The Network Professional's Choice

BATM Telco Systems

T5 Compact 24T/48T Routing Switch

Benefits and Features

- Advanced L3, 24+4 or 48+4 full wire speed non-blocking Routing Switch
- Ultra Compact Size – 1RU height, under 12" depth
- 24 or 48 10/100BaseTX ports plus 4 fiber/copper Gigabit Ethernet ports
- Telecom-grade version with NEBS certification
- Maximum savings on infrastructure. Use a single fiber instead of two!
- Unique option for plug-in Gigabit Ethernet transceivers, including:
  - CWDM, Extra Long-Haul, Bi-Directional and many more...
- High level of redundancy including dual AC or DC Power Supplies
- Embedded All-Telco-Platforms uniform BiNOS Operating System - learn once for all our platforms
- Enhanced Security and Maximum Protection with:
  - SNMPv3, 802.1x, SSH, RADIUS, Secured Telnet, Advanced Access Control List (ACL) and many more...
- IPv4 to IPv6 migration path and awareness
- Complete Professional Management tools for best control of your network:
  - IB and OOB management with CLI (Industry Standard), WEB management via Embedded Java™, and unique Alarms management
  - HPOV and SNMPc integration keys
  - BiNOSCenter – your EMS platform
- Unique feature-rich support including:
  - 802.1p 8 priority queues
  - DHCP Relay & Server
  - RMON & Syslog
  - TLS for E-2-E tunneling
  - Port trunking
  - Rate limiting and Traffic Shaping for efficient bandwidth control
- Lowest power consumption in the Industry

Ultra-Compact High-Density 10/100/1000 Ethernet Routing Switch

Telco System's T5 Compact 10/100/1000 Ethernet Routing Switch provides high performance in a super-compact, super-efficient size. The T5 Compact's small size, only 1RU in height, combines the capacity of physically larger backbone switches with the economy of workgroup switches.

Very high port density means that a single T5 Compact Routing Switch can support 2 Gigabit Ethernet 10/100/1000 ports, 2 Gigabit Ethernet plug-in (SFP) ports, and 24 or 48 auto-sensing 10/100BaseTX ports.

The T5 Compact Routing Switch is the optimal platform for many applications, from the Metro access arena to the Metro edge and enterprise boundaries. Data centers, server farms, wiring closets and other application users can benefit from Its uncompromised standards-compatibility that delivers flawless interoperability, its modular support of various interfaces that guarantees easy upgradeability and scalability, and its feature-rich routing capabilities that make the T5 Compact a versatile, effective platform for any IP-based service.

Copper Gigabit Ethernet provides cost-effective high-speed uplink and cascading capabilities, and pluggable miniGBIC (SFP) optical Gigabit Ethernet interfaces allow network extension over large distances. Various fiber interfaces for both MM (SX) and SM long-haul Optics, Bi-directional (single fiber usage) and CWDM modules are supported.

The resident BiNOS (BATM Inter Networking Operating System) operating software anticipates the administration, management, QoS, and security performance requirements of telecom networks by supporting a breadth of IEEE standards and industry conventions, such as Access Control Lists. Hardware based implementation of BiNOS mandated policies enables the T5C Routing Switch to perform Layer 2 switching and Layer 3 routing at wire speed. Field upgrades of BiNOS software from Layer 2 to Layer 3 use a patented procedure that incurs no downtime.

T5 Compact Routing Switches are fully manageable via SNMP, CLI, or the Web with either In-band (IB) or Out-of-Band (OOB) management tools. The CLI complies with the de facto industry standard and enables administration via a user friendly interface. Web management is made possible by utilizing embedded Java™ based user friendly management technology.

Administrators can use industry-standard SNMP-based network management systems, or BiNOSCenter. The BiNOSCenter is BATM/Telco Systems EMS/NMS Element/Network Management System and provides the network operator with a state-of-the-art, powerful, SNMP based configuration, monitoring and maintenance platform. The BiNOSCenter can manage any SNMP based element.

