

T5 Compact 24F FTTH Routing Switch

Benefits and Features

- ❖ **Advanced L3, non-blocking Routing Switch**
- ❖ **Ultra Compact Size – 1RU height, under 12" depth**
- ❖ **24 x 100BaseFX plug-in (SFP) ports plus 4 fiber/copper Gigabit-all wire speed Ethernet ports**
- ❖ **Maximum savings on infrastructure. Use a single fiber instead of two!**
- ❖ **Unique option for plug-in Fast and Gigabit Ethernet transceivers including: CWDM, Extra Long-Haul (more than 100Km) optics, Bi-Directional, and many more...**
- ❖ **High level of redundancy with AC or DC Power Supplies**
- ❖ **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 standard industry CLI, 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, many more**
- ❖ **Lowest power consumption in the Industry**



Ultra-Compact High-Density Optical Fast Ethernet Concentrating Residential Access and FTTH Routing Switch

BATM/Telco System's T5 Compact optical Fast Ethernet routing switch provides an optimal solution for mid and long distance intelligent Layer 3 broadband services. Ideal for Fiber-to-the-Home (FTTH) and centralizing remote sites applications. The T5 Compact's super-efficient size, only 1RU in height, affords not only the capacity of physically larger backbone routing switches, but also the economy offered by workgroup switches.

T5 Compact 24F supports 24 Fast Ethernet plug-in (SFP) or fixed multi mode ports, 2 Gigabit Ethernet fixed 10/100/1000BaseT and 2 Gigabit Ethernet plug-in miniGBIC (SFP) ports. Residential access and FTTH applications are tailored exactly to the T5 Compact 24F capabilities offering. SFP pluggable 100FX modules grant ultimate flexibility in choosing the right transceiver to any application need. Multi-mode, single-mode and Bi-Directional single-mode interface elevates Telco System's T5C-24F into the optimal platform in terms of flexibility and cost-effectiveness.

Copper Gigabit Ethernet provides cost-effective high-speed uplink and cascading capabilities, plug-able miniGBIC (SFP) optical Gigabit Ethernet interfaces allow network extension over large distances.

The resident BiNOS (BATM/Telco Systems Inter Networking Operating System) software anticipates the administration, management, QoS, and security performance requirements of enterprise 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 T5 Compact 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.

Description of Product Technology

FTTH and Centralizing Routing Switch

Answering the needs of FTTH and high-bandwidth distribution applications means to be able to implement interface-rich centralizing equipment provide optimal solution for any distance at any rate. Centralizing routing switch allow mid and long distance connectivity of broadband applications for servicing remote site, bandwidth-hungry residential neighborhoods and high quality connectivity to backbone layer.

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.

Flexibility

One of the most important features that switches can have is their ability to conform to the needs of the network, and not vice versa. The T5C-24F provides an ideal choice for telecom and mid-tier operators. The T5C-24F offers 24 optical Fast Ethernet plug-in ports. Plug-in support presents maximal flexibility when allowing the operator to mixing any Fast Ethernet optical interface type without the need either to add un-necessary equipment or double the investment. When implementing FTTH and centralizing applications, there is a requirement for allowing various distances overcoming and various fiber types (MMF, SMF and even single-fiber) with the same "box", and T5C-24F provides more than that. Besides the plug-in (SFP) ports that provides any-distance and fiber type compliant, 4 Gigabit Ethernet, 2 10/100/1000 copper and 2 fiber, plug-ins miniGBIC ports are available to provide the required connectivity to the backbone layer, servers farms or any additional high-bandwidth requirement. This versatility in GigE ports enables the user to "close" rings and ears topologies using a single T5 Compact Routing Switch. The T5C-24F fixed configurations, offer the operator with the option to choose the most suitable optical platform for any application.

