

Experience the power of one
Ubigate iBG1000™



System Description



www.samsungnetwork.com

The purposes of Safety Concerns are to ensure user's safety and to prevent property losses. Please read this document carefully for proper use.

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This manual should be read before the installation and operation, and the operator should correctly install and operate the product by using this manual.

This manual may be changed for the system improvement, standardization and other technical reasons without prior notice.

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Homepage: <http://www.samsungdocs.com>



GENERAL USER INFORMATION

Radio Frequency Interference

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at user's own expense.

FCC Requirements

This equipment, Ubigate iBG1000, complies with Part 68 of the FCC rules and the requirements adopted by the ATCA. On the bottom of this equipment is a label that contains, among other information, a product identifier in the format **US: A3LIS00BiBG1000**. If requested, this number must be provided to the telephone company.

Unauthorized Modifications

Any changes or modifications performed on this equipment that are not expressly approved in writing by SAMSUNG ELECTRONICS, CO., LTD. could cause non-compliance with the FCC rules and void the user's authority to operate the equipment.



NOTE

Allowing this equipment to be operated in such a manner as to not provide for proper answer supervision is a violation of Part 68 of the FCC's rules.

Telephone Connection Requirement

A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ATCA. A compliant telephone cord and modular plug is provided with this product. It is designed to be connected to a compatible modular jack that is also compliant. See installation instructions for details.

FCC Part 68

This equipment complies with Part 68 of the FCC rules. The FCC Part 68 label is located on the bottom chassis panel. This label contains the FCC Registration Number and Ringer Equivalence Number (REN) for this equipment. If requested, this information must be provided to your telephone company.

Incidence of Harm

If this equipment, Ubigate iBG1000, causes harm to the telephone network, the telephone company will notify you in advance that temporary discontinuance of service may be required. But if advance notice isn't practical, the telephone company will notify the customer as soon as possible. Also, you will be advised of your right to file a complaint with the FCC if you believe it is necessary.

Service Center

If trouble is experienced with Ubigate iBG1000, please contact your local office of SAMSUNG ELECTRONICS, CO., LTD. for repair or warranty information. If the trouble is causing harm to the telephone network, the telephone company may request that you remove the equipment from the network until the problem is resolved.

Field Repairs

Only technicians certified on Ubigate iBG1000, are authorized by SAMSUNG ELECTRONICS, CO., LTD. to perform system repairs. Certified technicians may replace modular parts of a system to repair or diagnose trouble. Defective modular parts can be returned to SAMSUNG ELECTRONICS, CO., LTD. for repair.

General

Connection to party line service is subject to state tariffs. Contact the state public utility commission, public service commission or corporation commission for information.

Electrical Safety Advisory

Parties responsible for equipment requiring AC power should consider including an advisory notice in their customer information suggesting the customer use a surge arrester. Telephone companies report that electrical surges, typically lightning transients, are very destructive to customer terminal equipment connected to AC power sources. This has been identified as a major nationwide problem.

Safety Warning



High touch current earth connection is essential before making telecommunication network connection.



Energy Hazard-careful treatment is needed.



Every wire for communication should be larger than 26 AWG.



Double pole/neutral fusing.

Underwriters Laboratories

Ubigate iBG1000 system has been tested to comply with safety standards in the United States and Canada. This system is listed with Underwriters Laboratories. The cUL Mark is separately shown on the label.

The following statement from Underwriters Labs applies to Ubigate iBG1000 System:

- 1.** Separation of TNV and SELV - Pluggable A:
Instruction: The separate protective earthing terminal provided on this product shall be permanently connected to earth.
- 2.** Separation of TNV and SELV - Pluggable B:
Instruction: Disconnect TNV circuit connector (s) before disconnecting power.

3. Warning to service personnel:
CAUTION: Double pole/neutral fusing

4. Telephone line cord:
CAUTION: To reduce the risk of fire, use only No. 26 AWG or larger (e.g., 24 AWG) UL Listed or CSA Certified Telecommunication Line Cord

5. Leakage currents due to ringing voltage - Earthing installation instructions:
 1. A supplementary equipment earthing conductor is to be installed between the product or system and earth, that is, in addition to the equipment earthing conductor in the power supply cord.
 2. The supplementary equipment earthing conductor may not be smaller in size than the unearthed branch-circuit supply conductors. The equipment earthing conductor is to be connected to the product at the terminal provided, and connected to earth in a manner that will retain the earth connection when the power supply cord is unplugged. The connection to earth of the supplementary earthing conductor shall be in compliance with the appropriate rules for terminating bonding jumpers in Part K of Article 250 of the National Electrical Code, ANSI/NFPA 70 and Article 10 of Part 1 of the Canadian Electrical Code, Part 1, C22.1. Termination of the supplementary earthing conductor is permitted to be made to building steel, to a metal electrical raceway system, or to any earthed item that is permanently and reliably connected to the electrical service equipment earthed.
 3. Bare, covered, or insulated earthing conductors are acceptable. A covered or insulated conductor must have a continuous outer finish that is either green, or green with one or more yellow stripes.

