Changes to existing IEEE 802.3 Definitions (1.4, References and Clauses.)

40C.1— CHANGES TO CLAUSE 1

Editor's note: Changes are against the definitions shown in (in order of precedence) 802.3z, 802.3x&y, 802.3, except in those cases where the 802.3z text does not reflect changes made by 802.3x&y.

Change the following definitions in 1.4.

1.4.42 Category 5 balanced cabling: Balanced 100 ohm and 120 ohm UTP cables and associated connecting hardware whose transmission characteristics are specified up to 100 MHz (i.e., performance meets the requirements of a Class D link as per ISO/IEC 11801). In addition to the requirements outlined in ISO/IEC 11801, IEEE 802.3 clauses 14, 23, 25, ~~and~~ 32 and 40 specify additional requirements for this cabling when used with 10BASE-T and 100BASE-T.

1.4.76 End of Stream Delimiter (ESD): Within IEEE 802.3, the End of Stream Delimiter is a code-group pattern used to terminate a normal data transmission. For 100BASE-T4, the ESD is indicated by the transmission of five predefined ternary code-groups named eop1-5. For 100BASE-X, the ESD is indicated by the transmission of the code-group /T/R. For 100BASE-T2, the ESD is indicated by two consecutive pairs of predefined PAM5x5 symbols (see Table 32-15) which are generated using unique SSD/ESD coding rules. For 1000BASE-T, the ESD is indicated by two consecutive vectors of four quinary symbols which are generated using table 40-1.

1.4.148 Physical Coding Sublayer (PCS): Within IEEE 802.3, A sublayer used in 100BASE-T to couple the MII and the PMA. The Physical Coding Sublayer contains the functions to encode data bits into code-groups that can be transmitted over the physical medium. Three PCS structures are defined for 100BASE-T: one for 100BASE-T2, one for 100BASE-T4 and one for 100BASE-X. (See IEEE 802.3 clauses 23, 24, 32.) One PCS structure is defined for 1000BASE-X and one PCS structure is defined for 1000BASE-T (See clauses 36 and 40.)

1.4.149 Physical Layer entity (PHY): Within IEEE 802.3, the portion of the physical layer between the MDI and MII consisting of the PCS, PMA and, if present, PMD sublayers. The PHY contains the functions that transmit, receive, and manage the encoded signals that are impressed on and recovered from the physical medium. (See IEEE 802.3 clauses 23-26, 32, 36 and 40.)

1.4.150 Physical Medium Attachment (PMA) sublayer: Within IEEE 802.3, that portion of the physical layer that contains the functions for transmission, reception, and (depending on the PHY) collision detection, clock recovery and skew alignment. (See IEEE 802.3 clauses 7, 12, 14, 16, 17, 18, 23, 24, 32, ~~and~~ 36, and 40.)

1.4.180 Start-of-Stream Delimiter (SSD): Within IEEE 802.3 a pattern of defined code words used to delineate the boundary of a data transmission sequence on the physical layer stream. The SSD is unique in that it may be recognized independent of previously defined code-group boundaries and it defines subsequent code-group boundaries for the stream it delimits. For 100BASE-T4, SSD is a pattern of three predefined sosb code-groups (one per wire pair) indicating the positions of the first data code-group on each wire pair. For 100BASE-X, SSD consists of the code-group sequence /J/K/. For 100BASE-T2, the SSD is indicated by two consecutive pairs of predefined PAM5x5 symbols (+/-2, +/-2) (+/-2, 0) which are generated using unique SSD/ESD coding rules. For 1000BASE-T, the SSD is indicated by two consecutive vectors of four quinary symbols as specified in table 40-1.

1.4.182 symbol: Within IEEE 802.3, the smallest unit of data transmission on the medium. Symbols are unique to the coding system employed. 100BASE-T4 uses ternary symbols; 10BASE-T and 100BASE-X use binary symbols or code bits; 100BASE-T2 and 1000BASE-T use~~s~~ quinary symbols.

1.4.183 symbol rate (SR): Within IEEE 802.3 the total number of symbols per second transferred to or from the Media Dependent Interface (MDI) on a single wire pair. For 100BASE-T4, the symbol rate is 25 MBd; for 100BASE-X, the symbol rate is 125 MBd; for 100BASE-T2, the symbol rate is 25 MBd; for 1000BASE-T, the symbol rate is 125 MBd.

1.4.185 Technology Ability Field: Within 802.3 an eight-bit field in the Auto-Negotiation base page that is used to indicate the abilities of a local station, such as support for 10BASE-T, 100BASE-T2, 100 BASE-T4, ~~and~~100BASE-TX, and 1000BASE-T, as well as full-duplex.

