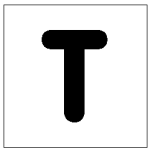
T: *Abbreviation for* **tera (10^{12}).** *See* **International System of Units.**



Tactical Automatic Digital Switching System (TADSS): A transportable store-and-forward message-switching system used for rapid deployment in support of tactical forces. (188)

tactical command and control (C^2) systems: The equipment, communications, procedures, and personnel essential to a commander for planning, directing, coordinating, and controlling tactical operations of assigned forces pursuant to assigned missions.

tactical communications: Communications in which information of any kind, especially orders and decisions, are conveyed from one command, person, or place to another within the tactical forces, usually by means of electronic equipment, including communications security equipment, organic to the tactical forces. (188) *Note:* Tactical communications do not include communications provided to tactical forces by the Defense Communications System (DCS), to nontactical military commands, and to tactical forces by civil organizations.

tactical communications system: A communications system that (a) is used within, or in direct support of, tactical forces, (b) is designed to meet the requirements of changing tactical situations and varying environmental conditions, (c) provides securable communications, such as voice, data, and video, among mobile users to facilitate command and control within, and in support of, tactical forces, and (d) usually requires extremely short installation times, usually on the order of hours, in order to meet the requirements of frequent relocation. (188)

tactical data information link (TADIL): A standardized communications link, approved by the Joint Staff, that is suitable for transmission of digital information, and is characterized by standardized message formats and transmission characteristics. (188)

tactical data information link—A (TADIL—A): A netted link in which one unit acts as a net control station and interrogates each unit by roll call. *Note:* Once interrogated, that unit transmits its data to the net. This means that each unit receives all the information transmitted. This is a direct transfer of data and no relaying is involved. (188)

tactical data information link—B (TADIL—B): A point-to-point data link between two units which provides for simultaneous transmission and reception of data (duplex). (188)

tactical load: For the host service tactical forces, the total power requirements for communications, including the requirements for weapons, detection, command and control systems, and related support functions. (188) *Note:* The tactical load is a part of the operational load.

TADIL: *Acronym for* **tactical data information link.**

TADSS: *Acronym for* **Tactical Automatic Digital Switching System.**

tag: *See* **flag, label**.

tag image file format (TIFF): A file format used to store an image using the particular data structure of the file. (188)

TAI: *Abbreviation for* **International Atomic Time.**

tail circuit: A communications line from the end of a major transmission link, such as a microwave link, satellite link, or LAN, to the end-user location. *Note:* A tail circuit is a part of a user-to-user connection.

tailing: In facsimile systems, the excessive prolongation of the decay of the signal. (188) *Synonym* **hangover**.

takeoff angle: *Synonym* **departure angle.**

tandem: Pertaining to an arrangement or sequencing of networks, circuits, or links, in which the output terminals of one network, circuit, or link are connected directly to the input terminals of another network, circuit, or link. *Note:* For example, concatenated microwave links constitute a tandem connection. (188)

tandem center: In a switched public telecommunications network, a facility that connects trunks to trunks and does not connect any local loops. (188)

tandem office: A central office that serves local subscriber loops, and also is used as an intermediate switching point for traffic between central offices.

tandem tie trunk network (TTTN): An arrangement that permits sequential connection of tie trunks between PBX and Centrex® locations by using tandem operation. *Note:* Tandem operation permits two or more dial tie trunks to be connected at a tandem center to form a through connection.

tap: 1. To draw energy from a circuit. **2.** To monitor, with or without authorization, the information that is being transmitted via a communications circuit. **3.** To extract a portion of the signal from an optical fiber or communications link. *Note:* One method of tapping an optical fiber is to bend it to a relatively short radius, thus promoting radiation of a portion of the optical signal. [After FAA]

tapered fiber: An optical fiber in which the cross section, *i.e.*, cross-sectional diameter or area, varies, *i.e.,* increases or decreases, monotonically with length.

tape relay: A method of retransmitting TTY traffic from one channel to another, in which messages arriving on an incoming channel are recorded in the form of perforated tape, this tape then being either fed directly and automatically into an outgoing channel, or manually transferred to an automatic transmitter for transmission on an outgoing channel. (188)

target language: In computing, data processing, and communications systems, a language into which statements are translated. *Note:* Translators, assemblers, and compilers prepare target language programs, usually machine-language programs, from source language programs, usually high-level language programs written by programmers.

tariff: The published schedule of rates or charges for a specific unit of equipment, facility, or type of service such as might be provided by a telecommunications common carrier.

TASI: *Acronym for* **time-assignment speech interpolation.**

tasking: *See* **multitasking.**

TAT: *Abbreviation for* **trans-Atlantic telecommunications (cable).** *Note: TAT* formerly stood for *transatlantic telephone (cable).*

T-carrier: The generic designator for any of several digitally multiplexed telecommunications carrier systems. *Note 1:* The designators for T-carrier in the North American digital hierarchy correspond to the designators for the digital signal (DS) level hierarchy. *See the table on the following page. Note 2:* T-carrier systems were originally designed to transmit digitized voice signals. Current applications also include digital data transmission. (188) *Note 3:* If an "F" precedes the "T", a fiber optic cable system is indicated at the same rates. *Note 4:* The table below lists the designators and rates for current T-Carrier systems. *Note 5:* The North American and Japanese hierarchies are based on multiplexing 24 voice-frequency channels and multiples thereof, whereas the European hierarchy is based on multiplexing 30 voice-frequency channels and multiples thereof. *See table on following page.*

TCB: *Abbreviation for* **trusted computing base.**

TCF: *Abbreviation for* **technical control facility.**

T-coupler: A passive optical coupler having three ports (three fibers). *Note 1:* Two isolated inputs may be combined into one output; or one input, into two isolated outputs. *Note 2:* The amount of coupling loss, usually expressed in dB, between ports is determined by the design and construction of the coupler. [After FAA] *Synonym* **splitter**.

TCP: *Abbreviation for* **Transmission Control Protocol.** In the Internet Protocol suite, a standard, connection-oriented, full-duplex, host-to-host protocol used over packet-switched computer communications networks. *Note 1:* TCP corresponds closely to the ISO Open Systems Interconnection—Reference Model (OSI—RM) Layer 4 (Transport Layer). *Note 2:* The OSI—RM uses TP-0 or TP-4 protocols for transmission control.

T-Carrier Systems	North American	Japanese	European (CEPT)
Level zero (Channel data rate)	64 kb/s (DS0)	64 kb/s	64 kb/s
First level	1.544 Mb/s (DS1) (24 user channels)	1.544 Mb/s (24 user channels)	2.048 Mb/s (30 user channels)
(Intermediate level, North American Hierarchy only)	3.152 Mb/s (DS1C) (48 Ch.)	-	-
Second level	6.312 Mb/s (DS2) (96 Ch.)	6.312 Mb/s (96 Ch.), or 7.786 Mb/s (120 Ch.)	8.448 Mb/s (120 Ch.)
Third level	44.736 Mb/s (DS3) (672 Ch.)	32.064 Mb/s (480 Ch.)	34.368 Mb/s (480 Ch.)
Fourth level	274.176 Mb/s (DS4) (4032 Ch.)	97.728 Mb/s (1440 Ch.)	139.268 Mb/s (1920 Ch.)
Fifth level	400.352 Mb/s (5760 Ch.)	565.148 Mb/s (7680 Ch.)	565.148 Mb/s (7680 Ch.)

Note 1: The DS designations are used in connection with the North American hierarchy only.

Note 2: There are other data rates in use, *e.g.*, military systems that operate at six and eight times the DS1 rate. At least one manufacturer has a commercial system that operates at 90 Mb/s, twice the DS3 rate. New systems, which take advantage of the high data rates offered by optical communications links, are also deployed or are under development.

TCP/IP: *Abbreviation for* **Transmission Control Protocol/Internet Protocol.** Two interrelated protocols that are part of the Internet protocol suite. *Note 1:* TCP operates on the OSI Transport Layer and breaks data into packets. IP operates on the OSI Network Layer and routes packets. *Note 2:* TCP/IP was originally developed by the U.S. Department of Defense.

TCP/IP Suite: The suite of interrelated protocols associated with Transmission Control Protocol/Internet Protocol. *Note 1:* The TCP/IP Suite includes, but is not limited to, protocols such as TCP, IP, UDP, ICMP, FTP, and SMTP. *Note 2:* Additional application and management protocols are sometimes considered part of the TCP/IP Suite. This includes protocols such as SNMP.

