1.4.38 bundle: A group of signals that have a common set of characteristics and differ only in their information content.

1.4.39 carrier sense: In a local area network, an ongoing activity of a data station to detect whether another station is transmitting. *Note*—The carrier sense signal indicates that one or more DTEs are currently transmitting.

1.4.40 Category 3 balanced cabling: Balanced 100 Ω and 120 Ω cabling (cable and associated connecting hardware) whose transmission characteristics are specified up to 16 MHz (i.e., performance meets the requirements of a Class C link in accordance with ISO/IEC 11801: 1995). Commonly used by IEEE 802.3 10BASE-T installations. In addition to the requirements outlined in ISO/IEC 11801: 1995, IEEE 802.3 clause 23 specifies additional requirements for these cables when used with 100BASE-T4.

1.4.41 Category 4 balanced cabling: Balanced 100 Ω and 120 Ω cabling (cable and associated connecting hardware) whose transmission characteristics are specified up to 20 MHz in accordance with ISO/IEC 11801: 1995. In addition to the requirements outlined in ISO/IEC 11801: 1995, IEEE 802.3 clause 23 specifies additional requirements for these cables when used with 100BASE-T4.

1.4.42 Category 5 balanced cabling: Balanced 100 Ω and 120 Ω cabling (cable 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: 1995). In addition to the requirements outlined in ISO/IEC 11801: 1995, IEEE 802.3 clauses 23 and 25 specify additional requirements for these cables when used with 100BASE-T.

1.4.43 CATV-Type broadband medium: A broadband system comprising coaxial cables, taps, splitters, amplifiers, and connectors the same as those used in Community Antenna Television (CATV) or cable television installations. (See IEEE 802.3 clause 11.)

1.4.44 center wavelength: The average of two optical wavelengths at which the spectral radiant intensity is 50% of the maximum value. (See IEEE 802.3 clause 11.)

1.4.45 channel: A band of frequencies dedicated to a certain service transmitted on the broadband medium. (See IEEE 802.3 clause 11.)

1.4.46 circuit: The physical medium on which signals are carried across the AUI for 10BASE-T or MII (for 100BASE-T). For 10BASE-T, the data and control circuits consist of an A circuit and a B circuit forming a balanced transmission system so that the signal carrier on the B circuit is the inverse of the signal carried on the A circuit.

1.4.47 Class I repeater: A type of 100BASE-T repeater set with internal delay such that only one repeater set may exist between any two DTEs within a single collision domain when two maximum length copper cable segments are used. (See IEEE 802.3 clause 27.)

1.4.48 Class II repeater: A type of IEEE 802.3 100BASE-T repeater set with internal delay such that only two or fewer such repeater sets may exist between any two DTEs within a single collision domain when two maximum length copper cable segments are used. (See IEEE 802.3 clause 27.)

1.4.49 Clocked Data One (CD1): A Manchester-encoded data 1. A CD1 is encoded as a LO for the first half of the bit-cell and a HI for the second half of the bit-cell. (See IEEE 802.3 clause 12.)

1.4.50 Clocked Data Zero (CD0): A Manchester-encoded data 0. A CDO is encoded as a HI for the first half of the bit-cell and a LO for the second half of the bit-cell. (See IEEE 802.3 clause 12.)

1.4.51 Clocked Violation HI (CVH): A symbol that deliberately violates Manchester-encoding rules, used as a part of the Collision Presence signal. A CVH is encoded as a transition from LO to HI at the beginning of the bit cell, HI for the entire bit cell, and a transition from HI to LO at the end of the bit cell. (See IEEE 802.3 clause 12.)

1.4.52 Clocked Violation LO (CVL): A symbol that deliberately violates Manchester-encoding rules, used as a part of the Collision Presence signal. A CVL is encoded as a transition from HI to LO at the beginning of the bit cell, LO for the entire bit cell, and a transition from LO to HI at the end of the bit cell. (See IEEE 802.3 clause 12.)

1.4.53 coaxial cable interface: The electrical and mechanical interface to the shared coaxial cable medium either contained within or connected to the MAU. Also known as the Medium Dependent Interface (MDI).

1.4.54 coaxial cable section: A single length of coaxial cable, terminated at each end with a male BNC connector. Cable sections are joined to other cable sections via BNC plug/receptacle barrel or Type T adapters.

1.4.55 coaxial cable segment: A length of coaxial cable made up from one or more coaxial cable sections and coaxial connectors, and terminated at each end in its characteristic impedance.

1.4.56 coaxial cable: A two-conductor (center conductor, shield system), concentric, constant impedance transmission line used as the trunk medium in the baseband system.

1.4.57 Code Rule Violation (CRV): An analog waveform that is not the result of the valid Manchester-encoded output of a single optical transmitter. The collision of two or more 10BASE-FB optical transmissions will cause multiple CRVs. The preamble encoding of a single 10BASE-FP optical transmission contains a single CRV. (See IEEE 802.3, 16.3.1.1.)

1.4.58 code-bit: In 100BASE-X, the unit of data passed across the PMA service interface, and the smallest signaling element used for transmission on the medium. A group of five code-bits constitutes a code-group in the 100BASE-X PCS. (See IEEE 802.3 clause 24.)

1.4.59 code-group: For IEEE 802.3, a set of encoded symbols representing encoded data or control information. For 100BASE-T4, a set of six ternary symbols that, when representing data, conveys an octet. (See IEEE 802.3 clause 23.) For 100BASE-TX and 100BASE-FX, a set of five code-bits that, when representing data, conveys a nibble. (See IEEE 802.3 clause 24.)

1.4.60 collision domain: A single CSMA/CD network. If two or more MAC sublayers are within the same collision domain and both transmit at the same time, a collision will occur. MAC sublayers separated by a repeater are in the same collision domain. MAC sublayers separated by a bridge are within different collision domains.

1.4.61 collision presence: A signal generated within the Physical Layer by an end station or hub to indicate that multiple stations are contending for access to the transmission medium. (See IEEE 802.3 clauses 8 and 12.)

1.4.62 collision: A condition that results from concurrent transmissions from multiple DTE sources within a single collision domain.

1.4.63 common-mode voltage: The instantaneous algebraic average of two signals applied to a balanced circuit, with both signals referenced to a common reference. Also called *longitudinal voltage* in the telephone industry.

1.4.64 compatibility interfaces: The MDI cable, the AUI branch cable, and the MII; the three points at which hardware compatibility is defined to allow connection of independently designed and manufactured components to a baseband transmission medium. (See IEEE 802.3 clause 8.)

1.4.65 continuous wave (CW): A carrier that is not modulated or switched.

1.4.66 Control Signal One (CS1): An encoded control signal used on the Control In and Control Out circuits. A CS1 is encoded as a signal at half the bit rate (BR/2). (See IEEE 802.3 clause 12.)

1.4.67 Control Signal Zero (CS0): An encoded control signal used on the Control In and Control Out circuits. A CS0 is encoded as a signal at the bit rate (BR). (See IEEE 802.3 clause 12.)

1.4.68 cross connect: A group of connection points, often wall- or rack-mounted in a wiring closet, used to mechanically terminate and interconnect twisted-pair building wiring.

