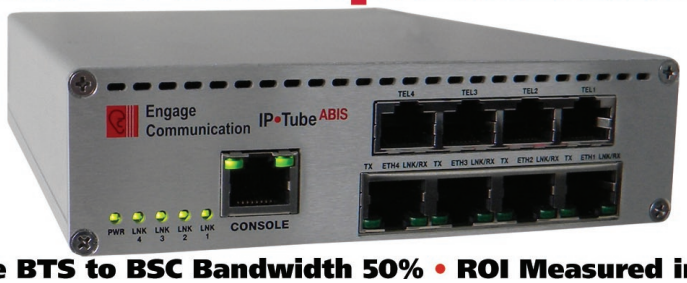
IP•Tube G4 ABIS

GSM A-bis Optimization



• Reduce BTS to BSC Bandwidth 50% • ROI Measured in Weeks

Mobile Backhaul Optimization Solution

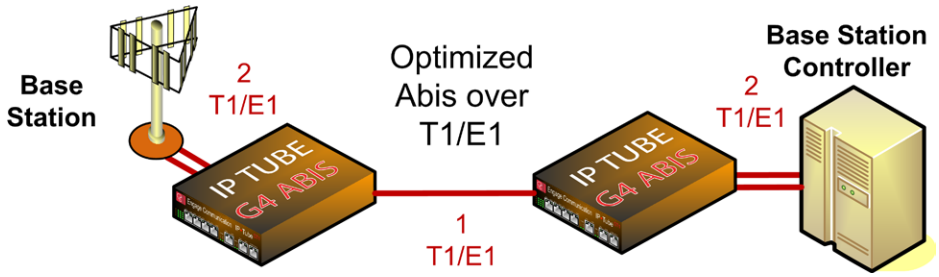
The **IP•Tube G4 Abis** provides advanced optimization of 3GPP Abis traffic for efficient and cost effective GSM Cellular Base Station backhaul. Its Powerful and flexible Field Programmable Gate Array based Abis engine provides for the simultaneous full duplex optimization of 512 TRAU sub channels. The **IP•Tube G4 Abis** transports the optimized Basestation traffic over a WAN Circuit or as TDM over IP packets via wired or wireless Ethernet connections.

The major benefit of **Abis** optimization is significantly reducing backhaul bandwidth requirements by removing redundant traffic such as Silence Indicators, Idle Data and idle sub channels resulting in more capacity for service expansion or support for advanced subscriber applications.

The **IP•Tube G4 Abis** optimizer has two modes of operation: Fixed and Dynamic bandwidth. The Fixed bandwidth mode limits the amount of bandwidth to a specific number of 16 kilobit sub channels optimizing the Abis traffic into the available WAN T1/E1 timeslots or IP packet bandwidth. The Dynamic Abis optimization mode limits the aggregate IP packet bandwidth.

Optimized Abis Over Circuits

With configurable Abis optimization the number of T1/E1 circuits or timeslots required for backhaul is reduced by as much as 2:1 saving precious Opex, especially if the circuits are leased from another service provider. The additional capacity created can also be used to increase base station traffic load without additional T1/E1 Capex or Opex investment.



Optimized Abis Over Packets

Conversion of T1/E1 circuits to facilitate the use of IP/Ethernet connectivity eliminates or dramatically reduces Base Station to Base Station Controller backhaul Opex. Adding Fixed Abis optimization to this solution enables the use of bandwidth limited IP transport such as Satellite and xDSL for mobile backhaul. With Dynamic Abis optimization traffic loading of broadband networks is further minimized, reducing the cost of IP connectivity and freeing bandwidth for other applications.

