G.703/G.704

G.703 is a standard that originally described voice over digital networks. It is an ITU recommendation that is associated with the PCM voice standard. According to the PCM standard voice to digital conversion requires 64 kbps of bandwidth, resulting the basic channel bandwidth for G.703. Thus T1 25 channels equals 1554 kbps and E1 32 channels equals 2048 kbps.G.703 is the electrical and functional description. Other characteristics are described in other G series standards. Among these are G.704 Framing, G.706 CRC-4 procedure and G.732 Fault handling.
G.703 can be transported over balanced circuits (120Ω Twisted pair) and unbalanced (75Ω coaxial) cabling.
The balanced version operating at speeds of up to 64 kbps can use one of three methods of transmission. These are **co-directional** using 4 wires. The data and timing are sent in the same direction over the same wires. **Central-directional** using 6 or 8 wires. This means that a central clock can be used and sent in both directions at the same time (6 wire) or in both directions separately (8 wires). This is rarely used. **Contra-directional** using 8 wires. This means there are pairs for transmit and receive data and two clock signals one in each direction.
For speeds higher than 64 kbps
The following tables give the major electrical characteristics for the T1 and E1 speeds. These are the most commonly used.

Electrical characteristics for T1	
Cabling	Co-directional
Mark	3.0 VDC
Space	0 VDC +/- 0.30 VDC
Pulse Width	647 nsec
Encoding	AMI (bipolar) or B8ZS
Speed	1544 kbps.

Electrical characteristics for E1	
Cabling	Coaxial or symmetrical pairs (4 wires) for each direction
Mark	Balanced: 3.0 VDC Unbalanced: 2.37 VDC
Space	Balanced: 0 VDC +/- 0.237 VDC Unbalanced: 0 VDC +/- 0.3 VDC
Pulse Width	488 nsec
Encoding	AMI (bipolar) or High Density Bipolar order 3 (HDB3)
Speed	2048 kbps.

Pinning Specifications:

Signal	RJ45 Description	RJ45 Pins	BNC Descrition	DTE BNC
RxA	Receive Input Negative	1	Receive Input	Tip
RxB	Receive Input Positive	2	Receive Ground	Ring
TxA	Transmit Input Negative	4	Transmit Input	Tip
TxB	Transmit Input Positive	5	Transmit Ground	Ring
S1	Transmit Ground	3		
S2	Receive Ground	6		

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G.704

G.704 is the framing specification for G.703. A carrier can “borrow” a 64 kbps time slot (TS0) from a 2.048 Mbps line. This slot is used to provide timing and supervisory information. This results in the maximum bandwidth being reduced to 1984 kbps. This means that 31 slots are left for data. The data slots can be used to provide N x 64 kbps services. G.703 lines with G.704 are known as structured G.703.

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