1.4.69 data frame: Consists of the Destination Address, Source Address, Length Field, logical link control (LLC) Data, PAD, and Frame Check Sequence.

1.4.70 Data Terminal Equipment (DTE): Any source or destination of data connected to the LAN.

1.4.71 dBmV: Decibels referenced to 1.0 mV measured at the same impedence. Used to define signal levels in CATV-type broadband systems. (See IEEE 802.3 clause 11.)

1.4.72 dedicated service: A CSMA/CD network in which the collision domain consists of two and only two DTEs so that the total network bandwidth is dedicated to supporting the flow of information between them.

1.4.73 differential-mode voltage: The instantaneous algebraic difference between the potential of two signals applied to the two sides of a balanced circuit. Also called *metallic voltage* in the telephone industry.

1.4.74 drop cable: In 10BROAD36, the small diameter flexible coaxial cable of the broadband medium that connects to a MAU. (*See:* **trunk cable**.)

1.4.75 eight-pin modular: An eight-wire connector. (From ISO/IEC 8877: 1992.)

1.4.76 End-of-Stream Delimiter (ESD): 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. (See IEEE 802.3 clause 23.) For 100BASE-X, the ESD is indicated by the transmission of the code-group /T/R. (See IEEE 802.3 clause 24.)

1.4.77 Extinction Ratio: The ratio of the low optical power level to the high optical power level on an optical segment. (See IEEE 802.3 clause 15.)

1.4.78 Fast Link Pulse (FLP) Burst: A group of no more than 33 and not less than 17 10BASE-T compatible link integrity test pulses. Each FLP Burst encodes 16 bits of data using an alternating clock and data pulse sequence. (See figure 14-12, IEEE 802.3 clause 14 and figure 28-4, IEEE 802.3 clause 28.)

1.4.79 Fibre Distributed Data Interface (FDDI): A 100 Mb/s, fiber optic-based, token-ring LAN standard (ANSI X3T12, formerly X3.237-199X.

1.4.80 fiber optic cable: A cable containing one or more optical fibers as specified in IEEE 802.3, 15.3.1.

1.4.81 Fiber Optic Inter-Repeater Link (FOIRL): A Fiber Optic Inter-Repeater Link segment and its two attached MAUs. (See IEEE 802.3 clause 15.)

1.4.82 Fiber Optic Inter-Repeater Link Segment (FOIRL Segment): A fiber optic link segment providing a point-to-point connection between two FOIRL MAUs or between one FOIRL MAU and one 10BASE-FL MAU. *See:* **link segment**.

1.4.83 Fiber Optic Medium Attachment Unit (FOMAU): A MAU for fiber applications. (See IEEE 802.3 clause 9.)

1.4.84 Fiber Optic Medium-Dependent Interface (FOMDI): For 10BASE-F, the mechanical and optical interface between the optical fiber cable link segment and the FOMAU. (See IEEE 802.3 clause 9.)

1.4.85 Fiber Optic Physical Medium Attachment (FOPMA): For 10BASE-F, the portion of the FOMAU that contains the functional circuitry. (See IEEE 802.3 clause 9.)

1.4.86 fiber pair: Optical fibers interconnected to provide two continuous light paths terminated at each end in an optical connector. Any intermediate optical connections must have insertion and return loss characteristics that meet or exceed IEEE 802.3, 15.3.2.1 and 15.3.2.2, respectively. (See IEEE 802.3, 15.3.1.)

1.4.87 FOIRL BER: For 10BASE-F, the mean bit error rate of the FOIRL. (See IEEE 802.3 clause 9.)

1.4.88 FLP Burst Sequence: The sequence of FLP Bursts transmitted by the Local Station. This term is intended to differentiate the spacing between FLP Bursts from the individual pulse spacings within an FLP Burst. (See IEEE 802.3 clause 28.)

1.4.89 FOIRL collision: For 10BASE-F, the simultaneous transmission and reception of data in a FOMAU. (See IEEE 802.3 clause 9.)

1.4.90 FOIRL Compatibility Interface: For 10BASE-F, the FOMDI and AUI (optional); the two points at which hardware compatibility is defined to allow connection of independently designed and manufactured components to the baseband optical fiber cable link segment. (See IEEE 802.3 clause 9.)

1.4.91 FOMAU's Receive Optical Fiber: For 10BASE-F, the optical fiber from which the local FOMAU receives signals. (See IEEE 802.3 clause 9.)

1.4.92 FOMAU's Transmit Optical Fiber: For 10BASE-F, the optical fiber into which the local FOMAU transmits signals. (See IEEE 802.3 clause 9.)

1.4.93 full duplex: A type of networking that supports duplex transmission as defined in IEEE Std 610.7-1995 [A16]. Although some types of full-duplex networking are popularly referred to as Ethernet because they use the IEEE 802.3 defined frame, full duplex does not employ CSMA/CD and is not covered by this standard.

1.4.94 group: A repeater port or a collection of repeater ports that can be related to the logical arrangement of ports within a repeater.

1.4.95 group delay: In 10BROAD36, the rate of change of total phase shift, with respect to frequency, through a component or system. Group delay variation is the maximum difference in delay as a function of frequency over a band of frequencies. (See IEEE 802.3 clause 11.)

1.4.96 headend: In 10BROAD36, the location in a broadband system that serves as the root for the branching tree comprising the physical medium; the point to which all inbound signals converge and the point from which all outbound signals emanate. (See IEEE 802.3 clause 11.)

1.4.97 header hub (HH): The highest-level hub in a hierarchy of hubs. The HH broadcasts signals transmitted to it by lower level hubs or DTEs such that they can be received by all DTEs that may be connected to it either directly or through intermediate hubs. (See IEEE 802.3, 12.2.1 for details.)

1.4.98 hub: A device used to provide connectivity between DTEs. Hubs perform the basic functions of restoring signal amplitude and timing, collision detection, and notification and signal broadcast to lower level hubs and DTEs. (See IEEE 802.3 clause 12.)

1.4.99 idle (IDL): A signal condition where no transition occurs on the transmission line, that is used to define the end of a frame and ceases to exist after the next LO or HI transition on the AUI or MII circuits. An IDL always begins with a HI signal level. A driver is required to send the IDL signal for at least 2 bit times and a receiver is required to detect IDL within 1.6 bit times. (See IEEE 802.3, 7.3 and 12.3.2.4.4 for additional details.)

1.4.100 in-band signaling: The transmission of a signal using a frequency that is within the bandwidth of the information channel. *Contrast with:* **out-of-band signaling**. *Syn:* **in-channel signaling**. (From IEEE Std 610.7-1995 [A16].)

1.4.101 Inter-Repeater Link (IRL): A mechanism for connecting two and only two repeater sets.

1.4.102 Inter-Packet Gap (IPG): A delay or time gap between CSMA/CD packets intended to provide interframe recovery time for other CSMA/CD sublayers and for the Physical Medium. (See IEEE 802.3, 4.2.3.2.1 and 4.2.3.2.2.) For example, for 10BASE-T, the IPG is 9.6 μs (96 bit times); for 100BASE-T, the IPG is 0.96 μs (96 bit times.)

1.4.103 intermediate hub (IH): A hub that occupies any level below the header hub in a hierarchy of hubs. (See IEEE 802.3, 12.2.1 for details.)

