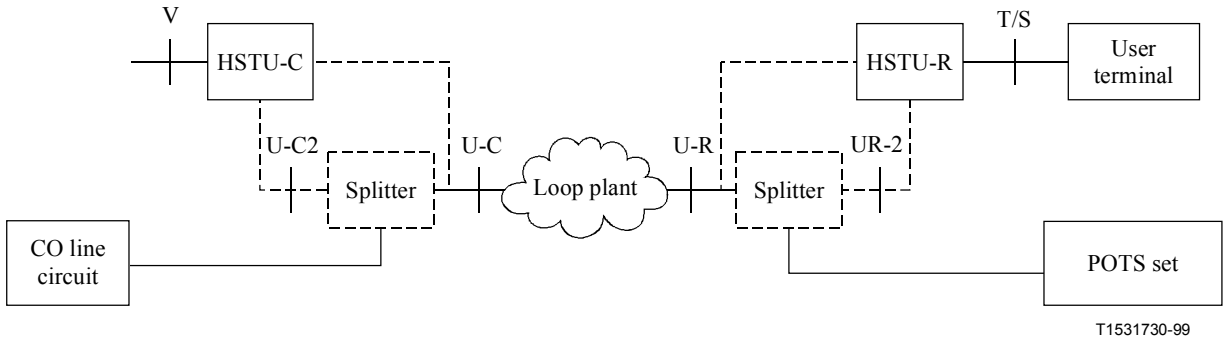



**Figure 1/G.994.1 – System reference model**

The system reference model identifies the necessary functional blocks and the reference points and/or interface points that may be used or have implications in this Recommendation.

The system reference model comprises the following blocks:

- transceivers: HSTU-C and HSTU-R;
- splitter function;
- loop plant;
- user terminal;
- POTS set;
- CO line circuit.

This Recommendation defines the signals, messages and procedures for common mode selection, and as such only relates to the functions associated with the HSTU-C and HSTU-R blocks. HSTU is used to signify that the signals, messages and procedures defined in this Recommendation are different from the G.99x Recommendations that use this Recommendation as a common start-up procedure. The remaining blocks are included to illustrate a reference system.

Splitters may or may not be present at the central and remote sites and are therefore signified by dotted boxes. If splitters are present, the HSTU-C (HSTU-R) may be connected to either or to both the U-C (U-R) and U-C2 (U-R2) interface points, signified by the dotted connecting lines.

The reference points V, U, T/S may not need to be exposed. This system reference model does not imply any particular implementation of the signals, messages, and procedures defined in the Recommendation.

The HSTU negotiates modes of operation on behalf of one or more xDSL terminal units that are hereafter referred to as xTU.

# 6 Signals and modulation

## 6.1 Description of signals

The signalling families used in this Recommendation, and the carrier sets defined within each family, are described in this clause.

Each xDSL mode of operation has a mandatory carrier set associated with it. For each xDSL mode of operation implemented by a G.994.1 station, the initial G.994.1 transmission from the station shall include the associated mandatory carrier set for that mode.

NOTE 1 – In the interest of explicitly indicating the presence of HSTU-x that might not have common modes, the initial transmission should use as many carriers as possible, and HSTU-x are encouraged to detect all carriers from all signalling families.

Both duplex and half-duplex transmission modes are defined for use within this Recommendation. The transmission mode supported is a function of carrier set and is specified in Tables 1 and 3.

Frequencies other than those specified in Tables 1 and 3 shall not be transmitted simultaneously with G.994.1 signals.

The tolerance of the symbol rate and carrier frequencies for an HSTU-C shall be ±50 ppm. The tolerance of the symbol rate and carrier frequencies for an HSTU-R shall be ±200 ppm during R-TONES-REQ and ±50 ppm during and after R-TONE1 (in duplex transmission mode) or R-FLAG1 (in half-duplex transmission mode). The HSTU-R may perform partial or full loop timing acquisition during the silence period preceding R-TONE1 or R-FLAG1. For both the HSTU-C and HSTU-R transmitter, the symbol rate and carrier frequencies shall be time locked.

NOTE 2 – National regulations may limit signal transmission to those carriers that fall within the PSD mask of the xDSL mode(s) supported by the station.

NOTE 3 – It is advised to monitor for existing services prior to transmitting signals to avoid interfering with them.

NOTE 4 – New xDSL services that wish to use this Recommendation are strongly encouraged to use currently defined carrier sets rather than defining new carrier sets.

NOTE 5 – The need for any additional carrier set(s) to support the VDSL specifications identified in Table 11.0.1 is for further study.

### 6.1.1 4.3125 kHz signalling family

Carrier frequencies within this signalling family are given by N × 4.3125 kHz, where N is a positive integer. The symbol rate shall be 4312.5/8 ≡ 539.0625 symbols per second.

Within this family, there are three upstream carrier sets, designated A43, B43, and C43. Each upstream carrier set has an associated downstream carrier set that carries the same designation. The carrier set frequencies and the maximum transmit power level per carrier for each carrier set are defined in Table 1 where frequency = N × 4.3125 kHz.

The carrier sets in this family are mandatory for the xDSL modes listed in Table 2. One or more carriers listed in Tables 1 or 3 may be transmitted in addition to the mandatory carrier set listed in Table 2. Carriers not listed in Tables 1 or 3 shall not be transmitted.

**Table 1/G.994.1 – Carrier sets for the 4.3125 kHz signalling family**

| Carrier set designation | Upstream carrier sets | | Downstream carrier sets | | Transmission mode |
|---|---|---|---|---|---|
| | Frequency indices (N) | Maximum power level/carrier (dBm) | Frequency indices (N) | Maximum power level/carrier (dBm) | |
| A43 | 9 17 25 | –1.65 | 40 56 64 | –3.65 | duplex only |
| B43 | 37 45 53 | –1.65 | 72 88 96 | –3.65 | duplex only |
| C43 | 7 9 | –1.65 | 12 14 64 | –3.65 | duplex only |

**Table 2/G.994.1 – Mandatory carrier sets**

| xDSL Recommendation(s) | Carrier set designation |
|---|---|
| G.992.1 Annex A, G.992.2 Annex A/B | A43 |
| G.992.1 Annex B | B43 |
| G.992.1 Annex C, G.992.2 Annex C, G.992.1 Annex H | C43 |

**Table 3/G.994.1 – Carrier sets for the 4 kHz signalling family**

| Carrier set designation | Upstream carrier sets | | Downstream carrier sets | | Transmission mode |
|---|---|---|---|---|---|
| | Frequency indices (N) | Maximum power level/carrier (dBm) | Frequency indices (N) | Maximum power level/carrier (dBm) | |
| A4 | 3 | +5 | 5 | +5 | half-duplex only |

### 6.1.2 4 kHz signalling family

Carrier frequencies within this signalling family are given by $N \times 4$ kHz, where N is a positive integer. The symbol rate shall be 4000/5 ≡ 800 symbols per second.

Within this family there is one upstream carrier set, designated A4. The associated downstream carrier set has the same designation. The carrier frequencies and the maximum transmit power level per carrier are defined in Table 3, where frequency = $N \times 4$ kHz.

The carrier sets in this family are mandatory for the xDSL modes listed in Table 4. One or more carriers listed in Tables 1 or 3 may be transmitted in addition to the mandatory carrier set listed in Table 4. Carriers not listed in Tables 1 or 3 shall not be transmitted.

**Table 4/G.994.1 – Mandatory carrier sets**

| xDSL Recommendation(s) | Carrier set designation |
|---|---|
| G.991.2 | A4 |

## 6.2 Modulation

All messages in G.994.1 are sent with one or more carrier sets. All carrier frequencies within a carrier set, and all carrier sets are simultaneously modulated with the same data bits using Differentially encoded binary Phase Shift Keying (DPSK). The transmit point is rotated 180° from

the previous point if the transmit bit is a 1, and the transmit point is rotated 0° from the previous point if the transmit bit is a 0.

For each signal transmitted, the transmit signal shall have a rectangular pulse shaping, defined as:

$$s(t) = \left[ \left( \sum_i \cos(2\pi f_i t + \varphi_i) \right) \times \sum_n A_n \times rect(t - nT) \right] \otimes h_{tx}(t)$$

where:

$\times$ means signal multiplication

$\otimes$ means signal convolution

$f_i$ are the G.994.1 carrier frequencies (defined in 6.1)

$\varphi_i$ are the G.994.1 carrier phases (discretionary constants)

$T$ is the symbol period

$T =$ (8/4312.5) seconds for the 4.3125 kHz signalling family and (5/4000) seconds for the 4 kHz signalling family

$A_n =$ +1 or –1 and is differentially encoded according to:

$A_n = A_{n-1}$ if $b_n = 0$;

$A_n = -A_{n-1}$ if $b_n = 1$.

$b_n$ represents the bit transmitted in symbol $n$

rect($t$) is a rectangular pulse shape defined by:

rect($t$) = 1 if $|t| < T/2$;

= 0 otherwise;

$h_{tx}$ represents the impulse response of the transmit filter.

## 6.3 Transmit filter characteristics

### 6.3.1 4.3125 kHz signalling family

For the 4.3125 kHz signalling family, the transmit filter shall have a bandwidth such that all of the –3 dB points of the filter shall have frequencies which differ at least 4.3125 kHz from any G.994.1 carrier frequency used.

### 6.3.2 4 kHz signalling family

The transmit spectrum is shaped by the rectangular pulse filtering of the modulation; no additional shaping is needed to be introduced by the transmit filter. Therefore, for the 4 kHz signalling family, the transmit filter shall not introduce significant distortion to the rectangular pulse shaping. Specifically, at frequencies less than ±4 kHz from the carrier frequency, the magnitude response of the transmit filter shall have less than ±0.5 dB variation from the magnitude response at the carrier frequency. At other frequencies the magnitude response of the transmit filter shall not exceed the magnitude response at the carrier frequency. The magnitude response at the carrier frequency is such that the maximum power requirements in Table 3 are satisfied. Variation in the group delay of the transmit filter should not be excessive at frequencies that are less than ±4 kHz from the carrier frequency.

# 7 Description of messages

## 7.1 CL – Capabilities List

This message may be sent by an HSTU-C in response to the reception of either a complete CLR message, or an intermediate frame of a segmented CLR message. It conveys a list of possible modes of operation of the xTU-C.

## 7.2 CLR – Capabilities List + Request

This message may be sent by an HSTU-R. It conveys a list of possible modes of operation of the xTU-R and requests the transmission of a CL message by the HSTU-C.

## 7.3 MR – Mode Request

This message may be sent by an HSTU-R. It requests the transmission of an MS message by the HSTU-C.

## 7.4 MS – Mode Select

This message may be sent by an HSTU-C or an HSTU-R. It requests the initiation of a particular mode of operation.

## 7.5 MP – Mode Proposal

This message may be sent by an HSTU-R. It proposes a particular mode of operation and requests the transmission of an MS message by the HSTU-C.

## 7.6 ACK(1) – Acknowledge, Type 1

This message either:

- acknowledges receipt of a complete CL message or an intermediate frame of a segmented CL message and ends a G.994.1 transaction; or
- acknowledges receipt of a complete MS message or an intermediate frame of a segmented MS message and initiates the G.994.1 session cleardown procedure specified in 11.3.

## 7.7 ACK(2) – Acknowledge, Type 2

This message acknowledges receipt of an intermediate frame of a segmented CL, CLR, MP or MS message and requests the transmission of the next frame of the message.

## 7.8 NAK-EF – Negative Acknowledge, Errored Frame

This message is sent in response to the reception of an errored frame. It aborts a G.994.1 session in accordance with the error recovery procedure specified in clause 12.

## 7.9 NAK-NR – Negative Acknowledge, Not Ready

This message may be sent by an HSTU-C or an HSTU-R to acknowledge receipt of a complete MS message or an intermediate frame of a segmented MS message. It ends a G.994.1 transaction. It indicates that the receiving station is temporarily unable (i.e. Not Ready) to invoke the mode requested by the transmitting station but wishes to continue the G.994.1 session.

### 7.10 NAK-NS – Negative Acknowledge, Not Supported

This message may be sent by an HSTU-C or an HSTU-R to acknowledge receipt of a complete MP or MS message or an intermediate frame of a segmented MP or MS message. It ends a G.994.1 transaction. For a received message with the same or lower G.994.1 version number, transmission of NAK-NS indicates that the receiving station either does not support or has disabled the mode requested by the transmitting station. For a received message with a higher G.994.1 version number, NAK-NS indicates either reception of an unknown message type or reception of an unexpected message according to the transactions defined in this version of the Recommendation.

### 7.11 NAK-CD – Negative Acknowledge, Clear Down

This message may be sent in response to any frame of a message other than one of the NAK messages. It indicates that the received information was not understood. This may be due to an unknown message type (same or lower G.994.1 version level), an unexpected message type according to the defined transactions (same or lower G.994.1 version level), or a syntax error while parsing the message. Since a NAK-CD normally indicated a lack of compliance with this Recommendation, it initiates the G.994.1 session cleardown procedure specified in 11.3.

### 7.12 REQ-MS – Request MS Message

This message may be sent by an HSTU-C in response to the reception of an MR message. It requests the transmission of an MS message by the HSTU-R. It indicates that the HSTU-C does not wish to select a mode and is deferring the mode selection to the HSTU-R.

### 7.13 REQ-MR – Request MR Message

This message may be sent by an HSTU-C in response to the reception of a complete MS message or an intermediate frame of a segmented MS message. It requests the transmission of an MR message by the HSTU-R. It indicates that the HSTU-C wishes to select the mode.

### 7.14 REQ-CLR – Request CLR Message

This message may be sent by an HSTU-C in response to the reception of either an MR message, a complete MP or MS message, or an intermediate frame of a segmented MP or MS message. It requests the transmission of a CLR message by the HSTU-R. It indicates that the HSTU-C wishes to perform a capabilities exchange.

## 8 Structure of messages

A message consists of one or more segments. Each segment is encapsulated in a frame.

### 8.1 Format convention

The basic format convention used for messages is illustrated in Figure 2. Bits are grouped into octets. The bits of each octet are shown horizontally and are numbered from 1 to 8. Octets are displayed vertically and are numbered from 1 to N.

The octets are transmitted in ascending numerical order. Within an octet, bit 1 is the first bit to be transmitted.

For fields that are contained within a single octet, the lowest numbered bit of the field represents the least significant bit ($2^0$). When a field spans multiple octets, the lowest numbered bit of the field in the highest numbered octet containing the field represents the least significant bit ($2^0$). The order of bit values within each octet increases as the bit number increases. The order of bit values from octet to octet increases as the octet number decreases. Figure 3 illustrates a field that spans two octets.

An exception to this convention is the Frame Check Sequence (FCS) field, which spans two octets. In this case, the order of bit values within the octets is reversed. Bit 1 of the first octet is the MSB and bit 8 of the second octet is the LSB (Figure 4).

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Octet |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 1 |
| | | | | | | | | 2 |
| | | | | | | | | ... |
| | | | | | | | | N |

**Figure 2/G.994.1 – Format convention**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| | | | | | $2^4$ | $2^3$ | $2^2$ | 1st octet of field |
| $2^1$ | $2^0$ | | | | | | | 2nd octet of field |

**Figure 3/G.994.1 – Field mapping convention**

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | |
|---|---|---|---|---|---|---|---|---|
| $2^8$ | | | | | | | $2^{15}$ | 1st octet of field |
| $2^0$ | | | | | | | $2^7$ | 2nd octet of field |

**Figure 4/G.994.1 – FCS mapping convention**

## 8.2 Frame structure

The frame structure is shown in Figure 5. The contents of a frame shall consist of an integer number of octets.

Frames shall begin and end with standard HDLC flag octets (01111110) as defined in ISO/IEC 3309. At least three but not more than five flags shall be sent to begin a frame. At least two but not more than three flags shall follow the FCS of each frame.

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Octet |
|---|---|---|---|---|---|---|---|---|
| Flag | | | | | | | | 1 |
| Flag | | | | | | | | 2 |
| Flag | | | | | | | | |
| Flag (optional) | | | | | | | | |
| Flag (optional) | | | | | | | | |
| Message segment | | | | | | | | |
| FCS (first octet) | | | | | | | | |
| FCS (second octet) | | | | | | | | |
| Flag | | | | | | | | N – 2 |
| Flag | | | | | | | | N – 1 |
| Flag (optional) | | | | | | | | N |

**Figure 5/G.994.1 – Frame structure**

## 8.3 Frame check sequence field

The FCS field is 16 bits (2 octets) in length. As defined in ISO/IEC 3309, it shall be the ones complement of the sum (modulo 2) of:

a) the remainder of $x^k (x^{15} + x^{14} + x^{13} + x^{12} + x^{11} + x^{10} + x^9 + x^8 + x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x + 1)$ divided (modulo 2) by the generator polynomial $x^{16} + x^{12} + x^5 + 1$, where k is the number of bits in the frame existing between, but not including, the last bit of the final opening flag and the first bit of the FCS, excluding octets inserted for transparency; and

b) the remainder of the division (modulo 2) by the generator polynomial $x^{16} + x^{12} + x^5 + 1$, of the product of $x^{16}$ by the content of the frame existing between, but not including, the last bit of the final opening flag and the first bit of the FCS, excluding octets inserted for transparency.

As a typical implementation at the transmitter, the initial content of the register of the device computing the remainder of the division is preset to all binary ONEs and is then modified by division by the generator polynomial (as described above) on the information field. The ones complement of the resulting remainder is transmitted as the 16-bit FCS.

As a typical implementation at the receiver, the initial content of the register of the device computing the remainder of the division is preset to all binary ONEs. The final remainder, after multiplication by $x^{16}$ and then division (modulo 2) by the generator polynomial $x^{16} + x^{12} + x^5 + 1$ of the serial incoming protected bits and the FCS after removal of the transparency octets, will be $0001110100001111_2$ ($x^{15}$ through $x^0$, respectively) in the absence of transmission errors.