1.4.xxx dual duplex: Within IEEE 802.3, a signaling system which supports simultaneous duplex communication over two cabling pairs.

1.4.xxx master PHY: Within IEEE 802.3 , in a 100BASE-T2 or 1000BASE-T link containing a pair of PHYs, the PHY which uses an external clock for generating its clock signals to determine the timing of transmitter and receiver operations. It also uses the master transmit scrambler generator polynomial for side-stream scrambling. Master and slave PHY status is determined during the Auto-Negotiation process which takes place prior to establishing the transmission link. (See also, slave PHY.)

1.4.xxx receiver training: Within IEEE 802.3 , a startup routine in 100BASE-T2 and 1000BASE-T used to acquire receiver parameters and synchronize the scramblers of two connected PHYs.

1.4.xxx retraining: Within IEEE 802.3 , the process of re-acquiring receiver parameters and synchronizing the scramblers of two connected 100BASE-T2 or 1000BASE-T PHYs. (See receiver training, blind mode.)

1.4.xxx side stream scrambling: A data scrambling technique, used by 100BASE-T2 and 1000BASE-T to randomize the sequence of transmitted symbols and avoid the presence of spectral lines in the signal spectrum. Synchronization of the scrambler and descrambler of connected PHYs is required prior to operation.

1.4.xxx slave PHY: Within IEEE 802.3 , in a 100BASE-T2 or 1000BASE-T link containing a pair of PHYs, the PHY which recovers its clock from the received signal and uses it to determine the timing of transmitter operations. It also uses the slave transmit scrambler generator polynomial for side-stream scrambling. Master and slave PHY status is determined during the Auto-Negotiation process which takes place prior to establishing the transmission link. (See also, master PHY.)

40C.2— CHANGES TO CLAUSE 30

In 30.1 (Overview), change paragraph 8 to read as follows.:

Implementation of part or all of 10 Mb/s, ~~and~~ 100 Mb/s, and 1000 Mb/s Management is not a requirement for conformance to clauses 4, 7, 9, 22, 23, 24, 25, 26, 27, 28, 31, ~~or~~ 32 or 40.

Change 30.2.2.2 (Functions to support management) to read as follows:

Functions are defined in clauses 5, 7, 22, 23, 24, 25, 26, 27, 28, 31, ~~and~~ 32 and 40 both to facilitate unmanaged operation and managed operation. The functions in these clauses which facilitate managed operation are referenced from the text of this management clause.

Change 30.3.2.1.2 aPhyType to read as follows:

ATTRIBUTE

APPROPRIATE SYNTAX:

An ENUMERATED VALUE that has one of the following entries:

other	Undefined
unknown	Initializing, true state or type not yet known
none	MII present and nothing connected
10 Mb/s	Clause 7 10 Mb/s Manchester
100BASE-T4	Clause 23 100 Mb/s 8B/6T
100BASE-X	Clause 24 100 Mb/s 4B/5B
100BASE-T2	Clause 32 100 Mb/s PAM5X5
1000BASE-T	Clause 40 1000 Mb/s 4D5LPAM

BEHAVIOUR DEFINED AS:

A read only value that identifies the PHY type. The enumeration of the type is such that the value matches the clause number of this International Standard that specifies the particular PHY. The value of this attribute maps to the value of aMAUType. The enumeration "none" can only occur in a standard implementation where an MII exists and there is nothing connected. However the attribute aMIIDetect should be used to determine whether an MII exists or not.;

Change 30.5.1.1.2 (aMauType) to read as follows:

ATTRIBUTE

APPROPRIATE SYNTAX:

A GET-SET ENUMERATION that meets the requirements of the description below:

