Engage Communication

IP•Tube GT1-*Ecan*

T1 Over IP for Voice with Echo Canceller

T1 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

T1 Voice Over IP

The **IP•Tube GT1-Ecan** encapsulates full and fractional T1 circuits into IP packets. T1 Over IP connections provide for the interconnection of Channel Banks, PBXs and Telecom Switches via LANs, WANs, MANs, Satellite and Wireless Ethernet.

The **IP•Tube GT1-Ecan** ships with four T1 interfaces and two 10/100 BaseT Ethernet Interfaces.

Transparent Interconnect

The **IP•Tube GT1-Ecan's** transparent operation maintains the proprietary signaling required to support PBX features such as call conferences, call forwarding, caller ID and SS7.

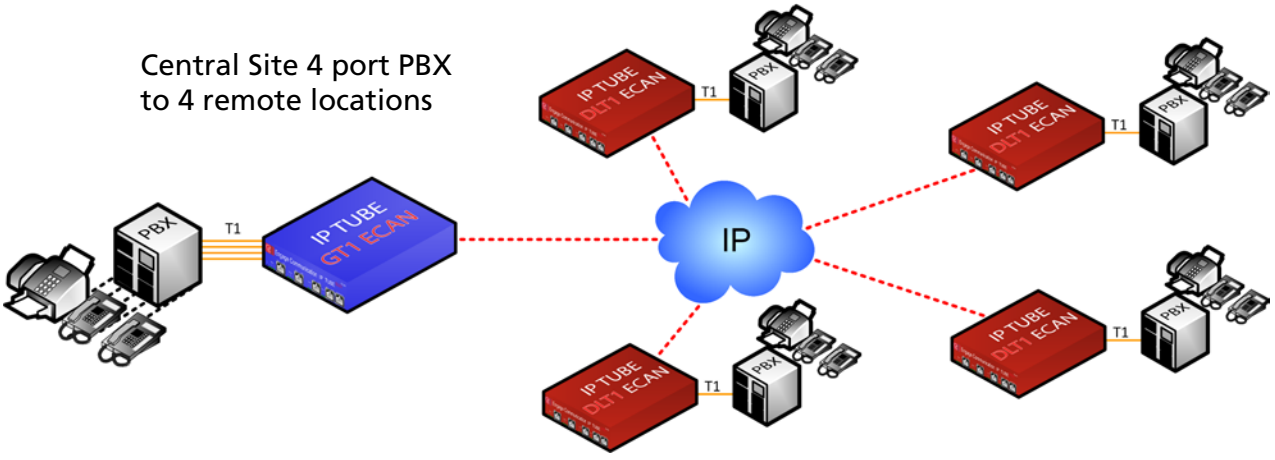
Echo Canceller

The **IP•Tube GT1-Ecan** has four integrated T1 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

Robbed Bit, PRI ISDN, SS7, ESF, D4, SLC-96, Proprietary out of band, and robbed bit signaling is 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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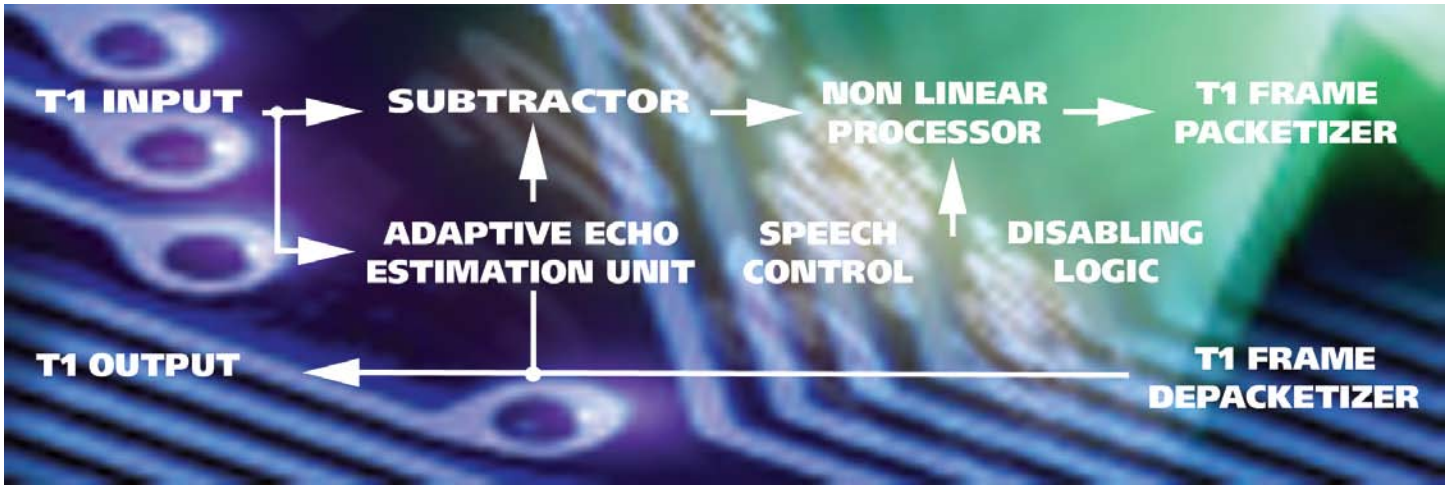
Far End Echo Cancelling

IP•Tube GT1-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 24 milliseconds.