## 8.4 Octet transparency

G.994.1 messages use the octet transparency method defined in ISO/IEC 3309. In this approach, any data that is equal to $7E_{16}$ (the Flag Sequence) or $7D_{16}$ (the Control Escape) are escaped as described below.

After Frame Check Sequence (FCS) computation, the transmitter examines the entire frame between the two Flag Sequences. Any data octets which are equal to the Flag Sequence or the Control Escape are replaced by a two-octet sequence consisting of the Control Escape octet followed by the original octet Exclusive-OR'ed with hexadecimal $20_{16}$. In summary, the following substitutions are made:

- a data octet of $7E_{16}$ is encoded as two octets $\{7D_{16}, 5E_{16}\}$;
- a data octet of $7D_{16}$ is encoded as two octets $\{7D_{16}, 5D_{16}\}$.

On reception, prior to FCS computation, each Control Escape octet ($7D_{16}$) is removed, and the following octet is exclusive-OR'ed with hexadecimal $20_{16}$ (unless the following octet is $7E_{16}$, which is the flag, and indicates the end of frame, and therefore an abort has occurred). In summary, the following substitutions are made:

- a sequence of $7D_{16}$, $5E_{16}$ is replaced by the data octet $7E_{16}$;
- a sequence of $7D_{16}$, $5D_{16}$ is replaced by the data octet $7D_{16}$;
- a sequence of $7D_{16}$, $7E_{16}$ aborts the frame.

Since octet stuffing is used, the frame is guaranteed to have an integer number of octets.

## 8.5 Inter-frame time fill

In duplex mode, an integer number of flags shall be transmitted between frames. In half-duplex mode, silence shall be transmitted between frames.

# 9 Message coding format

## 9.1 General

The message information field consists of three components:

a) an identification field (I); followed by

b) a standard information field (S); and

c) an optional non-standard information field (NS).

This general structure is shown in Figure 6.

| | | |
|---|---|---|
| Identification (I) field | Standard information (S) field | Non-standard information (NS) field |

**Figure 6/G.994.1 – Information field structure**

## 9.2 Coding format for parameters in the I and S fields

In both the I and S fields most of the information to be conveyed consists of parameters relating to particular modes, features or capabilities associated with the two stations.

In order to:

a) encode these parameters in accordance with a consistent set of rules; and

b) allow future extension to the parameter list in a way that permits present and future G.994.1 implementations to correctly parse the information field,

the parameters are linked together in a pre-defined tree structure. The order in which the parameters in the tree are transmitted and the use of delimiting bits that enable the tree to be reconstructed at the receiver are described in the rules set out below.

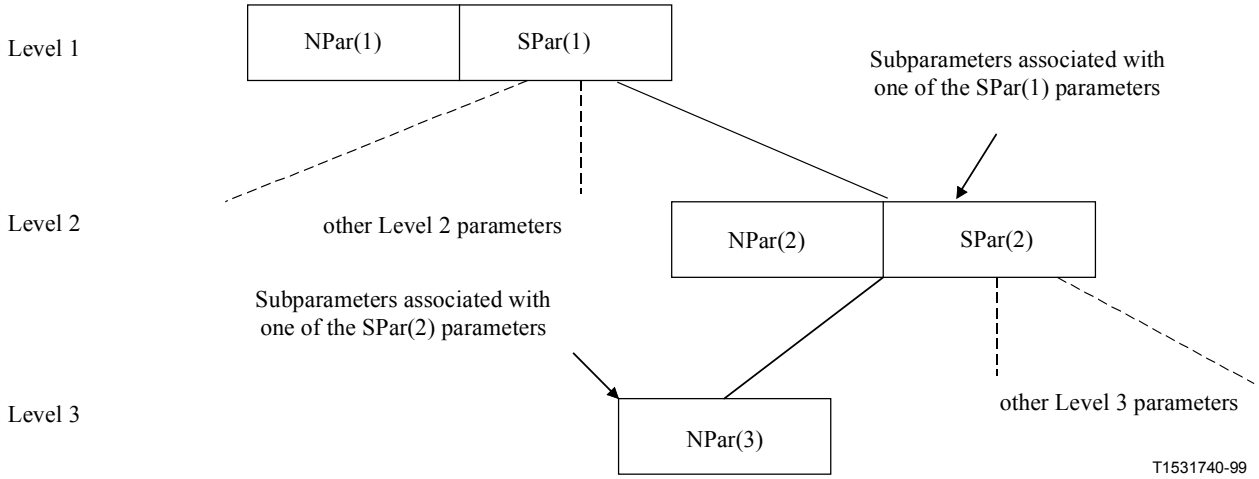
### 9.2.1 Parameter classification

Parameters (Pars) are classified as:

- NPars – Parameters which have no subparameters associated with them; and
- SPars – Parameters that have subparameters associated with them.

The general structure of this tree is as shown in Figure 7.

At level 1, the highest level of the tree, each SPar has associated with it a series of Pars (NPars and possibly SPars) at level 2 in the tree. At level 2 in the tree, each SPar has associated with it a series of NPars at level 3 in the tree. Level 3 is the lowest level in the tree. Therefore, there are no SPars at this level.




NPar(n) indicates a set of NPar parameters at level n in the tree.

**Figure 7/G.994.1 – Tree structure linking parameters in the I and S fields**

### 9.2.2 Order of transmission of parameters

Parameters are binary encoded and transmitted serially. Parameters of the same type (i.e. level, classification and association) are transmitted sequentially as a parameter block consisting of an integral number of octets.

The order of transmission of NPars and SPars is specified in Figure 8.

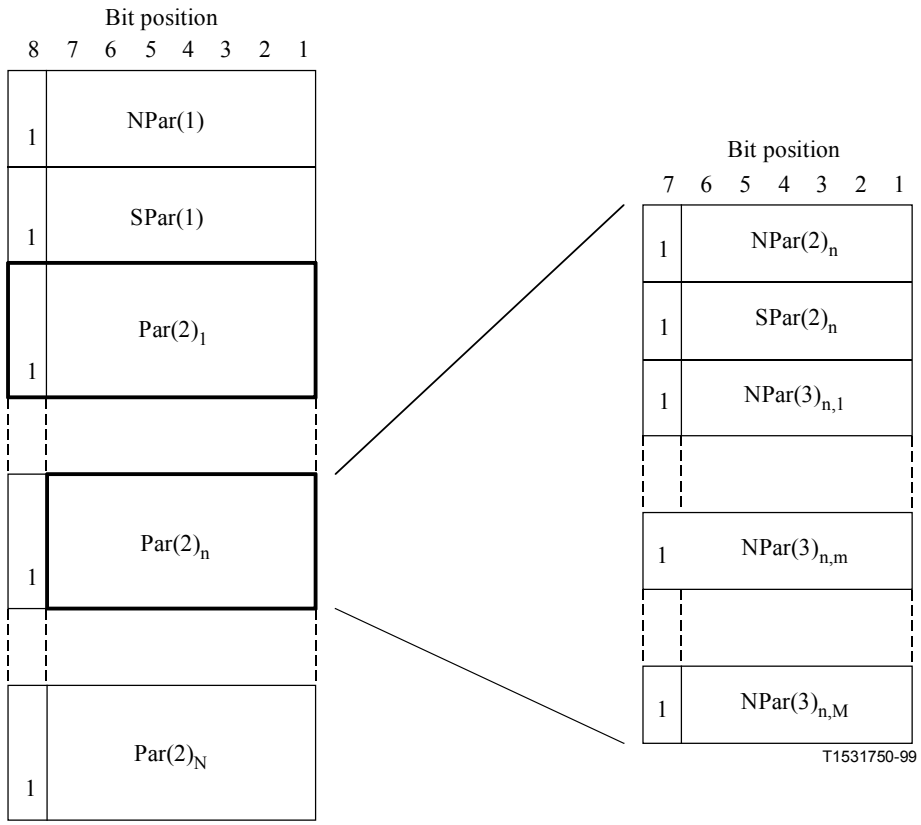



**Figure 8/G.994.1 – Order of transmission of NPars and SPars**

$Par(2)_n$ indicates a set of level 2 parameters associated with the nth level 1 SPar, and consists of $NPar(2)_n$ parameters and possibly $SPar(2)_n$ parameters.

$NPar(3)_{n,m}$ indicates a set of level 3 NPars associated with the mth level 2 SPar which in turn is associated with the nth level 1 SPar.

Transmission of parameters begins with the first octet of NPar(1) and ends with the last octet of $Par(2)_N$.

The order of transmission of the Par(2) blocks is the same as the order of transmission of the corresponding SPar(1) bits. Similarly, the order of transmission of the $NPar(3)_n$ blocks is the same as the order of transmission of the corresponding $SPar(2)_n$ bits.

### 9.2.3 Delimiting and parsing of parameter blocks

The use of delimiting bits is illustrated in Figure 8. Within each octet of a parameter block, at least one bit is defined as a delimiting bit. This is used to define the last octet in the block to be transmitted. A binary ZERO in this bit position indicates that there is at least one additional octet in the block to be transmitted. A binary ONE in this bit position indicates the last octet in the block to be transmitted.

Bit 8 is used to delimit the NPar(1) block, the SPar(1) block, and each of the Par(2) blocks. There are N of these Par(2) blocks, one for each of the capabilities in the SPar(1) block that is enabled (set to binary ONE).

In order for this parsing rule to function correctly, both the identification field (I) and the standard information field (S) shall include at least one octet of NPar(1) and at least one octet of SPar(1).

Bit 7 is used to delimit each NPar(2) block, each SPar(2) block, and each of the associated NPar(3) blocks. Figure 8 indicates that there are M of these NPar(3) blocks, one for each of the capabilities in the $SPar(2)_n$ block that is enabled (set to binary ONE). M may be different for each of the Par(2) blocks.

A Par(2) block may either contain both NPar(2) and SPar(2) octets, or NPar(2) octets alone. To indicate that a Par(2) block contains only NPar(2) octets, bits 7 and 8 are both set to binary ONE in the last NPar(2) octet to be transmitted.

Bits 1 through 7 at level 1 of the tree and bits 1 through 6 at levels 2 and 3 of the tree may be used to encode parameters.

Octets at the end of any Par block that would have contained all ZEROs except for delimiting bits may be omitted from transmission, provided that terminating bits are correctly set for the transmitted octets.

To allow for compatibility with future versions of this Recommendation, receivers shall parse all parameter blocks and ignore information that is not understood. However, to be able to correctly parse the parameter blocks, it is necessary to pay attention to the number of SPar(1) and SPar(2) bits that are set, even if the meaning of one or more of these bits is not understood.

## 9.3 Identification field (I)

The identification field consists of four components:

a) a one-octet message type field; followed by

b) a one-octet version number field;

c) an 8-octet Vendor ID field; and

d) a bit-encoded parameter field.

This general structure is shown in Figure 9.

| Message type field | Version number field | Vendor ID field | Bit-encoded parameter field |
|---|---|---|---|

**Figure 9/G.994.1 – Identification field structure**

### 9.3.1 Message type

The purpose of the message type field is to identify the message type of the frame. The field is one octet in length and occupies the first octet in the identification field. The tree structure encoding rules specified in 9.2 are not applicable to this field. The encoding shall be as shown in Table 5. An "X" indicates that the message type is supported for the stated version number (see 9.3.2) whilst a "–" indicates that it is not.

NOTE – Message types other than those specified in Table 5 are reserved for allocation by the ITU-T.

**Table 5/G.994.1 – Message type field format**

| Bits | | | | | | | | Message type | G.994.1 Version 1 support | G.994.1 Version 2 support |
|---|---|---|---|---|---|---|---|---|---|---|
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | | | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | MS | X | X |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | MR | X | X |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | CL | X | X |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | CLR | X | X |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | MP | – | X |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | ACK(1) | X | X |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | ACK(2) | X | X |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | NAK-EF | X | X |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | NAK-NR | X | X |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | NAK-NS | X | X |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | NAK-CD | X | X |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | REQ-MS | X | X |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | REQ-MR | X | X |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | REQ-CLR | X | X |

### 9.3.2 Version number

The purpose of the version number field is to identify the version number of ITU-T G.994.1 to which the equipment conforms.

This part includes the functionality of ITU-T G.994.1 Version 1 (1999) in its entirety and therefore replaces it. It also specifies new functionality by way of a new message type and new transactions, resulting in Version 2. Tables 5, 13 and 14 indicate the message types, basic transactions and extended transactions respectively that are supported by each version. All transmitted messages shall indicate the highest version number supported by the transmitting equipment, independent of the version number received in any message.

NOTE 1 – The version number of G.994.1 is not updated with the addition of new codepoints. The version number is updated when a structural change is made. Examples of structural changes are the addition of new message types and new transactions. To ensure backward compatibility, future versions with higher revision numbers will include, without change, all of the existing transactions, messages and information from previous versions.

If the received message is an MS, it is the expected message according to the defined transactions, and it can be parsed correctly; it shall be ACKed if the features are supported, independent of the version number of the message.

If the received message is of an unknown type or is not the expected message according to the defined transactions, and the version number field indicates a higher revision, a NAK-NS shall be sent.

The field is one octet in length and occupies the second octet of the identification field. The tree structure encoding rules specified in 9.2 are not applicable to this field. The encoding shall be in accordance with Table 6.

NOTE 2 – Version numbers other than those specified in Table 6 are reserved for allocation by the ITU-T.

**Table 6/G.994.1 – Version number field format**

| Bits | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | **Version number** |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Version 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Version 2 |

### 9.3.3 Vendor ID field

Coding for the Vendor ID field is shown in Table 7. The tree structure encoding rules specified in 9.2 are not applicable to this field. For MP, MR, MS, ACK, NAK, and REQ messages, the vendor ID field is not used and is therefore of zero length.

**Table 7/G.994.1 – Vendor ID information block**

| |
|---|
| T.35 country code<br>(2 octets – See Note 1) |
| Provider code (vendor identification)<br>(4 octets – See Note 2) |
| Vendor-specific information<br>(2 octets) |
| NOTE 1 – If the bits in the first octet are not all set to binary ONE, the bits in the second octet shall be set to binary ZERO by the transmitter and ignored by the receiver.<br>NOTE 2 – Specification of the coding and order of transmission of this field is the responsibility of the regional standards body allocating the provider code. See Appendix II for provider code contact information. |

### 9.3.4 Parameter field

This field contains parameters that are independent of the mode to be selected and are typically either service or application related.

The parameter field of CL, CLR, MP and MS messages is encoded in accordance with the rules described in 9.2. For MR, ACK, NAK and REQ messages, the parameter field is not used and is therefore of zero length.

The parameter field consists of a set of octets in which each parameter is assigned a unique bit position. A binary ONE in the assigned bit position indicates that the parameter is valid. The validity of multiple parameters may be conveyed by transmitting a binary ONE in each bit position corresponding to a valid parameter.

The NPars and SPars are listed from Table 8 to Table 9-31.

**Table 8/G.994.1 – Identification field – NPar(1) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | NPar(1)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Reserved for allocation by the ITU-T |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by the ITU-T |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 1 | x | x | x | x | x | x | Non-standard field |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters set in this octet |

**Table 9/G.994.1 – Identification field – SPar(1) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | SPar(1)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Net data rate upstream (Note 1) |
| x | x | x | x | x | x | 1 | x | Net data rate downstream (Note 1) |
| x | x | x | x | x | 1 | x | x | Data flow characteristics upstream (Note 2) |
| x | x | x | x | 1 | x | x | x | Data flow characteristics downstream (Note 2) |
| x | x | x | 1 | x | x | x | x | xTU-R splitter information (Note 3) |
| x | x | 1 | x | x | x | x | x | xTU-C splitter information (Note 3) |
| x | 1 | x | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters set in this octet |

NOTE 1 – In a CLR, CL, or MP message, the data rates indicated in this Recommendation are of informative nature and do not imply any requirements on the net data rate during data mode. The data rate values are set and used by layers higher than the xTU-x although an xTU-x may monitor the information. The data rate values are useful to help the higher layers to select between the various G.99x.x transceivers based upon information indicated by an application layer.

In an MS message:

- If the xTU-x is capable of supporting the information, it shall respond with an ACK.
- If the xTU-x is either not capable of supporting the information or the negotiation of this information, it shall respond with a NAK-NS.

NOTE 2 – In a CLR, CL, or MP message, the latencies indicated in this Recommendation are of informative nature and do not imply any requirements on the latency during data mode. The latency values are set and used by layers higher than the xTU-x although an xTU-x may monitor the information. The latency values are useful to help the higher layers to select between the various G.99x.x transceivers and coding parameters based upon information indicated by an application layer.

In an MS message:

- If the xTU-x is capable of supporting the information, it shall respond with an ACK.
- If the xTU-x is either not capable of supporting the information or the negotiation of this information, it shall respond with a NAK-NS.

NOTE 3 – Splitter information is only conveyed by an xTU-x if it has the capability of determining the local splitter information. Splitter information is only a capabilities indication and shall not be included in an MP or MS message.

### Table 9.0.1/G.994.1 – Identification field – SPar(1) coding – Octet 2

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | SPar(1)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Relative power level/carrier for upstream carrier set A43 (Note) |
| x | x | x | x | x | x | 1 | x | Relative power level/carrier for downstream carrier set A43 (Note) |
| x | x | x | x | x | 1 | x | x | Relative power level/carrier for upstream carrier set B43 (Note) |
| x | x | x | x | 1 | x | x | x | Relative power level/carrier for downstream carrier set B43 (Note) |
| x | x | x | 1 | x | x | x | x | Relative power level/carrier for upstream carrier set C43 (Note) |
| x | x | 1 | x | x | x | x | x | Relative power level/carrier for downstream carrier set C43 (Note) |
| x | 1 | x | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

NOTE – The relative power level/carrier reported in a CLR, CL, MP, or MS message indicates the level used during the current G.994.1 session, including the start-up and cleardown procedures. It does not imply any requirements on the transmit power in this or future sessions.