6. Safety Instructions-Rack Mount ‘Rack Mount Instructions-
The following or similar rack-mount instructions are included with the installation instructions:
 - A) Elevated Operating Ambient-If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment may be greater than room ambient. Therefore, consideration should be given to installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.

- B) **Reduced Air Flow**-Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised.
- C) **Mechanical Loading**-Mounting of the equipment in a rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- D) **Circuit Overloading**-Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- E) **Reliable Earthing**-Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (e.g., use of power strips).’



INTRODUCTION

Purpose

Ubigate iBG1000™ System Description describes general information for Ubigate iBG1000 hardware and software.

Document Content and Organization

This description is composed of three Chapters, one Annex, the Abbreviation, and the Index.

CHAPTER 1. Introducing Ubigate iBG1000

- Ubigate iBG1000 Overview
- Product Specifications
- Ubigate iBG1000 Software Features and Licenses

CHAPTER 2. Hardware Overview

- Ubigate iBG1000 Chassis
- Ubigate iBG1000 Boot Sequence
- Ubigate iBG1000 Top Side
- Ubigate iBG1000 Rear Side
- Port Numbering

CHAPTER 3. Software Overview

- Management Plane
- Control Plane
- Packet Forwarding Plane

ANNEX A. Cable Specifications

Describes cable specifications.

ANNEX B. Open Source Announcement

Open source announcements for this product.

ABBREVIATION

Describes the acronyms used in this description.

INDEX

Index provides main searching keywords to be found.

Conventions

The following types of paragraphs contain special information that must be carefully read and thoroughly understood. Such information may or may not be enclosed in a rectangular box, separating it from the main text, but is always preceded by an icon and/or a bold title.



NOTE

NOTE

Indicates additional information as a reference.

Information for Product and Technical Support

For questions regarding the product and technical supports:

<http://www.samsungnetwork.com>

Revision History

EDITION	DATE OF ISSUE	REMARKS
00	03. 2008.	First edition
01	06. 2008.	Revised for port name printing changes
02	08. 2010.	Modified Open Source Announcement



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TABLE OF CONTENTS

GENERAL USER INFORMATION	I
Radio Frequency Interference	I
FCC Requirements	I
Safety Warning	IV
Underwriters Laboratories	IV
INTRODUCTION	VII
Purpose	VII
Document Content and Organization.....	VII
Conventions.....	VIII
Information for Product and Technical Support.....	IX
Revision History.....	IX
CHAPTER 1. Introducing Ubigate iBG1000	1-1
Ubigate iBG1000 Overview	1-1
Main Features, Functions and Benefits	1-1
Branch Office Configuration Example.....	1-2
Product Specifications	1-4
Ubigate iBG1000 Specifications	1-4
Interfaces.....	1-5
Memory.....	1-6
Power Supply	1-7
Ventilation	1-7
Real-Time Clock	1-7
Ubigate iBG1000 Software Features and Licenses	1-8
Switch/Router Features	1-8
Security Features	1-9

CHAPTER 2. Hardware Overview	2-1
Ubigate iBG1000 Chassis	2-2
Ubigate iBG1000 Boot Sequence	2-3
Ubigate iBG1000 Top Side	2-4
Ubigate iBG1000 Rear Side	2-6
Console Port	2-6
Auxiliary Port	2-6
Port Numbering	2-7
iBG1000 Port Numbering	2-8
CHAPTER 3. Software Overview	3-1
Management Plane	3-1
SNMP	3-1
MIB Information	3-1
Community-based Authentication	3-1
User-Based Security Model (USM)	3-2
View-based Access Control Model (VACM)	3-2
TRAPS	3-2
Command Line Interface (CLI)	3-3
Web GUI (HTTP Server)	3-4
Control Plane	3-5
Unicast Routing Protocols	3-5
Multicast Routing Protocols	3-6
WAN Protocols	3-7
Packet Forwarding Plane	3-10
ANNEX A. Cable Specifications	A-1
Console Port Cable	A-1
Auxiliary Port Cable	A-2
Ethernet Cable	A-3
T1/E1 Cable	A-4