TCS: *Abbreviation for* **trusted computer system.**

TCU: *Abbreviation for* **teletypewriter control unit.**

TDD: *Abbreviation for* **Telecommunications Device for the Deaf.**

TDM: *Abbreviation for* **time division multiplex.**

TDMA: *Abbreviation for* **time-division multiple access.**

TE: *Abbreviation for* **transverse electric.** *See* **transverse electric mode.**

technical area: In the military community, an area in which temperature, humidity, or access is controlled because it contains equipment, such as communications, computing, control, or support equipment, that requires such controls.

technical control facility (TCF): A physical plant, or a designated and specially configured part thereof, that (a) contains the equipment necessary for ensuring fast, reliable, and secure exchange of information, (b) typically includes distribution frames and associated panels, jacks, and switches and monitoring, test, conditioning, and orderwire equipment, and (c) allows telecommunications systems control personnel to exercise operational control of communications paths and facilities, make quality analyses of communications and communications channels, monitor operations and maintenance functions, recognize and correct deteriorating conditions, restore disrupted communications, provide requested on-call circuits, and take or direct such actions as may be required and practical to provide effective telecommunications services. (188)

technical control hubbing repeater: *Synonym* **data conferencing repeater.**

technical load: The portion of the operational load required for communications, tactical operations, and ancillary equipment including necessary lighting, air-conditioning, or ventilation required for full continuity of communications. (188)

technical vulnerability: In information handling, a hardware, software, or firmware weakness, or design deficiency, that leaves a system open to assault, harm, or unauthorized exploitation, either externally or internally, thereby resulting in unacceptable risk of information compromise, information alteration, or service denial.

TED: *Abbreviation for* **trunk encryption device.**

tee coupler: A passive coupler that has three ports.

TEK: *Abbreviation for* **traffic encryption key.**

teleaction service: In Integrated Services Digital Network (ISDN) applications, a telecommunications service that uses very short messages with very low data transmission rates between the user and the network.

telecommand: The use of telecommunication for the transmission of signals to initiate, modify or terminate functions of equipment at a distance. [NTIA] [RR]

telecommunication: 1. Any transmission, emission, or reception of signs, signals, writing, images and sounds or intelligence of any nature by wire, radio, optical or other electromagnetic systems. [NTIA] [RR] **2.** Any transmission, emission, or reception of signs, signals, writings, images, sounds, or information of any nature by wire, radio, visual, or other electromagnetic systems. [JP1]

telecommunication architecture: *See* **network architecture.**

telecommunications center: *See* **communications center.**

Telecommunications Device for the Deaf (TDD): A machine that uses typed input and output, usually with a visual text display, to enable individuals with hearing or speech impairments to communicate over a telecommunications network.

telecommunications facilities: The aggregate of equipment, such as radios, telephones, teletypewriters, facsimile equipment, data equipment, cables, and switches, used for providing telecommunications services.

telecommunications management network (TMN): A network that interfaces with a telecommunications

network at several points in order to receive information from, and to control the operation of, the telecommunications network. (188) *Note:* A TMN may use parts of the managed telecommunications network to provide for the TMN communications.

telecommunications security: *See* **communications security.**

telecommunications service: 1. Any service provided by a telecommunication provider. **2.** A specified set of user-information transfer capabilities provided to a group of users by a telecommunications system. (188) *Note:* The telecommunications service user is responsible for the information content of the message. The telecommunications service provider has the responsibility for the acceptance, transmission, and delivery of the message.

Telecommunications Service Priority (TSP) service: A regulated service provided by a telecommunications provider, such as an operating telephone company or a carrier, for NS/EP telecommunications. *Note:* The TSP service replaced Restoration Priority (RP) service effective September 1990.

Telecommunications Service Priority (TSP) system: A system that provides a means for telecommunications users to obtain priority treatment from service providers for the NS/EP telecommunications requirements. *Note:* The TSP system replaced the Restoration Priority (RP) system effective September 1990.

Telecommunications Service Priority (TSP) system user: Any individual, organization, or activity that interacts with the NS/EP TSP System.

telecommunications system: *See* **communications system.**

telecommunications system operator: The organization responsible for providing telecommunications services to users.

teleconference: The live exchange of information among persons and machines remote from one another but linked by a telecommunications system. *Note:* The telecommunications system may support the teleconference by providing audio, video, and data services by one or more means, such as telephone, telegraph, teletype, radio, and television. (188)

telegram: Written matter intended to be transmitted by telegraphy for delivery to the addressee. This term also includes radiotelegrams unless otherwise specified. In this definition the term telegraphy has the same general meaning as defined in the [1979 General Worldwide Administrative Radio Conference] Convention. [RR with editor's note in brackets]

telegraph: *See* **telegraphy.**

telegraphy: A form of telecommunication which is concerned in any process providing transmission and reproduction at a distance of documentary matter, such as written or printed matter or fixed images, or the reproduction at a distance of any kind of information in such a form. For the purposes of the *Radio Regulations*, unless otherwise specified therein, telegraphy shall mean a form of telecommunication for the transmission of written matter by the use of a signal code. [NTIA] [RR]

telemetry: The use of telecommunication for automatically indicating or recording measurements at a distance from the measuring instrument. [RR]

telephone: A user end instrument that is used to transmit and receive voice-frequency signals.

telephone exchange: *Synonym* **central office.**

telephone frequency: *See* **audio frequency, voice frequency.**

telephone number: The unique network address that is assigned to a telephone user, *i.e.*, subscriber, for routing telephone calls.

telephone sidetone: *Synonym* **sidetone.**

telephony: 1. The branch of science devoted to the transmission, reception, and reproduction of sounds, such as speech and tones that represent digits for signaling. *Note 1:* Transmission may be via various media, such as wire, optical fibers, or radio. *Note 2:* Analog representations of sounds may be digitized,

transmitted, and, on reception, converted back to analog form. *Note 3:* "*Telephony*" originally entailed only the transmission of voice and voice-frequency data. Currently, it includes new services, such as the transmission of graphics information. **2.** A form of telecommunication set up for the transmission of speech or, in some cases, other sounds. [NTIA] [RR]

telephoto: Pertaining to pictures transmitted via a telecommunications system.

teleprinter: A teletypewriter that can only receive data and does not have a keyboard for transmission.

teleprocessing: The combining of telecommunications and computer operations interacting in the automatic processing, reception, and transmission of data and/or information. [JP1] *Note:* Teleprocessing includes human-machine interface equipment. (188)

teleseminar: *See* **teletraining**.

teleservice: *See* **telecommunications service.**

teletex: An international store-and-forward essentially error-free communications service that is defined by the CCITT, has a data signaling rate (DSR) of 2400 b/s over switched telephone networks, and has a communications protocol that supports the CCITT Group 4 facsimile service.

teletext: A type of one-way information service in which a subscriber can receive data on a video display. *Note:* The information is transmitted to the subscriber's video display over a common carrier channel. A proprietary video adapter unit is required for reception. *Contrast with* **viewdata.**

teletraining: Training that (a) in which usually live instruction is conveyed in real time via telecommunications facilities, (b) that may be accomplished on a point-to-point basis or on a point-to-multipoint basis, and (c) may assume many forms, such as a teleseminar, a teleconference, or an electronic classroom, usually including both audio and video. (188) *Synonyms* **distance learning, distance training, electronic classroom, virtual instruction.**

teletypewriter (TTY): A printing telegraph instrument that has a signal-actuated mechanism for automatically printing received messages. *Note 1:* A TTY may have a keyboard similar to that of a typewriter for sending messages. (188) *Note 2:* Radio circuits carrying TTY traffic are called "RTTY circuits" or "RATT circuits."

teletypewriter control unit (TCU): A device that controls and coordinates operations between teletypewriters and message switching centers. (188)

teletypewriter exchange service (TWX): A switched teletypewriter service in which suitably arranged teletypewriter stations are provided with lines to a central office for access to other such stations.

teletypewriter signal distortion: The shifting of signal pulse transitions from their proper positions relative to the beginning of the start pulse. *Note:* The magnitude of the distortion is expressed in percent of a perfect unit pulse length. (188) *Synonym* **start-stop TTY distortion.**

television (TV): A form of telecommunication for the transmission of transient images of fixed or moving objects. [NTIA] [RR] *Note 1:* The picture signal is usually accompanied by the sound signal. *Note 2:* In North America, TV signals are generated, transmitted, received, and displayed in accordance with the NTSC standard.

television broadcast translator: *See* **translator (def. #3)**.

Telex®: A communication service involving teletypewriters connected through automatic exchanges.

Telnet: The TCP/IP standard network virtual terminal protocol that is used for remote terminal connection service and that allows a user at one site to interact with systems at other sites as if that user terminal were directly connected to computers at those sites.