### Table 9.0.2/G.994.1 – Identification field – SPar(1) coding – Octet 3

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | SPar(1)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Relative power level/carrier for upstream carrier set A4 (Note) |
| x | x | x | x | x | x | 1 | x | Relative power level/carrier for downstream carrier set A4 (Note) |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 1 | x | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

NOTE – The relative power level/carrier reported in a CLR, CL, MP, or MS message indicates the level used during the current G.994.1 session, including the start-up and cleardown procedures. It does not imply any requirements on the transmit power in this or future sessions.

**Table 9.1/G.994.1 – Identification field – Net data rate upstream NPar(2) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Net data rate upstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 1 | x | x | x | x | x | Maximum net data rate upstream (bits 5-1 × 2 Mbit/s) |
| x | x | 0 | x | x | x | x | x | Maximum net data rate upstream (bits 5-1 × 64 kbit/s) |

**Table 9.1.1/G.994.1 – Identification field – Net data rate upstream NPar(2) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Net data rate upstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 1 | x | x | x | x | x | Maximum net data rate upstream (bits 5-1 × 2 Mbit/s) |
| x | x | 0 | x | x | x | x | x | Maximum net data rate upstream (bits 5-1 × 64 kbit/s) |

**Table 9.1.2/G.994.1 – Identification field – Net data rate upstream NPar(2) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Net data rate upstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 1 | x | x | x | x | x | Average net data rate upstream (bits 5-1 × 2 Mbit/s) |
| x | x | 0 | x | x | x | x | x | Average net data rate upstream (bits 5-1 × 64 kbit/s) |

**Table 9.3/G.994.1 – Identification field – Net data rate downstream NPar(2) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Net data rate downstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 1 | x | x | x | x | x | Maximum net data rate downstream (bits 5-1 × 2 Mbit/s) |
| x | x | 0 | x | x | x | x | x | Maximum net data rate downstream (bits 5-1 × 64 kbit/s) |

**Table 9.3.1/G.994.1 – Identification field – Net data rate downstream NPar(2) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Net data rate downstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 1 | x | x | x | x | x | Maximum net data rate downstream (bits 5-1 × 2 Mbit/s) |
| x | x | 0 | x | x | x | x | x | Maximum net data rate downstream (bits 5-1 × 64 kbit/s) |

**Table 9.3.2/G.994.1 – Identification field – Net data rate downstream NPar(2) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Net data rate downstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 1 | x | x | x | x | x | Average net data rate downstream (bits 5-1 × 2 Mbit/s) |
| x | x | 0 | x | x | x | x | x | Average net data rate downstream (bits 5-1 × 64 kbit/s) |

**Table 9.5/G.994.1 – Identification field – Data flow characteristics upstream NPar(2) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Data flow characteristics upstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 0 | x | x | x | x | x | Maximum latency upstream (bits 5 to 1) × 1 ms |
| x | x | 1 | x | x | x | x | x | Maximum latency upstream (4 + bits 5 to 1) × 10 ms |

**Table 9.5.1/G.994.1 – Identification field – Data flow characteristics upstream NPar(2) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Data flow characteristics upstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 0 | x | x | x | x | x | Average latency upstream (bits 5 to 1) × 1 ms |
| x | x | 1 | x | x | x | x | x | Average latency upstream (4 + bits 5 to 1) × 10 ms |

### Table 9.7/G.994.1 – Identification field – Data flow characteristics downstream NPar(2) coding – Octet 1

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Data flow characteristics downstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 0 | x | x | x | x | x | Maximum latency downstream (bits 5 to 1) × 1 ms |
| x | x | 1 | x | x | x | x | x | Maximum latency downstream (4 + bits 5 to 1) × 10 ms |

### Table 9.7.1/G.994.1 – Identification field – Data flow characteristics downstream NPar(2) coding – Octet 2

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | Data flow characteristics downstream NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Unspecified by terminal |
| x | x | 0 | x | x | x | x | x | Average latency downstream (bits 5 to 1) × 1 ms |
| x | x | 1 | x | x | x | x | x | Average latency downstream (4 + bits 5 to 1) × 10 ms |

### Table 9.9/G.994.1 – Identification field – xTU-R splitter information NPar(2) coding

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | xTU-R splitter information NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | LPF is voice |
| x | x | x | x | x | x | 1 | x | LPF is USA ISDN |
| x | x | x | x | x | 1 | x | x | LPF is European ISDN |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Non-standard LPF |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

### Table 9.11/G.994.1 – Identification field – xTU-C splitter information NPar(2) coding

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | xTU-C splitter information NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | HPF is 25 kHz (voice) |
| x | x | x | x | x | x | 1 | x | HPF is 90 kHz USA ISDN |
| x | x | x | x | x | 1 | x | x | HPF is 150 kHz (ADSL with European ISDN) |
| x | x | x | x | 1 | x | x | x | HPF is 300 kHz (VDSL) |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Non-standard HPF |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 9.15/G.994.1 – Identification field – Relative power level/carrier for upstream carrier set A43 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for upstream carrier set A43 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for upstream carrier set A43 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.17/G.994.1 – Identification field – Relative power level/carrier for downstream carrier set A43 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for downstream carrier set A43 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for downstream carrier set A43 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.19/G.994.1 – Identification field – Relative power level/carrier for upstream carrier set B43 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for upstream carrier set B43 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for downstream carrier set A43 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.21/G.994.1 – Identification field – Relative power level/carrier for downstream carrier set B43 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for downstream carrier set B43 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for downstream carrier set B43 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.23/G.994.1 – Identification field – Relative power level/carrier for upstream carrier set C43 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for upstream carrier set C43 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for upstream carrier set C43 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.25/G.994.1 – Identification field – Relative power level/carrier for downstream carrier set C43 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for downstream carrier set C43 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for downstream carrier set C43 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.29/G.994.1 – Identification field – Relative power level/carrier for upstream carrier set A4 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for upstream carrier set A4 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for upstream carrier set A4 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

**Table 9.31/G.994.1 – Identification field – Relative power level/carrier for downstream carrier set A4 – NPar(2) coding**

| Bits 8 7 | Bits 6 5 | Bits 4 3 2 1 | Relative power level/carrier for upstream carrier set A4 NPar(2)s |
|---|---|---|---|
| x x | x x | x x x x | Attenuation in G.994.1 Transmit Power per Carrier Relative to Maximum Power (bits 6-1 × 0.5 dB) for upstream carrier set A4 (Note). |
| NOTE – All carriers in the carrier set shall be transmitted at the same power level. | | | |

## 9.4 Standard information field (S)

In the standard information field the parameters represent modes of working or capabilities relating to the xTU-R or xTU-C.

The standard information field of CL, CLR, MP and MS messages is encoded in accordance with the rules described in 9.2. For MR, ACK, NAK and REQ messages, the standard information field is not used and is therefore of zero length.

The standard information field consists of a set of octets in which each capability is assigned a unique bit position. A binary ONE in the assigned bit position indicates that the capability is valid.

For messages CL and CLR, the validity of multiple capabilities may be conveyed by transmitting a binary ONE in each bit position corresponding to a valid capability. For messages MP and MS, multiple capabilities may be selected only if they can all be supported simultaneously within the xTU concerned.

The level 1 Pars for MP, MS, CL and CLR messages are listed below, beginning with Table 10. Lower level Pars follow, beginning with Table 11.1. The interpretation and use of these lower level Pars is defined in the respective xDSL Recommendations or other technical specifications.

The spectrum information indicated in the NPar(3) fields associated with each of the xDSL Recommendations is of informative nature and does not imply any requirements on the transmit spectrum used during initialization and data mode. Regardless of the spectrum information, the transmit spectrum shall comply with their respective Recommendations. Spectrum information may only be included in a CLR or CL message, not in an MP or MS message. The spectrum information associated with ITU-T G.992.1 and ITU-T G.992.2 are coded in 8 bits (across 2 octets) as a binary representation of the tone index.

Maximum frequencies: up to and including the tone index

Minimum frequencies: above and including the tone index.

**Table 10/G.994.1 – Standard information field – NPar(1) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | NPar(1)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Voiceband: V.8 (Note 1) |
| x | x | x | x | x | x | 1 | x | Voiceband: V.8 *bis* (Note 1) |
| x | x | x | x | x | 1 | x | x | Silent period (Note 2) |
| x | x | x | x | 1 | x | x | x | G.997.1 (Note 3) |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 1 | x | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

NOTE 1 – Setting this bit to binary ONE in an MS message initiates the G.994.1 session cleardown procedure specified in 11.3, and requests a V.8 or V.8 *bis* handshake in the voiceband, with the xTU-R taking on the role of a calling station and the xTU-C taking on the role of an answering station.

NOTE 2 – This bit shall be set to binary ONE in a CLR or CL message. Setting this bit to binary ONE in an MS message initiates the G.994.1 session cleardown procedure specified in 11.3, and requests a silence period at the other transmitter of approximately 1 minute. The station that invoked the silent period by transmitting MS may terminate the silent period prior to the 1 minute by restarting a G.994.1 session.

NOTE 3 – The use of this bit is for further study and shall be set to binary ZERO in CLR, CL and MS.

**Table 11/G.994.1 – Standard information field – SPar(1) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | SPar(1)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | G.992.1 Annex A |
| x | x | x | x | x | x | 1 | x | G.992.1 Annex B |
| x | x | x | x | x | 1 | x | x | G.992.1 Annex C |
| x | x | x | x | 1 | x | x | x | G.992.2 Annex A/B |
| x | x | x | 1 | x | x | x | x | G.992.2 Annex C |
| x | x | 1 | x | x | x | x | x | G.992.1 Annex H |
| x | 1 | x | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

## Table 11.0.1/G.994.1 – Standard information field – SPar(1) coding – Octet 2

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | SPar(1)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | G.991.2 Annex A |
| x | x | x | x | x | x | 1 | x | G.991.2 Annex B |
| x | x | x | x | x | 1 | x | x | Committee T1 MCM VDSL (Note 1) |
| x | x | x | x | 1 | x | x | x | Committee T1 SCM VDSL (Note 2) |
| x | x | x | 1 | x | x | x | x | ETSI MCM VDSL (Note 3) |
| x | x | 1 | x | x | x | x | x | ETSI SCM VDSL (Note 3) |
| x | 1 | x | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

NOTE 1 – Use of this bit is defined in "Draft Trial-Use Standard For Telecommunication – Interface Between Networks and Customer Installation – Very High Bit-rate Digital Subscriber Line (VDSL) Metallic Interface – Part 3: Technical Specification for Multi-Carrier Modulation (MCM) Transceivers".

NOTE 2 – Use of this bit is defined in "Draft Trial-Use Standard For Telecommunication – Interface Between Networks and Customer Installation – Very High Bit-rate Digital Subscriber Line (VDSL) Metallic Interface – Part 2: Technical Specification for Single-Carrier Modulation (SCM) Transceivers".

NOTE 3 – Use of this bit is defined in ETSI TS 101270-2.

## Table 11.1/G.994.1 – Standard information field – G.992.1 Annex A NPar(2) coding

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | R-ACK1 |
| x | x | x | x | x | x | 1 | x | R-ACK2 |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | STM |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

## Table 11.2/G.994.1 – Standard information field – G.992.1 Annex A SPar(2) coding

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Sub-channel information |
| x | x | x | x | x | x | 1 | x | Spectrum frequency upstream |
| x | x | x | x | x | 1 | x | x | Spectrum frequency downstream |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.2.1/G.994.1 – Standard information field – G.992.1 Annex A Sub-channel information NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Sub-channel information NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | AS0 downstream |
| x | x | x | x | x | x | 1 | x | AS1 downstream |
| x | x | x | x | x | 1 | x | x | AS2 downstream |
| x | x | x | x | 1 | x | x | x | AS3 downstream |
| x | x | x | 1 | x | x | x | x | LS0 downstream |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.2.1.1/G.994.1 – Standard information field – G.992.1 Annex A Sub-channel information NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Sub-channel information NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | LS1 downstream |
| x | x | x | x | x | x | 1 | x | LS2 downstream |
| x | x | x | x | x | 1 | x | x | LS0 upstream |
| x | x | x | x | 1 | x | x | x | LS1 upstream |
| x | x | x | 1 | x | x | x | x | LS2 upstream |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.2.2/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency upstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency upstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency upstream (bits 7 and 8) |

**Table 11.2.2.1/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency upstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency upstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency upstream (bits 1 to 6) |

**Table 11.2.2.2/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency upstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency upstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency upstream (bits 7 and 8) |

**Table 11.2.2.3/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency upstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency upstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency upstream (bits 1 to 6) |

**Table 11.2.3/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency downstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency downstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency downstream (bits 7 and 8) |

**Table 11.2.3.1/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency downstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency downstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency downstream (bits 1 to 6) |

**Table 11.2.3.2/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency downstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency downstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency downstream (bits 7 and 8) |

**Table 11.2.3.3/G.994.1 – Standard information field – G.992.1 Annex A Spectrum frequency downstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex A Spectrum frequency downstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency downstream (bits 1 to 6) |

**Table 11.3/G.994.1 – Standard information field – G.992.1 Annex B NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex B NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | R-ACK1 |
| x | x | x | x | x | x | 1 | x | R-ACK2 |
| x | x | x | x | x | 1 | x | x | Upstream tones 1 to 32 |
| x | x | x | x | 1 | x | x | x | STM |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.4/G.994.1 – Standard information field – G.992.1 Annex B SPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex B SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Sub-channel information |
| x | x | x | x | x | x | 1 | x | Spectrum frequency upstream |
| x | x | x | x | x | 1 | x | x | Spectrum frequency downstream |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.4.1/G.994.1 – Standard information field – G.992.1 Annex B Sub-channel information NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex B Sub-channel information NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | AS0 downstream |
| x | x | x | x | x | x | 1 | x | AS1 downstream |
| x | x | x | x | x | 1 | x | x | AS2 downstream |
| x | x | x | x | 1 | x | x | x | AS3 downstream |
| x | x | x | 1 | x | x | x | x | LS0 downstream |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.4.1.1/G.994.1 – Standard information field – G.992.1 Annex B Sub-channel information NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex B Sub-channel information NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | LS1 downstream |
| x | x | x | x | x | x | 1 | x | LS2 downstream |
| x | x | x | x | x | 1 | x | x | LS0 upstream |
| x | x | x | x | 1 | x | x | x | LS1 upstream |
| x | x | x | 1 | x | x | x | x | LS2 upstream |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.4.2/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency upstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex B Spectrum frequency upstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency upstream (bits 7 and 8) |

**Table 11.4.2.1/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency upstream NPar(3) coding – Octet 2**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency upstream NPar(3)s – Octet 2 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum minimum frequency upstream (bits 1 to 6) |

**Table 11.4.2.2/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency upstream NPar(3) coding – Octet 3**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency upstream NPar(3)s – Octet 3 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum maximum frequency upstream (bits 7 and 8) |

**Table 11.4.2.3/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency upstream NPar(3) coding – Octet 4**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency upstream NPar(3)s – Octet 4 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum maximum frequency upstream (bits 1 to 6) |

**Table 11.4.3/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency downstream NPar(3) coding – Octet 1**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency downstream NPar(3)s – Octet 1 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum minimum frequency downstream (bits 7 and 8) |

**Table 11.4.3.1/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency downstream NPar(3) coding – Octet 2**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency downstream NPar(3)s – Octet 2 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum minimum frequency downstream (bits 1 to 6) |

**Table 11.4.3.2/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency downstream NPar(3) coding – Octet 3**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency downstream NPar(3)s – Octet 3 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum maximum frequency downstream (bits 7 and 8) |

**Table 11.4.3.3/G.994.1 – Standard information field – G.992.1 Annex B Spectrum frequency downstream NPar(3) coding – Octet 4**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.1 Annex B Spectrum frequency downstream NPar(3)s – Octet 4 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum maximum frequency downstream (bits 1 to 6) |

**Table 11.5/G.994.1 – Standard information field – G.992.1 Annex C NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | R-ACK1 |
| x | x | x | x | x | x | 1 | x | R-ACK2 |
| x | x | x | x | x | 1 | x | x | DBM |
| x | x | x | x | 1 | x | x | x | STM |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.6/G.994.1 – Standard information field – G.992.1 Annex C SPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Sub-channel information |
| x | x | x | x | x | x | 1 | x | Spectrum frequency upstream |
| x | x | x | x | x | 1 | x | x | Spectrum frequency downstream |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.6.1/G.994.1 – Standard information field – G.992.1 Annex C Sub-channel information NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Sub-channel information NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | AS0 downstream |
| x | x | x | x | x | x | 1 | x | AS1 downstream |
| x | x | x | x | x | 1 | x | x | AS2 downstream |
| x | x | x | x | 1 | x | x | x | AS3 downstream |
| x | x | x | 1 | x | x | x | x | LS0 downstream |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.6.1.1/G.994.1 – Standard information field – G.992.1 Annex C Sub-channel information NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Sub-channel information NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | LS1 downstream |
| x | x | x | x | x | x | 1 | x | LS2 downstream |
| x | x | x | x | x | 1 | x | x | LS0 upstream |
| x | x | x | x | 1 | x | x | x | LS1 upstream |
| x | x | x | 1 | x | x | x | x | LS2 upstream |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.6.2/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency upstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency upstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency upstream (bits 7 and 8) |

**Table 11.6.2.1/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency upstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency upstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency upstream (bits 1 to 6) |

**Table 11.6.2.2/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency upstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency upstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency upstream (bits 7 and 8) |

**Table 11.6.2.3/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency upstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency upstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency upstream (bits 1 to 6) |

**Table 11.6.3/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency downstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency downstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency downstream (bits 7 and 8) |

**Table 11.6.3.1/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency downstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency downstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency downstream (bits 1 to 6) |

**Table 11.6.3.2/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency downstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency downstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency downstream (bits 7 and 8) |