1.4.104 Jabber function: A mechanism for controlling abnormally long transmissions (i.e., jabber.)

1.4.105 jabber: A condition wherein a station transmits for a period of time longer than the maximum permissible packet length, usually due to a fault condition.

1.4.106 link: The transmission path between any two interfaces of generic cabling. (From ISO/IEC 11801: 1995.)

1.4.107 Link Code Word: The 16 bits of data encoded into a Fast Link Pulse Burst. (See IEEE 802.3 clause 28.)

1.4.108 link partner: The device at the opposite end of a link segment from the local station. The link partner device may be either a DTE or a repeater. (See IEEE 802.3 clause 28.)

1.4.109 link pulse: Communication mechanism used in 10BASE-T and 100BASE-T networks to indicate link status and (in Auto-Negotiation-equipped devices) to communicate information about abilities and negotiate communication methods. 10BASE-T uses Normal Link Pulses (NLPs), which indicate link status only. 10BASE-T and 100BASE-T nodes equipped with Auto-Negotiation exchange information using a Fast Link Pulse (FLP) mechanism that is compatible with NLP. (See IEEE 802.3 clauses 14 and 28.)

1.4.110 link segment: The point-to-point full-duplex medium connection between two and only two MDIs.

1.4.111 Link Segment Delay Value (LSDV): A number associated with a given segment that represents the delay on that segment used to assess path delays for 100 Mb/s CSMA/CD networks. LSDV is similar to SDV; however, LSDV values do not include the delays associated with attached end stations and/or repeaters. (See IEEE 802.3, 29.3.)

1.4.112 local ability: *See:* **ability**.

1.4.113 local device: The local device that may attempt to Auto-Negotiate with a link partner. The local device may be either a DTE or repeater. (See IEEE 802.3 clause 28.)

1.4.114 Media Access Control (MAC): The data link sublayer that is responsible for transferring data to and from the Physical Layer.

1.4.115 Media Independent Interface (MII): A transparent signal interface at the bottom of the Reconciliation sublayer. (See IEEE 802.3 clause 22.)

1.4.116 Medium Attachment Unit (MAU): A device containing an AUI, PMA, and MDI that is used to connect a repeater or DTE to a transmission medium.

1.4.117 Medium Dependent Interface (MDI): The mechanical and electrical interface between the transmission medium and the MAU (10BASE-T) or PHY (100BASE-T).

1.4.118 Message Code (MC): The predefined 12-bit code contained in an Auto-Negotiation Message Page. (See IEEE 802.3 clause 28.)

1.4.119 Message Page (MP): An Auto-Negotiation Next Page encoding that contains a predefined 12-bit message code. (See IEEE 802.3 clause 28.)

1.4.120 Management Information Base (MIB): A repository of information to describe the operation of a specific network device.

1.4.121 mixing segment: A medium that may be connected to more than two MDIs.

1.4.122 network control host: A network management central control center that is used to configure agents, communicate with agents, and display information collected from agents.

1.4.123 Next Page Algorithm (NPA): The algorithm that governs Next Page communication. (See IEEE 802.3 clause 28.)

1.4.124 Next Page Bit: A bit in the Auto-Negotiation base Link Code Word or Next Page encoding(s) that indicates that further Link Code Word transfer is required. (See IEEE 802.3 clause 28.)

1.4.125 Next Page: General class of pages optionally transmitted by Auto-Negotiation-able devices following the base Link Code Word negotiation. (See IEEE 802.3 clause 28.)

1.4.126 nibble: A group of four data bits. The unit of data exchange on the MII. (See IEEE 802.3 clause 22.)

1.4.127 NLP Receive Link Integrity Test Function: Auto-Negotiation's Link Integrity Test function that allows backward compatibility with the 10BASE-T Link Integrity Test function of IEEE 802.3 figure 14-6. (See IEEE 802.3 clause 28.)

1.4.128 NLP sequence: A Normal Link Pulse sequence, defined in IEEE 802.3, 14.2.1.1 as TP_IDL.

1.4.129 Normal Link Pulse (NLP): An out-of-band communications mechanism used in 10BASE-T to indicate link status. (See IEEE 802.3 figure 14-12.)

1.4.130 NRZI-bit: A code-bit transferred in NRZI format. The unit of data passed across the PMD service interface in 100BASE-X.

1.4.131 NRZI: Non-Return-to-Zero, Invert on Ones. An encoding technique used in FDDI (ISO 9314-1: 1989, ISO 9314-2: 1989, ISO 9314-3: 1989) where a polarity transition represents a logical ONE. The absence of a polarity transition denotes a logical ZERO.

1.4.132 octet: A byte composed of eight bits. (From IEEE Std 610.7-1995 [A16].)

1.4.133 Optical Fiber Cable Interface: *See:* **FOMDI**.

1.4.134 Optical Fiber Cable Link Segment: A length of optical fiber cable that contains two optical fibers and is comprised of one or more optical fiber cable sections and their means of interconnection, with each optical fiber terminated at each end in the optical connector plug. (See IEEE 802.3, 9.9.5.1 and 9.9.5.2.)

1.4.135 optical fiber: A filament-shaped optical waveguide made of dielectric materials.

1.4.136 Optical Idle Signal: The signal transmitted by the FOMAU into its transmit optical fiber during the idle state of the DO circuit. (See IEEE 802.3 clause 9.)

1.4.137 Optical Interface: The optical input and output connection interface to a 10BASE-FP Star. (See IEEE 802.3 clause 15.)

1.4.138 out-of-band signaling: The transmission of a signal using a frequency that is within the pass band of the transmission facility but outside a frequency range normally used for data transmission. *Contrast with:* **in-band signaling**. (From IEEE Std. 610.7-1995 [A16].)

1.4.139 packet: Consists of a data frame as defined previously, preceded by the Preamble and the Start Frame Delimiter, encoded, as appropriate, for the PHY type.

1.4.140 page: In Auto-Negotiation, the encoding for a Link Code Word. Auto-Negotiation can support an arbitrary number of Link Code Word encodings. The base page has a constant encoding as defined in 28.2.1.2. Additional pages may have a predefined encoding *(see:* **Message Page**) or may be custom encoded *(see:* **Unformatted Page**).

1.4.141 parallel detection: In Auto-Negotiation, the ability to detect 100BASE-TX and 100BASE-T4 technology specific link signaling while also detecting the NLP sequence or FLP Burst sequence. (See IEEE 802.3 clause 28.)

1.4.142 Passive-Star Coupler: A component of a 10BASE-FP fiber optic mixing segment that divides optical power received at any of N input ports among all N output ports. The division of optical power is approximately uniform. (See IEEE 802.3 clause 15.)

1.4.143 patch cord: Flexible cable unit or element with connectors(s) used to establish connections on a patch panel. (From ISO/IEC 11801: 1995.)

1.4.144 patch panel: A cross-connect designed to accommodate the use of patch cords. It facilitates administration for moves and changes. (From ISO/IEC 11801: 1995.)

1.4.145 Path Delay Value (PDV): The sum of all Segment Delay Values for all segments along a given path. (See IEEE 802.3 clauses 13 and 29.)