ANNEX B. Open Source Announcement

B-1

ABBREVIATION

I

A ~ G I
H ~ Q II
R ~ W III

INDEX

I

A ~ S I
T ~ W II

LIST OF FIGURES

Figure 1.1 Branch office deployment example 1-3

Figure 1.2 Power Supply 1-7

Figure 1.3 Ventilation..... 1-7

Figure 2.1 Isometric View 2-2

Figure 2.2 Ubigate iBG1000 Top View..... 2-4

Figure 2.3 Ubigate iBG1000 Rear View 2-6

Figure 2.4 iBG1000 Port Numbering 2-8

Figure 3.1 iBG-DM Management Network Diagram 3-4

Figure A.1 Console Port Cable A-1

Figure A.2 Auxiliary Port Cable..... A-2

Figure A.3 Ethernet LAN Interface Cable A-3

Figure A.4 T1/E1 WAN Interface Cable A-4



CHAPTER 1. Introducing Ubigate iBG1000

Chapter1 describes Ubigate iBG1000 overview and specifications.

Ubigate iBG1000 Overview

Main Features, Functions and Benefits

Ubigate iBG1000 router is a Wide Area Network (WAN) router. It is a 1U router that supports multi-protocol routing on WAN/LAN interfaces. Using built-in encryption engine, Ubigate iBG1000 can provide IPsec Virtual Private Network (VPN).

Here are highlights of Ubigate iBG1000's features.

Performance and Scalability

- 150 Kpps Routing Capacity
- Maximum 4 T1/E1 and 2 FE UTP ports

Simple but Powerful Management

- Customers can manage all aspects of routing, switching, and security from a single Web-Graphic User Interface (GUI).
- Read-only remote management enables service providers a quick view of the router for easy troubleshooting of Customer Premises Equipment (CPE).

Versatility

- WAN: Clear-Channel/Channelized T1/E1, Integrated Service Digital Network (ISDN), Frame Relay, Multi-link Frame Relay (MFR), Point to Point Protocol (PPP), Multi-Link PPP (MLPPP), and PPP over Frame Relay
- LAN: 100 Mbps Metro Ethernet, Virtual Local Area Network (VLAN), and 802.1q
- QoS: DiffServ, Auto QoS, Link Fragmentation and Interleaving (LFI), Low-Latency Queuing (LLQ) and Frame Relay PVC Queuing

Rock-Solid but Flexible Security

IPSec, Generic Routing Encapsulation (GRE), Layer 2 Tunneling Protocol (L2TP), Triple Data Encryption Standard (3DES)/Advanced Encryption Standard (AES), and Content Filtering

Branch Office Configuration Example

Employing full routing capabilities as well as integrated security, Ubigate iBG1000 eliminates a need for many separate network devices at customer sites. In addition, remote management features of Ubigate iBG1000 allow you to graphically configure, monitor or troubleshoot Ubigate iBG1000 as a managed CPE device with ease. With Ubigate iBG1000 on your side, you will boost your revenue while providing a right solution to your customers. Customer may increase productivity for its mobile executives, improved contact center operations, and facilitated expansion and acquisitions.

In Figure 1.1, iBG1000 in Branch office is shown to provide features of a router, a firewall, and a VPN concentrator in a single device.