global	undefined
other	Ref: 30.2.5
unknown	Initializing, true state or type not yet known
AUI	no internal MAU, view from AUI
10BASE5	Thick coax MAU as specified in clause 8
FOIRL	FOIRL MAU as specified in 9.9
10BASE2	Thin coax MAU as specified in clause 10
10BROAD36	Broadband DTE MAU as specified in clause 11
10BASE-T	UTP MAU as specified in clause 14, duplex mode unknown
10BASE-THD	UTP MAU as specified in clause 14, half-duplex mode
10BASE-TFD	UTP MAU as specified in clause 14, full-duplex mode
10BASE-FP	Passive fiber MAU, specified in clause 16
10BASE-FB	Synchronous fiber MAU, specified in clause 17
10BASE-FL	Asynchronous fiber MAU, specified in clause 18, duplex mode unknown
10BASE-FLHD	Asynchronous fiber MAU, specified in clause 18, half-duplex mode
10BASE-FLFD	Asynchronous fiber MAU, specified in clause 18, full-duplex mode
100BASE-T4	Four-pair Category 3 UTP as specified in clause 23
100BASE-TX	Two-pair Category 5 UTP as specified in clause 25, duplex mode unknown
100BASE-TXHD	Two-pair Category 5 UTP as specified in clause 25, half-duplex mode
100BASE-TXFD	Two-pair Category 5 UTP as specified in clause 25, full-duplex mode
100BASE-FX	X fiber over PMD as specified in clause 26, duplex mode unknown
100BASE-FXHD	X fiber over PMD as specified in clause 26, half-duplex mode
100BASE-FXFD	X fiber over PMD as specified in clause 26, full-duplex mode
100BASE-T2	Two-pair Category 3 UTP as specified in clause 32, duplex mode unknown
100BASE-T2HD	Two-pair Category 3 UTP as specified in clause 32, half-duplex mode
100BASE-T2FD	Two-pair Category 3 UTP as specified in clause 32, full-duplex mode
1000BASE-THD	Four-pair Category 5 UTP as specified in clause 40, half-duplex mode
1000BASE-TFD	Four-pair Category 5 UTP as specified in clause 40, full-duplex mode
802.9a	Integrated services MAU as specified in IEEE 802.9a

BEHAVIOUR DEFINED AS:

Returns a value that identifies the 10 Mb/s, ~~or~~ 100 Mb/s or 1000 Mb/s internal MAU type. The enumeration of the type is such that the value matches the clause number of this International Standard that specifies the particular MAU. If an AUI is to be identified to access an external MAU then type "AUI" is returned. A SET operation to one of the possible enumerations indicated by aMAU-TypeList will force the MAU into the new operating mode. If a clause 22 MII is present then this will map to the mode force bits specified in 22.2.4.1. If clause 28 Auto-Negotiation is operational then this will change the advertised ability to the single enumeration specified in the SET operation, and cause an immediate link re-negotiation. A change in MAU Type will also be reflected in oPHY-Type.;

Change the definition of aIdleErrorCount as follows:

0.5.1.1.11 aIdleErrorCount

ATTRIBUTE

APPROPRIATE SYNTAX:

INTEGER

BEHAVIOUR DEFINED AS:

This attribute takes the eight-bit value from the 100BASE-T2/1000BASE-T Status register (MII management register 10) bits 7:0 "Idle Error Count" described in ~~100BASE-T2,~~ 32.5.3.2.6. or 40.6.3.2.9;

Change 30.6.1.1.5 (aAutoNegLocalTechnologyAbility) to read as follows:

ATTRIBUTE

APPROPRIATE SYNTAX:

A SEQUENCE that meets the requirements of the description below:

global	Reserved for future use
other	See 30.2.5
unknown	Initializing, true ability not yet known
10BASE-T	10BASE-T half-duplex as defined in clause 14
10BASE-TFD	full-duplex 10BASE-T
100BASE-T4	100BASE-T4 as defined in clause 23
100BASE-TX	100BASE-TX half-duplex as defined in clause 25
100BASE-TXFD	full-duplex 100BASE-TX as defined in clauses 25 and31
FDX PAUSE	PAUSE operation for full-duplex links as defined in Annex 31B
100BASE-T2	100BASE-T2 half-duplex as defined in clause 32
100BASE-T2FD	full-duplex 100BASE-T2 as defined in clauses 31 and 32
1000BASE-T	1000BASE-T half-duplex as defined in clause 40
1000BASE-TFD	full-duplex 1000BASE-T as defined in clauses 31 and 40
isoethernet	IEEE Std. 802.9 IS:AM-16T.

BEHAVIOUR DEFINED AS:

This indicates the technology ability of the local hardware, as defined in clause 28.;

40C.3— CHANGES TO ANNEX 1A

Add the following references to Annex 1A:

40C.4— CHANGES TO ANNEX 28B

Change 28B.3 to read as follows:

Since two devices may have multiple abilities in common a prioritization scheme exists to ensure that the highest common denominator ability is chosen. The following list shall represent the relative priorities of the technologies supported by the IEEE 802.3 Selector Field value, where priorities are listed from highest to lowest.

a) 1000BASE-T full-duplex
b) 1000BASE-T
c) 100BASE-T2 full-duplex
d) 100BASE-TX full-duplex
e) 100BASE-T2
f) 100BASE-T4
g) 100BASE-TX
h) 10BASE-T full-duplex
i) 10BASE-T