**Table 11.6.3.3/G.994.1 – Standard information field – G.992.1 Annex C Spectrum frequency downstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex C Spectrum frequency downstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency downstream (bits 1 to 6) |

**Table 11.7/G.994.1 – Standard information field – G.992.2 Annexes A/B NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annexes A/B NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | R-ACK1 |
| x | x | x | x | x | x | 1 | x | R-ACK2 |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Fast retrain |
| x | x | x | 1 | x | x | x | x | RS16 |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.8/G.994.1 – Standard information field – G.992.2 Annexes A/B SPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annexes A/B SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Reserved for allocation by the ITU-T |
| x | x | x | x | x | x | 1 | x | Spectrum frequency upstream |
| x | x | x | x | x | 1 | x | x | Spectrum frequency downstream |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.8.2/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency upstream NPar(3) coding – Octet 1**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency upstream NPar(3)s – Octet 1 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum minimum frequency upstream (bits 7 and 8) |

**Table 11.8.2.1/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency upstream NPar(3) coding – Octet 2**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency upstream NPar(3)s – Octet 2 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum minimum frequency upstream (bits 1 to 6) |

**Table 11.8.2.2/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency upstream NPar(3) coding – Octet 3**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency upstream NPar(3)s – Octet 3 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum maximum frequency upstream (bits 7 and 8) |

**Table 11.8.2.3/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency upstream NPar(3) coding – Octet 4**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency upstream NPar(3)s – Octet 4 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum maximum frequency upstream (bits 1 to 6) |

**Table 11.8.3/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency downstream NPar(3) coding – Octet 1**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency downstream NPar(3)s – Octet 1 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum minimum frequency downstream (bits 7 and 8) |

**Table 11.8.3.1/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency downstream NPar(3) coding – Octet 2**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency downstream NPar(3)s – Octet 2 |
|---|---|---|---|
| x x | x x | x x x x | Spectrum minimum frequency downstream (bits 1 to 6) |

**Table 11.8.3.2/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency downstream NPar(3) coding – Octet 3**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.992.2 Annexes A/B Spectrum frequency downstream NPar(3)s – Octet 3 |
|---|---|---|---|
| x x | 0 0 | 0 0 x x | Spectrum maximum frequency downstream (bits 7 and 8) |

**Table 11.8.3.3/G.994.1 – Standard information field – G.992.2 Annexes A/B Spectrum frequency downstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annexes A/B Spectrum frequency downstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency downstream (bits 1 to 6) |

**Table 11.9/G.994.1 – Standard information field – G.992.2 Annex C NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annexes A/B NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | R-ACK1 |
| x | x | x | x | x | x | 1 | x | R-ACK2 |
| x | x | x | x | x | 1 | x | x | DBM |
| x | x | x | x | 1 | x | x | x | Fast retrain |
| x | x | x | 1 | x | x | x | x | RS16 |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.10/G.994.1 – Standard information field – G.992.2 Annex C SPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Reserved for allocation by the ITU-T |
| x | x | x | x | x | x | 1 | x | Spectrum frequency upstream |
| x | x | x | x | x | 1 | x | x | Spectrum frequency downstream |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.10.2/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency upstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency upstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency upstream (bits 7 and 8) |

**Table 11.10.2.1/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency upstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency upstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency upstream (bits 1 to 6) |

**Table 11.10.2.2/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency upstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency upstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency upstream (bits 7 and 8) |

**Table 11.10.2.3/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency upstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency upstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency upstream (bits 1 to 6) |

**Table 11.10.3/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency downstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency downstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency downstream (bits 7 and 8) |

**Table 11.10.3.1/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency downstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency downstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency downstream (bits 1 to 6) |

**Table 11.10.3.2/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency downstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency downstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency downstream (bits 7 and 8) |

**Table 11.10.3.3/G.994.1 – Standard information field – G.992.2 Annex C Spectrum frequency downstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.2 Annex C Spectrum frequency downstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency downstream (bits 1 to 6) |

**Table 11.11/G.994.1 – Standard information field – G.992.1 Annex H NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | EFT |
| x | x | x | x | x | x | 1 | x | Fast path |
| x | x | x | x | x | 1 | x | x | 1.544 Mbit/s |
| x | x | x | x | 1 | x | x | x | STM |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.12/G.994.1 – Standard information field – G.992.1 Annex H SPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Reserved for allocation by the ITU-T |
| x | x | x | x | x | x | 1 | x | Spectrum frequency upstream |
| x | x | x | x | x | 1 | x | x | Spectrum frequency downstream |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.12.2/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency upstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency upstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency upstream (bits 7 and 8) |

**Table 11.12.2.1/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency upstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency upstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency upstream (bits 1 to 6) |

**Table 11.12.2.2/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency upstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency upstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency upstream (bits 7 and 8) |

**Table 11.12.2.3/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency upstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency upstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency upstream (bits 1 to 6) |

**Table 11.12.3/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency downstream NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency downstream NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum minimum frequency downstream (bits 7 and 8) |

**Table 11.12.3.1/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency downstream NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency downstream NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum minimum frequency downstream (bits 1 to 6) |

**Table 11.12.3.2/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency downstream NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency downstream NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | x | x | Spectrum maximum frequency downstream (bits 7 and 8) |

**Table 11.12.3.3/G.994.1 – Standard information field – G.992.1 Annex H Spectrum frequency downstream NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.992.1 Annex H Spectrum frequency downstream NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Spectrum maximum frequency downstream (bits 1 to 6) |

**Table 11.15/G.994.1 – Standard information field – G.991.2 Annex A – NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Training mode (Note) (see also Table 11.14) |
| x | x | x | x | x | x | 1 | x | PMMS mode (Note) (see also Table 11.14) |
| x | x | x | x | x | 1 | x | x | Regenerator silent period (Note) |
| x | x | x | x | 1 | x | x | x | 4-wire |
| x | x | x | 1 | x | x | x | x | SRU |
| x | x | 1 | x | x | x | x | x | Diagnostic mode |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

NOTE – Only one of these bits shall be set at any given time.

**Table 11.16/G.994.1 – Standard information field – G.991.2 Annex A – SPar(2) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream training parameters |
| x | x | x | x | x | x | 1 | x | Upstream training parameters |
| x | x | x | x | x | 1 | x | x | Downstream PMMS parameters |
| x | x | x | x | 1 | x | x | x | Upstream PMMS parameters |
| x | x | x | 1 | x | x | x | x | TPS-TC parameters |
| x | x | 1 | x | x | x | x | x | Downstream framing parameters |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.0.1/G.994.1 – Standard information field – G.991.2 Annex A – SPar(2) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream framing parameters |
| x | x | x | x | x | x | 1 | x | Dual-Mode TPS-TC parameters |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Downstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.16.1.1/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by the ITU-T |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.2/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.3/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.4/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.5/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.6/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.7/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 768 or 776 kbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.536 or 1.544 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.8/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream sub data rate = 0 kbit/s |
| x | x | x | x | x | x | 1 | x | Downstream sub data rate = 8 kbit/s |
| x | x | x | x | x | 1 | x | x | Downstream sub data rate = 16 kbit/s |
| x | x | x | x | 1 | x | x | x | Downstream sub data rate = 24 kbit/s |
| x | x | x | 1 | x | x | x | x | Downstream sub data rate = 32 kbit/s |
| x | x | 1 | x | x | x | x | x | Downstream sub data rate = 40 kbit/s |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.1.9/G.994.1 – Standard information field – G.991.2 Annex A Downstream training parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream training NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream sub data rate = 48 kbit/s |
| x | x | x | x | x | x | 1 | x | Downstream sub data rate = 56 kbit/s |
| x | x | x | x | x | 1 | x | x | Downstream sub data rate unspecified by terminal |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Upstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.16.2.1/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by the ITU-T |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.2/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.3/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.4/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.5/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.6/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.7/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 768 or 776 kbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.536 or 1.544 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.8/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream sub data rate = 0 kbit/s |
| x | x | x | x | x | x | 1 | x | Upstream sub data rate = 8 kbit/s |
| x | x | x | x | x | 1 | x | x | Upstream sub data rate = 16 kbit/s |
| x | x | x | x | 1 | x | x | x | Upstream sub data rate = 24 kbit/s |
| x | x | x | 1 | x | x | x | x | Upstream sub data rate = 32 kbit/s |
| x | x | 1 | x | x | x | x | x | Upstream sub data rate = 40 kbit/s |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.2.9/G.994.1 – Standard information field – G.991.2 Annex A Upstream training parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream training NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream sub data rate = 48 kbit/s |
| x | x | x | x | x | x | 1 | x | Upstream sub data rate = 56 kbit/s |
| x | x | x | x | x | 1 | x | x | Upstream sub data rate unspecified by terminal |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Downstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.16.3.1/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Transmit silence |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.2/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.3/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.4/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.5/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.6/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.7/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 768 kbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.544 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.8/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 1 | Fixed value during PMMS |

**Table 11.16.3.9/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Fixed value during PMMS |

**Table 11.16.3.10/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 11**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 11 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Downstream PMMS duration unspecified by terminal |
| x | x | x | x | x | x | x | x | Downstream PMMS duration (bits 6-1 × 50 ms) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |

**Table 11.16.3.11/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 12**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 12 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | x | x | x | Downstream PMMS scrambler polynomial Index (i2, i1, i0) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |

**Table 11.16.3.12/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 13**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 13 |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | x | x | x | x | x | Worst-case PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.3.13/G.994.1 – Standard information field – G.991.2 Annex A Downstream PMMS parameters – NPar(3) coding – Octet 14**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream PMMS NPar(3)s – Octet 14 |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | x | x | x | x | x | Current-condition PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Upstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.16.4.1/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Transmit silence |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.2/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.3/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.4/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.5/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.6/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.7/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 768 kbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.544 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.4.8/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 9**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 9 |
|---|---|---|---|
| x x | 0 0 | 0 0 0 1 | Fixed value during PMMS |

**Table 11.16.4.9/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 10**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 10 |
|---|---|---|---|
| x x | 0 0 | 0 0 0 0 | Fixed value during PMMS |

**Table 11.16.4.10/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 11**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 11 |
|---|---|---|---|
| x x | 0 0 | 0 0 0 0 | Upstream PMMS duration unspecified by terminal |
| x x | x x | x x x x | Upstream PMMS duration (bits 6-1 × 50 ms) |
| x x | 1 1 | 1 1 1 1 | Reserved for allocation by the ITU-T |

**Table 11.16.4.11/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 12**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 12 |
|---|---|---|---|
| x x | 0 0 | 0 x x x | Upstream PMMS scrambler polynomial Index (i2, i1, i0) |
| x x | 1 1 | 1 1 1 1 | Reserved for allocation by the ITU-T |

**Table 11.16.4.12/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 13**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 13 |
|---|---|---|---|
| x x | 1 x | x x x x | Worst-case PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x x | 0 0 | 0 0 0 0 | No parameters in this octet |

**Table 11.16.4.13/G.994.1 – Standard information field – G.991.2 Annex A Upstream PMMS parameters – NPar(3) coding – Octet 14**

| Bits 8 7 | 6 5 | 4 3 2 1 | G.991.2 Annex A Upstream PMMS NPar(3)s – Octet 14 |
|---|---|---|---|
| x x | 1 x | x x x x | Current-condition PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x x | 0 0 | 0 0 0 0 | No parameters in this octet |

**Table 11.16.5/G.994.1 – Standard information field – G.991.2 Annex A TPS-TC parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A TPS-TC parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Clock Mode 1 |
| x | x | x | x | x | x | 1 | x | Clock Mode 2 |
| x | x | x | x | x | 1 | x | x | Clock Mode 3a |
| x | x | x | x | 1 | x | x | x | Clock Mode 3b |
| x | x | x | 1 | x | x | x | x | Low Latency |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.5.1/G.994.1 – Standard information field – G.991.2 Annex A TPS-TC parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A TPS-TC parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Clear Channel |
| x | x | x | x | x | x | 1 | x | Clear Channel Byte Oriented |
| x | x | x | x | x | 1 | x | x | Unaligned DS1 |
| x | x | x | x | 1 | x | x | x | Aligned DS1/Fractional DS1 |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | Synchronous ISDN-BRA |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.5.2/G.994.1 – Standard information field – G.991.2 Annex A TPS-TC parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A TPS-TC parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | x | x | x | Number of ISDN BRA (0 to 6) |
| | | x | x | x | | | | Z-bits used for ISDN BRA Signalling (0 to 7) |

**Table 11.16.6/G.994.1 – Standard information field – G.991.2 Annex A Downstream framing parameters NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream framing parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | | x | x | Sync Word (bits 14 and 13) |
| | | x | x | x | x | | | Stuff Bits (bits 1 to 4) |

**Table 11.16.6.1/G.994.1 – Standard information field – G.991.2 Annex A Downstream framing parameters NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream framing parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Sync Word (bits 12 to 7) |

**Table 11.16.6.2/G.994.1 – Standard information field – G.991.2 Annex A Downstream framing parameters NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Downstream framing parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Sync Word (bits 6 to 1) |

**Table 11.16.7/G.994.1 – Standard information field – G.991.2 Annex A Upstream framing parameters NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream framing parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | | x | x | Sync Word (bits 14 and 13) |
| | | x | x | x | x | | | Stuff Bits (bits 1 to 4) |

**Table 11.16.7.1/G.994.1 – Standard information field – G.991.2 Annex A Upstream framing parameters NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream framing parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Sync Word (bits 12 to 7) |

**Table 11.16.7.2/G.994.1 – Standard information field – G.991.2 Annex A Upstream framing parameters NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Upstream framing parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Sync Word (bits 6 to 1) |

**Table 11.16.8/G.994.1 – Standard information field – G.991.2 Annex A Dual Mode TPS-TC parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Dual Mode TPS-TC parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | TPS-$TC_a$ data rate – $n \times 64$ kbit/s (1 to 36) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Unspecified by terminal |

**Table 11.16.8.1/G.994.1 – Standard information field – G.991.2 Annex A Dual Mode TPS-TC parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Dual Mode TPS-TC parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | x | x | x | TPS-$TC_a$ sub data rate – $i \times 8$ kbit/s (0 to 7) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Unspecified by terminal |

**Table 11.16.8.2/G.994.1 – Standard information field – G.991.2 Annex A Dual Mode TPS-TC parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Dual Mode TPS-TC parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Type 1 – TPS-$TC_b$: Clear Channel |
| x | x | x | x | x | x | 1 | x | Type 1 – TPS-$TC_b$: Clear Channel Byte-Oriented |
| x | x | x | x | x | 1 | x | x | Type 1 – TPS-$TC_b$: Unaligned DS1 |
| x | x | x | x | 1 | x | x | x | Type 1 – TPS-$TC_b$: Aligned DS1/Fractional DS1 |
| x | x | x | 1 | x | x | x | x | Type 1 – TPS-$TC_b$: ATM |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.16.8.3/G.994.1 – Standard information field – G.991.2 Annex A Dual Mode TPS-TC parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Dual Mode TPS-TC parameter NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | x | x | x | Number of ISDN BRA (0 to 6) |
| | | x | x | x | | | | Z-bits used for ISDN BRA Signalling (0 to 7) |

**Table 11.16.8.4/G.994.1 – Standard information field – G.991.2 Annex A Dual Mode TPS-TC parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Dual Mode TPS-TC parameter NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Type 2 – TPS-$TC_a$: Unaligned DS1 |
| x | x | x | x | x | x | 1 | x | Type 2 – TPS-$TC_a$: Aligned DS1/Fractional DS1 |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

### Table 11.16.8.5/G.994.1 – Standard information field – G.991.2 Annex A Dual Mode TPS-TC parameters – NPar(3) coding – Octet 6

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex A Dual Mode TPS-TC parameter NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Type 3 – TPS-$TC_a$: Unaligned DS1 |
| x | x | x | x | x | x | 1 | x | Type 3 – TPS-$TC_a$: Aligned DS1/Fractional DS1 |
| x | x | x | x | x | 1 | x | x | Type 3 – TPS-$TC_b$: Clear Channel |
| x | x | x | x | 1 | x | x | x | Type 3 – TPS-$TC_b$: Clear Channel Byte-Oriented |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

### Table 11.17/G.994.1 – Standard information field – G.991.2 Annex B – NPar(2) coding

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Training mode (Note) (see also Table 11.16) |
| x | x | x | x | x | x | 1 | x | PMMS mode (Note) (see also Table 11.16) |
| x | x | x | x | x | 1 | x | x | Regenerator silent period (Note) |
| x | x | x | x | 1 | x | x | x | 4-wire |
| x | x | x | 1 | x | x | x | x | SRU |
| x | x | 1 | x | x | x | x | x | Diagnostic Mode |

NOTE – Only one of these bits shall be set at any given time.

