Installation Guide

T5 Compact (T5C-L3)

High Density Fast/Gigabit Ethernet Routing Switch

CERTIFICATION

BATM certifies that this product met it's published specifications at the time of shipment from the factory.

SAFETY CONSIDERATIONS

These instructions are for use by qualified personnel only. To avoid shock, do not perform any servicing other than those contained in the unpacking instructions.

HIGH VOLTAGE

Disconnect the product from the power line before removing the cover. Any adjustment and maintenance of the opened device should be done only while the device is disconnected from its source of power and should only be performed by qualified personnel, authorized by BATM.

GROUNDING

Before connecting the product to the power line, make sure that the protective ground terminal of the device is connected to the safety ground conductor of the mains power cord.

The mains plug should only be inserted in a socket outlet provided with a connected safety ground. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding). Any interruption of the protective (grounding) conductor or disconnection of the protective ground terminal can make the device unsafe to use. Intentional interruption is prohibited.

WIRING FOR NATIONAL POWER PLUG

A mains power cord with molded IEC socket is supplied with each unit. The specific national mains power plug should be wired as follows:

Brown lead	Live (phase)
Blue lead	Neutral
Green/Yellow lead	Safety ground

FUSES

Make sure that only fuses with the specified rated current and of specified type are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

LINE VOLTAGE

Before connecting the product to the power line, make sure the voltage of the power source matches the requirements of the product, as marked on the label located near the power connectors

Table of Contents

Important Note: The User Documentation for the BiNOS management software and the BiNOSView Java™ based graphical manager may be downloaded from the BATM or Telco Systems websites as indicated page 5.

Chapter 1 Overview

T5C Routing Switch: High Density Fast/Gigabit Switch

The T5C Routing Switch is a compact high performance Ethernet routing switch. It is tailored made for demanding networks, which require multi-layer service capabilities at wire speed. A high density architecture enables the T5C Routing Switch to utilize a large variety of interfaces to transparently switch Layer 2, 3 and 4 network traffic over fiber or copper , at 10, 100 or 1000 Mbps speeds.

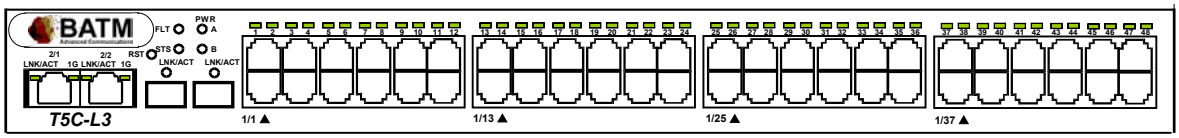

Figure 1-1. T5C Routing Switch

Figure 1-1 is a front view of T5C-L3

Main Features

Speed

Wire speed Layer 2 switching and Layer 3 routing are made possible by use of integrated hardware functionality. Hardware allows the T5C Routing to attain a surmountable performance advantage over traditional routers at a fraction of the cost. The non-blocking architecture of the T5C Routing Switch ensures that even under one hundred percent traffic load no packets are dropped. This combination makes the T5C Routing the pinnacle of performance.

Additional Features

The T5C Routing Switch incorporates a large number of features, such as line trunking, IEEE 802.1q VLAN, IEEE 802.1d, Spanning Tree Algorithm, IEEE 802.3x Flow Control and Backpressure, bandwidth reservation, and Differentiated Services and IEEE 802.1p based Quality of Service with four priority queues. Port trunking helps broaden the bandwidth between different switches dynamically. This important feature helps circumvent possible network bottlenecks. 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 T5C Routing Switch supports the full range (4k) of VLANs according to the IEEE 802.1q standard. Bandwidth reservation pertains to the ability to reserve critical bandwidth for specific applications, such as VoIP and video conferencing. Quality of Service will ensure transparent convergence between voice and data.

Routing

Routing capabilities are critical for improving network utilization. Routers are responsible for forwarding packets toward their destination 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 T5C Routing Switch to perform MAC resolution, CRC checks, and TTL updates at wire speed. The information used to forward packets is gathered by using special protocols, such as Routing Information Protocol (RIP) and Open Shortest Path First (OSPF). The T5C Routing Switch supports RIP, OSPF, and other routing protocols.