The rationale for this hierarchy is straightforward. 10BASE-T is the lowest common denominator and therefore has the lowest priority. full-duplex solutions are always higher in priority than their half-duplex counterparts. 1000BASE-T has a higher priority than 100 Mb/s technologies. 100BASE-T2 is ahead of 100BASE-TX and 100BASE-T4 because 100BASE-T2 runs across a broader spectrum of copper cabling and can support a wider base of configurations. 100BASE-T4 is ahead of 100BASE-TX because 100BASE-T4 runs across a broader spectrum of copper cabling. The relative order of the technologies specified herein shall not be changed. As each new technology is added, it shall be inserted into its appropriate place in the list, shifting technologies of lesser priority lower in priority. If a vendor specific technology is implemented, the priority of all IEEE 802.3 International Standard technologies shall be maintained, with the vendor specific technology inserted at any appropriate priority location.

40C.5— CHANGES TO ANNEX 28C

Replace Table 28C-1 with the following:.

Table 28C-1—Message code field values

Message Code #	M 10	M 9	M 8	M 7	M 6	M 5	M 4	M 3	M 2	M 1	M 0	Message Code Description
0	0	0	0	0	0	0	0	0	0	0	0	Reserved for future Auto-Negotiation use
1	0	0	0	0	0	0	0	0	0	0	1	Null Message
2	0	0	0	0	0	0	0	0	0	1	0	One UP with Technology Ability Field follows
3	0	0	0	0	0	0	0	0	0	1	1	Two UPs with Technology Ability Field follow
4	0	0	0	0	0	0	0	0	1	0	0	One UP with Binary coded Remote fault follows

Table 28C-1—Message code field values

5	0	0	0	0	0	0	0	0	1	0	1	Organizationally Unique Identifier Tagged Message
6	0	0	0	0	0	0	0	0	1	1	0	PHY Identifier Tag Code
7	0	0	0	0	0	0	0	0	1	1	1	100BASE-T2 Technology Message Code. 100BASE-T2 Ability Page to follow using Unformatted Next Page
8								1	0	0	0	1000BASE-T Technology message Code. Two 1000BASE-T Ability Pages to dollow using Unformatted Next Page.
2047	1	1	1	1	1	1	1	1	1	1	1	Reserved for future Auto-Negotiation use

Insert 28C.10:

Clause 40 (1000BASE-T) uses Next Page Message Code 8 to indicate that 1000BASE-T implementations will follow the transmission of this page (the initial, Message (formatted) Next Page) with two unformatted Next Pages which contain information defined in 40.6.3.4.

40C.6— Changes to Annex 28D

Add 28D.4 to the end of Annex 28D:

28D.4—Extensions required for Clause 40 (1000BASE-T)

Clause 40 (1000BASE-T) makes special use of Auto-Negotiation and requires additional MII registers. This use is summarized below. Details are provided in 40.6.

Auto-Negotiation is mandatory for 1000BASE-T. (40.1.3.4)

1000BASE-T uses MASTER and SLAVE to define DTEs and to facilitate the timing of transmit and receive operations. Auto-Negotiation is used to provide information used to configure MASTER/SLAVE status.(40.6.1.1)

1000BASE-T uses unique next page transmit and receive registers (MII registers 9 and 10) in conjunction with Auto-Negotiation. These registers are in addition to registers 0-87 as defined in 28.2.4 and 32.5.2. (40.6)

1000BASE-T use of Auto-Negotiation generates information which is stored in configuration and status bits defined for the 1000BASE-T Control register (MII register 9) and the 1000BASE-T Status register (MII register 10.)

1000BASE-T requires an ordered exchange of next page messages. (40.6.1.1, 40.6.3.2.1)

1000BASE-T parameters are configured based on information provided by the ordered exchange of next page messages.

1000BASE-T adds new message codes to be transmitted during Auto-Negotiation. (40.6.3)

1000BASE-T adds 1000BASE-T full-duplex and half-duplex capabilities to the priority resolution table. (28B.3) and MII Status Register (22.2.4.2)

1000BT is defined as a valid value for "x" in 28.3.1 (e.g., link_status_1000BT.) 1000BT represents that the 1000BASE-T PMA is the signal source.