### Table 11.18/G.994.1 – Standard information field – G.991.2 Annex B – SPar(2) coding – Octet 1

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream training parameters |
| x | x | x | x | x | x | 1 | x | Upstream training parameters |
| x | x | x | x | x | 1 | x | x | Downstream PMMS parameters |
| x | x | x | x | 1 | x | x | x | Upstream PMMS parameters |
| x | x | x | 1 | x | x | x | x | TPS-TC Parameters |
| x | x | 1 | x | x | x | x | x | Downstream framing parameters |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.0.1/G.994.1 – Standard information field – G.991.2 Annex B – SPar(2) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream framing parameters |
| x | x | x | x | x | x | 1 | x | Dual-Mode TPS-TC Parameters |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Downstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.18.1.1/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by the ITU-T |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.2/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.3/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.4/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.5/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.6/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.7/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 2.304 Mbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 2.048 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.8/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream sub data rate = 0 kbit/s |
| x | x | x | x | x | x | 1 | x | Downstream sub data rate = 8 kbit/s |
| x | x | x | x | x | 1 | x | x | Downstream sub data rate = 16 kbit/s |
| x | x | x | x | 1 | x | x | x | Downstream sub data rate = 24 kbit/s |
| x | x | x | 1 | x | x | x | x | Downstream sub data rate = 32 kbit/s |
| x | x | 1 | x | x | x | x | x | Downstream sub data rate = 40 kbit/s |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.1.9/G.994.1 – Standard information field – G.991.2 Annex B Downstream training parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream training NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream sub data rate = 48 kbit/s |
| x | x | x | x | x | x | 1 | x | Downstream sub data rate = 56 kbit/s |
| x | x | x | x | x | 1 | x | x | Downstream sub data rate unspecified by terminal |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Upstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.18.2.1/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by the ITU-T |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.2/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.3/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.4/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.5/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.6/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.7/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 2.304 Mbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 2.048 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.8/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream sub data rate = 0 kbit/s |
| x | x | x | x | x | x | 1 | x | Upstream sub data rate = 8 kbit/s |
| x | x | x | x | x | 1 | x | x | Upstream sub data rate = 16 kbit/s |
| x | x | x | x | 1 | x | x | x | Upstream sub data rate = 24 kbit/s |
| x | x | x | 1 | x | x | x | x | Upstream sub data rate = 32 kbit/s |
| x | x | 1 | x | x | x | x | x | Upstream sub data rate = 40 kbit/s |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.2.9/G.994.1 – Standard information field – G.991.2 Annex B Upstream training parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream training NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream sub data rate = 48 kbit/s |
| x | x | x | x | x | x | 1 | x | Upstream sub data rate = 56 kbit/s |
| x | x | x | x | x | 1 | x | x | Upstream sub data rate unspecified by terminal |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Downstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.18.3.1/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Transmit silence |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.2/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.3/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.4/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.5/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.6/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Downstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Downstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.7/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Downstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Downstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Downstream base data rate = 2.304 Mbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Downstream base data rate = 2.048 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.8/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 1 | Fixed value during PMMS |

**Table 11.18.3.9/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Fixed value during PMMS |

**Table 11.18.3.10/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 11**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 11 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Downstream PMMS duration unspecified by terminal |
| x | x | x | x | x | x | x | x | Downstream PMMS duration (bits 6-1 × 50 ms) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |

**Table 11.18.3.11/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 12**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 12 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | x | x | x | Downstream PMMS scrambler polynomial Index (i2, i1, i0) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |

**Table 11.18.3.12/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 13**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 13 |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | x | x | x | x | x | Worst-case PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.3.13/G.994.1 – Standard information field – G.991.2 Annex B Downstream PMMS parameters – NPar(3) coding – Octet 14**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream PMMS NPar(3)s – Octet 14 |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | x | x | x | x | x | Current-condition PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | x | x | x | x | x | Upstream PBO (dB) (bits 5-1 × 1.0 dB) |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |

**Table 11.18.4.1/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate unspecified by terminal |
| x | x | x | x | x | x | 1 | x | Transmit silence |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 192 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 256 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.2/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 320 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 384 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 448 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 512 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 576 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 640 kbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.3/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 704 kbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 768 kbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 832 kbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 896 kbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 960 kbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.024 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.4/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.088 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.152 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.216 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.280 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.344 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.408 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.5/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.472 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.536 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.600 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 1.664 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 1.728 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 1.792 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.6/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 7**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 7 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 1.856 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 1.920 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Upstream base data rate = 1.984 Mbit/s, symmetric PSD |
| x | x | x | x | 1 | x | x | x | Upstream base data rate = 2.048 Mbit/s, symmetric PSD |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 2.112 Mbit/s, symmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 2.176 Mbit/s, symmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.7/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 8**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 8 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream base data rate = 2.240 Mbit/s, symmetric PSD |
| x | x | x | x | x | x | 1 | x | Upstream base data rate = 2.304 Mbit/s, symmetric PSD |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Upstream base data rate = 2.304 Mbit/s, asymmetric PSD |
| x | x | 1 | x | x | x | x | x | Upstream base data rate = 2.048 Mbit/s, asymmetric PSD |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.8/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 9**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 9 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 1 | Fixed value during PMMS |

**Table 11.18.4.9/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 10**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 10 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Fixed value during PMMS |

**Table 11.18.4.10/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 11**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 11 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | Upstream PMMS duration unspecified by terminal |
| x | x | x | x | x | x | x | x | Upstream PMMS duration (bits 6-1 × 50 ms) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |

**Table 11.18.4.11/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 12**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 12 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | 0 | x | x | x | Upstream PMMS scrambler polynomial Index (i2, i1, i0) |
| x | x | 1 | 1 | 1 | 1 | 1 | 1 | Reserved for allocation by the ITU-T |

**Table 11.18.4.12/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 13**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 13 |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | x | x | x | x | x | Worst-case PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.4.13/G.994.1 – Standard information field – G.991.2 Annex B Upstream PMMS parameters – NPar(3) coding – Octet 14**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Upstream PMMS NPar(3)s – Octet 14 |
|---|---|---|---|---|---|---|---|---|
| x | x | 1 | x | x | x | x | x | Current-condition PMMS target margin (dB) (bits 5-1 × 1.0 dB – 10 dB) |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.5/G.994.1 – Standard information field – G.991.2 Annex B TPS-TC parameters – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B TPS-TC parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Clock Mode 1 |
| x | x | x | x | x | x | 1 | x | Clock Mode 2 |
| x | x | x | x | x | 1 | x | x | Clock Mode 3a |
| x | x | x | x | 1 | x | x | x | Clock Mode 3b |
| x | x | x | 1 | x | x | x | x | Low Latency |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.5.1/G.994.1 – Standard information field – G.991.2 Annex B TPS-TC parameters – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B TPS-TC parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Clear Channel |
| x | x | x | x | x | x | 1 | x | Clear Channel Byte Oriented |
| x | x | x | x | x | 1 | x | x | Unaligned D2048S |
| x | x | x | x | 1 | x | x | x | Aligned D2048S/Fractional D2048S |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | Unaligned D2048U |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.5.2/G.994.1 – Standard information field – G.991.2 Annex B TPS-TC parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B TPS-TC parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Synchronous ISDN-BRA |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by the ITU-T |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by the ITU-T |
| x | x | x | x | 1 | x | x | x | Reserved for allocation by the ITU-T |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.5.3/G.994.1 – Standard information field – G.991.2 Annex B TPS-TC parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B TPS-TC parameter NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | x | x | x | Number of ISDN BRA (0 to 6) |
| | | x | x | x | | | | Z-bits used for ISDN BRA Signalling (0 to 7) |

**Table 11.18.6/G.994.1 – Standard information field – G.991.2 Annex B Downstream framing parameters NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream framing parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | | x | x | Sync Word (bits 14 and 13) |
| | | x | x | x | x | | | Stuff Bits (bits 1 to 4) |

**Table 11.18.6.1/G.994.1 – Standard information field – G.991.2 Annex B Downstream framing parameters NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream framing parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Sync Word (bits 12 to 7) |

**Table 11.18.6.2/G.994.1 – Standard information field – G.991.2 Annex B Downstream framing parameters NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Downstream framing parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | x | Sync Word (bits 6 to 1) |

**Table 11.18.7/G.994.1 – Standard information field – G.991.2 Annex B Upstream framing parameters NPar(3) coding – Octet 1**

| Bits 8 7 | 6 5 | 4 3 | 2 1 | G.991.2 Annex B Upstream framing parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|
| x x | | | x x | Sync Word (bits 14 and 13) |
| | x x | x x | | Stuff Bits (bits 1 to 4) |

**Table 11.18.7.1/G.994.1 – Standard information field – G.991.2 Annex B Upstream framing parameters NPar(3) coding – Octet 2**

| Bits 8 7 | 6 5 | 4 3 | 2 1 | G.991.2 Annex B Upstream framing parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|
| x x | x x | x x | x x | Sync Word (bits 12 to 7) |

**Table 11.18.7.2/G.994.1 – Standard information field – G.991.2 Annex B Upstream framing parameters NPar(3) coding – Octet 3**

| Bits 8 7 | 6 5 | 4 3 | 2 1 | G.991.2 Annex B Upstream framing parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|
| x x | x x | x x | x x | Sync Word (bits 6 to 1) |

**Table 11.18.8/G.994.1 – Standard information field – G.991.2 Annex B Dual Mode TPS-TC parameters – NPar(3) coding – Octet 1**

| Bits 8 7 | 6 5 | 4 3 | 2 1 | G.991.2 Annex B Dual Mode TPS-TC parameter NPar(3)s – Octet 1 |
|---|---|---|---|---|
| x x | x x | x x | x x | TPS-$TC_a$ data rate – $n \times 64$ kbit/s (1 to 36) |
| x x | 1 1 | 1 1 | 1 1 | Unspecified by terminal |

**Table 11.18.8.1/G.994.1 – Standard information field – G.991.2 Annex B Dual Mode TPS-TC parameters – NPar(3) coding – Octet 2**

| Bits 8 7 | 6 5 | 4 3 | 2 1 | G.991.2 Annex B Dual Mode TPS-TC parameter NPar(3)s – Octet 2 |
|---|---|---|---|---|
| x x | 0 0 | 0 x | x x | TPS-$TC_a$ sub data rate – $i \times 8$ kbit/s (0 to 7) |
| x x | 1 1 | 1 1 | 1 1 | Unspecified by terminal |

**Table 11.18.8.2/G.994.1 – Standard information field – G.991.2 Annex B Dual Mode TPS-TC parameters – NPar(3) coding – Octet 3**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Dual Mode TPS-TC parameter NPar(3)s – Octet 3 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Type 1 – TPS-$TC_b$: Clear Channel |
| x | x | x | x | x | x | 1 | x | Type 1 – TPS-$TC_b$: Clear Channel Byte-Oriented |
| x | x | x | x | x | 1 | x | x | Type 1 – TPS-$TC_b$: Unaligned D2048U |
| x | x | x | x | 1 | x | x | x | Type 1 – TPS-$TC_b$: Unaligned D2048S |
| x | x | x | 1 | x | x | x | x | Type 1 – TPS-$TC_b$: Aligned D2048S/Fractional D2048S |
| x | x | 1 | x | x | x | x | x | Type 1 – TPS-$TC_b$: ATM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.8.3/G.994.1 – Standard information field – G.991.2 Annex B Dual Mode TPS-TC parameters – NPar(3) coding – Octet 4**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Dual Mode TPS-TC parameter NPar(3)s – Octet 4 |
|---|---|---|---|---|---|---|---|---|
| x | x | | | | x | x | x | Number of ISDN BRA (0 to 6) |
| | | x | x | x | | | | Z-bits used for ISDN BRA Signalling (0 to 7) |

**Table 11.18.8.4/G.994.1 – Standard information field – G.991.2 Annex B Dual Mode TPS-TC parameters – NPar(3) coding – Octet 5**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Dual Mode TPS-TC parameter NPar(3)s – Octet 5 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Type 2 – TPS-$TC_a$: Unaligned D2048U |
| x | x | x | x | x | x | 1 | x | Type 2 – TPS-$TC_a$: Unaligned D2048S |
| x | x | x | x | x | 1 | x | x | Type 2 – TPS-$TC_a$: Aligned D2048S/Fractional D2048S |
| x | x | x | x | 1 | x | x | x | Type 2 – TPS-$TC_a$: Synchronous ISDN BRA |
| x | x | x | 1 | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by the ITU-T |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.18.8.5/G.994.1 – Standard information field – G.991.2 Annex B Dual Mode TPS-TC parameters – NPar(3) coding – Octet 6**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | G.991.2 Annex B Dual Mode TPS-TC parameter NPar(3)s – Octet 6 |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Type 3 – TPS-$TC_a$: Unaligned D2048U |
| x | x | x | x | x | x | 1 | x | Type 3 – TPS-$TC_a$: Unaligned D2048S |
| x | x | x | x | x | 1 | x | x | Type 3 – TPS-$TC_a$: Aligned D2048S/Fractional D2048S |
| x | x | x | x | 1 | x | x | x | Type 3 – TPS-$TC_a$: Synchronous ISDN BRA |
| x | x | x | 1 | x | x | x | x | Type 3 – TPS-$TC_b$: Clear Channel |
| x | x | 1 | x | x | x | x | x | Type 3 – TPS-$TC_b$: Clear Channel Byte-Oriented |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.23/G.994.1 – Standard information field – ETSI MCM VDSL – NPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ETSI MCM VDSL NPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Upstream use of lower band |
| x | x | x | x | x | x | 1 | x | Downstream use of lower band |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by ETSI |
| x | x | x | x | 1 | x | x | x | STM |
| x | x | x | 1 | x | x | x | x | ATM |
| x | x | 1 | x | x | x | x | x | G.997.1 – Clear EOC OAM |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

**Table 11.24/G.994.1 – Standard information field – ETSI MCM VDSL – SPar(2) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ETSI MCM VDSL SPar(2)s |
|---|---|---|---|---|---|---|---|---|
| x | x | x | x | x | x | x | 1 | Sub-channel information (Note) |
| x | x | x | x | x | x | 1 | x | Reserved for allocation by ETSI |
| x | x | x | x | x | 1 | x | x | Reserved for allocation by ETSI |
| x | x | x | x | 1 | x | x | x | IDFT/DFT size |
| x | x | x | 1 | x | x | x | x | Initial length of CE |
| x | x | 1 | x | x | x | x | x | Reserved for allocation by ETSI |
| x | x | 0 | 0 | 0 | 0 | 0 | 0 | No parameters in this octet |

NOTE – The use of this bit is for further study and shall be set to ZERO in CLR, CL, MP and MS messages. This bit specifies the supported bearer channels for VDSL upstream/downstream transmissions in the TPS-TC sub-layer. The bearer channels are for further study.

**Table 11.24.4/G.994.1 – Standard information field – ETSI MCM VDSL IDFT/DFT size – NPar(3) coding**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ETSI MCM VDSL IDFT/DFT size NPar(3)s |
|---|---|---|---|---|---|---|---|---|
| x | x | $n_5$ | $n_4$ | $n_3$ | $n_2$ | $n_1$ | $n_0$ | IDFT/DFT size (n × 256 points) |

**Table 11.24.5/G.994.1 – Standard information field – ETSI MCM VDSL Initial length of CE – NPar(3) coding – Octet 1**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ETSI MCM VDSL Initial length of CE NPar(3)s – Octet 1 |
|---|---|---|---|---|---|---|---|---|
| x | x | 0 | 0 | $ce_9$ | $ce_8$ | $ce_7$ | $ce_6$ | Initial sample length of cyclic extension (high order bits) |

**Table 11.24.5.1/G.994.1 – Standard information field – ETSI MCM VDSL Initial length of CE – NPar(3) coding – Octet 2**

| Bits 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 | ETSI MCM VDSL Initial length of CE NPar(3)s – Octet 2 |
|---|---|---|---|---|---|---|---|---|
| x | x | $ce_5$ | $ce_4$ | $ce_3$ | $ce_2$ | $ce_1$ | $ce_0$ | Initial sample length of cyclic extension (high order bits) |

## 9.5 Non-standard information field (NS)

MP, MS, CL, and CLR messages may optionally contain a non-standard information field to convey information beyond that defined in this Recommendation. For MR, ACK, NAK and REQ messages, the non-standard information field is not used and is therefore of zero length. When non-standard information is to be sent, the "Non-standard field" parameter shall be set to binary ONE in the identification field of the transmitted message (see Table 8).

The non-standard information field may be composed of one or more non-standard information blocks. The format of the non-standard information field is shown in Figure 10. The first octet of the non-standard information field shall indicate the number of non-standard information blocks to follow.

| |
|---|
| Number of non-standard information blocks = N<br>(1 octet) |
| Non-standard information block 1 |
| Non-standard information block 2 |
| .<br>.<br>. |
| Non-standard information block N |

**Figure 10/G.994.1 – Non-standard information field (NS) format**

Each non-standard information block (see Figure 11) is composed of:

- a length indicator (one octet) specifying the length of the remainder of the block;
- a country code (2 octets), as defined in ITU-T T.35;
- a 4-octet provider code as specified by the country identified in ITU-T T.35; and
- non-standard information (M octets).

| 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
|---|---|---|---|---|---|---|---|
| Non-standard information length = M + 6<br>(1 octet) | | | | | | | |
| T.35 country code<br>(2 octets – see Note 1) | | | | | | | |
| Provider code (vendor identification)<br>(4 octets – see Note 2) | | | | | | | |
| Vendor-specific information<br>(M octets) | | | | | | | |

NOTE 1 – If the bits in the first octet are not all set to binary ONE, the bits in the second octet shall be set to binary ZERO by the transmitter and ignored by the receiver.

NOTE 2 – Specification of the coding and order of transmission of this field is the responsibility of the regional standards body allocating the provider code. See Appendix II for provider code contact information.

**Figure 11/G.994.1 – Non-standard information block format**

## 9.6 Overall message composition

Table 12 shows which fields are permitted in each message type. An "X" indicates that the field shall be included whilst a "–" indicates that the field shall not be included.

**Table 12/G.994.1 – Overall message composition**

| **Messages** | **Identification** | | | **Standard information** | **Non-standard information** |
|---|---|---|---|---|---|
| | **Message type and version**<br>**(2 octets)** | **Vendor ID**<br>**(8 octets)** | **Service and channel parameters**<br>**(Note 1)** | **Modulations and Protocols available**<br>**(Note 2)** | **(Note 3)**<br>$1+\sum_{i=1}^{N}(7+M_i)$<br>**octets** |
| MR | X | – | – | – | – |
| CLR | X | X | X | X | as necessary |
| CL | X | X | X | X | as necessary |
| MS | X | – | X | X | as necessary |
| MP | X | – | X | X | as necessary |
| ACK | X | – | – | – | – |
| NAK | X | – | – | – | – |
| REQ | X | – | – | – | – |

NOTE 1 – As defined in the tables in 9.3.4.