1.4.146 Path Variability Value (PVV): The sum of all Segment Variability Values for all the segments along a given path. (See IEEE 802.3 clause 13.)

1.4.147 path: The sequence of segments and repeaters providing the connectivity between two DTEs in a single collision domain. In CSMA/CD networks there is one and only one path between any two DTEs.

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

1.4.149 Physical Layer entity (PHY): 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.)

1.4.150 Physical Medium Attachment (PMA) sublayer: That portion of the Physical Layer that contains the functions for transmission, collision detection, reception, and (in the case of 100BASE-T4) clock recovery and skew alignment. (See IEEE 802.3 clauses 23 and 24.)

1.4.151 Physical Medium Dependent (PMD) sublayer: In 100BASE-X, that portion of the Physical Layer responsible for interfacing to the transmission medium. The PMD is located just above the MDI. (See IEEE 802.3 clause 24.)

1.4.152 Physical Signaling Sublayer (PLS): In 10BASE-T, that portion of the Physical Layer contained within the DTE that provides the logical and functional coupling between the MAU and the Data Link Layer.

1.4.153 port: A segment or IRL interface of a repeater unit.

1.4.154 postamble: In 10BROAD36, the bit pattern appended after the last bit of the Frame Check Sequence by the MAU. The Broadband End-of-Frame Delimiter (BEOFD). (See IEEE 802.3 clause 11.)

1.4.155 Priority Resolution Table: The look-up table used by Auto-Negotiation to select the network connection type where more than one common network ability exists (100BASE-TX, 100BASE-T4, 10BASE-T, etc.) The priority resolution table defines the relative hierarchy of connection types from the highest common denominator to the lowest common denominator. (See IEEE 802.3 clause 28.)

1.4.156 quad: *See:* **star quad**.

1.4.157 Reconciliation Sublayer (RS): A 100BASE-T mapping function that reconciles the signals at the MII to the MAC-PLS service definitions. (See IEEE 802.3 clause 22.)

1.4.158 remote fault: The generic ability of a link partner to signal its status even in the event that it may not have an operational receive link. (See IEEE 802.3 clause 28.)

1.4.159 renegotiation: Restart of the Auto-Negotiation algorithm caused by management or user interaction. (See IEEE 802.3 clause 28.)

1.4.160 repeater port: *See:* **port**.

1.4.161 repeater set: A repeater unit plus its associated Physical Layer interfaces (MAUs or PHYs) and, if present, AU or MI Interfaces (i.e., AUIs, MIIs).

1.4.162 repeater unit: The portion of a repeater that is inboard of its PMA/PLS or PMA/PCS interfaces.

1.4.163 repeater: A device used to extend the length, topology or interconnectivity of the physical medium beyond that imposed by a single segment, up to the maximum allowable end-to-end trunk transmission line length. Repeaters perform the basic actions of restoring signal amplitude, waveform, and timing applied to the normal data and collision signals. For wired star topologies, repeaters provide a data distribution function. In 100BASE-T, a device that allows the interconnection of 100BASE-T Physical Layer network

segments using similar or dissimilar PHY implementations (e.g., 100BASE-X to 100BASE-X, 100BASE-X to 100BASE-T4, etc.). (See IEEE 802.3 clauses 9 and 27.)

1.4.164 Return Loss: In 10BROAD36, the ratio in decibels of the power reflected from a port to the power incident to the port. An indicator of impedance matching in a broadband system. (See IEEE 802.3 clause 11.)

1.4.165 router: A layer 3 interconnection device that appears as a MAC to a CSMA/CD collision domain. (See IEEE Std 610.7-1995 [A16].)

1.4.166 Seed: In 10BROAD36, the 23 bits residing in the scrambler shift register prior to the transmission of a packet. (See IEEE 802.3 clause 11.)

1.4.167 Segment Delay Value (SDV): A number associated with a given segment that represents the delay on that segment including repeaters and end stations, if present, used to assess path delays for 10 Mb/s CSMA/CD networks. (See IEEE 802.3, 13.4.)

1.4.168 Segment Variability Value (SVV): A number associated with a given segment that represents the delay variability on that segment (including a repeater) for 10 Mb/s CSMA/CD networks. The SVVs for different segment types are specified in IEEE 802.3 table 13-3. (See IEEE 802.3, 13.4.)

1.4.169 segment: The medium connection, including connectors, between MDIs in a CSMA/CD LAN.

1.4.170 Selector field: A five-bit field in the Base Link Code Word encoding that is used to encode up to 32 types of messages that define basic abilities. For example, selector field 00001 indicates that the base technology is IEEE 802.3. (See IEEE 802.3 clause 28.)

1.4.171 shared service: A CSMA/CD network in which the collision domain consists of more than two DTEs so that the total network bandwidth is shared among them.

1.4.172 shielded twisted-pair (STP) cable: An electrically conducting cable, comprising one or more elements, each of which is individually shielded. There may be an overall shield, in which case the cable is referred to as shielded twisted pair cable with an overall shield. (From ISO/IEC 11801: 1995.) Specifically for IEEE 802.3 100BASE-TX, 150 Ω balanced inside cable with performance characteristics specified to 100 MHz (i.e., performance to Class D link standards as per ISO/IEC 11801: 1995). In addition to the requirements specified in ISO/IEC 11801: 1995, IEEE 802.3 clauses 23 and 25 provide additional performance requirements for 100BASE-T operation over STP.

1.4.173 Simplex Fiber Optic Link Segment: A single fiber path between two MAUs or PHYs, including the terminating connectors, consisting of one or more fibers joined serially with appropriate connection devices, for example, patch cables and wall plates. (See IEEE 802.3 clause 15.)

1.4.174 simplex link segment: A path between two MDIs, including the terminating connectors, consisting of one or more segments of twisted pair cable joined serially with appropriate connection devices, for example, patch cords and wall plates. (See IEEE 802.3 figure 14-2.)

1.4.175 skew between pairs: The difference in arrival times of two initially coincident signals propagated over two different pairs, as measured at the receiving end of the cable. Total skew includes contributions from transmitter circuits as well as the cable.

1.4.176 special link (SL): A transmission system that replaces the normal medium. (See IEEE 802.3, 12.8.)

1.4.177 Spectral Width, Full-Width Half Maximum (FWHM): The absolute difference between the wavelengths at which the spectral radiant intensity is 50% of the maximum. (See IEEE 802.3 clause 15.)

1.4.178 spectrum mask: A graphic representation of the required power distribution as a function of frequency for a modulated transmission.

1.4.179 star quad: A cable element that comprises four insulated connectors twisted together. Two diametrically facing conductors form a transmission pair. *Note*—Cables containing star quads can be used interchangeably with cables consisting of pairs, provided the electrical characteristics meet the same specifications. (From ISO/IEC 11801: 1995.)

1.4.180 Start-of-Stream Delimiter (SSD): 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/.

1.4.181 stream: The Physical Layer encapsulation of a MAC frame. Depending on the particular PHY, the MAC frame may be modified or have information appended or prepended to it to facilitate transfer through the PMA. Any conversion from a MAC frame to a PHY stream and back to a MAC frame is transparent to the MAC. (See IEEE 802.3 clauses 23 and 24.)