Management

Front panel LED indicators provide switch and port status information. With RMON MIB support (4 groups), extensive analysis of the switch is available. The T5C's Routing offers additional

monitoring and diagnostic capabilities via Port Mirroring. Any one port may be mirrored, allowing for detailed traffic analysis via a sniffer.

Important Note: The User Documentation for the BiNOS management software and the BiNOSView Java™ based graphical manager may be downloaded from the BATM or Telco Systems websites at:

http://www.batm.com/in_downl.htm

or

http://www.telco.com/service_support/tech_publications.cfm

T5C Routing Switch Basic Unit

BTI-0430-L3	T5C Routing Switch High Density Switch Base Unit.
BTI-0430DC-L3	T5C Routing Switch High Density Switch Base Unit. (DC Power Input)
BTI-0430DC-R-L3	T5C Routing Switch High Density Switch Base Unit. (DC Power Input x 2 - Redundancy)
BTI-2SC-LD-L3	2 Ports 100BaseFX module with SC connectors. Distance: 14 km
BTI-2SC-EX-L3	2 Ports 100BaseFX module with SC connectors. Distance: 40 km

Packing List

The **T5C Routing Switch** is factory tested and configured. The shipping package includes the following items:

- 1- T5C Routing Switch.
- 1- Installation Guide
- 1- Power cable
- 1- Console cable

Chapter 2 System Specifications

Basic Chassis

BTI-0430-L3	T5C Routing Switch Chassis
Dimensions:	17.72”(W) x 11.02”(L) x 1.77”(H)
	450(W) x 280(L) x 45(H) mm
	19” x 1.5U’ rack mountable
Weight:	5.15 kg (11.6 lbs) without modules
Shipping Weight:	5.75 kg (12.7 lbs) without modules
Weight:	6.30 kg (13.8 lbs) with 4 modules
Shipping Weight:	7.00 kg (14.9 lbs) with 4 modules

Physical/Environmental

Operating Temperature:	0°C - 40°C (32°F – 104°F)
Humidity:	95% non-condensing
Input power:	100-120VAC / 200-240VAC, 50/60 Hz
	36-60VDC for BTI-0430DC-L3

Switch Characteristics

Technology:	ASIC based store-and-forward
Bridging:	Per IEEE 802.1d Spanning Tree
Address Table:	Maximum- 64K MAC addresses per switch
Forwarding Rate:	148,800 packets-per-second maximum for 100Base ports.
Internal Bandwidth:	4.8 Gbps
Buffer Memory:	4 Mbytes
VLAN	per 802.1q
Flow Control	Back pressure for Half Duplex per 802.3x for Full Duplex
Priority queuing	Four Priority per port per 802.1p

Routing Characteristics

Technology:	ASIC based IP routing.
Address Table:	64K IP addresses, 17 default gateways.
Forwarding Rate:	Up to 148,800 packets-per-second maximum for 100Base ports. Up to 1,488,000 packets-per-second maximum for 1000Base ports.

Management Features

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

Management

Inband:	Integrated SNMP agent Telnet
MIBs Supported:	MIB II, Bridge MIB, Private MIB ,RMON MIB (Groups 1,2,3,9)
Traps/Alarms:	SNMP traps to NMS
Console Port:	For initial configuration Via dedicated RJ-45 connector. EIA 232 protocol VT-100 compatible
Software Download:	Via TFTP

Compliance

IEEE 802.1d Spanning Tree Algorithm
IEEE 802.1p Priority Queuing
IEEE 802.1q VLAN tagging
IEEE 802.3ad Port Trunking
IEEE 802.3x Flow Control
IEEE 802.3 Ethernet
IEEE 802.3u Fast Ethernet
IEEE 802.3z Gigabit Ethernet
RFC 768 UDP
RFC 783 TFTP
RFC 791 IP
RFC 792 ICMP
RFC 793 TCP
RFC 826 ARP
RFC 854 Telnet
RFC 951 BootP
RFC 1058 RIP
RFC 1122 Host Requirements

RFC 1256 Router discovery protocol
RFC 1519 CIDR (Classless Interdomain Routing)
RFC 1542
RFC 1723 RIP-2
RFC 1724 RIP-2 MIB

Chapter 3 Hardware Description

Front Panel

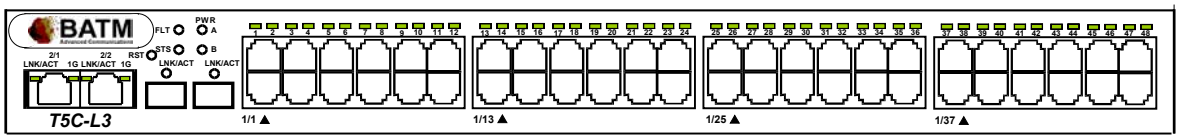

Figure 3: T5C Routing Switch front panel

Front Panel Main Components:

Console	RJ-45 connector for console interface (used for local configuration).
Init button	Internal push button which resets the switch. You must use a pin or similar object to push the button.