Product Technology

Performance

Wire speed Layer 2 switching, Layer 3 routing, and Layer 4 networking are made possible by use of advanced ASICs to perform all switching, routing, and policy enforcement in hardware. Concentration of services in hardware allows the T5 Compact Routing Switch to attain a significant performance advantage over traditional routers at a fraction of the cost. The non-blocking architecture of the T5 Compact Routing Switch ensures that no packets are lost - even under one hundred percent traffic load with full policy enforcement.

Cascadable Routing Switches

Network topologies must be easily scaled up to support high bandwidth applications and additional network services. Cascading is an economical solution, because routing switches are added only when required, in a "pay-as-you-grow" philosophy. Gigabit Ethernet ports can be trunked to provide redundant cascading configurations. In addition, the T5 Compact can be configured with a mixture of cascading and long reach connections.

Flexibility

Switches must conform to the needs of the network, and not vice versa. To allow flexibility in choosing various optical transceivers, the T5 Compact has two Small Form Pluggable, miniGBIC, modules (SFPs), supporting CWDM, short/ long-haul and Bi-directional (single fiber usage) transceivers. In addition, 2 10/100/1000BaseT Ethernet fixed ports are available for flexibility enhancement. The T5 Compact is supplied in two configurations: with 48 10/100BaseTX auto-sensing ports, or with 24 10/100BaseTX ports. This versatility enables the customer to choose the most suitable configuration while using a uniform platform and feature set. This versatility enables use of a single T5 Compact to “close” rings and ears topologies. AC, DC and NEBS versions units provide any-customer flexibility.

Features

The T5 Compact Routing Switch, under the BiNOS umbrella, incorporates a large number of features, such as IEEE 802.3ad link aggregation, IEEE 802.1Q VLAN, IEEE 802.1d Spanning Tree Algorithm, 802.1w and 802.1s Rapid and Multiple Spanning Tree Algorithm, IEEE 802.3x Flow Control and Backpressure, Resilient Ports, IGMP, Access Control Lists, bandwidth reservation, DHCP server/ relay with option 82 support, Diffserv and IEEE 802.1p based Quality of Service with eight (8) priority queues.

• Link Aggregation (802.3ad & LACP)

Link Aggregation helps broaden the bandwidth between different switches dynamically. This important feature helps circumvent possible network bottlenecks by aggregating bandwidth on crucial network connections. In addition to adding robustness, link aggregation also serves as a form of redundancy by ensuring that even if one link fails, all network traffic will still be propagated over the remaining links in the aggregation group.

• Virtual LANs

Virtual LANs allow network administrators to improve bandwidth capabilities and reduce administrative overhead by segmenting users into different logical groups that adhere to corporate policies. In order to implement a VLAN across a network the T5 Compact Routing supports the full 4K range of VLANs according to the IEEE 802.1q standard and auto-VLAN detection capabilities.

• IGMP Multicast Support

Network multicasts are geared toward reducing the amount of bandwidth needed for applications like video-conferencing and online learning. Hardware support for IGMP allows the T5 Compact Routing Switch to forward only single copies of transmissions to destination ports. The T5 Compact Routing Switch has the unique ability to automatically recognize IGMP join and leave messages, freeing network administrators from the strain of multicast management.

• Security and Policy Enforcement

Network security and policy enforcement consists of RADIUS and Secure Telnet for access, port-based MAC security and user-defined rules that determine how, where, and when various network functions are performed. While many early implementations focused on QoS across a number of network devices, the goal of policy-based networking is to allow the management of any type and number of policies across a network. BiNOS SSH server provides a more secure connection by providing authenticated services. In addition, all BATM/Telco Systems Routing Switches support IEEE 802.1x and SNMPv3 authentication features for enhanced security and encryption applications.

• Access Control Lists

The T5 Compact Routing Switch’s wire speed Access Control Lists (ACLs) enable the implementation of QoS, security, and marking for Differentiated Services at DiffServ Code Points upon entry to the switch. ACLs ensure that only authorized users have access to specific resources and block any unwarranted attempts to reach network resources. The policies implemented in the ACLs are used to provision bit rates IP or applications.