40C.7— CHANGES TO ANNEX 30B

In Clause 30B.2, replace PhyTypeValue (page 392 of IEEE 802.3u) as follows:

```
PhyTypeValue::=ENUMERATED {
other                   (1),        --undefined
unknown                 (2),        --initializing, true state or type not yet known
none                    (3),        --MII present and nothing connected
10 Mb/s                 (7),        --clause 7 10 Mb/s Manchester
100BASE-T4              (23),       --clause 23 100 Mb/s 8B/6T
100BASE-X               (24),       --clause 24 100 Mb/s 4B/5B
100BASE-T2              (32)        --clause 32 100 Mb/s PAM5x5
1000BASE-T              (40)        --clause 40 1000 Mb/s 4D5LPAM
}
```

Clause 30B.2, replace AutoNegTechnology as follows:

```
AutoNegTechnology::=ENUMERATED {
global                  (0),        --reserved for future use
other                   (1),        --undefined
unknown                 (2),        --initializing, true ability not yet known
10BASE-T                (14),       --10BASE-T as defined in clause 14
10BASE-TFD              (142),      --full-duplex 10BASE-T
100BASE-T4              (23),       --100BASE-T4 as defined in clause 23
100BASE-TX              (25),       --100BASE-TX as defined in clause 25
100BASE-TXFD            (252),      --full-duplex 100BASE-TX
FDX PAUSE               (312)       --PAUSE operation for full-duplex links as defined in
                                      Annex 31B
100BASE-T2              (32),       --100BASE-T2 as defined in clause 32
100BASE-T2FD            (322),      --full-duplex 100BASE-T2
1000BASE-T              (**),       --1000BASE-T as defined in clause 40
1000BASE-TFD            (***),      --full-duplex 1000BASE-T
isoethernet             (8029)      --IEEE Std 802.9 ISLAN-16T
}
```

Clause 30B.2, replace TypeValue as follows:

```
TypeValue::= ENUMERATED {
global                  (0),        --undefined
other                   (1),        --undefined
unknown                 (2),        --initializing, true state not yet known
AUI                     (7),        --no internal MAU, view from AUI
10BASE5                 (8),        --Thick coax MAU as specified in clause 8
FOIRL                   (9),        --FOIRL MAU as specified in 9.9
```

```
        10BASE2         (10),   --Thin coax MAU as specified in clause 10
        10BROAD36       (11),   --Broadband DTE MAU as specified in clause 11
        10BASE-T        (14),   --UTP MAU as specified in clause 14, duplex mode
                                  unknown
        10BASE-THD      (141),  --UTP MAU as specified in clause 14, half-duplex
                                  mode
        10BASE-TFD      (142),  --UTP MAU as specified in clause 14, full-duplex
                                  mode
        10BASE-FP       (16),   --Passive fiber MAU as specified in clause 16
        10BASE-FB       (17),   --Synchronous fiber MAU as specified in clause 17
        10BASE-FL       (18),   --Asynchronous fiber MAU as specified in clause 18,
                                  duplex mode unknown
        10BASE-FLHD     (181),  --Asynchronous fiber MAU as specified in clause 18,
                                  half-duplex mode
        10BASE-FLFD     (182),  --Asynchronous fiber MAU as specified in clause 18,
                                  full-duplex mode
        100BASE-T4      (23),   --Four-pair Category 3 UTP as specified in clause 23
        100BASE-TX      (25),   --Two-pair Category 5 UTP as specified in clause 25,
                                  duplex mode unknown
        100BASE-TXHD    (251),  --Two-pair Category 5 UTP as specified in clause 25,
                                  half-duplex mode
        100BASE-TXFD    (252),  --Two-pair Category 5 UTP as specified in clause 25,
                                  full-duplex mode
        100BASE-FX      (26),   --X fiber over PMD as specified in clause 26, duplex
                                  mode unknown
        100BASE-FXHD    (261),  --X fiber over PMD as specified in clause 26, half-du-
                                  plex mode
        100BASE-FXFD    (262),  --X fiber over PMD as specified in clause 26, full-du-
                                  plex mode
        100BASE-T2      (32),   --Two-pair category 3 UTP as specified in clause 32,
                                  duplex mode unknown
        100BASE-T2HD    (321),  --Two-pair category 3 UTP as specified in clause 32,
                                  half-duplex mode
        100BASE-T2FD    (322),  --Two-pair category 3 UTP as specified in clause 32,
                                  full-duplex mode
        1000BASE-T      (**),   --Four-pair category 5 UTP as specified in clause 40,
                                  duplex mode unknown
        1000BASE-THD    (***),  --Four-pair category 5 UTP as specified in clause 40,
                                  half-duplex mode
        1000BASE-TFD    (***),  --Four-pair category 5 UTP as specified in clause 40,
                                  full-duplex mode
        802.9a          (99)    --Integrated services MAU as specified in IEEE Std
                                  802.9 ISLAN-16T

        }
```