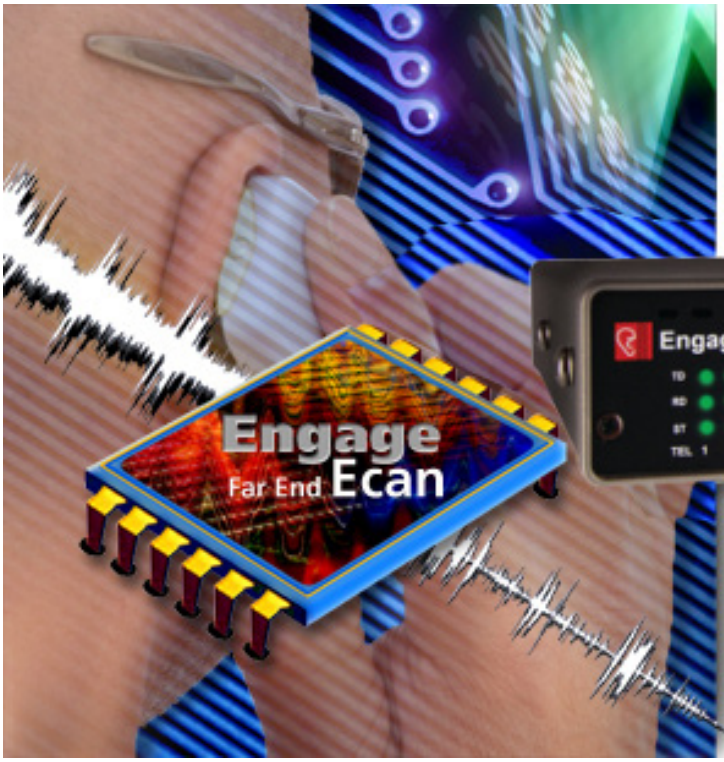
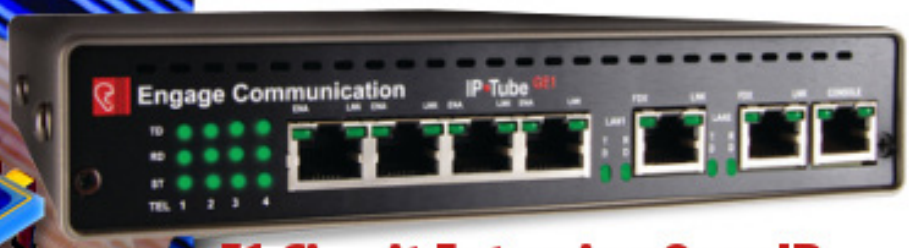
IP-Tube GE1-ECAN



E1 Over IP for Voice with Echo Canceller



E1 Circuit Extension Over IP

- ROI Measured in Weeks
- On-board Echo Canceller
- Supports Legacy Switches/PBX
- Crystal Clear Voice across Internet
- Exploits Efficiency of IP/Ethernet

E1 Voice & Data Over IP

The IP•Tube GE1 Ecan encapsulates full and fractional E1 and TDM circuits, along with their framing and signaling bits, into IP packets. The IP•Tube GE1 Ecan's E1 Over IP, E1 Over Ethernet connection provides for the transparent interconnection of PBXs, Telecom Switches and E1 based communication systems via LANs, WANs, MANs, Satellite and Wireless Ethernet.