1.4.182 symbol: 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.

1.4.183 symbol rate (SR): 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 megabaud; for 100BASE-X, the symbol rate is 125 megabaud.

1.4.184 symbol time (ST): The duration of one symbol as transferred to and from the MDI via a single wire pair. The symbol time is the reciprocal of the symbol rate.

1.4.185 Technology Ability Field: 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-TX, 100BASE-T4, as well as full-duplex capabilities.

1.4.186 ternary symbol: In 100BASE-T4, a ternary data element. A ternary symbol can have one of three values: –1, 0, or +1. (See IEEE 802.3 clause 23.)

1.4.187 translation: In a single-cable 10BROAD36 system, the process by which incoming transmissions at one frequency are converted into another frequency for outgoing transmission. The translation takes place at the headend. (See IEEE 802.3 clause 11.)

1.4.188 truncation loss: In a modulated data waveform, the power difference before and after implementation filtering necessary to constrain its spectrum to a specified frequency band.

1.4.189 trunk cable: The main (often large diameter) cable of a coaxial cable system. (*See:* **drop cable**.)

1.4.190 twisted-pair cable binder group: A group of twisted pairs within a cable that are bound together. Large telephone cables have multiple binder groups with high interbinder group near-end crosstalk loss.

1.4.191 twisted-pair cable: A bundle of multiple twisted pairs within a single protective sheath. (From ISO/IEC 11801: 1995.)

1.4.192 twisted-pair link: A twisted-pair cable plus connecting hardware. (From ISO/IEC 11801: 1995.)

1.4.193 twisted-pair link segment: In 100BASE-T, a twisted-pair link for connecting two PHYs.

1.4.194 twisted pair: A cable element that consists of two insulated conductors twisted together in a regular fashion to form a balanced transmission line. (From ISO/IEC 11801: 1995.)

1.4.195 Unformatted Page (UP): A Next Page encoding that contains an unformatted 12-bit message field. Use of this field is defined through Message Codes and information contained in the UP. (See IEEE 802.3, 28.2.1.2.)

1.4.196 unshielded twisted-pair cable (UTP): An electrically conducting cable, comprising one or more pairs, none of which is shielded. There may be an overall shield, in which case the cable is referred to as unshielded twisted pair with overall shield. (From ISO/IEC 11801: 1995.)

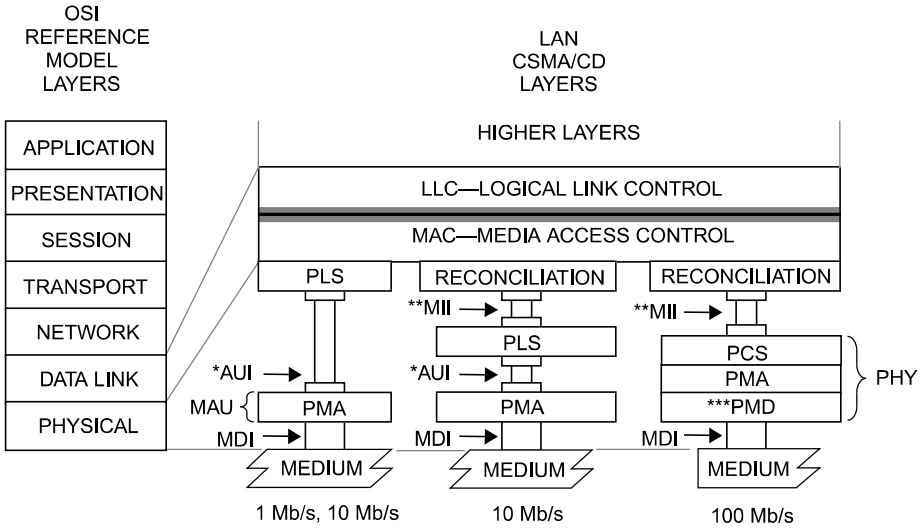
1.4.197 weight of 6T code group: The algebraic sum of the logical ternary symbol values listed in the 100BASE-T4 8B6T code table. (See IEEE 802.3 clause 23.)

Remove the definitions from 7.1.1, 8.1.2, 9.2, 10.1.2, 11.1.2, 12.1.3, 13.2, 14.1.2, 15.1.2, and 19.1.3 and insert the following text under each of these subclauses:

See 1.4.

2. MAC service specification

Replace figure 2-1 with the following:



AUI = ATTACHMENT UNIT INTERFACE
MDI = MEDIUM DEPENDENT INTERFACE
MII = MEDIA INDEPENDENT INTERFACE
MAU = MEDIUM ATTACHMENT UNIT

PLS = PHYSICAL LAYER SIGNALING
PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PHY = PHYSICAL LAYER DEVICE
PMD = PHYSICAL MEDIUM DEPENDENT

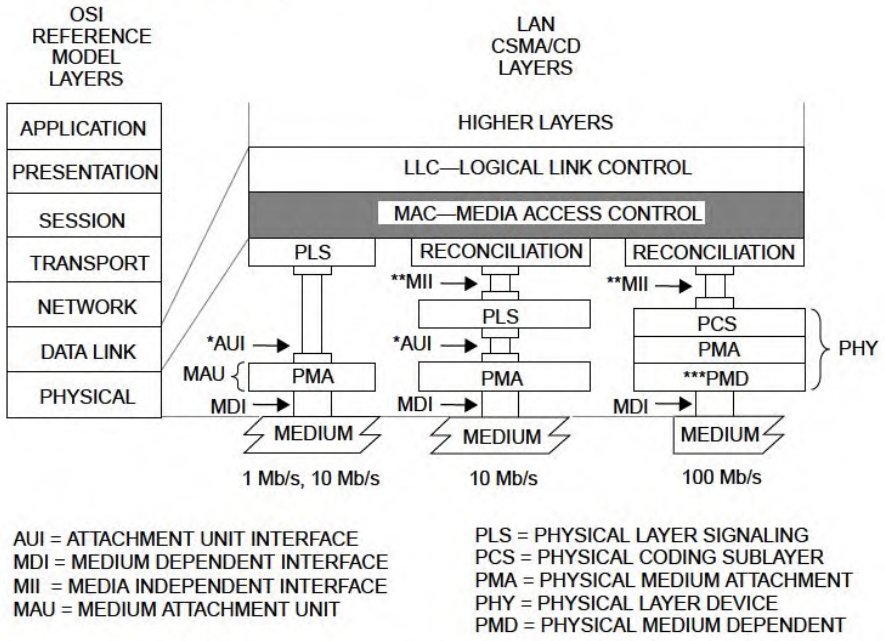
NOTE—The three types of layers below the MAC sublayer are mutually independent.

* AUI is optional for 10 Mb/s systems and is not specified for 1 Mb/s and 100 Mb/s systems.
** MII is optional for 10 Mb/s DTEs and for 100 Mb/s systems and is not specified for 1 Mb/s systems.
*** PMD is specified for 100BASE-X only; 100BASE-T4 does not use this layer.
For an exposed AUI residing below an MII, see 22.5.