TEM: *Abbreviation for* **transverse electric and magnetic.**

TEMPEST: **1.** [A] Short name referring to investigation, study, and control of compromising

emanations from telecommunications and automated information systems equipment. [NIS] (188) **2.** To shield against compromising emanations.

temporal application: A video application requiring high temporal resolution, *i.e.*, reduced jerkiness, possibly at the expense of reduced spatial resolution. *Note:* An example of temporal applications is the ability to accurately discern moving image features such as facial expressions and lip movements.

temporal coherence: *See* **coherent**.

temporal edge noise: In a video display, that form of edge busyness that is characterized by time-varying sharpness at the edges of objects.

temporally coherent radiation: *See* **coherence time**.

terahertz (THz): A unit denoting one trillion (10^{12}) hertz. (188)

terminal: A device capable of sending, receiving, or sending and receiving information over a communications channel. (188)

Terminal Access Controller (TAC): A host computer that accepts terminal connections, usually from dial-up lines, and that allows the user to invoke Internet remote log-on procedures, such as Telnet.

terminal adapter: An interfacing device employed at the "R" reference point in an ISDN environment that allows connection of a non-ISDN terminal at the physical layer to communicate with an ISDN network. *Note:* Typically, a terminal adapter will support standard RJ-11 telephone connection plugs for voice and RS-232C, V.35 and RS-449 interfaces for data.

terminal endpoint (TE) functional group: A functional group that includes functions broadly belonging to Layer 1 and higher layers of the CCITT Recommendation X.200 Reference Model. (188) *Note 1:* The functions of a TE functional group are performed on various types of equipment, or combinations of equipment, such as digital telephones, data terminal equipment, and/or integrated work stations. *Note 2:* Examples of TE functions are protocol-handling, maintenance, interface, and connection functions.

terminal equipment: 1. Communications equipment at either end of a communications link, used to permit the stations involved to accomplish the mission for which the link was established. **2.** In radio-relay systems, equipment used at points where data are inserted or derived, as distinct from equipment used only to relay a reconstituted signal. **3.** Telephone and telegraph switchboards and other centrally located equipment at which communications circuits are terminated.

terminal impedance: 1. The impedance as measured at the unloaded output terminals of transmission equipment or a line that is otherwise in normal operating condition. (188) **2.** The ratio of voltage to current at the output terminals of a device, including the connected load.

terminal mobility: In commercial wireless networks, the ability of a terminal, while in motion, to access telecommunication services from different locations, and the capability of the network to identify and locate that terminal.

terminal mobility management: In personal communications service (PCS), (a) providing authentication of terminal information, (b) maintaining terminal location and capability information for each terminal, and (c) providing translation between terminal identification and location (routing address) for the completion of calls to terminals.

termination: 1. The load connected to a transmission line, circuit, or device. *Note:* For a uniform transmission line, if the termination impedance is equal to the characteristic impedance of the line, wave reflections from the end of the line will be avoided. [From Weik '89] **2.** In hollow metallic waveguides, the point at which energy propagating in the waveguide continues in a nonwaveguide propagation mode into a load. [From Weik '89] **3.** An impedance, often resistive, that is connected to a transmission line or piece of equipment as a dummy load, for test purposes.

terminus: A device used to terminate, position, and hold an optical fiber within a connector.

ternary signal: A signal that can assume, at any given instant, one of three significant conditions, such as power level, phase position, pulse duration, or frequency. *Note:* Examples of ternary signals are (a) a pulse that can have a positive, zero, or negative voltage value at any given instant, (b) a sine wave that can assume phases of 0°, 120°, or 240° relative to a clock pulse, and (c) a carrier wave that can assume any one of three different frequencies depending on three different modulation signal significant conditions.

terrestrial radiocommunication: Any radiocommunication other than space radiocommunication or radio astronomy. [NTIA] [RR]

terrestrial station: A station effecting terrestrial radiocommunication. In these *[Radio] Regulations*, unless otherwise stated, any station is a terrestrial station. [NTIA] [RR]

test and validation: Physical measurements taken (a) to verify conclusions obtained from mathematical modeling and analysis or (b) for the purpose of developing mathematical models. (188)

test antenna: An antenna of known performance characteristics used in determining transmission characteristics of equipment and associated propagation paths. (188)

test center: *See* **patch and test facility, technical control facility.**

test point: A point within a piece of equipment or an equipment string that provides access to signals for the purpose of fault isolation. (188)

test tone: A tone sent at a predetermined level and frequency through a transmission system for test purposes, such as for facilitating measurements and for aligning gains and losses in the system. (188)

text processing: *Synonym* **word processing.**

T4 (carrier): *See* **T-carrier.**

T5 (carrier): *See* **T-carrier.**

TG: *Abbreviation for* **telegraph.** *See* **telegraphy.**

TGM: *Abbreviation for* **trunk group multiplexer.**

THD: *Abbreviation for* **total harmonic distortion.**

thermal noise: The noise generated by thermal agitation of electrons in a conductor. The noise power, P, in watts, is given by $P = kT\Delta f$, where k is Boltzmann's constant in joules per kelvin, T is the conductor temperature in kelvins, and Δf is the bandwidth in hertz. (188) *Note 1:* Thermal noise power, per hertz, is equal throughout the frequency spectrum, depending only on k and T. *Note 2:* For the general case, the above definition may be held to apply to charge carriers in any type of conducting medium. *Synonym* **Johnson noise.**

thermal radiation: **1.** Electromagnetic radiations emitted from a heat or light source as a consequence of its temperature; it consists essentially of ultraviolet, visible, and infrared radiations. [JP1] **2.** The heat and light produced by a nuclear explosion. [JP1]

thermodynamic temperature: A measure, in kelvins (K), proportional to the thermal energy of a given body at equilibrium. *Note 1:* A temperature of 0 K is called "absolute zero," and coincides with the minimum molecular activity (*i.e.*, thermal energy) of matter. *Note 2:* Thermodynamic temperature was formerly called "absolute temperature." *Note 3:* In practice, the International Temperature Scale of 1990 (ITS-90) serves as the basis for high-accuracy temperature measurements in science and technology.

THF: *Abbreviation for* **tremendously high frequency.** *See* **electromagnetic spectrum.**

thin-film laser: A laser that is constructed by thin-film deposition techniques on a substrate for use as a light source, is usually used to drive thin-film optical waveguides, and may be used in integrated optical circuits.

thin-film optical modulator: A modulator that consists of multilayered films of material of different optical characteristics, is capable of modulating transmitted light by using electro-optic, electro-acoustic, or magneto-optic effects to obtain signal modulation, and may be used as a component in integrated optical circuits. [From Weik '89]

thin-film optical multiplexer: A multiplexer that consists of multilayered films of material of different optical characteristics, is capable of multiplexing transmitted light by using electro-optic, electro-acoustic, or magneto-optic effects to obtain signal multiplexing, and may be used as a component in integrated optical circuits. [From Weik '89]

thin-film optical switch: A switch that consists of multilayered films of material of different optical characteristics, that is capable of switching transmitted light by using electro-optic, electro-acoustic, or magneto-optic effects to obtain signal switching, and is usually used as a component in integrated optical circuits. *Note:* Thin-film optical switches may support only one propagation mode. [From Weik '89]

thin-film optical waveguide: A slab-dielectric waveguide that consists of multilayered films of material of different optical characteristics, is capable of guiding an optical signal, and may be used as a component in integrated optical circuits. [From Weik '89]

third-order intercept point: A point (a) that is an extrapolated convergence—not directly measurable—of intermodulation distortion products in the desired output and (b) that indicates how well a receiver performs in the presence of strong nearby signals. (188) *Note:* Determination of a third-order intercept point is accomplished by using two test frequencies that fall within the first intermediate frequency mixer passband. Usually, the test frequencies are about 20 to 30 kHz apart.

third window: Of silica-based optical fibers, the transmission window at approximately 1.55 µm. *Note:* The third window is the minimum-loss window in silica-based fibers. [After FAA]

threat: Capabilities, intentions, and attack methods of adversaries to exploit, or any circumstance or event with the potential to cause harm to, information or an information system. [NIS]

three-bit byte: *Synonym* **triplet.**

three-way calling: A switching system service feature that permits users to add a third party at a different number during a call, without the assistance of an attendant.

threshold: 1. The minimum value of a signal that can be detected by the system or sensor under consideration. (188) **2.** A value used to denote predetermined levels, such as those pertaining to volume of message storage, *i.e.*, in-transit storage or queue storage, used in a message switching center. (188) **3.** The minimum value of the parameter used to activate a device. (188) **4.** The minimum value a stimulus may have to create a desired effect.

threshold current: In a laser, the driving current corresponding to lasing threshold.

threshold extension: *See* **FM threshold extension.**

threshold frequency: In optoelectronics, the frequency of incident radiant energy below which there is no photoemissive effect. (188)

through group: A group of 12 voice-frequency channels transmitted as a unit through a carrier system. (188)

through-group equipment: In carrier telephone transmission, equipment that accepts the signal from a group receiver output and attenuates it to the proper signal level for insertion, without frequency translation, at the input of a group transmitter. (188)

throughput: 1. The number of bits, characters, or blocks passing through a data communication system, or portion of that system. *Note 1:* Throughput may vary greatly from its theoretical maximum. (188) *Note 2:* Throughput is expressed in data units per period of time; *e.g.*, in the DDN, as blocks per second. **2.** The maximum capacity of a communications channel or system. **3.** A measure of the amount of work performed by a system over a period of time, *e.g.*, the number of jobs per day.

through supergroup: An aggregate of 60 voice-frequency channels, *i.e.*, five groups, transmitted as a unit through a carrier system. (188)

through-supergroup equipment: In carrier telephone transmission, equipment that accepts the multiplexed signal from a supergroup receiver output, amplifies it

without frequency translation, and provides the proper signal level to the input of a supergroup transmitter equipment. (188)

THz: *Abbreviation for* **terahertz.** *See* **International System of Units**.