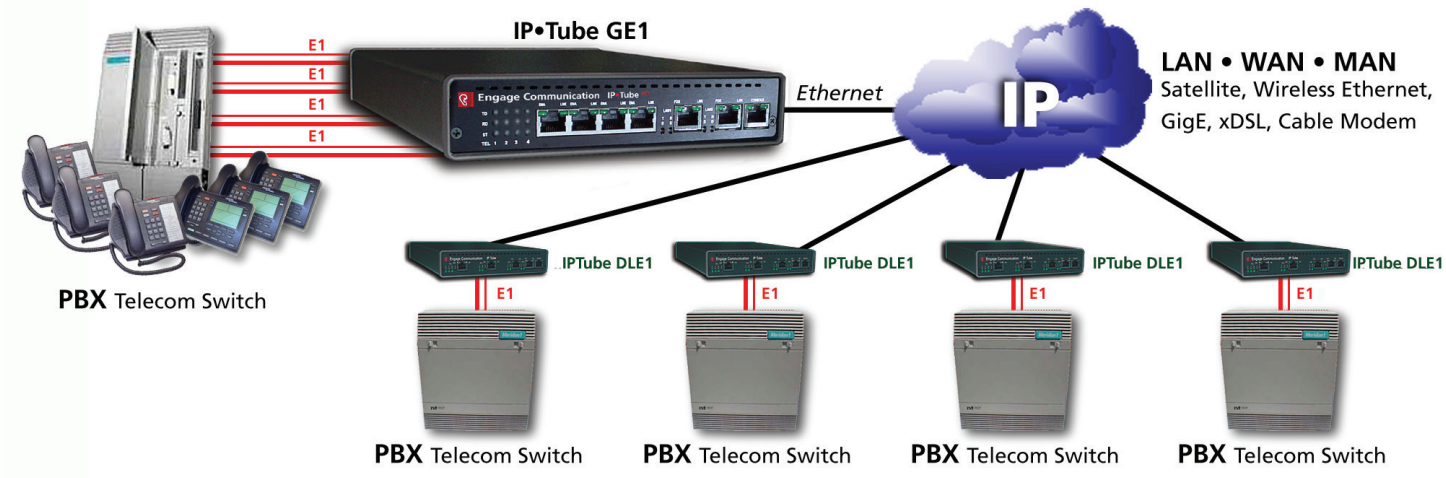
The IP•Tube GE1-Ecan ships with four E1 interfaces with **Echo Cancellation** and two 10/100 BaseT Ethernet Interfaces.

Echo Canceller

The IP•Tube GE1 Ecan has four integrated E1 Echo Cancellers that cancels up to 64 milliseconds of Far End echo. The echo canceller meets ITU-T G.164, G.165 and ITU-T G.168 requirements for echo cancellation.

Signaling Support

PRI ISDN, SS7, and Proprietary out of band are supported. Echo cancellation is automatically disabled during FAX and Modem communications. Transparent support for Modem or Fax. Voice quality is not compromised.
Legacy phone equipment investment is preserved

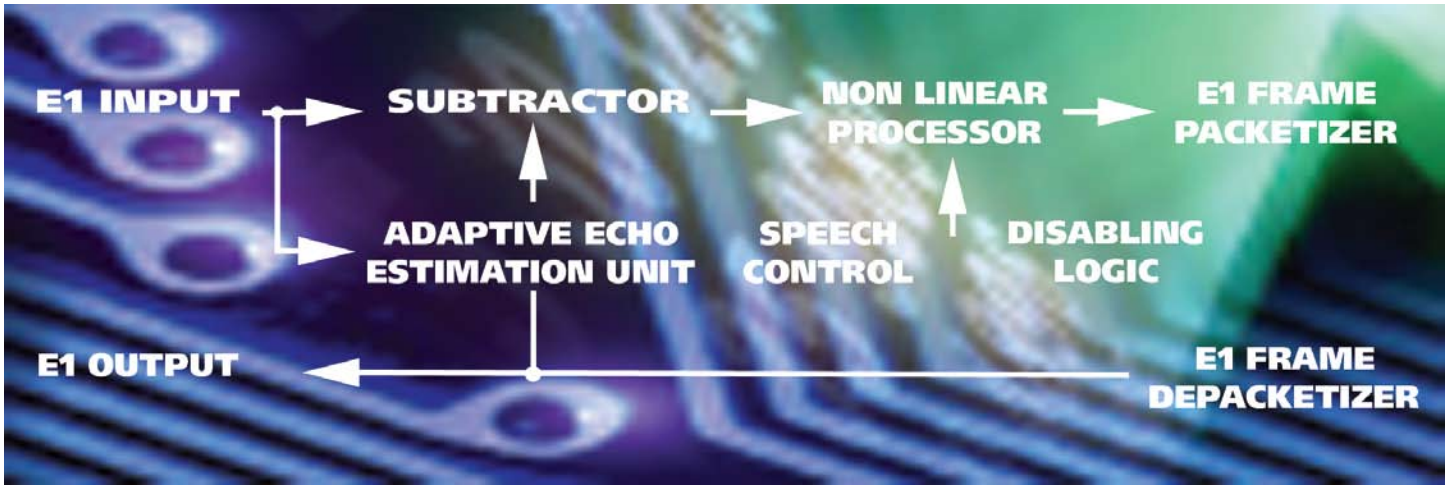


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Far End Echo Cancelling

IP•Tube GE1-Ecan utilizes a Digital Signal Processor that detects and cancels echo at the far end so that the packet network delay has no impact on echo. The echo canceller samples the voice signal, estimates and removes the echo, leaving the original speech. The linear digital signal processor (DSP) models the echo and performs the main echo cancellation task. A non-linear DSP processor is then optimally employed to subtract out any residual echo or reflected noise components.