Figure 2-1—Service specification relation to the LAN model

4. Media Access Control

Replace figure 4-1 with the following:



AUI = ATTACHMENT UNIT INTERFACE
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** MII is optional for 10 Mb/s DTEs and for 100 Mb/s systems and is not specified for 1 Mb/s systems.
*** PMD is specified for 100BASE-X only; 100BASE-T4 does not use this layer.
For an exposed AUI residing below an MII, see 22.5.

Figure 4-1—MAC sublayer partitioning, relationship to the ISO Open Systems Interconnection (OSI) reference model

Add to 4.4.2 the following subclause:

4.4.2.3 Parameterized values

The following parameter values shall be used for 100 Mb/s implementations:

Parameters	Values
slotTime	512 bit times
interFrameGap	0.96 µs
attemptLimit	16
backoffLimit	10
jamSize	32 bits
maxFrameSize	1518 octets
minFrameSize	512 bits (64 octets)
addressSize	48 bits

WARNING—Any deviation from the above specified values may affect proper operation of the network.

5. Layer management

Insert before 5.1:

Clause 5 is deprecated by clause 30.

14. Twisted-pair Medium Attachment Unit (MAU) and baseband medium, Type 10BASE-T

EDITORIAL NOTE—The following changes add references to Auto-Negotiation and specifications for Auto-Negotiation to the appropriate places in clause 14 of ISO/IEC 8802-3: 1993 [ANSI/IEEE Std 802.3-1993 Edition] and IEEE Std 802.3l-1992. (These changes will also identically affect the 1995 edition of ISO/IEC 8802-3.) The changes do not alter the specifications for existing systems.

In 14.2, renumber the list items (1) through (7) as a) through g) and add the following paragraph as the eighth functional capability:

h) Auto-Negotiation. Optionally provides the capability for a device at one end of a link segment to advertise its abilities to the device at the other end (its link partner), to detect information defining the abilities of the link partner, and to determine if the two devices are compatable.

Add to 14.2.1 the following sentence to the end of the paragraph:

The MAU may optionally provide the Auto-Negotiation algorithm. When provided, the Auto-Negotiation algorithm shall be implemented in accordance with clause 28.

Add to 14.2.1.1 the following paragraph after the fourth paragraph:

For a MAU that implements the Auto-Negotiation algorithm defined in clause 28, clause 28 shall define the allowable transmitted link pulse sequence.

Add to 14.2.1.7 the following sentence at the end of the fourth paragraph:

For a MAU that implements the Auto-Negotiation algorithm defined in clause 28, the MAU shall enter the LINK TEST FAIL RESET state at power-on as specified in clause 28. For a MAU that does not implement the Auto-Negotiation algorithm defined in clause 28, it is highly recommended that it also power-on in the LINK TEST FAIL RESET state, although implementations may power-on in the LINK TEST PASS state. For a MAU that implements the Auto-Negotiation function defined in clause 28, the Auto-Negotiation Technology Dependent Interface shall be supported. Supporting the Technology Dependent Interface requires that in the Link Integrity Test function state diagram 'link_status=OK' is added to the LINK TEST PASS state and 'link_status=FAIL' is added to the LINK TEST FAIL RESET state. Note these ISO message variables follow the conventions of clause 21.

Add to 14.3.1.2.1 the following paragraph after the sixth paragraph:

For a MAU that implements the Auto-Negotiation algorithm defined in clause 28, the FLP Burst Sequence will consist of multiple link test pulses. All link test pulses in the FLP Burst sequence shall meet the template requirements of figure 14-12 when measured across each of the test loads defined in figure 14-11; both with the load connected directly to the TD circuit and with the load connected through the twisted-pair model as defined in figures 14-7 and 14-8.

Add to 14.10.4.5.1 the following entry as the eighth parameter:

	Parameter	Section	Req	Imp	Value/Comment
8	Auto-Negotiation		C		Function provided by MAUs implementing the Auto-Negotiation algorithm, as defined in clause 28

Add this new subclause after 14.10.4.7:

14.10.4.8 PICS proforma tables for Auto-Negotiation-able MAUs

The following are conditional on whether the Auto-Negotiation algorithm is provided (clause 28).

	Parameter	Section	Req	Imp	Value/Comment
1	TP_IDL	14.2.1.1	C		Defined in clause 28.2.1
2	Link Integrity Test Function State Diagram power-on default	14.2.1.7	C		Power-on in Link Test Fail Reset state
3	Link Test Fail state exit conditions	14.2.1.7	C		autoneg_wait_timer expired and either RD = active or consecutive link test pulses = 3 min., 10 max
4	Technology Dependent Interface support	14.2.1.7	C		In the Link Integrity Test state diagram function 'link_status=OK' is added to the LINK TEST PASS state and 'link_status=FAIL' is added to the LINK TEST FAIL RESET state
5	Link test pulse waveform for FLP Burst with and without twisted-pair model	14.3.1.2.1	C		Within figure 14-10 template for, all pulses in FLP Burst, overshoot ≤ +50 mV after excursion below –50 mV

19. Layer management for 10 Mb/s baseband repeaters

EDITORIAL NOTE—This clause can be found in IEEE Std 802.3k-1992.

Insert the following phrase in front of 19.1:

Clause 19 is deprecated by clause 30.

20. Layer management for 10 Mb/s baseband Medium Attachment Units (MAUs)

EDITORIAL NOTE—This clause can be found in IEEE Stds 802.3p&q-1993.

Insert the following phrase in front of 20.1:

Clause 20 is deprecated by clause 30.

Annex A

(informative)[11]

Additional reference material

EDITORIAL NOTES

1—This clause was changed from Annex to Annex A by IEEE Std 802.3j-1993.

2—In the following references, changes are not indicated by strikethroughs and underscores.

3—The reference numbers in this annex do not correspond to those of ISO/IEC 8802-3: 1993 or the 1995 edition of ISO/IEC 8802-3.

Replace annex A with the following:

[A1] ANSI/EIA 364A: 1987, Standard Test Procedures for Low-Frequency (Below 3 MHz) Electrical Connector Test Procedure.

[A2] ANSI/EIA 455-34: 1985, Fiber Optics—Interconnection Device Insertion Loss Test.

[A3] ANSI/EIA/TIA 455-59-1989, Measurement of Fiber Point Defects Using an Optical Time Domain Reflectometer (ODTR).

[A4] ANSI/EIA/TIA 455-180-1990, FOTP-180, Measurement of the Optical Transfer Coefficients of a Passive Branching Device (Coupler).

[A5] ANSI/EIA/TIA 526-14-1990, Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

[A6] ANSI/EIA/TIA 568-1991, Commercial Building Telecommunications Wiring Standard.

[A7] ANSI/IEEE Std 770X3.97-1983, IEEE Standard Pascal Computer Programming Language.[12]

[A8] ANSI/NFPA 70-1993, National Electrical Code.

[A9] ANSI/UL 94-1990, Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

[A10] ANSI/UL 114-1982, Safety Standard for Office Appliances and Business Equipment.[13]

[11]This annex is informative for the International Standard but normative for IEEE Std 802.3.

[12]ANSI/IEEE Std 770X3.97-1983 has been withdrawn; however, copies can be obtained from Global Engineering, 15 Inverness Way East, Englewood, CO 80112-5704, USA, tel. (303) 792-2181.

[13]ANSI/UL 114-1982 was withdrawn and replaced by ANSI/UL 1950-1994.