TIA: *Abbreviation for* **Telecommunications Industry Association.** *See* **EIA interface.**

ticketed call: A call for which a record is made of certain facts concerning the call, such as the time it was placed, the duration, the call originator, call destination numbers, and, where applicable, the attendant's name or initials. [From Weik '89]

TIE: *Acronym for* **time interval error.**

tie line: *See* **tie trunk.**

tie trunk: A telephone line that directly connects two private branch exchanges (PBXs).

TIFF: *Acronym for* **tagged image file format.**

tight buffer: *See* **buffer.**

tiling: *See* **block distortion.**

time: 1. An epoch, *i.e.,* the designation of an instant on a selected time scale, astronomical or atomic. It is used in the sense of time of day [JP1] (188) **2.** On a time scale, the interval between two events, or the duration of an event. (188) **3.** An apparently irreversible continuum of ordered events.

time ambiguity: A situation in which more than one different time or time measurement can be obtained under the stated conditions.

time-assignment speech interpolation (TASI): An analog technique used on certain long transmission links to increase voice-transmission capacity. *Note:* TASI works by switching additional users onto any channel temporarily idled because an original user has stopped speaking. When the original user resumes speaking, that user will, in turn, be switched to any channel that happens to be idle. (188)

time availability: *Synonym* **circuit reliability.**

time block: An arbitrary grouping of several consecutive hours of a day, usually for a particular season, during which it is assumed that propagation data are statistically homogeneous. (188)

time code: A code used for the transmission and identification of time signals. (188) *Note:* In telecommunications systems, the format of the time code must be specified.

time code ambiguity: The shortest interval between successive repetitions of the same time code value. *Note:* For example, in a time code in which year-of-century is the most slowly changing field, the time code ambiguity would be 100 years; for a digital clock in which hours and minutes up to a maximum of 11:59 are displayed, the time code ambiguity would be 12 hours.

time code resolution: The interval between two successive time code states. *Note:* Time code resolution is determined by the most rapidly changing symbol position within the time code. For example, for a digital clock that displays hours and minutes, the time code resolution would be 1 minute.

time constant: The interval required for a system or circuit to change a specified fraction from one state or condition to another. *Note 1:* The time constant is used in the expression

$$A(t) = A(0)\,e^{-\frac{t}{a}} ,$$

where $A(t)$ is the value of the state at time t, $A(0)$ is the value of the state at time $t = 0$, a is the time constant, and t is the time that has elapsed from the start of the exponential decay. *Note 2:* When $t = a$, $A(t)/A(0) = 1/e$, or approximately 0.37, and the system has changed about 63% toward its new value in one time constant. A system is considered to have changed its state after the elapse of three time constants, which corresponds to a 95% change in state. For example, if an electrical capacitor, having a capacitance of C farads, is discharged through a resistor, having a resistance of R ohms, the capacitor will be approximately 95% discharged after the elapse of $3RC$ seconds. *Note 3:* Time constants are expressed in seconds, such as 3.5×10^{-6} seconds, *i.e.,* 3.5 µs. [From Weik '89]

time-delay distortion: *Synonym* **delay distortion.**

time-derived channel: *See* **time-division multiplexing.**

time diversity: Transmission in which signals representing the same information are sent over the same channel at different times. (188) *Note:* Time diversity is often used over systems subject to burst error conditions, and at intervals adjusted to be longer than an error burst.

time division: *See* **time-division multiplexing.**

time-division multiple access (TDMA): A communications technique that uses a common channel (multipoint or broadcast) for communications among multiple users by allocating unique time slots to different users. (188) *Note:* TDMA is used extensively in satellite systems, local area networks, physical security systems, and combat-net radio systems.

time-division multiplexing (TDM): Digital multiplexing in which two or more apparently simultaneous channels are derived from a given frequency spectrum, *i.e.*, bit stream, by interleaving pulses representing bits from different channels. (188) *Note:* Successive pulses represent bits from successive channels, *e.g.*, voice channels in a T1 system.

time-division switching: Switching of time-division multiplexed (TDM) channels by shifting bits between time slots in a TDM frame. (188)

time-domain reflectometer (TDR): An electronic instrument used to characterize and locate faults in metallic cables (*e.g.*, twisted pair, coax). *Note 1:* A TDR transmits a fast rise time pulse along the conductor. The resulting reflected pulse is measured at the input as a function of time and displayed on the instrument or plotted, as a function of cable length. *Note 2:* A TDR may be used to verify cable impedance characteristics, splice and connector location and associated losses, and estimate cable lengths.

time-gated direct-sequence spread spectrum: Direct-sequence spread spectrum where the transmitter is on only for a short fraction of a time interval. The on-time can be periodic or random within a time interval. [NTIA]

time guard band: A time interval left vacant on a channel to provide a margin of safety against intersymbol interference in the time domain between sequential operations, such as detection, integration, differentiation, transmission, encoding, decoding, or switching. (188)

time instability: The fluctuation of the time interval error caused by the instability of a real clock.

time interval error (TIE): The time difference between a real clock and an ideal uniform time scale, after a time interval following perfect synchronization between the clock and the scale.

time jitter: Short-term variation or instability in the duration of a specified time interval. (188)

timeliness: *See* **responsiveness.**

time marker: A reference signal, often repeated periodically, enabling the correlation of specific events with a time scale, such as for establishing synchronization.

time of occurrence: The date of an event, *i.e.*, the instant an event occurs, with reference to a specified time scale. (188)

time-out: **1.** A network parameter related to an enforced event designed to occur at the conclusion of a predetermined elapsed time. (188) **2**. A specified period of time that will be allowed to elapse in a system before a specified event is to take place, unless another specified event occurs first; in either case, the period is terminated when either event takes place. (188) *Note:* A time-out condition can be canceled by the receipt of an appropriate time-out cancellation signal. **3.** An event that occurs at the end of a predetermined period of time that began at the occurrence of another specified event. The time-out can be prevented by an appropriate signal.

time scale: **1.** A time measuring system defined to relate the passage of temporal events since a selected epoch. (188) *Note:* The internationally recognized time interval is the second. Time scales are graduated

in intervals such as seconds, minutes, hours, days, and years, and in fractions of a second, such as milliseconds, nanoseconds, and picoseconds. **2.** Time coordinates placed on the abscissa (x-axis) of Cartesian-coordinate graphs used for depicting waveforms and similar phenomena.

time scale factor: A multiplier used to transform the real time of occurrence of an event or a problem into system time, such as that of a telecommunications system or a computer.

time-sharing: 1. The interleaving of two or more independent processes on one functional unit. (188) **2.** Pertaining to the interleaved use of computer time that enables two or more users to execute programs concurrently.

time slot: 1. Period of time during which certain activities are governed by specific regulations. [JP1] **2.** A time interval that can be recognized and uniquely defined. (188)

time standard: A stable device that emits signals at equal intervals such that their count may be used as a clock.

time tick: A time mark output of a clock system.

timing extraction: *Synonym* **timing recovery.**

timing recovery: The derivation of a timing signal from a received signal. (188) *Synonym* **timing extraction.**

timing signal: 1. The output of a clock. (188) **2.** A signal used to synchronize interconnected equipment. (188)

timing tracking accuracy: A measure of the ability of a timing synchronization system to minimize the clock difference between a master clock and any slaved clock.

T-interface: For basic rate access in an Integrated Services Digital Network (ISDN) environment, a user-to-network interface reference point that (a) is characterized by a four-wire, 144-kb/s (2B+D) user rate, (b) accommodates the link access and transport layer function in the ISDN architecture, (c) is located at the user premises, (d) is distance sensitive to the servicing network terminating equipment, and (e) functions in a manner analogous to that of the Channel Service Units (CSUs) and the Data Service Units (DSUs).

T junction: *See* **series T junction.**

TLM: *Abbreviation for* **telemetry.**

TLP: *Abbreviation for* **transmission level point**.

TM: *Abbreviation for* **transverse magnetic.** *See* **transverse magnetic mode.**

TOD: *Abbreviation for* **time of day.** *See* **time of occurrence.**

token: In certain local-area-network protocols, a group of bits that serves as a symbol of authority, is passed among data stations, and is used to indicate the station that is temporarily in control of the transmission medium.

token-bus network: A bus network in which a token passing procedure is used.

token passing: A network access procedure in which a token passes from station to station and the only station allowed to transmit information is the station with the token.