Echo is one of the most important factors that affects voice quality. The presence of echo depends on both echo level and echo delay. The primary source of echo is the impedance mismatch at the hybrid that links a 2-wire analog loop to a 4-wire digital trunk. The hybrid is not completely efficient in carrying the electrical energy and a certain amount of the electrical energy, or voice signal, is reflected back and may be perceived as echo. Occasionally, acoustic feedback of certain phones also causes noticeable echoes. These sources of echo are able to be cancelled by the human brain as long as the time between our speech and the echoed speech is not greater than 32 milliseconds.



Engage's E1 Over IP products have a minimum delay configuration, 1 millisecond packetization and 4 packet buffering, which introduces a delay of 5 milliseconds. The amount of delay introduced by the packet network depends upon its switching times, packet processing, packet jitter, transmission, loading and quality of service configuration.

For example a network connection that utilize Gigabit Ethernet switches, which introduce delays in the microseconds, does not require echo cancellation. Wide Area Networks that traverse an intranet or internet backbone have varying degrees of delay which can easily exceed 28 milliseconds. Total round trip delays in excess of 32 millisecond makes echo perceptible.

The IPTube's Echo Cancellation provides the elasticity to support clear connections across networks with significant delay and packet jitter such as **Wireless** connections in point to point or especially multipoint configurations.

IP•Tube GE1-Ecan Standard Features

Dual LAN Interfaces

All **IP•Tube GE1-Ecan** models ship with dual 10/100BaseT Ethernet LAN ports. The dual Ethernet interfaces provide for:

- Management interface on LAN port 2 when LAN port 1 is connected to a VPN tunnel
- Alternator Option for load balanced interconnects
- Protector Option for Redundant Packet Path connections with Constant or Switch Over Criteria

Assured Delivery Protocol

In order to assure high quality communications over links with intermittent or noisy performance, such as Wireless, the **IP•Tube GE1-Ecan** employs Engage's robust Assured Delivery Protocol with the following benefits:

- Packet out of sequence detection and re-sequencing
- Lost packet retransmission with configured delay

IP•Tube GE1-Ecan Optional Features

Protector OPTION -PRO

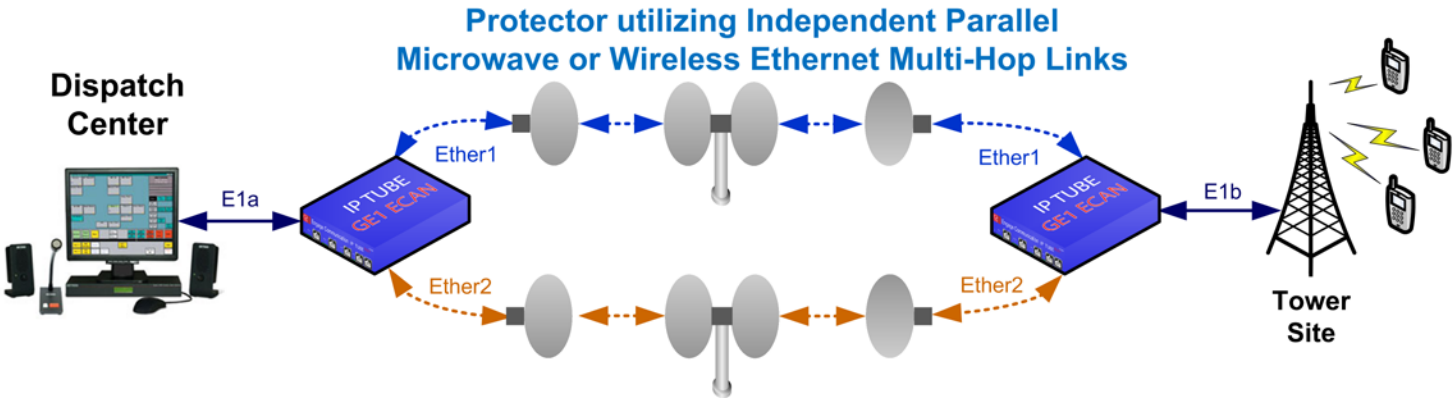
The Protector option provides for automatic protection of the E1 circuit over independent IP packet routes. After conversion of the E1 circuit into IP packets, two identical packet streams are created. These duplicate packet streams are used to provide redundant IP connectivity to the remote location in either "Always-On" or "On-Demand" switch over modes.