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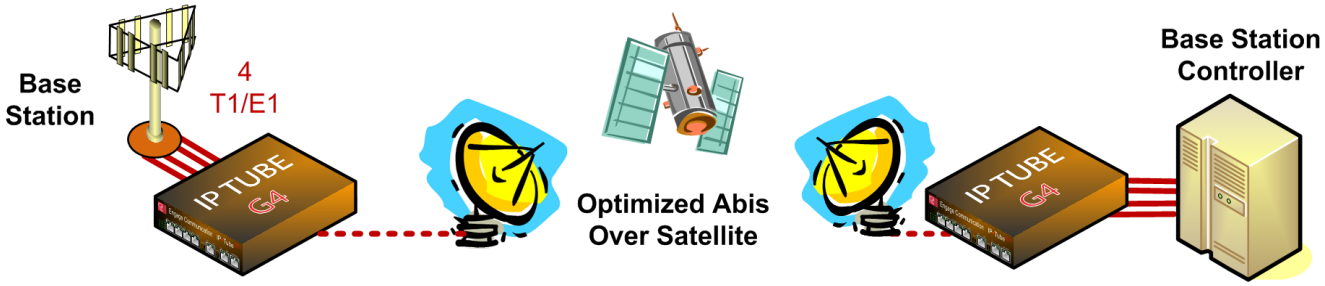
OPTIMIZED Abis OVER SATELLITE

IP•Tube G4 Abis enables Satellite Service Providers to efficiently tap into the multi-billion dollar GSM mobile operator backhaul service business. GSM operators are expanding from urban areas to rural and remote areas with lower **A**verage **R**evenue **P**er User, especially in economically emerging countries.

Satellite transmission offers the proven solution for quickly reaching smaller, remote and dispersed communities, and delivering reliable connectivity, provided that the cost is right.

The high Opex typically associated with satellite transponder usage lowers profitability of such deployment, limiting its application to specific cases and interim fast service coverage deployment.

Engage's **Abis Optimization,** which achieves a 50% reduction in the bandwidth required for GSM BTS satellite backhaul, makes it possible to provide mobile services to locations that are revenue challenged.



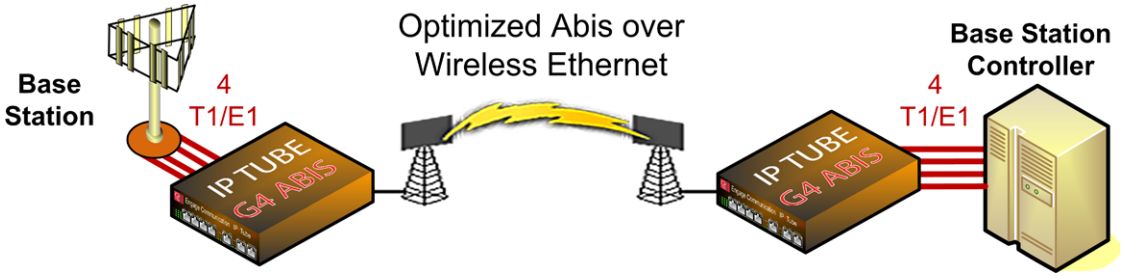
OPTIMIZED Abis OVER WIRELESS ETHERNET

For over Ten years the IPTube has proven itself around the world as an effective method for using Commercial Off the Shelf Wireless Ethernet Bridges, such as 802.x and WiMax, to backhaul T1/E1 Base Station traffic.

Abis optimization facilitates more robust Wireless Ethernet by freeing up bandwidth so wireless retransmission protocols can be effective.

The IPTube's Assured Delivery Protocol, for example, has the sophistication required to create solid performance across a wide range of wireless connections.

Since the majority of Wireless Radios are half duplex, with limited packet forwarding rates, the IP Tube also has the ability to multiplex multiple T1/E1 circuits into a single packet further reducing packet rate and over head by up to 75%.



OPTMIZED Abis OVER BROADBAND

Abis Over IP works with a wide variety of Broadband Ethernet and IP packet service offerings: MPLS, Metro Ethernet, HFC Cable, xDSL, etc. The bandwidth required to transport a single full T1/E1 circuit with low latency IP packets without Abis Optimization consumes up to 2.5 Mbps and 4 E1s requires 10 Mbps.

Voice communication is typically half duplex, where one individual talks while the other listens. Thus, Abis optimization typically reduces IP/Ethernet bandwidth by 50% and during non peak times when the cell traffic is idle bandwidth is reduced by up to 90%.

Fixed Abis optimization enables the use of last mile connections, such as ubiquitous DSL, with bandwidth significantly less than the number of 64 Kbps T1/E1 timeslots used by the Base Station.

Dynamic Abis optimization reduces the committed information rate needed from the Broadband Ethernet Service provider by more than 50% for each base station connected. This bandwidth reduction also minimizes the aggregate Ethernet bandwidth and equipment required to connect to the Base Station Controller T1/E1 circuits.