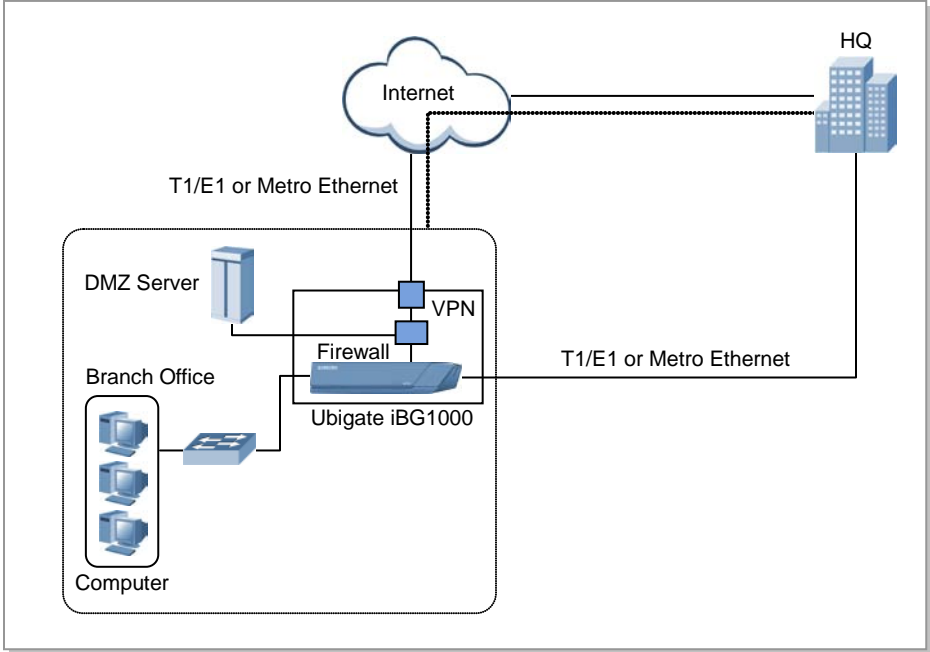


Figure 1.1 Branch office deployment example

Product Specifications

Ubigate iBG1000 Specifications

The following table lists specifications for Ubigate iBG1000.

Item	Specification
Router Memory	- Typical: 512 MB - Maximum: 1 GB
Internal Storage	SD Memory: 1 GB
Boot Flash	2 MB
AC Power Adapter	- Input Voltage: 100~240 V - Frequency: 50~60 Hz - Power Consumption: 24 W
High Temperature (Operating)	104°F (+40°C)
Low Temperature (Operating)	32°F (0°C)
High Temperature (Non-Operating)	158°F (+70°C)
Low Temperature (Non-Operating)	-13°F (-25°C)
Humidity (Operating)	5 to 95%, non-condensing
Dimension (H x W x D)	- Height: 1.75-inch (44.45 mm) - Width: 10.24-inch (260 mm) - Depth: 7.48-inch (190 mm)
Weight	1 Kg
Altitude	0 to 13,123 ft (0 to 4, 018 m)
Regulatory & Safety Compliance	- MIC Type Approval/EMC Registration - IEC 60950-1/EN 60950-1/UL 60950-1 - EN 55022/EN 55024/EN 61000-3-2/ EN 61000-3-3 - FCC Part 15 Class A - FCC Part 68

Interfaces

iBG1000 has four T1/E1 interfaces and two Fast Ethernet ports.

E1 WAN Interface

Specifications	Descriptions
Receive line rate	2.048 Mbps \pm 50 ppm (payload = 1.984 Mbps)
Line code	HDB3
Framing CRC	non-CRC (ITU G.704), and unframed
Input signal	DSX-1, 0 to -24 dB
Output signal build out	long-haul or short-haul
Impedance	75 or 120 ohm
Connectors	RJ-48C
Timing	Internal or network
Pulse density	ITU G.703

T1 WAN Interface

Specifications	Descriptions
Receive line rate	1.544 Mbps \pm 32 ppm
Line code	B8ZS or AMI
Framing	D4 or ESF
Interface ESF FDL	- AT & T TR-54016-1986 - AT & T TR-54016-1989 - ANSI T1.403-1989
Input signal	DSX-1, 0 to -24 dB
Output signal build out	0, -7.5 dB, -5 dB
Equalization	0 to 655 ft. (DSX-1)
Impedance	100 Ω
Connectors	RJ-48C
Timing	Internal or network
Pulse density	AT & T TR-62411; HDLC Inversion, forced

Ethernet LAN Interface

Specifications	Descriptions
Data flow	Full-duplex or half-duplex
Connectors	RJ-45
Data speed	10/100 Mbps, auto negotiating

Memory

Ubigate iBG1000 supports the following types of memory:

- **Double-Data-Rate II Synchronous Dynamic Random Access Memory (DDR II SDRAM):** This type of memory stores the running configuration and routing tables. It also buffers packets at the network interfaces. The base configuration shipped from the factory has 512 MB of main memory. The Small Outline Dual In-line Memory Module (SODIMM) slot can be used to upgrade the main memory to a maximum of 1 GB.
- **Internal Flash Memory:** Ubigate iBG1000 includes 2 MB of internal flash memory which is used to boot the router. Ubigate iBG1000 also has 1GB of internal flash memory to store application software and user configuration information.