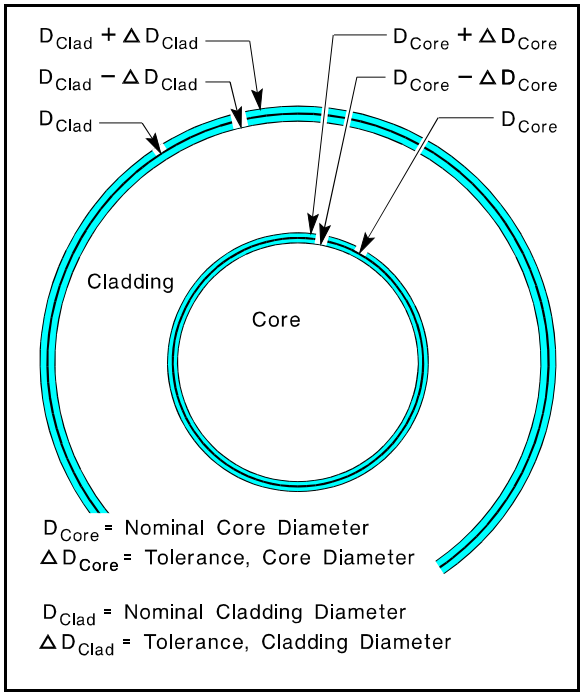
token ring adapter: A network interface card (NIC) designed to attach a client workstation to a token ring computer network and operate as a token-passing interface.

token-ring network: *See* **network topology.**

tolerance: The permissible range of variation of some characteristic from its nominal value.

tolerance field: 1. The region between two curves, such as circles or rectangles, used to specify the tolerance on component size and geometry. **2.** Pertaining to the cross section of an optical fiber, when used to specify the respective diameters and ovalities of, and concentricity error between, the core and cladding; two concentric annular regions which define the core-cladding boundary and the cladding outer boundary. *Note:* Dimensions are usually

expressed in micrometers (µm). The larger annular region is defined by concentric circles of diameter $[D_C+\Delta D_C]$ and $[D_C - \Delta D_C]$, where D_C is the nominal diameter of the cladding and ΔD_C is the cladding diameter tolerance. The smaller annular region is defined by concentric circles of diameter $[D_c+\Delta D_c]$ and $[D_c - \Delta D_c]$, where D_c is the nominal diameter of the core and ΔD_c is the core diameter tolerance. When the core and cladding boundaries of the cross section of the fiber in question fall entirely within their respective defined areas, the fiber meets the specification. [After FAA] **3**. Of the cross section of a given optical fiber, when used to characterize the respective diameters and ovalities of the core and cladding, and the concentricity error between the core and cladding; two such pairs of concentric circles, the concentric pairs not necessarily being concentric with one another. *Note 1:* One pair of concentric circles characterizes the core, and the other pair, the cladding. The cladding *ovality* is characterized by the smallest circle that circumscribes its cross section, and the largest circle that fits within its cross section. (The cross section is assumed, to a first approximation, to be elliptical in shape, so these defining circles will be concentric.) The core cross section is characterized by an analogous pair of circles, also concentric with one another, but not necessarily with those defining the cladding cross section. *Note 2:* The distance between the centers of the two concentric pairs (core pair and cladding pair) defines the offset between the core and cladding (the *"core-cladding offset,"* also called the *"concentricity error"*). The width of the annulus defined by the cladding circles determines the ovality of the cladding, and the width of the annulus defined by the core determines the ovality of the core. [After FAA]



tolerance field

toll call: *See* **long-distance call.**

toll diversion: A system service feature by which users are denied the ability to place toll calls without the assistance of an attendant.

toll office: A central office used primarily for supervising and switching toll traffic.

toll quality: The voice quality resulting from the use of a nominal 4-kHz telephone channel. (188) *Note:* Toll quality may be quantized in terms of a specified bit error ratio.

toll restriction: *See* **classmark.**

toll switching trunk: A trunk connecting one or more end offices to a toll center as the first stage of concentration for intertoll traffic. (188) *Note:* Operator assistance or participation may be an optional function. In U.S. common carrier telephony service, a toll center designated *"Class 4C"* is an office where assistance in completing incoming calls is provided in addition to other traffic; a toll center designated *"Class 4P"* is an office where operators

handle only outbound calls, or where switching is performed without operator assistance.

T1 (carrier): *See* **T-carrier.**

T1C (carrier): *See* **T-carrier.**

T2 (carrier): *See* **T-carrier.**

T3 (carrier): *See* **T-carrier.**

T4 (carrier): *See* **T-carrier.**

T5 (carrier): *See* **T-carrier.**

tone diversity: In a voice frequency telegraph (VFTG) transmission system, the use of two channels to carry the same information. (188) *Note:* Tone diversity is usually achieved by twinning the channels of a 16-channel VFTG to obtain 8 channels with dual diversity.

tone signaling: *See* **dual-tone multifrequency signaling.**

tool: *Synonym* **utility program.**

topography: The specification and arrangement in physical locations of actual communication and information system components which implement the topology. [NATO]

topology: *See* **network topology.**

torn-tape relay: An antiquated tape relay system in which the perforated tape is manually transferred by an operator to the appropriate outgoing transmitter. (188)

total channel noise: The sum of random noise, intermodulation noise, and crosstalk. (188) *Note:* Total channel noise does not include impulse noise because different techniques are required for its measurement.

total harmonic distortion (THD): Of a signal, the ratio of (a) the sum of the powers of all harmonic frequencies above the fundamental frequency to (b) the power of the fundamental frequency. *Note 1:* The THD is usually expressed in dB. *Note 2:* Measurements for calculating the THD are made at the output of a device under specified conditions. (188)

total internal reflection: The reflection that occurs when light, in a higher refractive-index medium, strikes an interface, with a medium with a lower refractive index, at an angle of incidence (with respect to the normal) greater than the critical angle. (188) *See* **Snell's law** (Note 3).

total line length: In facsimile, the spot speed divided by the scanning line frequency. *Note:* The total line length may be greater than the length of the available line.

touch panel: *See* **touch-sensitive.**

touch screen: *See* **touch-sensitive.**

touch-sensitive: Pertaining to a device that allows a user to interact with a computer system by touching an area on the surface of the device with a finger, pencil, or other object; for example, a touch-sensitive keypad or screen.

trace packet: In a packet-switching network, a unique packet that causes a report of each stage of its progress to be sent to the network control center from each visited system element.

trace program: A computer program that performs a check on another computer program by exhibiting the sequence in which the instructions are executed and usually the results of executing the instructions.

track: On a data medium, a path associated with a single read/write head position as data move past the head.

trackball: A ball that can be rotated about its center and that is used as an input device, *e.g.*, to position a cursor. *Synonym* **control ball.**

track density: The number of tracks per unit length, measured in a direction perpendicular to the direction in which the tracks are read.

tracking error: The deviation of a dependent variable with respect to a reference function.

tracking mode: An operational mode during which a system is operating within specified movement limits relative to a reference. (188)

tracking phase: *See* **tracking mode.**

traffic: **1.** The information moved over a communication channel. (188) **2.** A quantitative measurement of the total messages and their length, expressed in CCS or other units, during a specified period of time. (188)

traffic analysis: **1.** In a communications system, the analysis of traffic rates, volumes, densities, capacities, and patterns specifically for system performance improvement. [From Weik '89] **2.** [The] study of communications characteristics external to the text. [NIS] **3.** The analysis of the communications-electronic environment for use in the design, development, and operation of new communications systems. [From Weik '89]

traffic capacity: The maximum traffic per unit of time that a given telecommunications system, subsystem, or device can carry under specified conditions. (188)

traffic encryption key (TEK): [A] key used to encrypt plain text or to superencrypt previously encrypted text and/or to decrypt cipher text. [NIS]

traffic engineering: The determination of the numbers and kinds of circuits and quantities of related terminating and switching equipment required to meet anticipated traffic loads throughout a communications system. (188)

traffic-flow security: **1.** The protection resulting from features, inherent in some cryptoequipment, that conceal the presence of valid messages on a communications circuit; normally achieved by causing the circuit to appear busy at all times. [After JP1] **2.** Measures used to conceal the presence of valid messages in an on-line cryptosystem or secure communications system. *Note:* Encryption of sending and receiving addresses and causing the circuit to appear busy at all times by sending dummy traffic are two methods of traffic-flow security. A more common method is to send a continuous encrypted signal, whether or not traffic is being transmitted.

traffic intensity: A measure of the average occupancy of a facility during a specified period of time, normally a busy hour, measured in traffic units (erlangs) and defined as the ratio of the time during which a facility is occupied (continuously or cumulatively) to the time this facility is available for occupancy. (188) *Note:* A traffic intensity of one traffic unit (one erlang) means continuous occupancy of a facility during the time period under consideration, regardless of whether or not information is transmitted. *Synonym* **call intensity.**

traffic load: The total traffic carried by a trunk or trunk group during a specified time interval. (188)

traffic monitor: In a communications network, a service feature that provides basic data on the amount and type of traffic handled by the network. (188)

traffic overflow: **1.** That condition wherein the traffic offered to a portion of a communication system exceeds its capacity and the excess may be blocked or may be provided with alternate routing. (188) **2.** The excess traffic itself. (188)

traffic register: *See* **register.**

traffic service position system (TSPS): A stored program electronic system associated with one or more toll switching systems which provides centralized traffic service position functions for several local offices at one location. [47CFR part 67, Appendix.]

traffic unit: *Synonym* **erlang.**

traffic usage recorder: A device for measuring and recording the amount of telephone traffic carried by a group, or several groups, of switches or trunks. (188)

transceiver: **1.** A device that performs, within one chassis, both transmitting and receiving functions. **2.** In military communications, the combination of transmitting and receiving equipment that (a) is in a common housing, (b) usually is designed for portable or mobile use, (c) uses common circuit components for both transmitting and receiving, and (d) provides half-duplex operation. (188)

transcoding: The direct digital-to-digital conversion from one encoding scheme, such as voice LPC-10, to a different encoding scheme without returning the signals to analog form. (188) *Note:* The transcoded signals, *i.e.*, the digital representations of analog signals may be any digital representation of any analog signal, such as voice, facsimile, or quasi-analog signals.

transducer: A device for converting energy from one form to another for the purpose of measurement of a physical quantity or for information transfer.