• Quality of Service

Quality of Service is vital to ensure proper flow control and bandwidth management in a network. Eight (8) priority queues give the T5 Compact Routing Switch the capability to differentiate between time sensitive VoIP applications and other network data transmissions. In addition to IEEE 802.1p support, the T5 Compact Routing Switch also supports Differentiated Services (Diffserv). Diffserv is used for specifying and controlling network traffic by class so that certain types of traffic get precedence. Diffserv avoids simple priority tagging and depends on a policy which determines how to forward a given network transmission. One of the T5 Compact Routing Switch’s more unique qualities is its ability to provide adaptive bandwidth control. Thresholds can be set by using Weighted Random Early Detection (WRED) to start segregating TCP traffic when it exceeds a given threshold. This allows networks a great amount of flexibility and the ability to avoid unnecessary static bandwidth provisioning.

Routing & Multicast Routing

Layer 3 routing capabilities are critical for improving network utilization. Routers are responsible for forwarding packets towards their destinations via adjacent networks. Routers “decide” which way to forward a packet based on the current state of the networks they are connected to. Special network routing hardware enables the T5 Compact Routing Switch to perform MAC resolution, CRC checks, and TTL updates on a packet-by-packet basis at wire speed. The information used to forward packets is gathered by using special protocols, such as Routing Information Protocol (RIP), Open Shortest Path First (OSPF) and Border Gateway Protocol 4 (BGP4). When routing between VLANs, the T5 Compact Routing Switch is capable of replacing the 802.1Q based VLAN tags at wire speed. The T5 Compact Routing Switch VRRP eliminates the single point of failure inherent in the static default routed environments. The T5 Compact Routing Switch supports Routing Multicasts features such as PIM (Protocol Independent Multicast).

Standards

IEEE 802.3 CSMA/CD method and physical layer specifications
IEEE 802.1d Spanning Tree Algorithm
IEEE 802.1p Priority Queuing
IEEE 802.1q VLAN tagging
IEEE 802.1w Rapid Spanning Tree
IEEE 802.1s Multiple Spanning Tree
IEEE 802.1x Authentication
IEEE 802.3ac VLAN Tagging
IEEE 802.3ad Link Aggregation
IEEE 802.3x Flow Control
IEEE 802.3 Ethernet
IEEE 802.3u Fast Ethernet
IEEE 802.3z Gigabit Ethernet
RFC 768 UDP
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 Telnet Client & Server
RFC 862 Echo Protocol
RFC 863 Discard Protocol
RFC 867 Daytime Protocol
RFC 868 Time Protocol
RFC 904 Exterior Gateway Protocol Formal Specification
RFC 919 Broadcasting Internet Datagrams
RFC 922 Broadcasting Internet Datagrams in the Presence of Subnets
RFC 951 BootP
RFC 1024, 1035 Domain names
RFC 1027 Using ARP to Implement Transparent Subnet Gateways
RFC 1042 Standard for the Transmission of IP Datagrams over IEEE 802 Networks
RFC 1058 RIP
RFC 1059, 1119 NTPv1/2
RFC 1112 IGMP
RFC 1122 Host Requirements
RFC 1166 Internet Numbers
RFC 1256 ICMP Router discovery protocol
RFC 1267 A Border Gateway Protocol 3 (BGP-3)
RFC 1305 Network Time Protocol, NTPv3
RFC 1350 TFTP
RFC 1388 RIP Version 2 Carrying Additional Information
RFC 1403 BGP OSPF Interaction
RFC 1519 CIDR (Classless Inter-domain Routing)
RFC 1542 Bootstrap Extensions
RFC 1587 OSPF NSSA
RFC 1661 PPP
RFC 1701 Generic Routing Encapsulation
RFC 1702 Generic Routing Encapsulation over IPv4 Networks
RFC 1723 RIP V2
RFC 1771 BGP4*
RFC 1745 BGP4/OSPF*
RFC 1765 OSPF Database Overflow
RFC 1812 Requirements for IP Version 4 Routers
RFC 1851 The ESP Triple DES Transform
RFC 1866 HTML
RFC 1965 Autonomous system configuration for BGP
RFC 1966 BGP Route Reflection*
RFC 1997 BGP Communities Attribute*
RFC 2131 DHCP Server
RFC 2132 DHCP Options and BOOTP Vendor Extensions
RFC 2138 RADIUS
RFC 2139 RADIUS Accounting*
RFC 2236 IGMPv2
RFC 2328 OSPF V2
RFC 2338 VRRP
RFC 2362 PIM-SM/DM
RFC 2370 The OSPF Opaque LSA Option
RFC 2439 Route Flap Damping
RFC 2453 RIPv2
RFC 2474 DiffServ Precedence
RFC 2475 DiffServ Core and Edge Router Functions
RFC 2597 DiffServ Assured Forwarding
RFC 2598 DiffServ Expedited Forwarding
RFC 2644 Directed Broadcasts
RFC 2697 A Single Rate Three Color Marker
RFC 2698 A Two Rate Three Color Marker
RFC 2792 DSA and RSA Key and Signature Encoding for the KeyNote TMS
RFC 2865 Remote Authentication Dial In User Service (RADIUS)
RFC 3046 DHCP Relay Agent Information Option
RFC 3084 COPS-PR*
RFC 3140 PHB Identification Codes
RFC 3222 Forwarding Information Base (FIB)
DVMRP v3*
GMRP
GVRP
RSVP*
SSH2
PVST
SNMPv3
IGMP snooping
BiNOS enabled
* - future implementation