Power Supply

Ubigate iBG1000's AC power adapter provides +12 VDC with an AC input between 100 and 240 VAC.

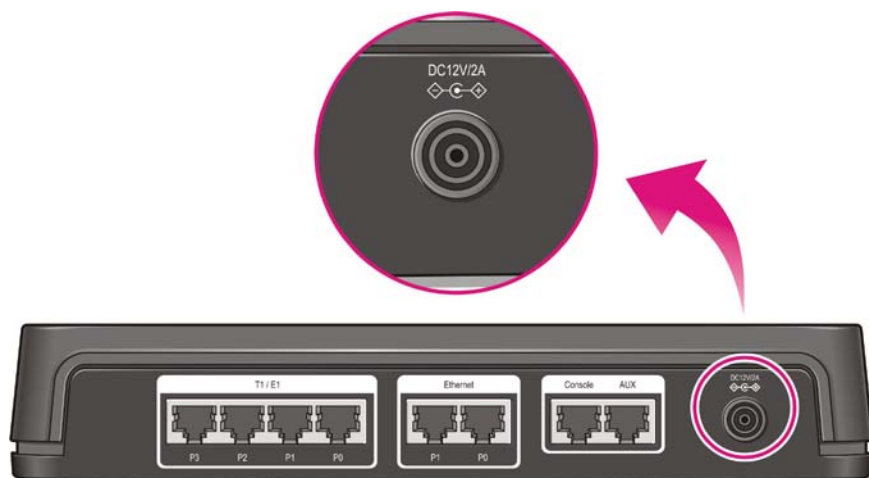


Figure 1.2 Power Supply

Ventilation

On both sides, there are grids of holes where air comes in and goes out. When installing Ubigate iBG1000, ensure to make room around the system in order not to block air flow.



Figure 1.3 Ventilation

Real-Time Clock

Ubigate iBG1000 provides a real-time clock so that Ubigate iBG1000 can maintain the correct date and time.

Ubigate iBG1000 Software Features and Licenses

Switch/Router Features

The following table lists the switch/router features supported by iBG1000.

Category	Features and Licenses	
Layer 2 Protocols	- VLAN (802.1q, Port)	
WAN Protocols	<ul style="list-style-type: none"> - ISDN PRI, HDLC - FR/MLFR, PPP/MLPPP - PPP over FR, Multi-Link PPP over FR - PPP/MLPPP over ISDN - FR Congestion Management and Traffic Policing 	
Routing Protocols	<ul style="list-style-type: none"> - Static Routing - OSPF v1/v2, RIP v1/v2 - IGMP v1/v2/v3 - PIM-SM/SSM, DVMRP - VRRP - Policy-Based Forwarding/Routing 	
Quality of Service	DiffServ	<ul style="list-style-type: none"> - Classification (MF, Flow Label) - Marker (SrTCM/TrTCM) - Policing/Shaping - Queuing (CBQ, PQ) - Congestion Avoidance (WRED)
	<ul style="list-style-type: none"> - Bandwidth Guarantee - LFI - Mapping of IP DSCP field to Frame Relay DE bit - QoS for FR PVC - Inter-PVC QoS - Queuing for IPSec Encryption Engine 	
Load Balancing	<ul style="list-style-type: none"> - Per Flow (ECMP) - Per Packet 	
Performance	Routing	<ul style="list-style-type: none"> - IPv4 Forwarding: 150 Kpps - Max. Route Table Size: 10 K - Max. MAC Table Size: 1 K

(Continued)

Category	Features and Licenses
Management	<ul style="list-style-type: none"> - Multilevel Administration Access (MLA) - SNMP v1/v2/v3 - CLI, Telnet, SNTP, tftp, DHCP, SSHv2 - Web based GUI, MIBs - Logging & Reporting, Diagnostic - System Image rollback
AAA Client	<ul style="list-style-type: none"> - RADIUS - TACACS+

Security Features

The following table lists the security features supported by iBG1000.