TRANSEC: *Abbreviation for* **transmission security.** *See* **communications security.**

transfer: To send information from one location and to receive it at another.

transfer characteristics: Those intrinsic parameters of a system, subsystem, or equipment which, when applied to the input of the system, subsystem, or equipment, will fully describe its output.

transfer function: 1. A mathematical statement that describes the transfer characteristics of a system, subsystem, or equipment. **2.** The relationship between the input and the output of a system, subsystem, or equipment in terms of the transfer characteristics. *Note 1:* When the transfer function operates on the input, the output is obtained. Given any two of these three entities, the third can be obtained. *Note 2:* Examples of simple transfer functions are voltage gains, reflection coefficients, transmission coefficients, and efficiency ratios. An example of a complex transfer function is envelope delay distortion. *Note 3:* For a negative feedback circuit, the transfer function, *T*, is given by

$$T = \frac{e_0}{e_i} = \frac{G}{1 + GH} \quad ,$$

where e_o is the output, e_i is the input, G is the forward gain, and H is the backward gain, *i.e.*, the fraction of the output that is fed back and combined with the input in a subtracter. **3**. Of an optical fiber, the complex mathematical function that expresses the ratio of the variation, as a function of modulation frequency, of the instantaneous power of the optical signal at the output of the fiber, to the instantaneous power of the optical signal that is launched into the fiber. *Note:* The optical detectors used in communication applications are square-law devices. Their output current is proportional to the input optical power. Because electrical power is proportional to current, when the optical power input drops by one-half (3 dB), the electrical power at the output of the detector drops by three-quarters (6 dB). [FAA]

transfer mode: In an integrated services digital network, (ISDN), a method of transmitting, multiplexing, and switching.

transfer rate: *See* **data transfer rate.**

transient: *See* **dynamic variation.**

transit delay: Between two given points in an integrated services digital network (ISDN), the time between the moment that the first bit of a data unit, such as a frame or block, passes the first given point and the moment that bit passes the second given point, plus the transmission time of the data unit.

transition: In a signal, the changing from one significant condition to another. *Note:* Examples of transitions are the changing from one voltage level to another in a data stream, the shifting from one phase position to another in phase-shift keying, and the translation from one frequency to another in frequency-shift keying. [From Weik '89]

transition frequency: The frequency associated with the difference between two discrete energy levels in an atomic system, given by

$$f_{2,1} = \frac{E_2 - E_1}{\hbar} \quad ,$$

where $f_{2,1}$ is the frequency associated with the difference between two energy levels, E_2 and E_1 ($E_2 > E_1$), and $\hbar$ is Planck's constant. *Note:* If a transition from E_2 to E_1 occurs, a photon with frequency $f_{2,1}$ is likely to be emitted. If the atomic system is at energy level E_1, and a photon of frequency $f_{2,1}$ is absorbed, the energy level will be raised to E_2. [From Weik '89]

transition zone: *Synonym* **intermediate-field region.**

transit network identification: A network service feature that specifies the sequence of networks used to establish or partially establish a virtual circuit.

transit time: *Synonym* **phase delay.**

translating program: *Synonym* **translator (def. #2).**

translator: 1. A device that converts information from one system of representation into equivalent information in another system of representation. (188) *Note:* An example of a translator in telephony is the device that converts dialed digits into call-routing information. **2.** A computer program that translates from one language into another language and in particular from one programming language into another programming language. *Synonym* **translating program. 3.** In FM and TV broadcasting, a repeater station that receives a primary station's signal, amplifies it, shifts it in frequency, and rebroadcasts it. **4.** A device that converts one frequency to another.

transliterate: To convert the characters of one alphabet to the corresponding characters of another alphabet.

transmission: 1. The dispatching, for reception elsewhere, of a signal, message, or other form of information. **2.** The propagation of a signal, message, or other form of information by any means, such as by telegraph, telephone, radio, television, or facsimile via any medium, such as wire, coaxial cable, microwave, optical fiber, or radio frequency. (188) **3.** In communications systems, a series of data units, such as blocks, messages, or frames. **4.** The transfer of electrical power from one location to another via conductors. (188)

transmission block: 1. A group of bits or characters transmitted as a unit and usually containing an encoding procedure for error control purposes. **2.** In data transmission, a group of records sent, processed, or recorded as a unit. *Note:* A transmission block is usually terminated by an end-of-block character (EOB), end-of-transmission-block character (ETB), or end-of-text character (EOT or ETX).

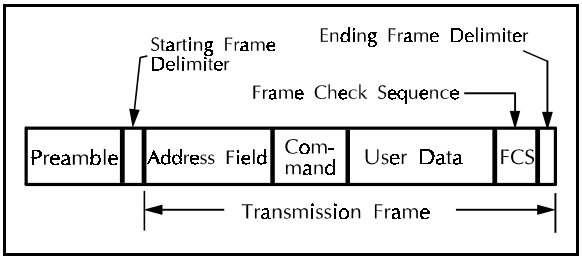
transmission channel: *See* **channel.**

transmission coefficient: 1. The ratio of the transmitted field strength to the incident field strength of an electromagnetic wave when it is incident upon an interface surface between media with two different refractive indices. **2.** In a transmission line, the ratio of the amplitude of the complex transmitted wave to that of the incident wave at a discontinuity in the line. **3.** The probability that a portion of a communications system, such as a line, circuit, channel or trunk, will meet specified performance criteria. *Note:* The value of the transmission coefficient is inversely related to the quality of the line, circuit, channel or trunk. (188)

transmission control character: *See* **control character.**

transmission control protocol: A network protocol that controls host-to-host transmissions over packet-switched communication networks.

transmission frame: A data structure, beginning and ending with delimiters, that consists of fields predetermined by a protocol for the transmission of user data and control data.



transmission frame

transmission level: At a specified point in a telecommunications system, the power that is measured when a standard test signal, *e.g.,* 0 dBm or –16 dBm at 1000 Hz, is transmitted from a corresponding reference point. (188) *Note:* The transmission level is usually expressed in dBm.

transmission level point (TLP): In a telecommunications system, a test point, *i.e.*, a point where a signal may be inserted or measured, and for which the nominal power of a test signal is specified. (188) *Note 1:* In practice, the abbreviation, TLP, is usually used, and it is modified by the nominal level for the point in question. For example, where the nominal level is 0 dBm, the expression 0 dBm TLP, or simply, 0TLP, is used. Where the nominal level is

–16 dBm, the expression –16 dBm TLP, or –16TLP, is used. *Note 2:* The nominal transmission level at a specified TLP is a function of system design and is an expression of the design gain or loss. *Note 3:* Voice-channel transmission levels, *i.e.*, TLPs, are usually specified for a frequency of approximately 1000 Hz. *Note 4:* The TLP at a point at which an end instrument, *e.g.*, a telephone set, is connected is usually specified as 0 dBm.

transmission line: The material medium or structure that forms all or part of a path from one place to another for directing the transmission of energy, such as electric currents, magnetic fields, acoustic waves, or electromagnetic waves. *Note:* Examples of transmission lines include wires, optical fibers, coaxial cables, rectangular closed waveguides, and dielectric slabs.

transmission loss: The decrease in power that occurs during transmission from one point to another. *Note:* Transmission loss is usually expressed in dB. (188)

transmission medium: Any material substance, such as fiber-optic cable, twisted-wire pair, coaxial cable, dielectric-slab waveguide, water, and air, that can be used for the propagation of signals, usually in the form of modulated radio, light, or acoustic waves, from one point to another. *Note:* By extension, free space can also be considered a transmission medium for electromagnetic waves, although it is not a material medium.

transmission security: *See* **communications security.**

transmission security key (TSK): [A] key that is used in the control of transmission security processes, such as frequency hopping and spread spectrum. [NIS]

transmission service channel: In video systems, the one-way transmission path between two designated points.