LEDs:

Basic Unit LEDs:

Pwr (green)	- ON (green) when power switch is ON.
Status (green)	- ON in normal operation,
	- Blinks (every 0.5 sec) when self-test fails.
	- Blinks (every 1 sec) in TFTP mode
Mngt (green)	- OFF in normal operation,
	- Blinks when the switch is managed

Rear Panel

Chapter 4 Installation and Setup

Installation

This section provides instructions on how to install and operate the T5C Routing Switch. The switch is a 'plug-and-play' device and can be installed in a standard 19-inch rack or as a standalone unit in a desktop configuration.

Unpacking

The T5C Routing Switch is factory tested and inspected prior to shipment. In the event that there is obvious damage to the shipping container, contact the carrier involved.

It is recommended that you keep the shipping package until the unit has been installed and verified as being fully operational. The T5C Routing Switch, such as all electronic devices with static sensitive components, should be handled with care.

Desktop Installation

If you are using the T5C Routing Switch as a desktop unit, place it on a secure flat surface. Ensure that the unit is within reach of the necessary connections:

- Power outlet
- Ethernet connections

As with all electronic devices, ensure that adequate air flow is provided around the unit.

Ethernet Cables

When connecting an RJ-45 port to an end station, workstation or server, use a standard RJ-45 pin-out cable. When connecting to network devices such as switches or hubs, remember to use a crossover cable.

Console Interface

A simple menu-driven interface provides system initialization and diagnostics. The Console interface is EIA232 VT-100 compatible. The primary purpose of the terminal interface is to set basic operational parameters.

The terminal interface is password protected.

Using the enclosed serial cable (see table below for wiring), connect the RJ-45 connector to the connector marked "Console" and the other side to the 9-pin serial port connector on the back of your PC.

The supplied cable has the following pinout:

Switch Side	PC Side
RJ-45 Pin #	DB-9 Female
3	2
2	3
5	5

Chapter 5 Initial Configuration Using the Console

Initial Configuration

The Configuration Menu is accessed by using a VT-100 (or compatible terminal) to the console port of the T5C Routing Switch. The terminal port parameters are fixed at: 9600 bps, 8 data bits, 1 stop bit, no parity and without flow control. This provides a convenient method for initial setup of the T5C Routing Switch. System parameters are stored in a non-volatile memory. They have to be set up only once during initial setup or after setup is changed.

The following keys are used to access the menu:

Enter	Ends input or refreshes a menu
Backspace	Clears last character in input mode
Tab	Command Auto-Completion

The following screens (examples only) appear on the Console Port at power up or reset.

```
>>Starting default primary application, please wait...
>


 ////////////////////////////////////////////////////////////////
//                                                              //
//                                                              //
//  B A T M   A d v a n c e d   C o m m u n i c a t i o n s     //
//                                                              //
//  T e l c o   S y s t e m s                                   //
//                                                              //
//  Switch model   : T5C-L3 256M                                //
//  SW version     : 4.5.0.1.5 created Aug  1 2003 - 15:40:51   //
//                                                              //
//                                                              //
 ////////////////////////////////////////////////////////////////

User Access Verification

Password:
```

Type **batm** for default password and then press Enter.

Note *The default password may be changed later.*

```
Type ? To display the available commands:

 T5cL3>
   alias     An alias of a command
   enable    Turn on privileged mode command
   exit      Exit current mode and down to previous mode
   help      Description of the interactive help system
   no        Negate a command or set to defaults
   quit      Disconnect and logout
   show      Show running system information
```

To continue initial configuration procedure perform the following steps:

Step #1:
Enter privileged mode. Type the command: **enable**

Step #2:
Enter configure mode. Type the command: **configure terminal**

Step #3:
Set the T5C Routing Switch IP address: Type the command**: ip address** <**aa.bb.cc.dd/yy**>, where <**aa.bb.cc.dd**> is the IP address assigned to the T5C Routing Switch and **yy** is the number of bits in the netmask (e.g. netmask of 255.255.255.0 would be **/24**).