Category	Features and Licenses
Secure Connectivity	<ul style="list-style-type: none"> - IPSec for Site to Site - IPSec for Remote Access - hub-and-spoke support - Encryption (DES, 3DES, AES) - L2TP, GRE - Data Integrity (MD5, SHA-1) - Authentication (XAUTH) - Key Management (Manual, IKE v1 (PKI, Pre-shared)) - NAT Traversal
Internal Security	<ul style="list-style-type: none"> - AAA - ACL - MAC Address Filtering
Attack Defense	<ul style="list-style-type: none"> - Route mode - Packet Filtering - Stateful Packet Inspection - NAT (1:1, N:1, Reverse, Dynamic) - ALG (FTP, DNS, TFTP, RPC, HTTP (WEB), and SMTP) - Application Content filtering (Java, ActiveX) - Dos/DDoS Protection - IP/TCP fragment attack protection - IP Spoofing Protection - URL Filtering - DMZ

(Continued)

Category	Features and Licenses	
Management	- Reporting - Logging	
Performance	Firewall	- Performance: 60 Kpps - Concurrent Sessions: 64 K - Sessions setup rate: 500 sessions/Sec
	VPN	- Performance: 130 Mbps - Maximum Tunnels: 1,500 - Tunnel Setup rate: 3 tunnels/sec



CHAPTER 2. Hardware Overview

Chapter2 describes the hardware overview.

Ubigate iBG1000 is enclosed in a 1U enclosure, designed for installing on a desktop or wall-mount. The unit is approximately 10.24-inch wide, 7.48-inch deep and 1.75-inch high. The front side has LED indicators. The rear side has console port, auxiliary port, T1/E1 ports, and Fast Ethernet UTP ports. All cabling, including power cable, are installed from the rear side.

Ubigate iBG1000 Routing Engine

The Routing Engine (Main Board) contains the central processor of the router, core peripherals, memory, and external interfaces including serial management ports, two Fast Ethernet ports, and four T1/E1 ports.

Ubigate iBG1000 Chassis

Ubigate iBG1000 is designed for installing on a desktop or wall-mount.

The following figure is an isometric view of the router, with the main chassis without the external enclosure.

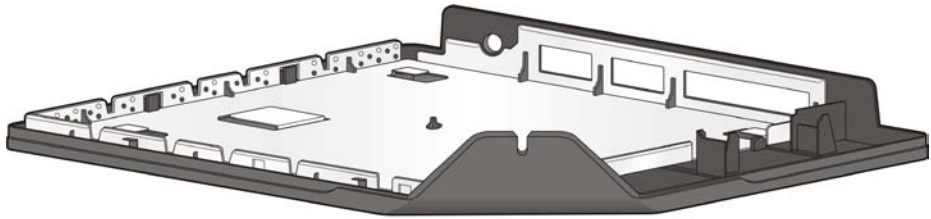


Figure 2.1 Isometric View

Ubigate iBG1000 Boot Sequence

All circuitry within Ubigate iBG1000 is reset to its initial state by the reset circuitry on the main board.

During normal operation, the reset circuitry monitors an internal power supply of the main board and, after it reaches a normal operating level, generates a reset pulse to the routing processor and all of the other circuitry on the main board.

The main board reset circuitry also includes a watchdog timer. The watchdog timer causes Ubigate iBG1000 reset if the programmed interval elapses without the processor triggering the watchdog.

Ubigate iBG1000 boot is the sequence of software-driven events starting from the reset pulse to the loading and running of the application image. On reset, the processor starts executing instruction from a specific location in the boot ROM. This first software run is the boot loader. After CPU memory controller initialization, the boot loader locates, verifies, and runs a boot image located in the internal flash storage. The boot image then continues with the necessary initialization, decompresses, and moves itself to RAM. Once the boot image is moved to RAM, control is given to boot software residing in RAM. At this point the additional initialization of hardware and driver software is performed before SNOS (Samsung Network Operating System) can be loaded onto RAM from flash. The SNOS software prepares Ubigate iBG1000 for forwarding packets through the interfaces at which time Ubigate iBG1000 is fully up and running.

There are various software services that support the application software. These include a file system, logging, monitoring, validation of downloaded image and flash update.

Ubigate iBG1000 Top Side

The top side of Ubigate iBG1000 has LEDs in order to indicate the router's performance and operation status as shown Figure 2.2. Proper LED status is shown as follows.




Figure 2.2 Ubigate iBG1000 Top View

LED Description

LED	Indication & Color	Description
SYS	Solid green	System is operating normally.
	Solid red	System is not operating normally.
	Amber	System diagnostic mode.
	Off	Router is not receiving power.
P0~P3 (T1/E1)	Solid green	T1/E1 port is operating normally.
	Solid red	T1/E1 port cable is not connected properly or critical alarm detected.
	Amber	User alarm detected.
	Off	Router is not operating normally.