NOTE 2 – As defined in the tables in 9.4.

NOTE 3 – As defined in Figures 10 and 11 in 9.5.

Once a Transaction C (see 10.1) has been completed, any subsequent MS message within the same G.994.1 session shall only contain those octets of the identification (I) and standard information (S) fields, and those blocks of non-standard information (NS) that were contained in both the CLR and CL messages of the previous Transaction C.

## 10 G.994.1 transactions

All permitted G.994.1 transactions are described in this clause.

An overview of the set of basic transactions specified in this Recommendation and the use of ACK(1) is given in 10.1. The use of REQ-MS, REQ-MR and REQ-CLR to create extended transactions is described in 10.2. Message segmentation and the use of ACK(2) is discussed in 10.3. The complete specification of all state transitions permitted during a G.994.1 session is contained in 10.4.

Error recovery procedures and the use of NAK-EF are discussed in clause 12.

### 10.1 Basic transactions

Basic transactions may be classified as one of two types:

- those that exchange and negotiate capabilities between the HSTU-C and HSTU-R; and
- those that select a mode of operation.

Table 13 shows the set of basic transactions specified in this Recommendation. An "X" indicates that the basic transaction is supported for the stated version number (see 9.3.2) whilst a "–" indicates that it is not. Each transaction is initiated by the HSTU-R, and ends with an ACK(1). With basic transactions, the HSTU-R controls the negotiation procedure. At the end of a basic G.994.1 transaction, the stations shall either terminate the G.994.1 session (applies to transactions A, B, C and D) as specified in 11.3, or shall go to the Initial HSTU-x Transaction state (applies to transaction C only) as shown in Figures 12 or 13.

NOTE – The continuation of G.994.1 modulation after the conclusion of the G.994.1 session, for the purpose of implementing other protocols (for example Recommendation G.997.1 – see Table 10), is for further study.

**Table 13/G.994.1 – Basic G.994.1 transactions**

| Transaction identifier | HSTU-R | HSTU-C | HSTU-R | G.994.1 Version 1 support | G.994.1 Version 2 support |
|---|---|---|---|---|---|
| A | MS → | ACK(1) | | X | X |
| B | MR → | MS → | ACK(1) | X | X |
| C | CLR → | CL → | ACK(1) | X | X |
| D | MP → | MS → | ACK(1) | – | X |

#### 10.1.1 Transaction A

In Transaction A, the HSTU-R selects a mode of operation and requests that the HSTU-C transition to the selected mode. When the HSTU-C responds with an ACK(1) message, both stations shall transition to the selected mode.

If the HSTU-R cannot determine a common mode of operation (either standard or non-standard) from previous capabilities exchanges, or is not prepared to select a mode at this time, it shall send an MS message with the Non-standard field bit in Table 8 and all coding points in Tables 10 and 11 set to binary ZERO. When the HSTU-C receives this message, it shall respond with an ACK(1) message. The HSTU-R shall then initiate the cleardown procedure specified in 11.3.

### 10.1.2 Transaction B

In Transaction B, the HSTU-R requests that the HSTU-C select the mode of operation. The HSTU-C selects the mode by transmitting an MS message. When the HSTU-R responds with an ACK(1) message, both stations shall transition to the selected mode.

If the HSTU-C cannot determine a common mode of operation (either standard or non-standard) from previous capabilities exchanges, or is not prepared to select a mode at this time, it shall send an MS message with the Non-standard field bit in Table 8 and all coding points in Tables 10 and 11 set to binary ZERO. When the HSTU-R receives this message, it shall respond with an ACK(1) message. The HSTU-C shall then initiate the cleardown procedure specified in 11.3.

### 10.1.3 Transaction C

In Transaction C, capabilities are exchanged and negotiated by the two stations. Transaction C shall be followed by either Transaction A, Transaction B, or Transaction D during the same session to select a common mode of operation identified during the capabilities exchange.

### 10.1.4 Transaction D

In Transaction D, the HSTU-R proposes a mode of operation and requests that the HSTU-C select the mode of operation. The HSTU-C selects the mode by transmitting an MS message. When the HSTU-R responds with an ACK(1) message, both stations shall transition to the selected mode.

If the HSTU-C cannot determine a common mode of operation (either standard or non-standard) from previous capabilities exchanges, or is not prepared to select a mode at this time, it shall send an MS message with the Non-standard field bit in Table 8 and all coding points in Tables 10 and 11 set to binary ZERO. When the HSTU-R receives the MS message, it shall respond with an ACK(1) message. The HSTU-C shall then initiate the cleardown procedure specified in 11.3.

## 10.2 Extended transactions

Table 14 shows the set of extended transactions specified in this Recommendation. An "X" indicates that the extended transaction is supported for the stated version number (see 9.3.2) whilst a "–" indicates that it is not. Each transaction is initiated by the HSTU-R and ends with an ACK(1). Extended transactions are derived from a concatenation of two basic transactions. They are used when the HSTU-C wishes to control the negotiation procedure. At the end of an extended G.994.1 transaction, the stations shall either terminate the G.994.1 session as specified in 11.3, or shall go to the Initial HSTU-x Transaction state as shown in Figures 12 or 13.

NOTE – The continuation of G.994.1 modulation after the conclusion of the G.994.1 session, for the purpose of implementing other protocols (for example Recommendation G.997.1 – see Table 10), is for further study.

**Table 14/G.994.1 – Extended G.994.1 transactions**

| Transaction identifier | HSTU-R | HSTU-C | HSTU-R | HSTU-C | HSTU-R | G.994.1 Version 1 support | G.994.1 Version 2 support |
|---|---|---|---|---|---|---|---|
| A:B | MS → | REQ-MR → | MR → | MS → | ACK(1) | X | X |
| B:A | MR → | REQ-MS → | MS → | ACK(1) | | X | X |
| A:C | MS → | REQ-CLR → | CLR → | CL → | ACK(1) | X | X |
| B:C | MR → | REQ-CLR → | CLR → | CL → | ACK(1) | X | X |
| D:C | MP → | REQ-CLR → | CLR → | CL → | ACK(1) | – | X |

### 10.2.1 Transaction A:B

In Transaction A:B, the HSTU-R selects a mode of operation and requests that the HSTU-C transition to the selected mode. However, rather than responding to the MS message with an ACK(1) message as is the case for basic Transaction A, the HSTU-C responds to the MS message with a REQ-MR message requesting the HSTU-R to proceed directly into basic Transaction B without returning to the Initial Transaction state.

### 10.2.2 Transaction B:A

In Transaction B:A, the HSTU-R requests that the HSTU-C select the mode of operation. However, rather than responding to the MR message with an MS message as is the case for basic Transaction B, the HSTU-C responds to the MR message with a REQ-MS message requesting the HSTU-R to proceed directly into basic Transaction A without returning to the Initial Transaction state.

### 10.2.3 Transaction A:C

In Transaction A:C, the HSTU-R selects a mode of operation and requests that the HSTU-C transition to the selected mode. However, rather than responding to the MS message with an ACK(1) message as is the case for basic Transaction A, the HSTU-C responds to the MS message with a REQ-CLR message requesting the HSTU-R to proceed directly into basic Transaction C without returning to the Initial Transaction state.

### 10.2.4 Transaction B:C

In Transaction B:C, the HSTU-R requests that the HSTU-C select the mode of operation. However, rather than responding to the MR message with an MS message as is the case for basic Transaction B, the HSTU-C responds to the MR message with a REQ-CLR message requesting the HSTU-R to proceed directly into a Transaction C without returning to the Initial Transaction state.

### 10.2.5 Transaction D:C

In Transaction D:C, the HSTU-R proposes a mode of operation and requests that the HSTU-C select the mode of operation. However, rather than responding to the MP message with an MS message as is the case for basic Transaction D, the HSTU-C responds to the MP message with a REQ-CLR message requesting the HSTU-R to proceed directly into basic Transaction C without returning to the Initial Transaction state.

## 10.3 Message segmentation

Not including the two octets of FCS and any octets that have been inserted to achieve octet transparency (see 8.4), the maximum number of octets in any frame shall be 64. If the message exceeds this limit, the remainder of the message may be contained in subsequent frames. Whether or not the message exceeds 64 octets, it may be split into segments.

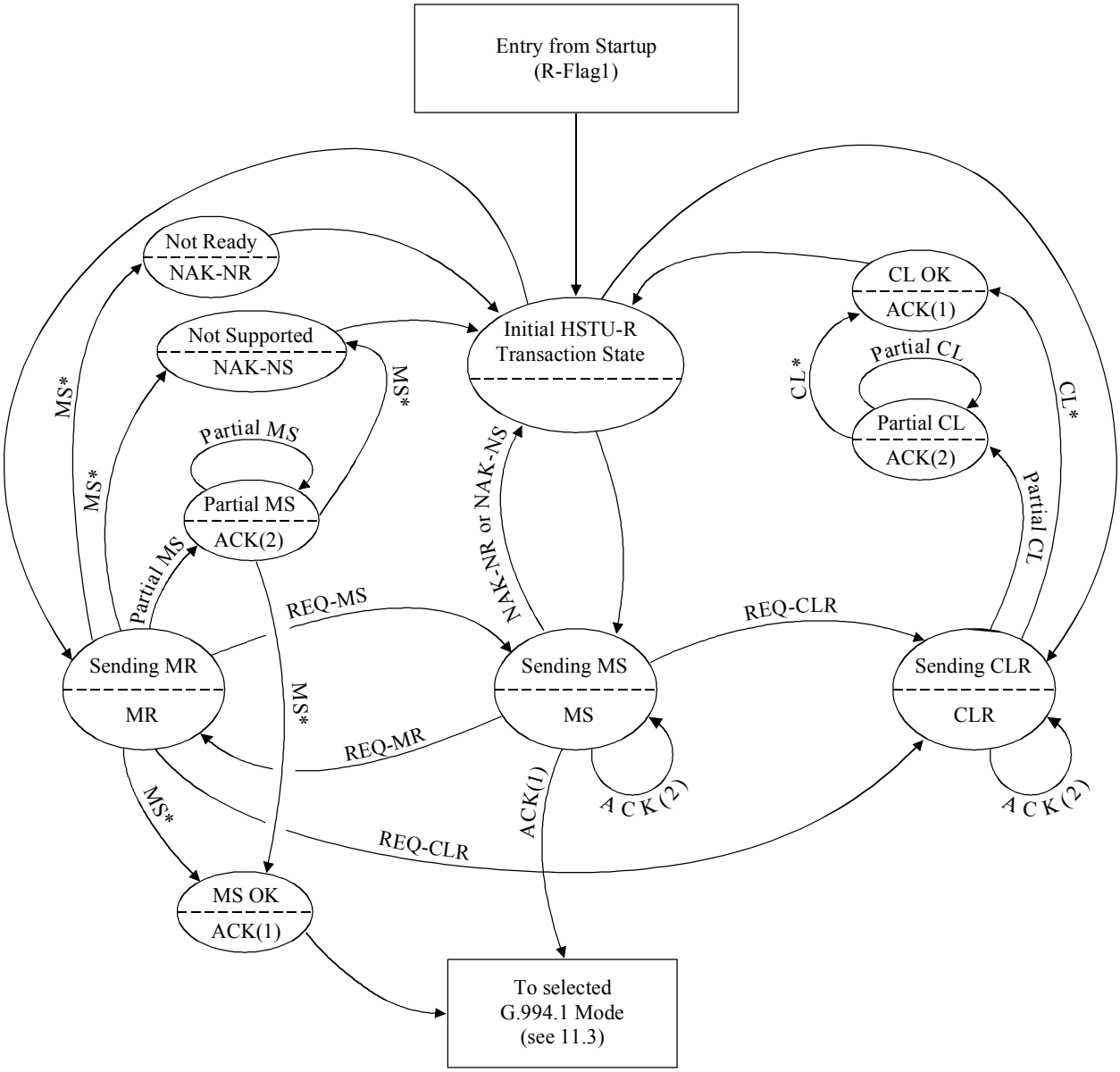
The receiving station shall parse the frame to determine if the message has been fully transmitted. If the message has not been fully transmitted, the receiving station may request transmission of the next segment by transmitting an ACK(2). Further segments shall only be sent in response to an ACK(2). Only CLR, CL, MP, and MS messages may be segmented.

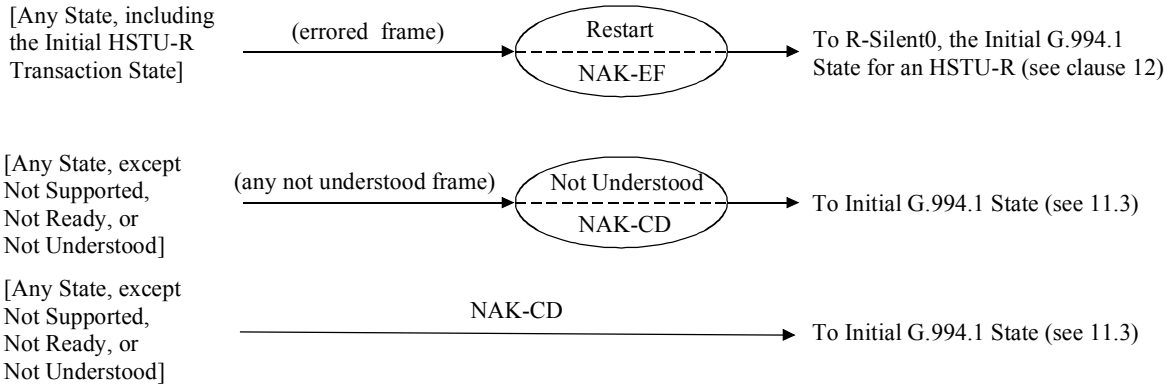
Where non-standard information is present in the message, the standard and non-standard information may be conveyed in separate frames.

## 10.4 State transition diagrams

For equipment that conforms to G.994.1 Version 1 (see 9.3.2), Figures 12.1 and 13.1 specify all permitted state transitions for the HSTU-R and HSTU-C stations respectively. For equipment that conforms to G.994.1 Version 2 (see 9.3.2), Figures 12.2 and 13.2 specify all permitted state transitions for the HSTU-R and HSTU-C stations respectively.

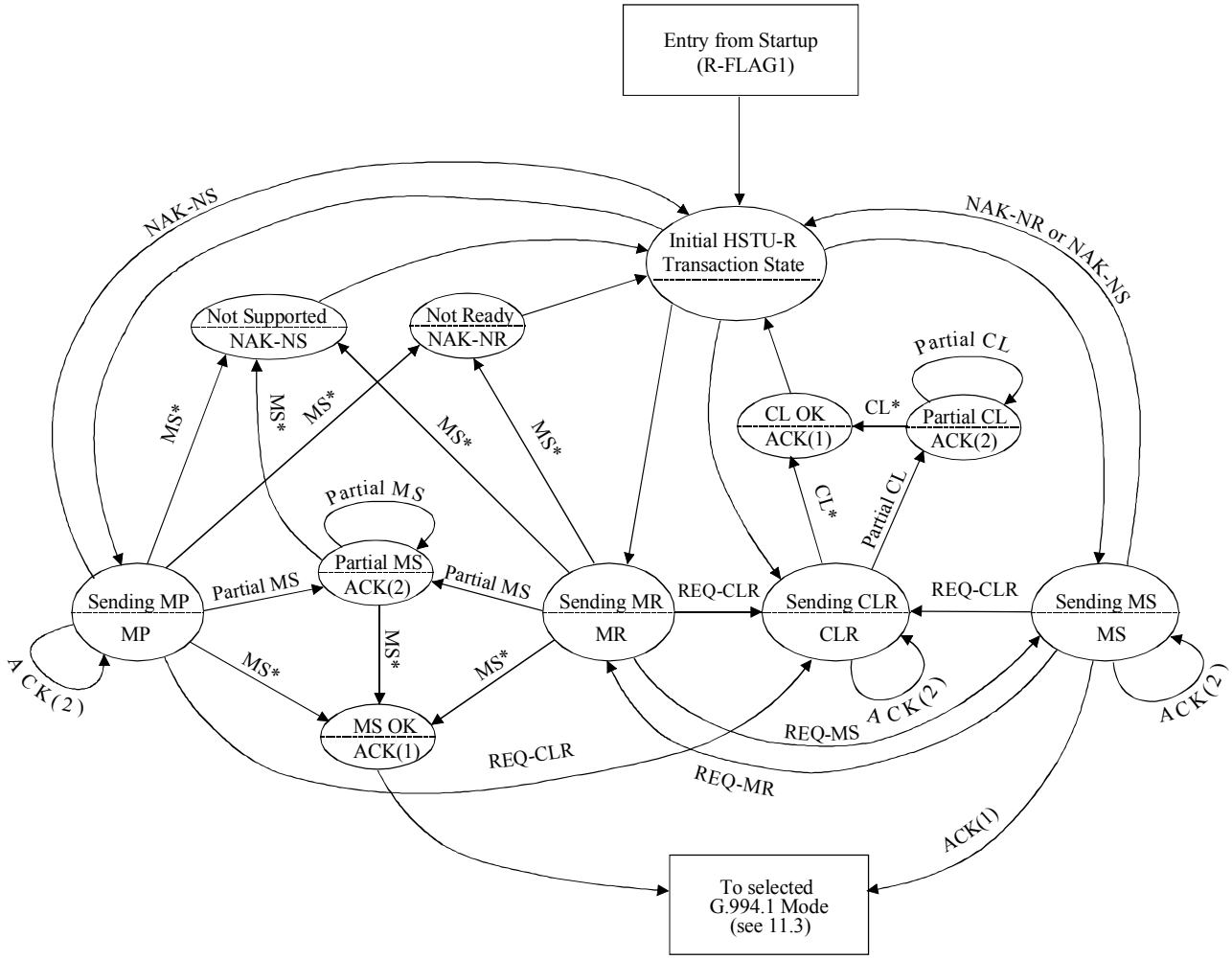
The state transition diagrams show state information (the state name and current transmitted message) and transition information (received message that caused the state change).