[A11] ANSI/UL 478-1979, Safety Standard for Electronic Data-Processing Units and Systems.[14]

[A12] ANSI/UL 1950-1994, Safety Standard for Information Technology Equipment Including Electrical Business Equipment.

[A13] ECMA-97 (1985), Local Area Networks Safety Requirements.

[A14] EIA CB8-1981, Components Bulletin (Cat 4) List of Approved Agencies, US and Other Countries, Impacting Electronic Components and Equipment.

[A15] FCC Docket 20780-1980 (Part 15), Technical Standards for Computing Equipment. Amendment of Part 15 to redefine and clarify the rules governing restricted radiation devices and low-power communication devices. Reconsidered First Report and Order, April 1980.

[A16] IEEE Std 610.7-1995, IEEE Standard Glossary of Computer Networking Terminology.

[A17] IEEE Std 802.9a-1995, IEEE Standards for Local and Metropolitan Area Networks: Integrated Services (IS) LAN: IEEE 802.9 Isochronous Services with Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Media Access Control (MAC) Service.[15]

[A18] IEEE P1394/D8.0v3, Draft Standard for a High-Performance Serial Bus (July 7, 1995).

[A19] MIL-C-17F-1983, General Specification for Cables, Radio Frequency, Flexible and Semirigid.

[A20] MIL-C-24308B-1983, General Specifications for Connector, Electric, Rectangular, Miniature Polarized Shell, Rack and Panel.

[A21] AMP, Inc., Departmental Publication 5525, Design Guide to Coaxial Taps. Harrisburg, PA 17105, USA.

[A22] AMP, Inc., Instruction Sheet 6814, Active Tap Installation. Harrisburg, PA 17105, USA.

[A23] Brinch Hansen, P. *The Architecture of Concurrent Programs.* Englewood Cliffs, NJ: Prentice Hall, 1977.

[A24] Digital Equipment Corporation, Intel, Xerox, The Ethernet, Version 2.0, November 1982.

[A25] Hammond, J. L., Brown, J. E., and Liu, S. S. Development of a Transmission Error Model and Error Control Model. Technical Report RADC-TR-75-138. Rome: Air Development Center (1975).

[A26] Shoch, J. F., Dalal, Y. K., Redell, D. D., and Crane, R. C., "The Evolution of Ethernet," *Computer Magazine*, August 1982.

[A27] UL Subject No 758: UL VW-1, Description of Appliance Wiring Material.

[14]ANSI/UL 478-1979 was withdrawn and replaced by ANSI/UL 1950-1994.

[15]As this standard goes to press, IEEE Std 802.9a-1995 is approved but not yet published. The approved draft standard is, however, available from the IEEE. Anticipated publication date is early 1996. Contact the IEEE Standards Department at 1 (908) 562-3800 for status information.

Annex D

(normative)

GDMO specifications for CSMA/CD managed objects

EDITORIAL NOTE—This annex can be found in IEEE Stds 802.3p&q-1993.

Insert the following note at three places immediately following the headings D1, D2, and D3:

NOTE—The arcs (that is, object identifier values) defined in annex 30A deprecate the arcs previously defined in D1 (Layer Management), D2 (Repeater Management), and D3 (MAU Management). See IEEE Std 802.1F-1993, annex C4.

IEEE Standards for Local and Metropolitan Area Networks:

Supplement to Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications

Media Access Control (MAC) Parameters, Physical Layer, Medium Attachment Units, and Repeater for 100 Mb/s Operation, Type 100BASE-T (Clauses 21–30)

21. Introduction to 100 Mb/s baseband networks, type 100BASE-T

21.1 Overview

100BASE-T couples the ISO/IEC 8802-3 CSMA/CD MAC with a family of 100 Mb/s Physical Layers. While the MAC can be readily scaled to higher performance levels, new Physical Layer standards are required for 100 Mb/s operation.

The relationships between 100BASE-T, the existing ISO/IEC 8802-3 (CSMA/CD MAC), and the ISO Open System Interconnection (OSI) reference model is shown in figure 21-1.

100BASE-T uses the existing ISO/IEC 8802-3 MAC layer interface, connected through a Media-Independent Interface layer to a Physical Layer entity (PHY) sublayer such as 100BASE-T4, 100BASE-TX, or 100BASE-FX.

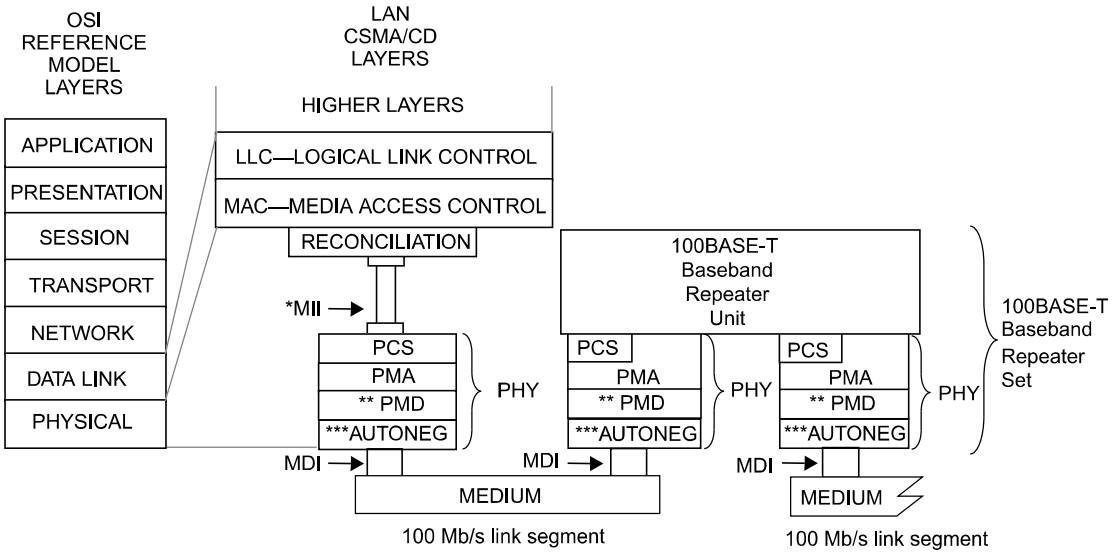
100BASE-T extends the ISO/IEC 8802-3 MAC to 100 Mb/s. The bit rate is faster, bit times are shorter, packet transmission times are reduced, and cable delay budgets are smaller—all in proportion to the change in bandwidth. This means that the ratio of packet duration to network propagation delay for 100BASE-T is the same as for 10BASE-T.

21.1.1 Reconciliation Sublayer (RS) and Media Independent Interface (MII)

The Media Independent Interface (clause 22) provides an interconnection between the Media Access Control (MAC) sublayer and Physical Layer entities (PHY) and between PHY Layer and Station Management (STA) entities. This MII is capable of supporting both 10 Mb/s and 100 Mb/s data rates through four bit wide (nibble wide) transmit and receive paths. The Reconciliation sublayer provides a mapping between the signals provided at the MII and the MAC/PLS service definition.