(Continued)

LED	Indication & Color	Description
P0~P1 (Ethernet)	Solid green	Ethernet port link is detected.
	Blinking green	Ethernet port activity is detected.
	Off	Ethernet port link is not detected.
 (Power)	Solid blue	Power supply installed and operating normally.
	Amber	Power supply installed but power fault condition detected.
	Off	Power supply not present or Power supply failure.

Ubigate iBG1000 Rear Side

Ubigate iBG1000 rear side has four T1/E1 ports, two Fast Ethernet UTP ports, one auxiliary port, and one console port.

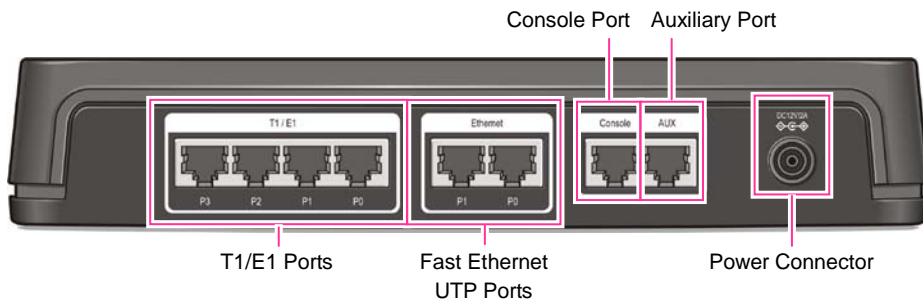


Figure 2.3 Ubigate iBG1000 Rear View

Connector	Description
T1/E1 Port	T1/E1 WAN connection
Fast Ethernet UTP Port	Fast Ethernet LAN connection
Auxiliary Port	Serial port for remote monitoring
Console Port	Serial port for local monitoring and configuring
Power Connector	DC power connector

Console Port

The console port is an RS-232, serial, asynchronous serial port that operates at up to 9,600 bps. The console port is activated immediately after system reset and allows the system operator to directly control the system using the Command Line Interface (CLI).

Auxiliary Port

The RJ-45 auxiliary port is used for connecting to an external modem.

Port Numbering

This section describes the port number conventions used by Ubigate routers such as iBG3026, iBG2016, iBG2006, and iBG1000.

Ports on a network module are numbered in a format: *network module slot-number/interface-number*, and ports on a mini-module are numbered in a format: *network module slot-number/mini-module slot number/interface-number*.

Network modules are numbered from right to left, starting with slot number one. If there is more than one row, the bottom row is numbered first, from right to left, starting at slot one, then the next row up is numbered, from right to left, starting with the next slot number based on the lower rows last (left most) numbered slot. The main board is considered as network module slot 0.

Mini modules are numbered from right to left, starting with slot number zero. If there is more than one row, the bottom row is numbered first, from right to left, starting at slot zero, then the next row up is numbered, from right to left, starting with the next slot number based on the lower rows last (left most) numbered slot.

Ports on any mini module or network module are numbered from right to left, starting with port number zero. If there is more than one row of ports on a given module, the bottom row is numbered first, from right to left, starting at port zero, then the next row up is numbered, from right to left, starting with the next port number based on the lower rows last (left most) numbered port.

iBG1000 Port Numbering

Since iBG1000 which is considered as network module slot 0 does not have any pluggable module unlike the others, all the ports are numbered in $0/x$ format. Therefore, the Fast Ethernet ports are numbered 0/0 and 0/1, starting from right to left. Likewise, the T1/E1 ports are numbered 0/0, 0/1, 0/2, and 0/3, starting from right to left.

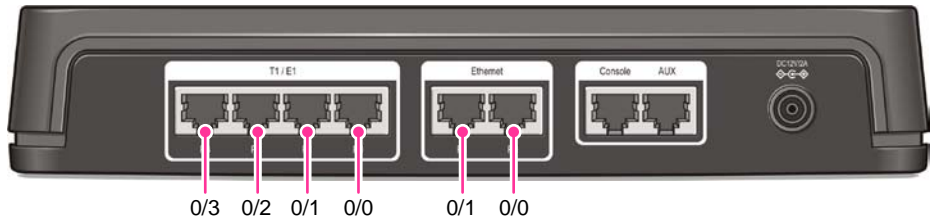


Figure 2.4 iBG1000 Port Numbering



CHAPTER 3. Software Overview

Chapter3 describes the overview of the Software features supported by iBG1000.