Engage's T1 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 24 milliseconds. Total round trip delays in excess of 24 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 GT1-Ecan Standard Features

Dual LAN Interfaces

All **IP•Tube GT1-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 GT1-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 GT1-Ecan Optional Features

Protector OPTION -PRO

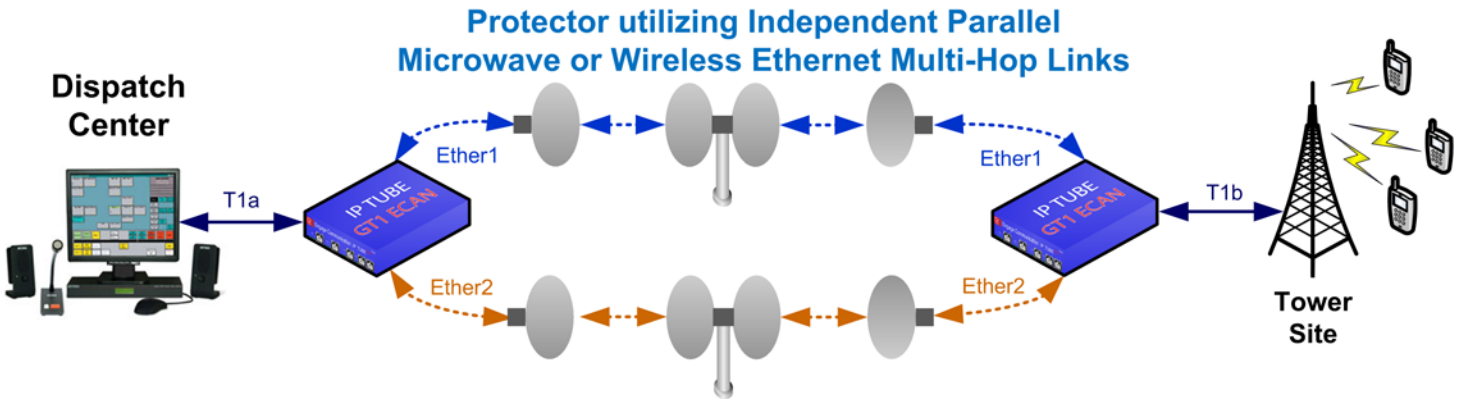
The Protector option provides for automatic protection of the T1 circuit over independent IP packet routes. After conversion of the T1 circuit into IP packets, two identical packet streams are created. These duplicate packet streams are used to provide redundant IP connectivity to the remote location 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

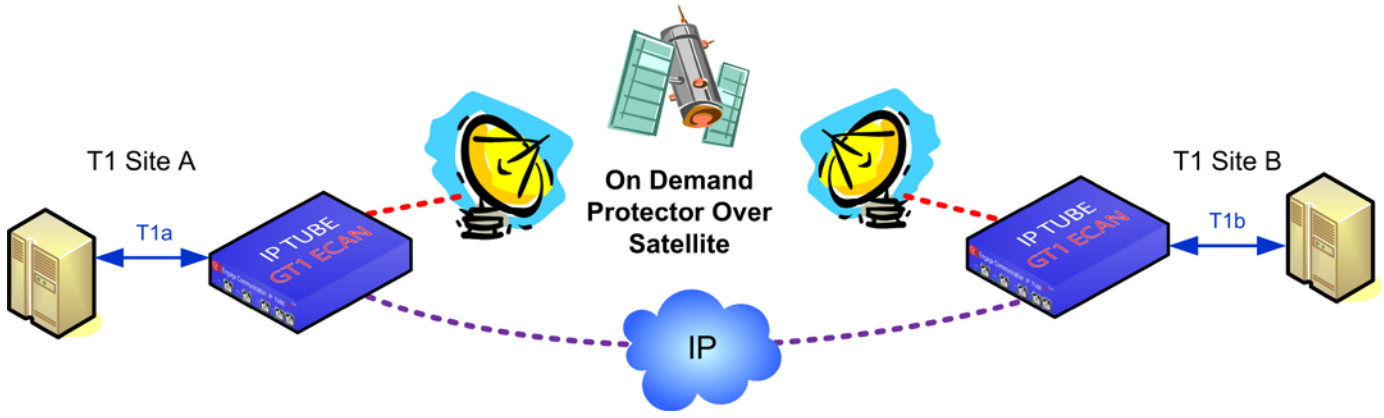
Always-On

In "Always-On mode, the Protector sends two identical packet streams simultaneously on the LAN1 and LAN2 ports of the local **IP•Tube GT1-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 T1. In most cases, switching of the receive packet source between LAN1 and LAN2 can be done without T1 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 T1 (non-optimized T1 over IP requires 1.8 megabits per second) would dictate transmitting duplicate packets only during a failure condition.