The need to Protect Critical Communications is in high demand for the following applications:

- Public Safety Network Redundancy for Police, Fire and Medical
- Auto Recovery for Military Communication
- Delivering on Service Level Agreements
- Resilient Cellular Backhaul

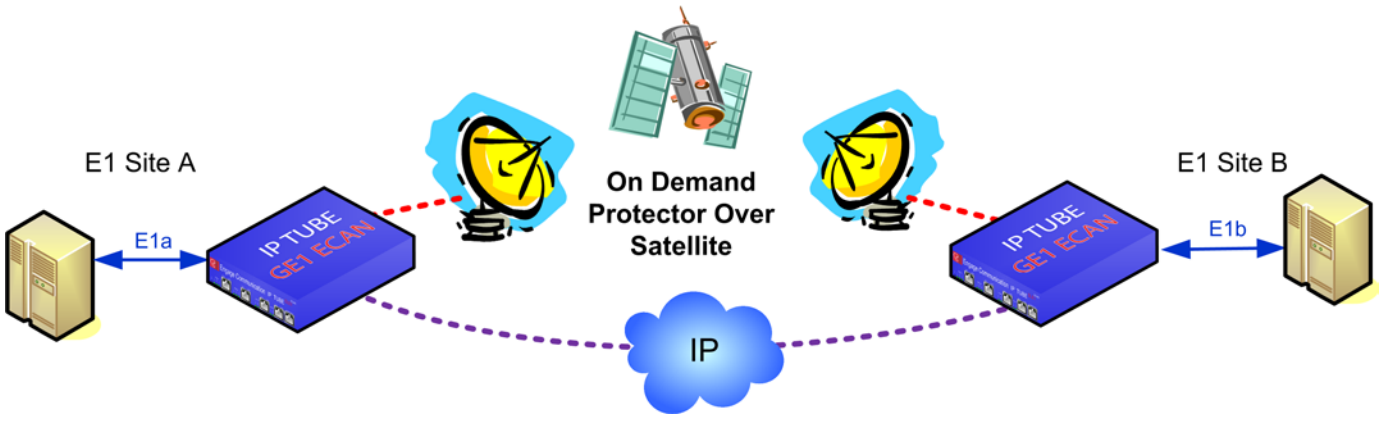
Always-On

In "Always-On mode, the Protector sends two identical packet streams simultaneously on the LAN1 and LAN2 ports of the local IP-Tube GE1-Ecan-Pro. The remote unit monitors both LAN1 and LAN2 incoming traffic and on a packet by packet basis selects the best packet to use for conversion from IP back to E1. In most cases, switching of the receive packet source between LAN1 and LAN2 can be done without E1 circuit interruption.



On Demand Protection

In "On-Demand" mode, the Protector only sends the duplicate packet stream over the second IP connection (LAN2 of the IP-Tube) if a failure is detected on the first IP connection. "On-Demand" connections can be used for cost savings or bandwidth reasons. For example, the expense associated with a backup IP Satellite connection for a full E1 (non-optimized E1 over IP requires 2.5 megabits per second) would dictate transmitting duplicate packets only during a failure condition.



Alternator Load Balancing OPTION -ALT

The **IP•Tube GE1-Ecan-ALT** Alternator option alternatively sends the IP packetized E1 frames on LAN 1 and LAN 2. The Alternator option enables fractional and full E1 circuits to be split over two IP WAN connections such as SDSL.

Lossless Data Compression OPTION -C

The **IP•Tube GE1-Ecan-C** continuously detects idle and redundant data within each E1 Voice circuit resulting in as much as a 40 to 1 bandwidth savings. TDM over IP WAN bandwidth is not consumed by silent or redundant samples.

IP-Tube GE1-ECAN

Pay-As-You-Grow Field Upgrades

The IP•Tube GE1 Ecans are designed for Pay-As-You-Grow growth from 1 E1 thru 4 E1s per IP•Tube GE1 Ecan. Customers can elect to economize initial network installations, by purchasing their IP•Tube GE1 Ecan with a single active E1 port. As the network grows enable additional E1 Ports via a software-based license key.
Field Upgrade benefits are extended to our Industry-Best Lossless Data Compression. Just as E1 ports are field upgrade able, so is Lossless Data Compression.
At any time, each E1 port on the IP•Tube GE1 Ecan can be upgraded to Lossless Data Compression with a software-based license key installation. If you determine that your IP•Tube GE1 Ecans are best deployed with Lossless Data Compression, your still in business with the per port field upgrade!