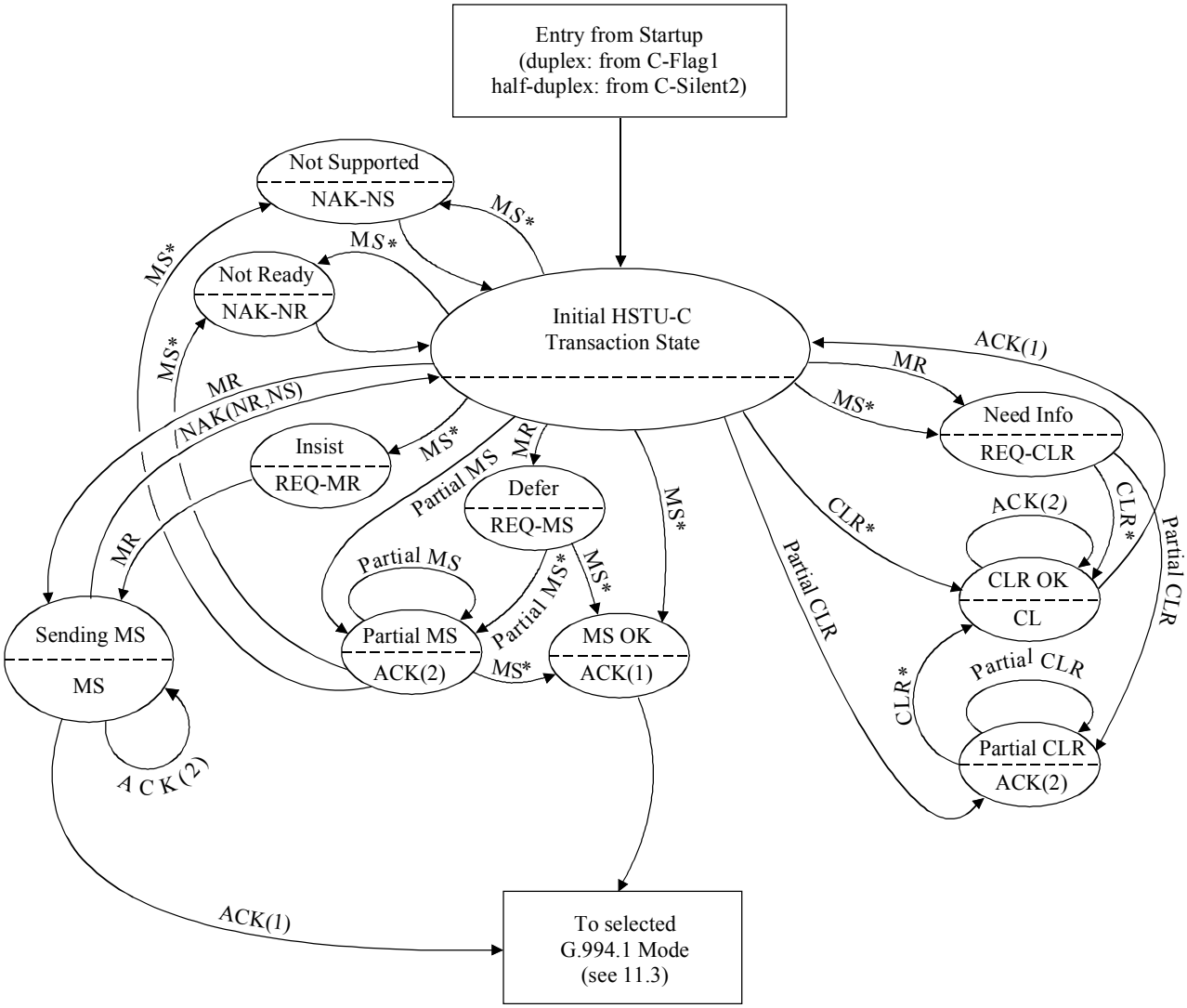

NOTE 1 – Message names followed by an asterisk (*) indicate that the state transition may be taken upon the reception of a complete message, or upon the reception of one or more segments of the message.
NOTE 2 – Figure12.1 is a modification of Figure 12 from G.994.1 (1998) (Version 1) to correct an error.
A new branch has been added from "Partial MS" to "Not Supported" with the label "MS*".

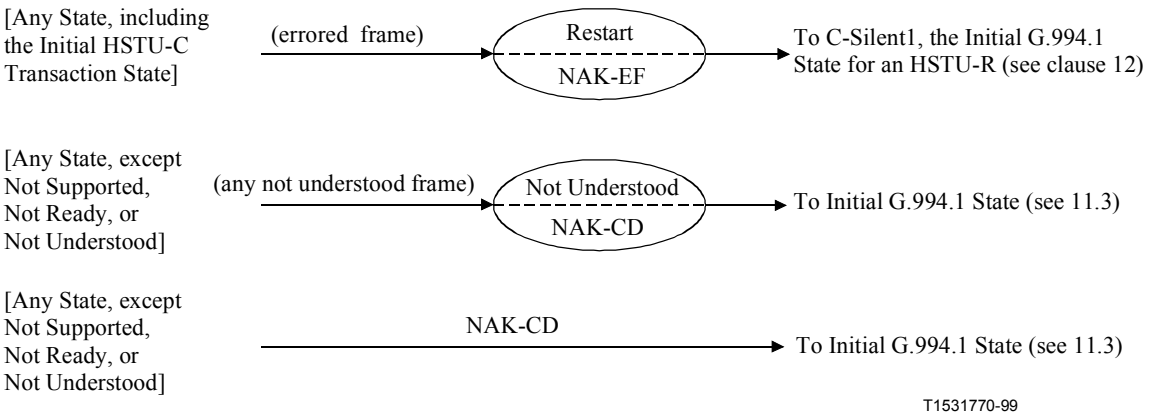
**Figure 12.1/G.994.1 – HSTU-R state transition diagram (Version 1)**




NOTE – Message names followed by an asterisk (*) indicate that the state transition may be taken upon the reception of a complete message, or upon the reception of one or more segments of the message.

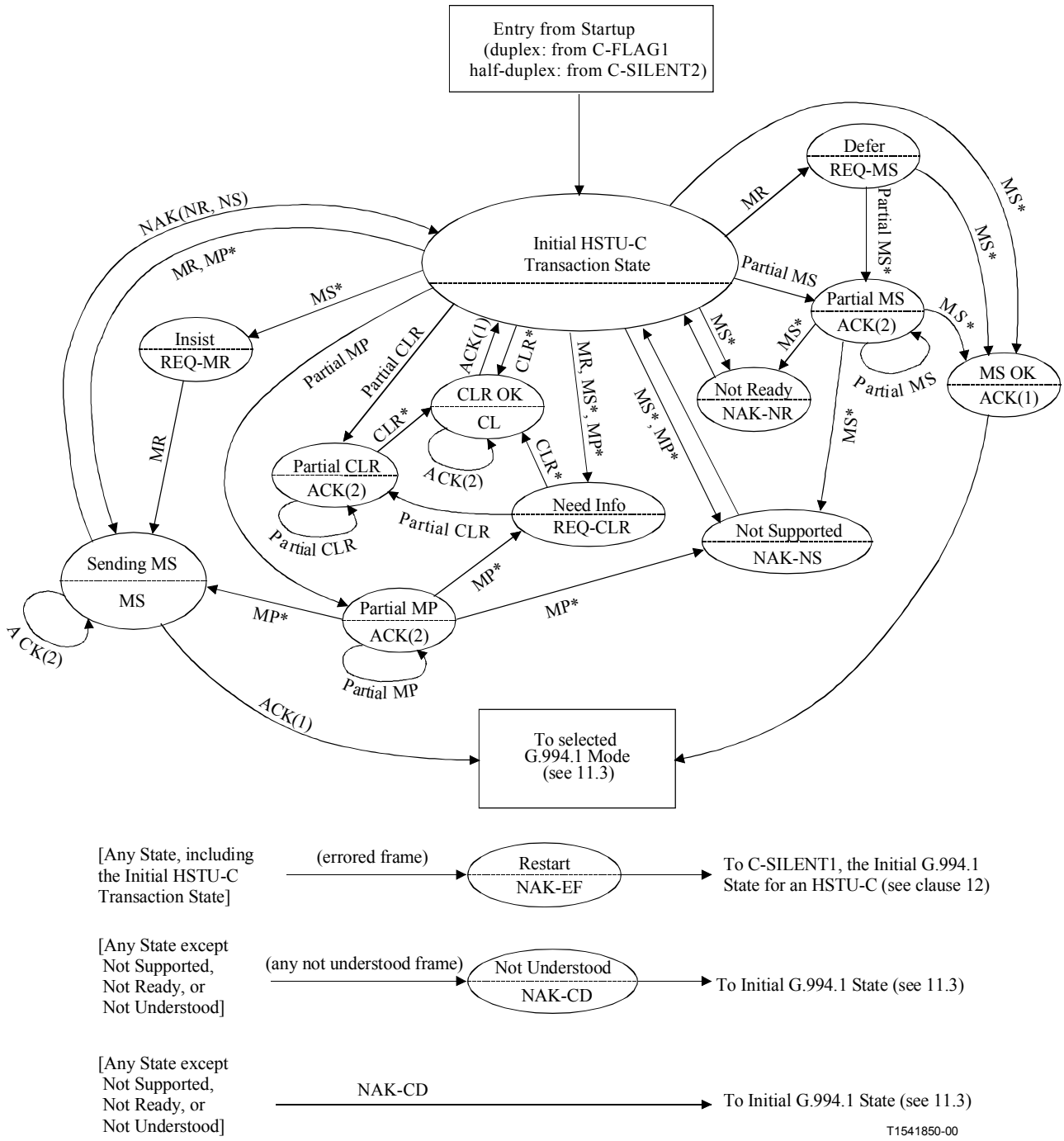
**Figure 12.2/G.994.1 – HSTU-R state transition diagram (Version 2)**




NOTE – Message names followed by an asterisk (*) indicate that the state transition may be taken upon the reception of a complete message, or upon the reception of one or more segments of the message.

**Figure 13.1/G.994.1 – HSTU-C state transition diagram (Version 1)**




NOTE – Message names followed by an asterisk (*) indicate that the state transition may be taken upon the reception of a complete message, or upon the reception of one or more segments of the message.

**Figure 13.2/G.994.1 – HSTU-C state transition diagram (Version 2)**

Transmission of signals associated with a selected mode shall follow the transmission of ACK(1) and the G.994.1 cleardown procedure. The time delay between the end of a G.994.1 session and the start of the selected mode is specified in the associated Recommendation.

## 11 Start-up/cleardown procedures

### 11.1 Duplex start-up procedures

#### 11.1.1 HSTU-R initiated start-up procedure

Figure 14 displays the timing for the HSTU-R initiated duplex start-up procedure. Initially, the HSTU-R is in state R-SILENT0 transmitting silence, and the HSTU-C is in state C-SILENT1 transmitting silence. The HSTU-R shall initiate the start-up procedure by transmitting signals from one or both of its signalling families, with phase reversals every 16 ms (R-TONES-REQ). When this has been detected by the HSTU-C, the HSTU-C shall respond by transmitting signals from one or both of its signalling families (C-TONES). When this has been detected by the HSTU-R, the HSTU-R shall transmit silence (R-SILENT1) for 50 to 500 ms and shall then transmit signals from only one signalling family (R-TONE1). The minimum detection time for C-TONES shall be 50 ms. When the HSTU-C has detected R-TONE1, it shall respond by transmitting Galfs on modulated carriers (C-GALF1). When the HSTU-R has detected Galfs, it shall respond by transmitting Flags on modulated carriers (R-FLAG1). When the HSTU-C has detected Flags, it shall respond by transmitting Flags (C-FLAG1). When the HSTU-R has detected Flags, it shall begin the first transaction.

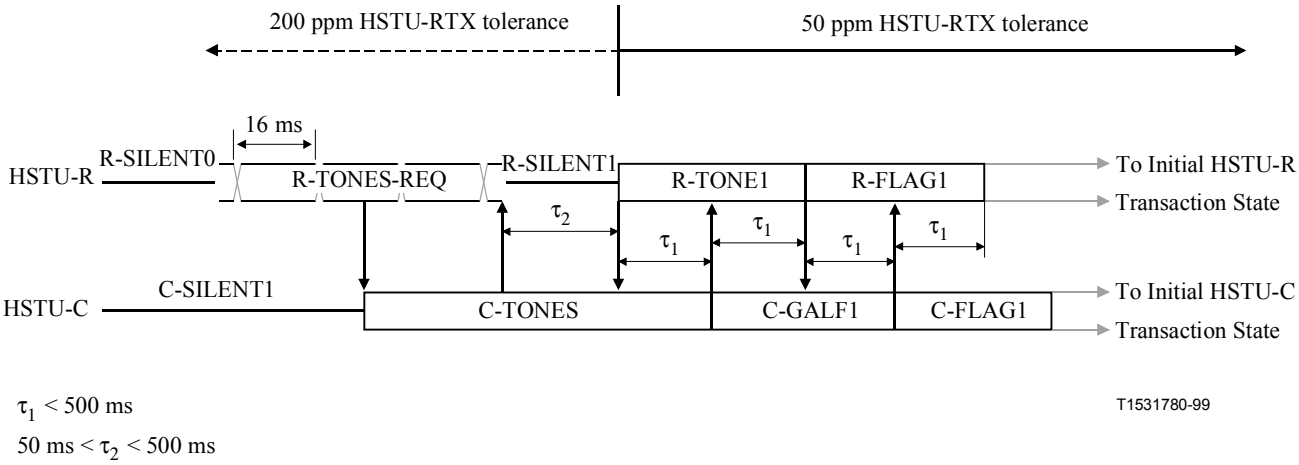



**Figure 14/G.994.1 – HSTU-R initiated duplex start-up procedure**

Figure 14 shows the timing requirements between events that shall be adhered to. $\tau_1$ is the time period from detection of a signal (e.g. R-TONE1) to the transmission of the next signal (e.g. C-GALF1).

#### 11.1.2 HSTU-C initiated start-up procedure

Figure 15 displays the timing for the HSTU-C initiated duplex start-up procedure. Initially, the HSTU-R is in state R-SILENT0 transmitting silence, and the HSTU-C is in state C-SILENT1 transmitting silence. The HSTU-C shall initiate the start-up procedure by transmitting signals from one or both of its signalling families (C-TONES). When this has been detected by the HSTU-R, the HSTU-R shall respond by transmitting signals from only one signalling family (R-TONE1). The minimum detection time for C-TONES shall be 50 ms. When the HSTU-C has detected R-TONE1, it shall respond by transmitting Galfs on modulated carriers (C-GALF1). When the HSTU-R has detected Galfs, it shall respond by transmitting Flags on modulated carriers (R-FLAG1). When the HSTU-C has detected Flags, it shall respond by transmitting Flags (C-FLAG1). When the HSTU-R has detected Flags, it shall begin the first transaction.

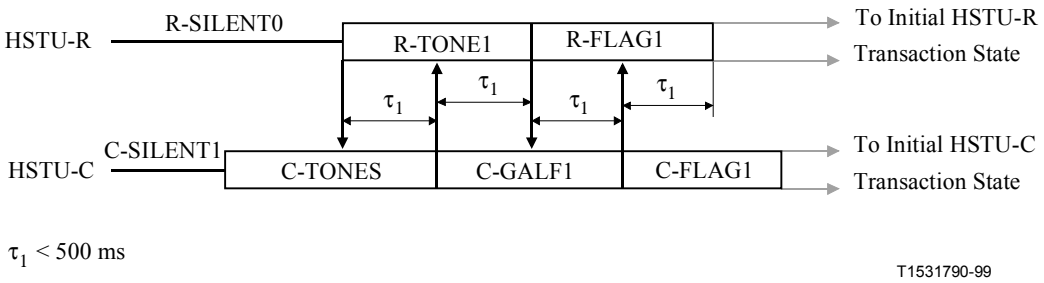



**Figure 15/G.994.1 – HSTU-C initiated duplex start-up procedure**

Figure 15 shows the timing requirements between events that shall be adhered to. $\tau_1$ is the time period from detection of a signal (e.g. R-TONE1) to the transmission of the next signal (e.g. C-GALF1).

## 11.2 Half-duplex start-up procedures

### 11.2.1 HSTU-R initiated start-up procedure

Figure 16 displays the timing for the HSTU-R initiated half-duplex start-up procedure. Initially, the HSTU-R is in state R-SILENT0 transmitting silence, and the HSTU-C is in state C-SILENT1 transmitting silence. The HSTU-R shall initiate the start-up procedure by transmitting signals from one or both of its signalling families, with phase reversals every 16 ms (R-TONES-REQ). When this has been detected by the HSTU-C, the HSTU-C shall respond by transmitting signals from one or both of its signalling families (C-TONES). When this has been detected by the HSTU-R, the HSTU-R shall transmit silence (R-SILENT1) for 50 to 500 ms and shall then transmit flags modulated on carriers from only one signalling family (R-FLAG1). The minimum detection time for C-TONES shall be 50 ms. When the HSTU-C has detected R-FLAG1, it shall respond by transmitting silence. When the HSTU-R has detected the silence, it shall continue to transmit Flags for period $\tau_1$ and shall then begin the first transaction.