transmission system: Part of a communication system organized to accomplish the transfer of information from one point to one or more other points by means of signals. *Note:* Examples of NATO-owned transmission systems are SATCOM, ACE HIGH and CIP-67. [NATO]

transmission time: In facsimile, the interval between the start of picture signals and the detection of the end-of-message signal by the receiver for a single document.

transmission window: *Synonym* **spectral window.** *See* **window.**

transmissivity: *Obsolete. See* **transmittance.**

transmit-after-receive time delay: The time interval from removal of rf energy at the local receiver input until the local transmitter is automatically keyed on and the transmitted rf signal amplitude has increased to 90% of its steady-state value. (188) *An Exception:* High-frequency (HF) transceiver equipment is normally not designed with an interlock between receiver squelch and transmitter on-off key. The transmitter can be keyed on at any time, independent of whether or not a signal is being received at the receiver input.

transmit flow control: In data communications systems, control of the rate at which data are transmitted from a terminal so that the data can be received by another terminal. *Note 1:* Transmit flow control may occur between data terminal equipment (DTE) and a switching center, via data circuit-terminating equipment (DCE), or between two DTEs. The transmission rate may be controlled because of network or DTE requirements. *Note 2:* Transmit flow control can occur independently in the two directions of data transfer, thus permitting the transfer rates in one direction to be different from the transfer rates in the other direction.

transmittance: The ratio of the transmitted power to the incident power. (188) *Note 1:* In optics, transmittance is usually expressed as optical density or in percent. *Note 2:* Transmittance was formerly called "*transmission.*"

transmitter attack-time delay: The interval from the instant a transmitter is keyed-on to the instant the transmitted radio frequency (rf) signal amplitude has increased to a specified level, usually 90% of its key-on steady-state value. *Note:* The transmitter attack-time delay excludes the time required for automatic antenna tuning. (188)

transmitter central wavelength range (λ_{tmax} - λ_{tmin}): In optical communication, the total allowed range of transmitter central wavelengths caused by the combined worst-case variations due to manufacturing, temperature, aging, and any other significant factors.

transmitter power output rating: The power output of a radio transmitter under stated conditions of operation and measurement. (188) *Note:* Power output ratings may be made against a number of criteria, *e.g.*, peak envelope power, peak power, mean power, carrier power, noise power, or stated intermodulation level.

transmitter release-time delay: The interval from the instant a transmitter is keyed-off to the instant the transmitted radio frequency (rf) signal amplitude has decreased to a specified level, usually 10% of its key-on steady-state value. (188)

transmultiplexer: Equipment that transforms signals derived from frequency-division multiplex equipment, such as group or supergroups, to time-division-multiplexed signals having the same structure as those derived from PCM multiplex equipment, such as primary or secondary PCM multiplex signals, and vice versa. (188)

transparency: 1. The property of an entity that allows another entity to pass thorough it without altering either of the entities. **2.** In telecommunications, the property that allows a transmission system or channel to accept, at its input, unmodified user information, and deliver corresponding user information at its output, unchanged in form or information content. *Note:* The user information may be changed internally within the transmission system, but it is restored to its original form prior to the output without the involvement of the user. (188) **3.** The quality of a data communications system or device that uses a bit-oriented link protocol that does not depend on the bit sequence structure used by the data source. **4.** An image fixed on a clear base by means of a photographic printing, chemical, or other process, especially adaptable for viewing by transmitted light. [JP1]

transparent interface: An interface that allows the connection and operation of a system, subsystem, or equipment with another without modification of system characteristics or operational procedures on either side of the interface. (188)

transparent network: *See* **transparency (def. #2)**.

transponder: 1. An automatic device that receives, amplifies, and retransmits a signal on a different frequency. (188) **2.** An automatic device that transmits a predetermined message in response to a predefined received signal. (188) *Note:* An example of transponders is in identification-friend-or-foe systems and air-traffic-control secondary radar (beacon radar) systems. **3.** A receiver-transmitter that will generate a reply signal upon proper interrogation. [JP1]

transportability: 1. In communications, the quality of equipment, devices, systems, and associated hardware that permits their being moved from one location to another to interconnect with locally available complementary equipment, devices, systems, associated hardware, or other complementary facilities. *Note:* Transportability implies the use of standardized components, such as standardized plugs and transmission media. **2.** The capability of material to be moved by towing, self-propulsion, or carrier via any means, such as railways, highways, waterways, pipelines, oceans, and airways. [JP1]

transportable station: A station which is transferred to various fixed locations but is not intended to be used while in motion. [NTIA]

Transport Layer: *See* **Open Systems Interconnection—Reference Model.**

transposition: 1. In data transmission, a transmission defect in which, during one character period, one or more signal elements are changed from one significant condition to the other, and an equal number of elements are changed in the opposite sense. (188) **2.** In outside plant construction, an interchange of spatial positions of the several conductors of a cable between successive concatenated sections. *Note:* Transposition is usually used to minimize inductive coupling and thus reduce interference in communications circuits. (188)

transverse electric and magnetic (TEM) mode: A mode whose electric and magnetic field vectors are

both normal to the direction of propagation. *Note:* The TEM mode is the most useful mode in a coaxial cable.

transverse electric (TE) mode: A mode whose electric field vector is normal to the direction of propagation. *Note:* TE modes may be useful modes in waveguides. In an optical fiber, TE and TM modes correspond to meridional rays.

transverse magnetic (TM) mode: A mode whose magnetic field vector is normal to the direction of propagation. *Note:* TM modes may be useful in waveguides. In an optical fiber, TE and TM modes correspond to meridional rays.

transverse offset loss: *Synonym* **lateral offset loss.**

transverse parity check: A parity check performed on a group of binary digits recorded on parallel tracks of a data medium, such as a magnetic disk, tape, drum, or card. [From Weik '89]

transverse redundancy check (TRC): In synchronized parallel bit streams, a redundancy check (a) that is based on the formation of a block check following preset rules, (b) in which the check-formation rule applied to blocks is also applied to characters, and (c) in which the check is made on parallel bit patterns. (188) *Note 1:* When the TRC is based on a parity bit applied to each character and block, the TRC can only detect, with limited certainty, whether or not there is an error. It cannot correct the error. Detection cannot be guaranteed because an even number of errors in the same character or block will escape detection, regardless of whether odd or even parity is used. *Note 2:* Two-dimensional arrays of bits may be used to represent characters or blocks in synchronized parallel data streams. When TRC is combined with longitudinal redundancy checking (LRC), individual erroneous bits can be corrected. *Synonym* **vertical redundancy check.**

transverse resolution: In a facsimile receiver, the dimension that (a) is perpendicular to a scanning line and (b) is the smallest recognizable detail of the image produced by the shortest signal capable of actuating the facsimile receiver under specified conditions. [From Weik '89]

trapped electromagnetic wave: An electromagnetic wave that enters a layer of material that is surrounded on both sides by a layer of material of a lesser refractive index such that, if the wave is traveling parallel or nearly parallel to the surfaces of the layers and hence the incident angles with the surfaces are greater than the critical angle, *i.e.*, the angles are grazing with the surface, total internal reflection will occur on both sides and hence trap the wave. *Note:* Dielectric slabs, optical fibers, and layers of air can serve as an electromagnetic wave trap, thus confining the wave to a given direction of propagation and to a given point. [From Weik '89]

trapped mode: *Synonym* **bound mode.**

trapped ray: *Synonym* **guided ray.**

traveling wave: A wave that (a) propagates in a transmission medium, (b) has a velocity determined by the launching conditions and the physical properties of the medium, and (c) may be a longitudinal or transverse wave. *Note 1:* For the purposes of this definition, free space may be considered a medium, although it is not a physical medium. *Note 2:* A traveling wave is not a wave that is reduced to a standing wave by reflections from a distant boundary. *Note 3:* Examples of traveling waves are radio waves propagating in free space, lightwaves propagating in optical fibers, water waves on the surface of the ocean, and seismic waves. [From Weik '89]

tree network: *See* **network topology.**

tree search: In a tree structure, a search in which it is possible to decide, at each step, which part of the tree may be rejected without a further search.

tree structure: A hierarchical organization in which a given node is considered to be an ancestor of all the lower level nodes to which the given node is connected. *Note 1:* The root node, *i.e.*, the base node, is an ancestor of all the other nodes. *Note 2:* In a tree structure there is one and only one path from any point to any other point.

tree topology: *See* **network topology.**

T reference point: In Integrated Services Digital Networks (ISDN), the conceptual point dividing NT2

and NT1 functional groupings in a particular ISDN arrangement. (188)

tremendously high frequency (THF): Frequencies from 300 GHz to 3000 GHz. (188)

tributary office: A local office, located outside the exchange in which a toll center is located, that has a different rate center from its toll center. [After 47CFR]

tributary station: 1. In a data network, a station other than the control station. **2.** On a multipoint connection or a point-to-point connection using basic mode link control, any data station other than the control station.