IP•Tube G4 Abis Standard Features

Assured Delivery Protocol

In order to assure high quality communications over links with intermittent or noisy performance, such as Wireless or Broadband over Power Line, the **IP•Tube G4 Abis** employs Engage's robust Assured Delivery Protocol with the following benefits:

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

Dynamic Host Configuration Protocol - DHCP

The **IP•Tube G4 Abis** can be configured to obtain its Internet Protocol network parameters: IP Address, Subnet Mask, Default Gateway, DNS; from a local DHCP server.

Domain Name Addressing

IP•Tube G4 Abis can be configured to use a Domain Name for the remote IP•Tube in place of a fixed IP address. This supports multiple mobile service provider installations with ease.

Dynamic DNS

IP•Tubes can be configured to register their IP address with Dynamic Domain Name Servers for discovery by the IPTube at the other end of the T1/E1 circuit. DDNS support combined with DHCP make installations Name-based which is very easy to setup and maintain when compared to Static IP addressing.

Secure Socket Shell - SSH

Engage's Secure Socket Shell, which is based upon industry proven Open SSH and FIPS 140 approved Open SSL version 2.0, provides secure encrypted communications between SSH clients such as OpenSSH, SecureCRT, and PuTTY and the IPTube's Command Line Interface.

SNMP

IP•Tube G4 Abis can be fully managed with SNMP via standard and private MIBs. Large scale deployments of IPTubes with centralized management made SNMP support a priority. SNMP Traps for error events enable proactive service fault isolation.

Ethernet Switch

IP•Tube G4 Abis has a four port 10/100 Ethernet QoS switch integrating a high-performance switching fabric with four priority queues. Advanced features include 802.1p/IPv4/IPv6 traffic classification, full IEEE 802.1Q VLAN, RMON, SNMP, Port Monitoring and Layer 2 firewall.

QoS determined by destination MAC address, port ID, IEEE 802.1p and multimedia traffic tags, IPv4 Type of Service (TOS), and Differentiated Services (DiffServ).

Rate Limiter

The Ethernet switch Ingress and/or Egress Rate Limiter option enables the reservation of bandwidth for time-sensitive T1/E1 Over IP real time connections.

This is required for applications where LAN traffic can exceed the WAN bandwidth required by the T1/E1 over IP/Ethernet application. The data rate limit range is 128 Kbps to 64 Mbps in binary increments.

IP•Tube G4 Abis Optional Features

Protector OPTION -PRO

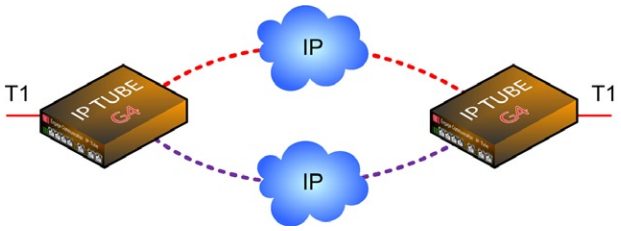
The protector option utilizes the Ethernet Switch port ETH1 as a redundant path for the interconnection of the IP encapsulated T1/E1 data.

The PRO Option is configured to Always-On, or with Switch-Over criteria.

Alternator OPTION -ALT

The Alternator option alternatively sends the IP packetized T1/E1 frames on two Ethernet interfaces, balancing the load.

The Alternator option enables fractional and full T1/E1 circuits to be split over two IP WAN connections such as ADSL.



Pay As You Grow Expansion

The **IP•Tube G4 Abis** is designed for Pay-As-You-Grow expansion. Customers can elect to economize initial installation and add additional capabilities via a software-based license key. Field Upgrade benefits are extended to additional T1/E1 interfaces, Protector and Alternator options.

IP Tube G4 Abis is a member of the proven and widely deployed IP Tube product family. It supports advanced IP Tube features such as automatic re-routing of TDM traffic to backup IP links for maximum availability. Assured access for high probability packet delivery over lossy backhaul circuits and comprehensive management capabilities through SNMP, CLI, SSH, Dynamic DNS, and DHCP.