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 Switch 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

Interfaces

100BaseFX multi-mode:

Connectors: SFP LC, MT-RJ fixed
 Transmission: Full/Half-Duplex
 Optical Budget: 14db
 Range: 2Km

100BaseFX single-mode:

Connectors: SFP LC
 Transmission: Full/Half-Duplex
 Optical Budget: 19db/30db
 Fiber: 9/125 micron, 1310nm
 Range: 14/30Km

10/100/1000BaseT:

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

1000BaseSX/1000BaseLX:

Connectors: SFP 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/1Gbps 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/1Gbps 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 1RU x 12")
 Power: 36-60VDC, 100-240 VAC,
 50/60 Hz, 100W 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)

Specifications

Ordering Information

Chassis and Power Suppliers

Part Number	Description
BTI-0524F	T5C-24F Compact routing switch with 24 unpopulated 100BaseX plug-in (SFP), 2 fixed 10/100/1000BaseT ports and 2 unpopulated miniGBIC (SFP) ports. AC power supply. BiNOS-Multi-Layer SW enabled
BTI-0524F-D	T5C-24F Compact routing switch with 24 unpopulated 100BaseX plug-in (SFP), 2 fixed 10/100/1000BaseT ports and 2 unpopulated miniGBIC (SFP) ports. Dual-feed -48VDC power supply. BiNOS-Multi-Layer SW enabled
BTI-0524F-M	T5C-24F Compact routing switch with 24 Fixed 100BaseX multi-mode MT-RJ connectors (up to 2Km reach), 2 fixed 10/100/1000BaseT ports and 2 unpopulated miniGBIC (SFP) ports. AC power supply. BiNOS-Multi-Layer SW enabled

100Mbps SFP Modules

Part Number	Description	Connector	Distance
BTI-SFP-FLX-LC	1 port 100BaseLX Single Mode miniGBIC transceiver (1310nm)	LC	30Km
BTI-SFP-FSX-LC	1 port 100BaseSX Multi Mode miniGBIC transceiver (1310nm)	LC	2Km

1000Mbps miniGBIC (SFP) Modules

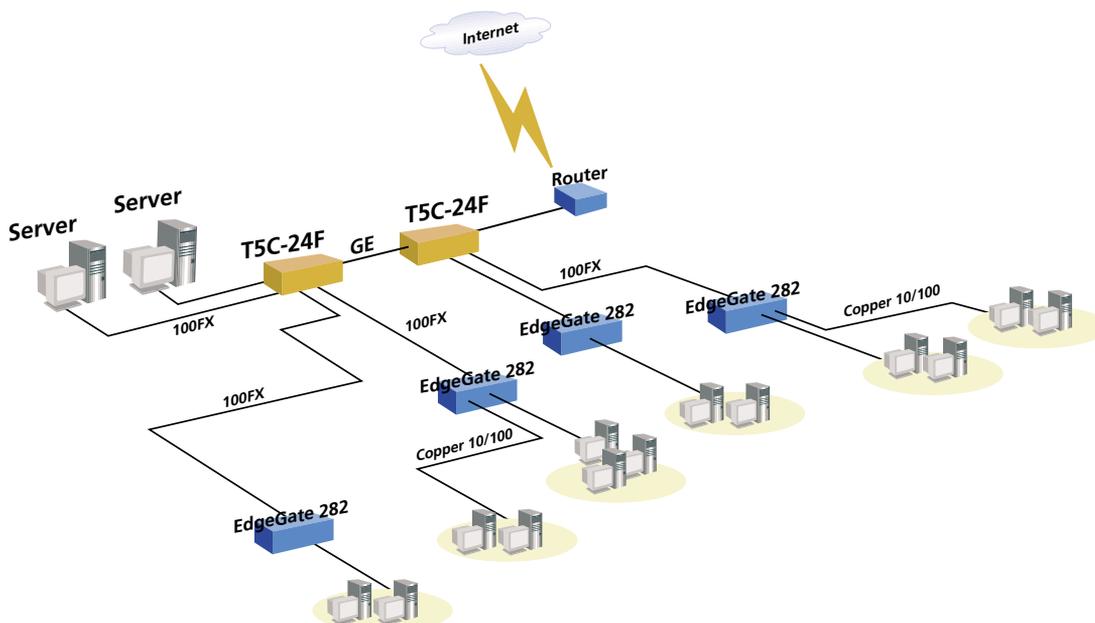
BTI-MGBIC-GLX-LC	1 port 1000BaseLX Single Mode miniGBIC transceiver (1310nm)	LC	10Km
BTI-MGBIC-GSX-LC	1 port 1000BaseSX Multi Mode miniGBIC transceiver (850nm)	LC	550m
BTI-MGBIC-GTX	1 port 1000BaseTX miniGBIC transceiver	RJ-45	100m

Operating Software

BiNOS-ML-Adv.	BiNOS-Multi-L + OSPF, BGP, PIM, VRRP
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Elements Management Software

BiNOSCenter-Single User	Elements Management System for Single Users 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



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