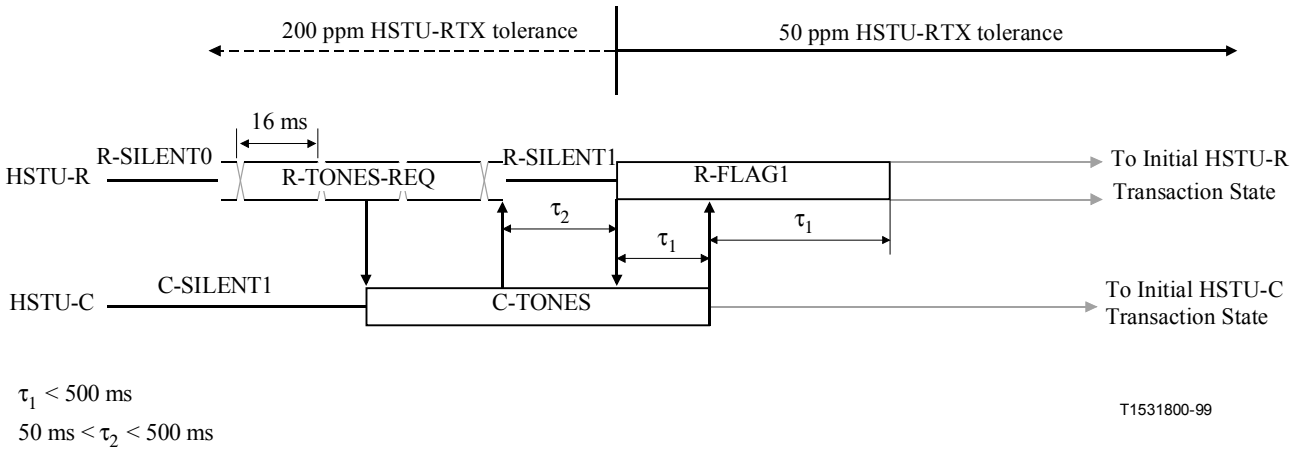



**Figure 16/G.994.1 – HSTU-R initiated half-duplex start-up procedure**

Figure 16 shows the timing requirements between events that shall be adhered to. $\tau_1$ is the time period from detection of a signal (e.g. R-TONE1) to the transmission of the next signal (e.g. C-GALF1).

### 11.2.2 HSTU-C initiated start-up procedure

Figure 17 displays the timing for the HSTU-C initiated half-duplex start-up procedure. Initially, the HSTU-R is in state R-SILENT0 transmitting silence, and the HSTU-C is in state C-SILENT1 transmitting silence. The HSTU-C shall initiate the start-up procedure by transmitting signals from one or both of its signalling families (C-TONES). When this has been detected by the HSTU-R, the HSTU-R shall respond by transmitting flags modulated on carriers from only one signalling family (R-FLAG1). The minimum detection time for C-TONES shall be 50 ms. When the HSTU-C has detected R-FLAG1, it shall respond by transmitting silence. When the HSTU-R has detected the silence, it shall continue to transmit Flags for period $\tau_1$ and shall then begin the first transaction.

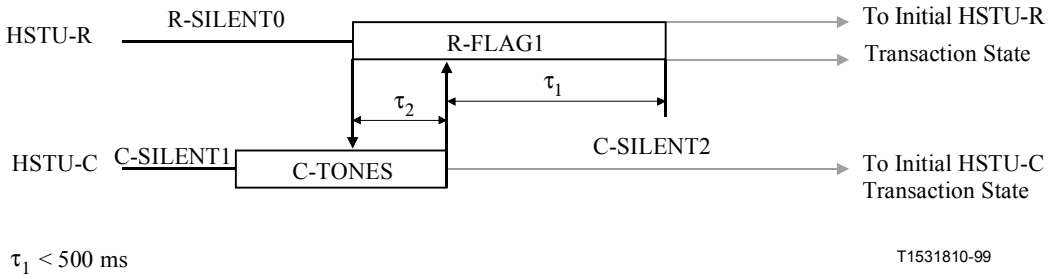



**Figure 17/G.994.1 – HSTU-C initiated half-duplex start-up procedure**

Figure 17 shows the timing requirements between events that shall be adhered to. $\tau_1$ is the time period from detection of a signal (e.g. R-TONE1) to the transmission of the next signal (e.g. C-GALF1).

## 11.3 Cleardown procedure

Figure 18 displays the timing for cleardown of a duplex G.994.1 session (by either the HSTU-R or the HSTU-C). When an HSTU-R (HSTU-C) receives an ACK(1) message in response to an MS message, or receives a NAK-CD message, it shall initiate the cleardown procedure. After receiving the ACK(1) or NAK-CD message, the HSTU-R (HSTU-C) shall continue to transmit Flags for a period not to exceed 0.5 s. It shall then transmit 4 octets of Galf (referred to as R-GALF2 for an HSTU-R, C-GALF2 for an HSTU-C), followed by silence which terminates the G.994.1 session. When the HSTU-C (HSTU-R) detects either Galfs or silence, it shall continue to transmit Flags (referred to as C-FLAG2 for an HSTU-C, R-FLAG2 for an HSTU-R) for a period not to exceed 0.5 s, followed by silence which terminates the G.994.1 session.

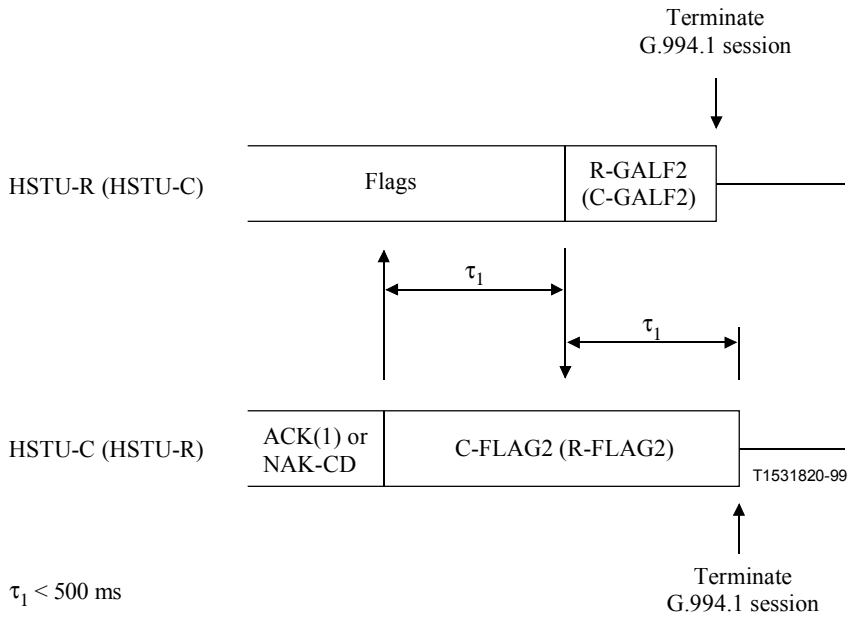



**Figure 18/G.994.1 – Duplex cleardown procedure**

If a received MS message indicates a common operating mode, both stations shall transition to the selected mode upon termination of the G.994.1 session. If a received MS message indicates that there is no common operating mode (see 10.1), or the cleardown was initiated by a NAK-CD, both stations shall return to the initial G.994.1 state (R-SILENT0 for an HSTU-R, C-SILENT1 for an HSTU-C).

Figure 19 displays the timing for cleardown of a half-duplex G.994.1 session (by either the HSTU-R or the HSTU-C). When an HSTU-R (HSTU-C) receives an ACK(1) message in response to an MS message or receives NAK-CD messages, it shall initiate the cleardown procedure.

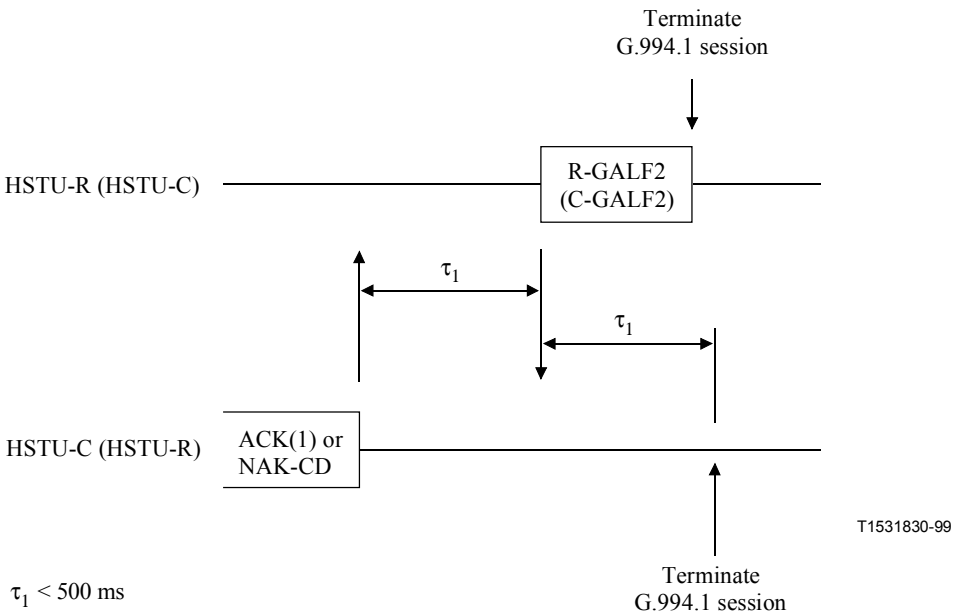



**Figure 19/G.994.1 – Half-duplex cleardown procedure**

After receiving the ACK(1) or NAK-CD message, the HSTU-R (HSTU-C) shall continue to transmit silence for a period not to exceed 0.5 s. It shall then transmit 4 octets of Galf (referred to as R-GALF2 for an HSTU-R, C-GALF2 for an HSTU-C), followed by silence which terminates the G.994.1 session.

When the HSTU-C (HSTU-R) detects either Galfs or continued silence after a time-out of 0.5 s, it shall continue to transmit silence for a period not to exceed 0.5 s and then terminate the G.994.1 session.

If a received MS message indicates a common operating mode, both stations shall transition to the selected mode upon termination of the G.994.1 session. If a received MS message indicates that there is no common operating mode (see 10.1) or cleardown was initiated by a NAK-CD, both stations shall return to the initial G.994.1 state (R-SILENT0 for an HSTU-R, C-SILENT1 for an HSTU-C).

## 12 Error recovery procedures

The timing requirements used for error recovery during the start-up procedure of a G.994.1 session are specified in Figures 14 through 17.

During a G.994.1 session, the maximum time between the reception of the end of any frame and the start of transmission of the next frame shall be 0.5 s.

During a G.994.1 session, for transactions where the HSTU-R transmits the final message, the maximum time between the end of transmission of the final frame of the transaction and the start of transmission of the first frame of the next transaction shall be 0.5 s.

If either station times out, it shall immediately return to the initial G.994.1 state (R-SILENT0 for an HSTU-R, C-SILENT1 for an HSTU-C) and remain silent for a minimum period of 0.5 s. It may then initiate another G.994.1 session.

If an errored frame is received in any state (including the Initial HSTU-x Transaction State), the receiving station shall abort the G.994.1 session by sending a NAK-EF message. It shall then return immediately to the initial G.994.1 state (R-SILENT0 for an HSTU-R, C-SILENT1 for an HSTU-C) and remain silent for a minimum period of 0.5 s. It may then initiate another G.994.1 session.

If a NAK-EF message is received in any state, the receiving station shall return immediately to the initial G.994.1 state (R-SILENT0 for an HSTU-R, C-SILENT1 for an HSTU-C) and remain silent for a minimum period of 0.5 s. It may then initiate another G.994.1 session.

If an invalid frame is received in any state, it shall be ignored.

# ANNEX A

## Support for Legacy non-G.994.1 devices

Systems that support interoperability with non-G.994.1-compliant devices shall perform the following procedure at initialization:

The HSTU-R shall alternately attempt G.994.1 and other non-G.994.1 initialization as follows:

– transmit R-TONES-REQ for 2 s;
– transmit silence for 100 ms;
– transmit other non-G.994.1 initiating signal for 2 s;
– transmit silence for 100 ms;
– repeat above (starting with R-TONES-REQ).

Manufacturers are encouraged to implement multimode systems to cover this interoperability issue.

NOTE – Future handshake protocols may modify the sequence described in this annex. Implementations are encouraged to tolerate such differences.

## ANNEX B

## Operation over multiple wire pairs

Some HSTU-x devices may support operation over multiple wire pairs as either a primary or secondary mode of operation. For these devices, the following additions shall be made to the start-up procedures shown in 11.1 and 11.2:

- R-Tones-Req (for HSTU-R initiated start-up) and C-Tones shall be transmitted simultaneously on all available wire pairs.
- The HSTU-R shall select an active wire pair from the set of pairs on which it receives C-Tones.

  NOTE – The criterion for active pair selection is implementation dependent; however, implementors are strongly encouraged to consider acceptable performance as a part of the selection process.
- R-Tone1, R-Flag1, and all succeeding signals transmitted by the HSTU-R shall only be transmitted on the selected active wire pair. Silence shall be sent on any other pairs.
- The HSTU-C shall designate the pair on which R-Tone1 and/or R-Flag1 is received as its active pair.
- All succeeding signals transmitted by the HSTU-C shall only be transmitted on the designated active wire pair. Silence shall be sent on any other pairs.

## APPENDIX I

## G.994.1 sample sessions

| Session | msg 1 | msg 2 | msg 3 | msg 4 | msg 5 | msg 6 | msg 7 | msg 8 |
|---|---|---|---|---|---|---|---|---|
| 1 | CLR | cl | ACK(1) | MS | ack(1) | | | |
| 2 | MS | ack(1) | | | | | | |
| 3 | MS | req-mr | MR | ms | ACK(1) | | | |
| 4 | MS | req-clr | CLR | cl | ACK(1) | MS | ack(1) | |
| 5 | CLR | cl | ACK(1) | MR | ms | ACK(1) | | |
| 6 | MR | ms | ACK(1) | | | | | |
| 7 | MR | req-ms | MS | ack(1) | | | | |
| 8 | MR | req-clr | CLR | cl | ACK(1) | MR | ms | ACK(1) |
| NOTE – HSTU-R transmitted messages are shown in uppercase, whilst HSTU-C transmitted messages are shown in lowercase. | | | | | | | | |

## APPENDIX II

### Provider code contact information

It is often difficult for implementers to find information about obtaining provider codes since they are regional and not specified in ITU-T T.35. This appendix contains information about obtaining provider codes.

| Country | Relevant document | Contact telephone | Contact information |
|---|---|---|---|
| USA | T1.220 | +1 732 699 5577 | Telcordia Language Standards Department<br>444 Hoes Lane, Piscataway NJ 08854 USA |
| Japan | – | +81 3 3432 1551 | TTC, 1-2-11, Hamamatsu-cho, Minato-ku,<br>Tokyo 105-0013, JAPAN |
| Belgium | – | Tel. +32 2 226 88 99<br>Fax. +32 2 223 11 28 | Belgian Institute of postal services and telecommunications<br>Avenue de l'Astronomie, 14 Boîte 21<br>1210 Brussels, BELGIUM |

## APPENDIX III

### Support for Legacy DMT-based devices

Systems that support interoperability with [1] (see Appendix VI – Bibliography) should perform the following functions at initialization:

– The HSTU-C should monitor for R-ACK-REQ (as defined in [1])

– The HSTU-R should monitor for C-ACT1, C-ACT2, C-ACT3, C-ACT4, and C-TONE (as defined in [1])

– The HSTU-R should alternately attempt initiating signals from this Recommendation and [1] as follows:

- transmit R-TONES-REQ for 2 s;
- transmit silence for 100 ms;
- transmit R-ACK-REQ for 2 s;
- transmit silence for 100 ms;
- repeat above (starting with R-TONES-REQ).

Upon detection of the above tones, the system that supports interoperability with [1] should follow the procedures and functions described therein.

## APPENDIX IV

### Procedure for the assignment of additional G.994.1 parameters

#### IV.1 Introduction

This appendix defines the procedure for requesting the assignment of G.994.1 parameters that are indicated as being "Reserved for allocation by the ITU-T." This procedure is intended to allow for the expedient assignment of such parameters.

This procedure does not cover changes to the overall structure of this Recommendation (which requires application of the ITU-T Resolution 1 procedures).

### IV.2 Procedure

An ITU-T Working Party or Study Group that identifies a need for the assignment of a G.994.1 parameter is required to make that request to the Chairman of the Study Group with responsibility for this Recommendation with copies of the request to the editor of this Recommendation and the TSB counsellor for the Study Group concerned. After consultation with the editor of this Recommendation, the Chairman will either approve the request or provide an alternative solution to the request (if a change is necessary to achieve compliance with this Recommendation). Periodically, these allocated parameters will be included in the G.994.1 Implementor's Guide, which will finally be merged into a subsequent version of this Recommendation.

It is expected that requests using this procedure will obtain a response within one month.

## APPENDIX V

## Rules for code point Table numbering

This appendix defines the rules that apply to the assignment of Table numbering in 9.3.4 (Parameter field), and in 9.4 (Standard information field).

| **Digit position** | **Used for** | | | | |
|---|---|---|---|---|---|
| **1**<br>examples →<br>rules → | **NPar(1)**<br>Table x<br>(x is even) | **SPar(1)**<br>Table x<br>(x is odd) | | | |
| **2**<br>examples →<br>rules → | **NPar(1) extensions**<br>Table x.1<br>(x is even) | | **NPar(2)**<br>Table x.y<br>(x is odd)<br>(y is odd) | **SPar(2)**<br>Table x.y<br>(x is odd)<br>(y is even) | |
| **3**<br>examples →<br>rules → | | **SPar(1) extensions**<br>Table x.y.1<br>(x is odd)<br>(y ≡ 0) | **NPar(2) extensions**<br>Table x.y.1<br>(x is odd)<br>(y is odd) | | **NPar(3)**<br>Table x.y.1<br>(x is odd)<br>(y is even) |
| **4**<br>examples →<br>rules → | | | | **SPar(2) extensions**<br>Table x.y.z.1<br>(x is odd)<br>(y is even)<br>(z ≡ 0) | **NPar(3) extensions**<br>Table x.y.1.1<br>(x is odd)<br>(y is even) |

## APPENDIX VI

## Bibliography

[1] ANSI T1.413-1998, *Network and Customer Installation Interfaces – Asymmetrical Digital Subscriber Line (ADSL) Metallic Interface*.

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