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IP•Tube G4 ABIS

Technical Specifications

LAN Network Interface:
- Two 10/100 BaseT LAN interfaces
- Four Port Ethernet Switch - Optional Management
- Auto negotiation or Configured Speed and Duplex

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

T1/E1 Specifications:
- One to Four Port Model • Connects directly to T1/E1 or DS1
- T1: Framing - ESF or D4 • Coding - B8ZS or AMI
- E1: Framing - CRC4 or FAS • Coding - HDB3
- Supports DS0 assignments from 1 to 24/31
- Not Contiguous Configuration x-y,z Supported
- Comprehensive Clocking:
  - **Internal** – the master clock source for the TDM circuit is provided by an internal clock oscillator
  - **Network/Loopback** – the transmit clock is derived from the T1/E1 port receive clock
  - **Adaptive** – the clock is recovered from the Ethernet network interface
  - **External** - Stratum1 GPS Clock Synchronization

Abis Protocol 3GPP Compliant:
- GSM 2G (GPRS), 2.5G (EDGE), 3G (UMTS & CDMA)
- GSM CODECS: FR, EFR, AMR
- Idle Sub Channel Suppression
- GSM06.81 Silence Descriptor Suppression
- 3GPPTS8.54 Idle Data Pattern Suppression
- Transparent TRAU O&M and data frame transport
- Sub Channel Resolution

Abis Over IP
- Circuit Extension Services Over IP - CESOIP
- Sub Channel Compactor Bandwidth Minimizer
- Low Latency Mode: 500 microseconds 4 T1/E1 frames
- Max Payload Mode: 7/5 millisecond 56/40 T1/E1 frames
- Configured jitter buffer to compensate for packet delay jitter/variance from 1.5 to 595 milliseconds

TFTP Online Upgrade Capable (FLASH ROMs)
- IPTube is fully operational during upgrade
- Abis optimization FPGA images are stored in FLASH

Quality of Service Support:
- IANA Registered UDP Port 3175 • IP Type of Service (TOS) CLI configured
- Diffserv configuration of TDMOverIP header
- VLAN tagging and priority labeling according to 802.1p&Q
- T1/E1 Over IP frames are tagged with a dedicated VLAN ID.

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:
- Remote config., monitoring, & reset • 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, Engage proprietary) with configured traps

Environmental:
- Temperature: 0–50°C (32–122°F). • Optional Extended Temp ranges avail.
- Humidity: Up to 90% non-condensing

Rear Panel/Power:
- 10-30 VDC, 1.0A. • Screw Locking Connector
- Power 7 Watts • Universal Adapter 100/240 VAC 50/60 Hz
- Optional -48V 0.25 Amp
- Hot Standby

Physical:
- Dimensions: Length 9"; Width 7"; Height 1.50"
- Weight 2 Pounds (1 kilogram)

Ethernet Switch:
- Out of band management interface with independent IP configuration
- 802.1Q VLAN support with Filtering for up to 64 VLANs
- Support both port-based membership or 802.1Q VLAN-based VLANs
- 2,048 MAC address entries with automatic learning and aging

Diagnostics:
- Telco Diagnostics: Local Loop, Remote Loop, Loop Up/Down NIU and CSU Codes. Enables isolation of connectivity faults to local, network or remote equipment
- Physical layer alarms for LOS, AIS, LOF
- Comprehensive statistics: LAN and IP layer network statistics: such as packet loss and packets arriving late, out of sequence, underruns, overruns

How to Order – IP•Tube G4 Abis

Part No.	Description	Notes
432-1520-0x	IP•Tube G4 Abis, (x=1 - 4 Ports)	Base Model Specify # of T1/E1 Ports Enabled
Base Options		Specify as suffix
-ROHS	ROHS compliant materials and processes	Restriction of Hazardous Substances no Pb
-SWITCH	4 Port QOS/VLAN/Rate Limiter 10/100 Ethernet Switch	QOS and VLAN tagging Reserve TDMOver IP Rate Limiter
-PRO	Protector Option	Fault Tolerant Network Interconnect Requires Ethernet Switch Option
-ALT	Alternator Load Balancing Option	Load Balancing Inverse Mux Requires Ethernet Switch Option
Power Options		Specify as suffix
-DCMOD	Power Module 10/30 VDC ADAPTER	Ships with Universal Adapter 100/240 50/60
-N48VDC	Power Supply Module Negative 48 Volt DC	Isolated Negative 48 Volt Power

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