21.1.2 Physical Layer signaling systems

This standard specifies a family of Physical Layer implementations. 100BASE-T4 (clause 23) uses four pairs of ISO/IEC 11801: 1995 Category 3, 4, or 5 balanced cable. 100BASE-TX (clauses 24 and 25) uses two pairs of Category 5 balanced cable or 150 Ω shielded balanced cable as defined by ISO/IEC 11801: 1995. 100BASE-FX (clauses 24 and 26) uses two multi-mode fibers. FDDI (ISO 9314 and ANSI X3T12) Physical Layers are used to provide 100BASE-TX and 100BASE-FX physical signaling channels, which are defined in 100BASE-X (clause 24).



MDI = MEDIUM DEPENDENT INTERFACE
MII = MEDIA INDEPENDENT INTERFACE

PCS = PHYSICAL CODING SUBLAYER
PMA = PHYSICAL MEDIUM ATTACHMENT
PHY = PHYSICAL LAYER DEVICE
PMD = PHYSICAL MEDIUM DEPENDENT

* MII is optional for 10 Mb/s DTEs and for 100 Mb/s systems and is not specified for 1 Mb/s systems.
** PMD is specified for 100BASE-X only; 100BASE-T4 does not use this layer.
Use of MII between PCS and Baseband Repeater Unit is optional.
*** AUTONEG is optional.

Figure 21-1—Architectural positioning of 100BASE-T

21.1.3 Repeater

Repeater sets (clause 27) are an integral part of any 100BASE-T network with more than two DTEs in a collision domain. They extend the physical system topology by coupling two or more segments. Multiple repeaters are permitted within a single collision domain to provide the maximum path length.

21.1.4 Auto-Negotiation

Auto-Negotiation (clause 28) provides a linked device with the capability to detect the abilities (modes of operation) supported by the device at the other end of the link, determine common abilities, and configure for joint operation. Auto-Negotiation is performed out-of-band using a pulse code sequence that is compatible with the 10BASE-T link integrity test sequence.

21.1.5 Management

Managed objects, attributes, and actions are defined for all 100BASE-T components (clause 30). This clause consolidates all IEEE 802.3 management specifications so that 10 Mb/s, 100 Mb/s or 10/100 Mb/s agents can be managed by existing 10 Mb/s-only network management stations with little or no modification to the agent code.

21.2 Abbreviations

This document contains the following abbreviations:

8802-3	ISO/IEC 8802-3 (IEEE Std 802.3)
8802-5	ISO/IEC 8802-5 (IEEE Std 802.5)
ASIC	application-specific integrated circuit
ASN.1	abstract syntax notation one as defined in ISO/IEC 8824: 1990
AUI	attachment unit interface
BPSK	binary phase shift keying
BR	bit rate
BT	bit time
CAT3	Category 3 balanced cable
CAT4	Category 4 balanced cable
CAT5	Category 5 balanced cable
CD0	clocked data zero
CD1	clocked data one
CMIP	common management information protocol as defined in ISO/IEC 9596-1: 1991
CMIS	common management information service as defined in ISO/IEC 9595: 1991
CMOS	complimentary metal oxide semiconductor
CRC	cyclic redundancy check
CVH	clocked violation high
CVL	clocked violation low
CRV	code rule violation
CS0	control signal zero
CS1	control signal one
CW	continuous wave
DTE	data terminal equipment
ELFEXT	equal-level far-end crosstalk
ESD	end of stream delimiter
FCS	frame check sequence
FDDI	fibre distributed data interface
FEXT	far-end crosstalk
FIFO	first in, first out
FLP	fast link pulse
FOIRL	fiber optic inter-repeater link
FOMAU	fiber optic medium attachment unit
FOMDI	fiber optic medium dependent interface
FOPMA	fiber optic physical medium attachment
HH	header hub
IH	intermediate hub
IPG	inter-packet gap
IRL	inter-repeater link
LAN	local area network
LLC	logical link control
LSDV	link segment delay value
MAC	medium access control
MAU	medium attachment unit
MC	message code
MDELFEXT	multiple-disturber equal-level far-end crosstalk
MDFEXT	multiple-disturber far-end crosstalk
MDI	medium dependent interface
MDNEXT	multiple-disturber near-end crosstalk
MIB	management information base

MII	media independent interface
MP	message page
NEXT	near-end crosstalk
NLP	normal link pulse
NPA	next page algorithm
NRZI	non return to zero and invert on ones
PCS	physical coding sublayer
PDV	path delay value
PHY	Physical Layer entity sublayer
PICS	protocol implementation conformance statement
PLS	physical signaling sublayer
PMA	physical medium attachment
PMD	physical medium dependent
PMI	physical medium independent
PVV	path variability value
RS	reconciliation sublayer
SSD	start-of-stream delimiter
SDV	segment delay value
SFD	start-of-frame delimiter
SR	symbol rate
ST	symbol time
STA	station management entity
STP	shielded twisted pair (copper)
SVV	segment variability value
UCT	unconditional transition
UP	unformatted page
UTP	unshielded twisted pair

21.3 References

References are shown beginning on pages 2 and 23 of this document (as updates to 1.3 and annex A).

21.4 Definitions

Definitions are shown beginning on page 5 of this document (as an update to 1.4).

21.5 State diagrams

State machine diagrams take precedence over text.

The conventions of 1.2 are adopted, with the following extensions.

21.5.1 Actions inside state blocks

The actions inside a state block execute instantaneously. Actions inside state blocks are atomic (i.e., uninterruptible).

After performing all the actions listed in a state block one time, the state block then continuously evaluates its exit conditions until one is satisfied, at which point control passes through a transition arrow to the next block. While the state awaits fulfillment of one of its exit conditions, the actions inside do not implicitly repeat.

The characters • and [bracket] are *not* used to denote any special meaning.

Valid state actions may include .indicate and request messages.

No actions are taken outside of any state block.

21.5.2 State diagram variables

Once set, variables retain their values as long as succeeding blocks contain no references to them.

Setting the parameter of a formal interface message assures that, on the next transmission of that message, the last parameter value set will be transmitted.

Testing the parameter of a formal interface messages tests the value of that message parameter that was received on the last transmission of said message. Message parameters may be assigned default values that persist until the first reception of the relevant message.

21.5.3 State transitions

The following terms are valid transition qualifiers:

a) Boolean expressions
b) An event such as the expiration of a timer: timer_done
c) An event such as the reception of a message: PMA_UNITDATA.indicate
d) An unconditional transition: UCT
e) A branch taken when other exit conditions are not satisfied: ELSE

Any open arrow (an arrow with no source block) represents a global transition. Global transitions are evaluated continuously whenever any state is evaluating its exit conditions. When a global transition becomes true, it supersedes all other transitions, including UCT, returning control to the block pointed to by the open arrow.

21.5.4 Operators

The state machine operators are shown in table 21-1.

Table 21-1—State machine operators

Character	Meaning
*	Boolean AND
+	Boolean OR
^	Boolean XOR
!	Boolean NOT
<	Less than
≤	Less than or equal to
=	Equals (a test of equality)
≠	Not equals
≥	Greater than or equal to
>	Greater than
( )	Indicates precedence
⇐	Assignment operator
∈	Indicates membership
∉	Indicates nonmembership
ELSE	No other state condition is satisfied