Step #4:
Set the default gateway IP address if the host is on a different subnet: Type the command**: ip route** <**aa.bb.cc.dd**>

Step #5:
Return to privileged mode: Type the command: **end**

Step #6:
To verify if the IP addresses were set correctly, type: **show ip**

For example:

```
>T5cL3#show ip
>IP-ADDR : 100.100.100.1 NET-MASK : 255.255.255.0
```

Note The **Show** command can be used to display a variety of parameters: Setup Configuration and others. To view the show command options type: **show**

Step #7:
Type the command: **write** from privileged mode.

At this point the Initial configuration setup is completed and the T5C Routing Switch can be accessed using **Ping** or **Telnet** commands.

Saving Configuration in Text File

A variety of TFTP Server programs can be used by the host computer where the software images and configuration files are located. The only information which is required by the TFTP Server, is the location of the file on the host computer's file system.

It is recommended to save the configuration in an external text backup file. To write the backup configuration file, use the command **copy**.
To view the copy command options type: **copy ?**

```
>T5cL3#copy ?
  application     Application downloading image
  java            Java downloading image
  running-config  Copy running config...
  startup-config  Startup configuration data
```

To write the backup configuration file, type**:**

copy startup-config upload-to <IP address> <filename>

Download Configuration from Backup Text File

Configuration file can be easily downloaded, using the **copy** command, type:
copy startup-config download-from <IP address> <filename>

<filename> is the file where the configuration file was saved.

> **Note** ***Copy*** *command use TFTP protocol for its execution, so prior using the* ***copy*** *command, verify that the TFTP Server program is executed by the addressed computer.*

Reload Factory Defaults Configuration

Reload factory defaults configuration is done using the **reload** command.

```
>T5cL3#reload to-defaults
 Restore factory setting and Reboot the Switch ! [y/n]: y
>Rebooting ...
```

> **Note** ***reload to-defaults*** *does* ***NOT*** *change the IP address and netmask of the switch*

Chapter 6 Software Download

The executable software image contained on the T5C Routing Switch can be upgraded via the network whenever new versions become available, reflecting changes in the MIBs or enhancements to the software. The software is stored in erasable Flash memory. It must be downloaded using the Trivial File Transfer Protocol (TFTP).

Important Note ***Before loading new software, Routing Switch configuration must be saved in an external text file as shown in Chapter 6, because downloading a new software version will cause the configuration to revert to the factory defaults.***

TFTP Procedure

Before the actual software transfer can begin, the following preparations have to be made:
Copy the file **T5CL3vxxx.bin** from the BATM website :

http://www.batm.com/in_downl.htm

or from the **Telco Systems** website:

http://www.telco.com/service_support/software_mib_upgrades.cfm

to your hard disk. (where **xxx** is the version number – ex. Version 2.00 file would be **T5CL3v200.bin**)

Verify that IP-traffic with the switch is possible by performing the PING command.

Connect to the T5C Routing Switch via Telnet or the Serial Console to access the menu, and enter to privileged mode as shown in chapter 6.

Note *When the **Copy** command is used for downloading process,a TFTP Server application must be started on the host computer from which the binary image file is to be uploaded*

When starting the downloading process:

Step #1:

Save the configuration as described in Chapter 6.

Step #2:

Type the command: **copy application <IP address> <t4l3vxxx.bin>**

Step #3

When the download is complete, enter the command: **reload to-defaults**

```
>T5c3#reload to-defaults
 Restore factory setting and Reboot the Switch ! [y/n]: y
>Rebooting .........
```

When Step #3 is finished, the T5C Routing Switch is running the new software which was downloaded and saved in NVRAM.

Step #4 – Reconstruction of Configuration

To reconstruct your previous configuration that was saved prior to software download, configure your switch IP address and execute the **reload save** command from privileged mode.

See **Download Configuration from backup text** file in Chapter 6.

Important Note: *The User Documentation for the* ***BiNOS*** *Command Line Network Operating System and the* ***BiNOSView*** *Java™ based graphical manager may be downloaded from the BATM or Telco Systems websites as indicated on the previous page of this Installation Guide .*