Alternator Load Balancing OPTION -ALT

The **IP•Tube GT1-Ecan-ALT** Alternator option alternatively sends the IP packetized T1 frames on LAN 1 and LAN 2. The Alternator option enables fractional and full T1 circuits to be split over two IP WAN connections such as SDSL.

Lossless Data Compression OPTION -C

The **IP•Tube GT1-Ecan-C** continuously detects idle and redundant data within each T1 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 GT1-Ecan

Pay-As-You-Grow Field Upgrades

The **IP•Tube GT1-Ecans** are designed for Pay-As-You-Grow expansion. Field Upgrade benefits are extended to Loss less Data Compression, Protector, and Alternator. Echo Cancellation is Hardware.

Technical Specifications

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

LAN Network Protocols Supported:
- IP, TCP, UDP, ICMP
- Assured Delivery Protocol
- DHCP • DNS Address Discovery • Dynamic DNS

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

T1/Fractional T1 Specifications:
- 4 T1 Interfaces • Connects directly to T1 or crossover to a DS1
- Framing - ESF or D4 • Coding - B8ZS or AMI
- Supports DS0 assignments from 1 to 24
- Not Contiguous Configuration x-y,z Supported

T1 Over IP Protocol:
- TDM Over IP
- Circuit Extension Services Over IP - CESOIP
- HDLC Over IP - HDLCOIP
- Frames Per Packet Configured 8 to 56
- Low Latency Mode: 1 millisecond 8 T1 frames
- Max Payload Mode: 7 millisecond 56 T1 frames
- Comprehensive Clocking: Internal, Network, Adaptive

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

Lossless Data Compression Option:
- Detects idle and redundant data within each DS0
- Configured Silence Detection Range
- Interconnect bandwidth is not consumed by silent or redundant data
- Low Latency 8 to 1 Compression settings from 8 to 1 to 56 to 1

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

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 Part 68

Management:
- Secure Socket Shell - SSH
  Diffie-Hellman Group1/14 key exchange and strong integrity checking via MAC SHA1/SHA1-96 with Cipher AES-128 and 3DES and DSS and OpenSSH public key format
- Telnet support with Edit and Paste Template Files
- Console Port for Out of Band Management
- SNMP support (MIB I, MIB II) with configured traps
- Remote config., monitoring, & reset
- Telco Diagnostics: Local Loop, Remote Loop

Rear Panel/Power:
- 10-30 VDC, 1.0A. • Screw Locking Connector
- Universal Adapter 100/240 VAC 50/60 Hz
- Optional -48V 0.25 Amp • Hot Standby
- Dimensions: 9" (L) x 7.3" (W) x 1.50" (H)

How to Order – IP•Tube GT1-Ecan

Part No.	Description	Notes
301-1544-04	IP•Tube GT1-Ecan, 4 T1 Ports	Echo Cancellation module has 4 T1 interfaces
CH-301-1544-04	CHUB IP•Tube GT1-Ecan, 4 T1 Ports	Slot Card Version for CHUB Chassis Echo Cancellation module has 4 T1 interfaces
303-1544-04	CHUB IP•Tube GT1-Ecan 4 T1 Ports Compression	Slot Card Version for CHUB Chassis w/Lossless Data Compression Option
CH-303-1544-04	IP•Tube GT1-Ecan 4 T1 Ports Compression	w/Lossless Data Compression Option
Base Options		Specify as suffix
-ROHS	ROHS compliant materials and processes	Restriction of Hazardous Substances no PB
-PRO	Protector Option	Fault Tolerant Network Interconnect
-ALT	Alternator Load Balancing Option	Load Balancing Inverse Mux
Power Options		Specify as suffix
Standard	10/30 VDC ADAPTER with IEC connector	DC Adapter 100/240 50/60 specify Power Cord
094-0930	Cable Kit for wiring DC input	9V-30VDC input - 10 Feet with Lugs
-N48VDC	Power Supply Module Negative 48 Volt DC	Isolated Negative 48 Volt Power
Rack Mount Option		Specify as suffix
-RACKMNT	Rack Mount Kit for Enclosure	Enclosure Nut Serts Installed
095-1000	19/23" Rack Mount Bracket	Requires -RACKMNT Option

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