Technical Specifications

LAN Network Interface:
• Two 10/100BaseT Full/Half Ethernet
• Auto negotiation or Configurable Speed and Duplex

LAN Network Protocols Supported:
• IP, TCP, UDP, ICMP, ADP
• DHCP • DNS Address Discovery • Dynamic DNS
• Transparent Ethernet Bridge: LAN1 to LAN2 -RLM Option

1 to 4 Duplicate Packet Transmission:
• Resilient performance through a lossy interconnect.

Echo Canceller:
• Voiceband Echo Cancelling according to ITU G.165 and G.168
• u- and A-Law coding according to ITU G.711
• 32 channels with end echo path delay of less than 63.75 ms

E1/Fractional E1 Specifications:
• One to Four Port Models • Connects directly to E1 or DS1
• Framing - CRC4, FAS or UNFRAMED • Coding - HDB3 or AMI
• Complies with ITU-T G.703, G.704 and G.823 standards
• Rate 2.048 Mbps +/- 50 ppm
• Jitter: complies with ITU-T G.823
• Supports DS0 assignments from 1 to 31
• Not Contiguous Configuration x-y,z Supported

E1 Over IP Protocol:
• TDM Over IP • Circuit Extension Services Over IP • HDLC Over IP
• Frames Per Packet Configurable 8 to 40
• Low Latency Mode: 1 millisecond 8 E1 frames
• Max Payload Mode: 5 millisecond 40 E1 frames
• Comprehensive Clocking: Internal, Network, Adaptive

Lossless Data Compression Option:
• Detects idle and redundant data within each Voice Circuit (DS0)
• Interconnect bandwidth is not consumed by silent or redundant data
• Low Latency 8 to 1 Compression, settings from 8 to 1 to 40 to 1

TFTP Online Upgrade Capable (FLASH ROMs)
• IPTube is fully operational during upgrade

Quality of Service Support:
• IP Type of Service (TOS) CLI configured • IANA Registered UDP Port 3175
• 802.1p/q mac level prioritization

Regulatory:
• CE • Safety -IEC60950 • EMC - CFR 47 Part 15 Sub Part B:2002, EN55022:1994+A1&A2, EN55024, ICES-003 1997, CISPR 22 Level A
• Telecom TBR12, TBR13

Management:
• Telnet support with Edit and Paste Template Files
• Console Port for Out of Band Management
• SNMP support (MIB I, MIB II) • Remote config., monitoring, & reset

Power:
• 10-30 VDC, 1.0A. • Screw Locking Connector • Power Consumption 6W
• Universal Adapter 100/240 VAC 50/60 Hz
• Optional -48V 0.25 Amp • Hot Standby

How to Order — IP•Tube GE1 Ecan

Part No.	Description	Notes
301-2048-0x	IP•Tube GE1 Ecan, xE1 (x=1 - 4 Ports)	Base Model Specify # of E1 Ports Enabled
CH-301-2048-0x	IP•Tube GE1 Ecan, xE1 (x=1 - 4 Ports)(CHUBE-Card)	Chube-Chassis Slot card model Specify # of E1 Ports Enabled
303-2048-0x	IP•Tube GE1 Ecan Compression (x=1 - 4 Ports)	w/Lossless Data Compression Option
CH-303-2048-04	IP•Tube GE1 Ecan Compression (x=1 - 4 Ports) (CHUBE-Card)	Enable Lossless Compression E1 (up to 4)
Base Options		Specify as Suffix
-ROHS	ROHS compliant materials and processes	Restriction of Hazardous Substances no PB
-PRO	Protector Option	Fault Tolerant Network Interconnect
Power Options		Specify as suffix
-DCMOD	Power Supply Module 12/26 VDC ADP CON	Ships with Universal Adapter 90/240 50/60
-WIREDC	Power Input Option 10-30 VDC Screw Term	DUAL REDUNDANT options available
-N48VDC	Power Input Option Negative 48 Volt DC	DUAL REDUNDANT options available
Rack Mount Option		
095-1000	19" Wide Rack Mount Brackets	Enclosure Nut Serts Installed
095-2000	2 unit 19" x 1RU Rack Mount Kit for 7" products	

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