Specifications

Interfaces

10/100BaseTX and 10/100/1000BaseT:

Connectors:	RJ-45
Transmission:	Full/Half-Duplex
Range:	100m

1000BaseSX/1000BaseLX:

Connectors:	LC
Transmission:	Full/Half-Duplex
Optical Budget:	9db
Fiber:	50/125 micron, 850nm, 9/125 micron, 1310nm
Range:	550m (50/125), 10Km (9/125)

Switching Characteristics

Technology:	ASIC based parallel Store-and-Forward
Bridging:	IEEE 802.1d Spanning Tree Algorithm
Address Table:	16K MAC addresses
Forwarding Rate:	Up to 148,800 pps/100 Mbps ports Up to 1,488,000 pps/1 Gbps ports
Flow Control:	802.3x for full duplex and back-pressure for half duplex transmission

Routing Characteristics

Technology:	ASIC based IP routing
Address Table:	256K IP Addresses, 16 default gateways
Forwarding Rate:	Up to 148,800 pps/100 Mbps ports Up to 1,488,000 pps/1 Gbps ports

Management:

STD-15 SNMPv1, STD-16 SMIv1, STD-17 MIB-II, STD-50 EtherLike MIB, STD-58 SMIv2, STD-59 RMON, STD-62 SNMPv3, SNMPv2c, SNMPv1, RFC2668 MAU, RFC2925 Ping MIB, BATM/Telco Systems Private MIBs

CLI:	Serial, Telnet, SSH
Internet:	JAVA based Web management
Interface:	In-Band/Out-of-Band
Local Interface:	RJ-45, RS-232
SW Download:	via TFTP

Management Features:

VLANs:	Up to 4k VLANs per 802.1q
Bridging:	Spanning Tree, Aging
Class of Service:	8 queues per port
Monitoring:	Single/Multi port mirroring

General:

Dimensions:	(W) 442 x (H) 44 x (L) 305 mm (17,5" x 1U x 12")
Power:	36-60VDC, 100-240 VAC, 50/60 Hz, 60W max.
Weight:	5.2 kg (11.5 lb)
Operating Temp.:	0°C - 45°C
Humidity:	up to 90%, non-condensing

Safety & Electro Magnetic Compatibility:

Safety - EN/IEC 60950, EN 60825
EMC - EN55022
Immunity - EN 61000
FCC, VCCI, UL/CUL, CE (EMI, EMS, LVD)
NEBS