trim effect: In a crystal oscillator, the degradation of frequency-vs.-temperature stability, and marked frequency offset, resulting from frequency adjustment which produces a rotation or distortion, or both, of the inherent frequency-vs.-temperature characteristic.

triple precision: Characterized by the use of three computer words to represent a number in accordance with required precision.

triplet: A byte composed of three bits. *Synonym* **three-bit byte.**

TRI-TAC: *Acronym for* **tri-services tactical.** *See* **tactical communications.**

TRI-TAC equipment: Equipment that (a) accommodates the transition from current manual and analog systems to fully automated digital systems and (b) provides for message switching, voice communications circuit switching, and the use of secure voice terminals, digital facsimile systems, and user digital voice terminals.

troposcatter: *Synonym* **tropospheric scatter.**

troposphere: 1. The lower layers of atmosphere, in which the change of temperature with height is relatively large. It is the region where clouds form, convection is active, and mixing is continuous and more or less complete. [JP1] **2.** The layer of the Earth's atmosphere, between the surface and the stratosphere, in which temperature decreases with altitude and which contains approximately 80% of the total air mass. (188) *Note:* The thickness of the troposphere varies with season and latitude. It is usually 16 km to 18 km thick over tropical regions, and less than 10 km thick over the poles.

tropospheric duct: *See* **atmospheric duct.**

tropospheric scatter: 1. The propagation of radio waves by scattering as a result of irregularities or discontinuities in the physical properties of the troposphere. [NTIA] [RR] [JP1] **2.** A method of transhorizon communications using frequencies from approximately 350 MHz to approximately 8400 MHz. (188) *Note:* The propagation mechanism is still not fully understood, though it includes several distinguishable but changeable mechanisms such as propagation by means of random reflections and scattering from irregularities in the dielectric gradient density of the troposphere, smooth-Earth diffraction, and diffraction over isolated obstacles (knife-edge diffraction). *Synonym* **troposcatter.**

tropospheric wave: A radio wave that is propagated by reflection from a place of abrupt change in the dielectric constant, or its gradient, in the troposphere. (188) *Note:* In some cases, a ground wave may be so altered that new components appear to arise from reflection in regions of rapidly changing dielectric constant. When these components are distinguishable from the other components, they are called *"tropospheric waves."*

true power: *Synonym* **effective power.**

truncated binary exponential backoff: In carrier sense multiple access with collision avoidance (CSMA/CA) networks and in carrier sense multiple access with collision detection (CSMA/CD) networks, the algorithm used to schedule retransmission after a collision such that the retransmission is delayed by an amount of time derived from the slot time and the number of attempts to retransmit.

truncation: The deletion or omission of a leading or a trailing portion of a string in accordance with specified criteria.

truncation error: In the representation of a number, the error introduced when one or more digits are dropped.

trunk: 1. In a communications network, a single transmission channel between two points that are switching centers or nodes, or both. (188) **2.** [A] circuit between switchboards or other switching equipment, as distinguished from circuits which extend between central office switching equipment and information origination/termination equipment. [47CFR] *Note:* Trunks may be used to interconnect switches, such as major, minor, public and private switches, to form networks.

trunk encryption device (TED): A bulk encryption device used to provide secure communications over a wideband digital transmission link. (188) *Note:* A TED is usually located between the output of a trunk group multiplexer and a wideband radio or cable facility.

trunk group: Two or more trunks of the same type between two given points. (188)

trunk group multiplexer (TGM): A time-division multiplexer that combines individual digital trunk groups into a higher rate bit stream for transmission over wideband digital communications links.

trunk hunting: *See* **hunting (def. #1).**

trusted computer system (TCS): [An] AIS that employs sufficient hardware and software assurance measures to allow simultaneous processing of a range of classified or sensitive information. [NIS] (188)

trusted computing base (TCB): [The] totality of protection mechanisms within a computer system, including hardware, firmware, and software, the combination of which is responsible for enforcing a security policy. *Note:* The ability of a trusted computing base to enforce correctly a unified security policy depends on the correctness of the mechanisms within the trusted computing base, the protection of those mechanisms to ensure their correctness, and the correct input of parameters related to the security policy. [NIS]

truth table: 1. An operation table for a logic operation. **2.** A table that describes a logic function by listing all possible combinations of input values and indicating, for each combination, the output value.

TSK: *Abbreviation for* **transmission security key.**

TSP: *Abbreviation for* **Telecommunications Service Priority.**

TSPS: *Abbreviation for* **traffic service position system.**

TSP system: *See* **Telecommunications Service Priority system.**

TTTN: *Abbreviation for* **tandem tie trunk network.**

TTY: *Abbreviation for* **teletypewriter.**

TTY/TDD: A unique telecommunication device for the deaf, using TTY principles.

tuning: Adjusting the parameters and components of a circuit so that it resonates at a particular frequency or so that the current or voltage is either maximized or minimized at a specific point in the circuit. *Note:* Tuning is usually accomplished by adjusting the capacitance or the inductance, or both, of elements that are connected to or in the circuit. [From Weik ’89]

tunneling mode: *Synonym* **leaky mode**.

tunneling ray: *Synonym* **leaky ray**.

Turing machine: A mathematical model of a device that changes its internal state and reads from, writes on, and moves a potentially infinite tape, all in accordance with its present state, thereby constituting a model for computer-like behavior.

turnaround time: In a half-duplex circuit, the time required to reverse the direction of transmission from transmit to receive or vice versa. (188)

turnkey: Pertaining to a procurement process that (a) includes contractual actions at least through the system, subsystem, or equipment installation phase and (b) may include follow-on contractual actions, such as testing, training, logistical, and operational support. (188) *Note:* Precise definition of the types of allowable contractual features are contained in the Federal Acquisition Regulations (FAR).

twin cable: A cable composed of two parallel conductors separated from each other by a ribbon-like insulator or encased by a foam insulator. (188) *Synonym* **twin-lead.**

twin-lead: *Synonym* **twin cable.**

twinplex: A frequency-shift-keyed (FSK) carrier telegraphy system in which four unique tones, *i.e.*, two pairs of tones, are transmitted over a single transmission channel, such as one twisted pair. *Note:* One tone of each pair represents a *"mark"* and the other a *"space."*

twin sideband transmission: *See* **independent-sideband transmission.**

twist: In telephony, a change, as a function of temperature, in the shape of the frequency-vs.-attenuation response curve, *i.e.*, characteristic, of a transmission line.

twisted pair cable: *See* **paired cable.**

two-out-of-five code: A binary-coded decimal notation in which (a) each decimal digit is represented by a binary numeral consisting of five binary digits of which two are of one kind, called *"ones,"* and three are of the other kind, called *"zeros"* and (b) the usual weights assigned to the digit positions are 0-1-2-3-6, except that *"zero"* is represented as 01100.

two-pilot regulation: In frequency-division multiplexed (FDM) systems, the use of two pilot frequencies within a band so that the differential change in attenuation with respect to temperature, *i.e.*, twist, can be detected and compensated by a regulator. (188)

two-sample deviation: The square root of the Allan variance.

two-sample variance: *Synonym* **Allan variance.**

two-source frequency keying: *Synonym* **frequency-exchange signaling.**

two-tone keying: In telegraphy systems, keying in which the modulating wave causes the carrier to be modulated with a single tone for the *"mark"* and modulated with a different single tone for the *"space."* (188)

two-tone telegraph: *See* **two-tone keying.**

two-way alternate operation: *Synonym* **half-duplex operation.**

two-way simultaneous operation: *Synonym* **duplex operation.**

two-wire circuit: A communications circuit formed by two metallic conductors insulated from each other. (188) *Contrast with* **four-wire circuit.**

TWX®: *Acronym for* **teletypewriter exchange service.**

TX: *Abbreviation for* **transmitter, transmit.**

type 1 product: [A] classified or controlled cryptographic item endorsed by the National Security Agency for securing classified and sensitive U.S. Government information, when appropriately keyed. *Note:* The term refers only to products, and not to information, key, services, or controls. Type 1 products contain classified National Security Agency algorithms. They are available to U.S. Government users, their contractors, and federally sponsored non-U.S. Government activities subject to export restrictions in accordance with International Traffic in Arms Regulation. [NIS]

type 2 product: Unclassified cryptographic equipment, assembly, or component, endorsed by the National Security Agency, for use in telecommunications and automated information systems for the protection of national security information. *Note:* The term refers only to products, and not to information, key, services, or controls. Type 2 products may not be used for classified information, but contain classified National Security Agency algorithms that distinguish them from products containing the unclassified data algorithm. Type 2 products are subject to export restrictions in accordance with the International Traffic in Arms Regulation. [NIS]

type 3 algorithm: [A] cryptographic algorithm that has been registered by the National Institute of Standards and Technology and has been published as

a Federal Information Processing Standard for use in protecting unclassified sensitive information or commercial information. [NIS]

type 4 algorithm: [An] unclassified cryptographic algorithm that has been registered by the National Institute of Standards and Technology, but is not a Federal Information Processing Standard. [NIS]

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