Specifications

Ordering Information

Chassis and Power Supplies

Part Number	Description
BTI-0548T	T5C-48T Compact Routing Switch with 48 ports 10/100BaseTX, 2 10/100/1000BaseT ports and 2 unpopulated 1000BaseX miniGBIC (SFP) ports. AC power supply. BiNOS-Multi-Layer SW enabled
BTI-0548T-D	T5C-48T Compact Routing Switch with 48 ports 10/100BaseTX, 2 10/100/1000BaseT ports and 2 unpopulated 1000BaseX miniGBIC (SFP) ports. Dual-feed -48VDC power supply. BiNOS-Multi-Layer SW enabled
BTI-0548T-DN	T5C-48T Compact Routing Switch with 48 ports 10/100BaseTX, 2 10/100/1000BaseT ports and 2 unpopulated 1000BaseX miniGBIC (SFP) ports. Dual-feed -48VDC power supply. BiNOS-Multi-Layer SW enabled. NEBS certified version
BTI-0524T	T5C-24T Compact Routing Switch with 24 ports 10/100BaseTX, 2 10/100/1000BaseT ports and 2 unpopulated 1000BaseX miniGBIC (SFP) ports. AC power supply. BiNOS-Multi-Layer SW enabled
BTI-0524T-D	T5C-24T Compact Routing Switch with 24 ports 10/100BaseTX, 2 10/100/1000BaseT ports and 2 unpopulated 1000BaseX miniGBIC (SFP) ports. Dual-feed -48VDC power supply. BiNOS-Multi Layer SW enabled

1000Mbps miniGBIC (SFP) Modules

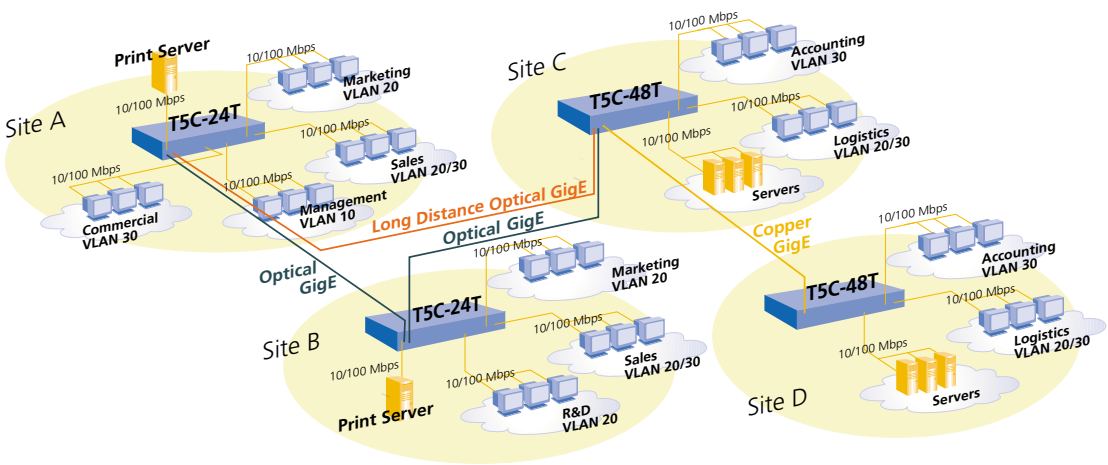
Part Number	Description	Connector	Distance
BTI-MGBIC-GLX-LC	1 port 1000BaseLX Single mode miniGBIC transceiver (1310nm)	LC	10Km
BTI-MGBIC-GSX-LC	1 port 1000BaseSX Multi mode miniGBIC transceiver (850nm)	LC	550m
BTI-MGBIC-GTX	1 port 1000BaseT miniGBIC transceiver	RJ-45	100m

Operating Software

BiNOS-Multi-L-Adv.	BiNOS-Multi-L + OSPF, BGP, VRRP, PIM

Elements Management Software

BiNOSCenter-Single User	Elements Management System for Single User license
BiNOSCenter-Multi User	Elements Management System for Multiple Users license
BTIView-OVW	SNMP GUI for HP's OpenView management software
BTIView-SUN	SNMP GUI for HP's OpenView management software for Sun Systems
BTIView-WIN	SNMP GUI for Castle Rock's SNMPc management software



AIRLINX Communications, Inc.
Box 253
Greenville, NH 03048
E-mail: sales@airlinx.com
Tel: (888) 224-6814
Fax: (603) 878-0530