Management Plane

The management plane consists of Command Line Interface (CLI), Simple Network Management Protocol (SNMP), and the Web-based management interface of Ubigate iBG1000.

SNMP

To allow network management systems to remotely manage Ubigate iBG1000 products, SNMP v1/v2/v3 are supported. The Structure of Management Interface-SMIv1 and SMIv2-as defined by RFC 1155 and 1902 are supported.

MIB Information

A number of feature-specific RFC Standard Management Information Base (MIB)s and Enterprise MIBs are supported. The Configuration Guide has listed the respective MIBs that are supported in iBG1000.

Community-based Authentication

Community-based SNMP v2 is supported, i.e., SNMP v2c. This SNMP framework associates each message with a 'community' as defined in SNMP v1 [RFC 1157].

User-Based Security Model (USM)

The User-Based Security Model (USM) for SNMP v3 [RFC2574] is supported.

To protect data integrity, USM uses MD5 and the Secure Hash Algorithm as keyed hashing algorithms for digest computation. This directly protects against data modification attacks, indirectly provides data origin authentication, and defends against masquerade attacks.

USM uses loosely synchronized, monotonically-increasing time indicators to defend against certain message stream modification attacks. Automatic clock synchronization mechanisms based on the protocol are specified without dependence on third-party time sources and concomitant security considerations.

USM uses the Data Encryption Standard (DES) in the Cipher Block Chaining (CBC) mode to protect against disclosure.

View-based Access Control Model (VACM)

The View-based Access Control Model for SNMP [RFC2575], which controls access to management information, is supported.

For security reasons, it is often beneficial to restrict the access rights of some groups to only a subset of the management data in the management domain. To provide this capability, access to a context is through an MIB view, which details a specific set of managed object types within that context.

TRAPS

All applicable standard and enterprise traps are supported. The trap support also follows the AgentX architecture. The sub-agents will generate traps whenever necessary and forward it to the master-agent using AgentX protocol. The master-agent will form a TRAP Packet Data Unit (PDU) and forward it to the pre-configured Network Management Station/Trap receiving station. Ubigate iBG1000 product supports more than one trap-host (up to 5) to send traps to.

Command Line Interface (CLI)

The Command Line Interface forms the link between the end user and the features of the device with a text-based interface. Users can issue commands that need to be executed on Ubigate iBG1000. The CLI provider's editor support for easy command editing/navigation, command history, and command completion.

The system operator is presented with a command prompt when logged into Ubigate iBG1000.

Each command is terminated by a new line (Enter key). The command string is passed on to the parser for syntax and semantic check. If the command has syntax error, the parser prints an error message and returns to prompt.

If the command is syntactically correct, the parser calls the target function.

The function is executed and return value is displayed back at the prompt.

It can be an error message or a confirmation message of the operation.

Some commands can return a value zero and the parser displays the prompt again without any message.

The CLI supports EMACS editor keystrokes. This is provided to facilitate correction/editing commands while entering commands.

This is restricted to single line editing. Some example keystrokes include:

- CTRL-A: Takes the cursor to beginning of line
- CTRL-E: Takes the cursor to end of line (last character)

The CLI maintains the list of user entered commands. You can get the list of previously executed commands by entering 'UP-ARROW'. The CLI stores a maximum of 100 commands. This is a configurable value.

CLI Privilege Levels

The CLI supports four levels of privileges. PRIVILEGE_ADMIN is the highest and PRIVILEGE_NORMAL being lowest.

The order of privileges is:

- PRIVILEGE_ADMIN 1
- PRIVILEGE_CONFIGURE 2
- PRIVILEGE_TEST 3
- PRIVILEGE_NORMAL 4

CLI Omnipresent Commands

The CLI supports omnipresent commands. The user at any level can execute these commands. These commands include: display, clear, save, show, ping, and telnet. For details refer to the Command Reference.

Web GUI (HTTP Server)

The web GUI (iBG-DM) is an additional interface that is supported on Ubigate iBG1000. This allows end users to monitor and configure the device. The GUI is targeted at novice and intermediate users only. The supported browser is Internet Explorer 5.5+.

iBG-DM supports web based management tool that allows the system operator to configure LAN and WAN interfaces, routing, Network Address Translation (NAT), firewalls, Virtual Private Networks (VPNs) and other features on the router. In addition, iBG-DM provides simple fault, performance, security management functions.

The figure below shows a network diagram when iBG-DM is used.

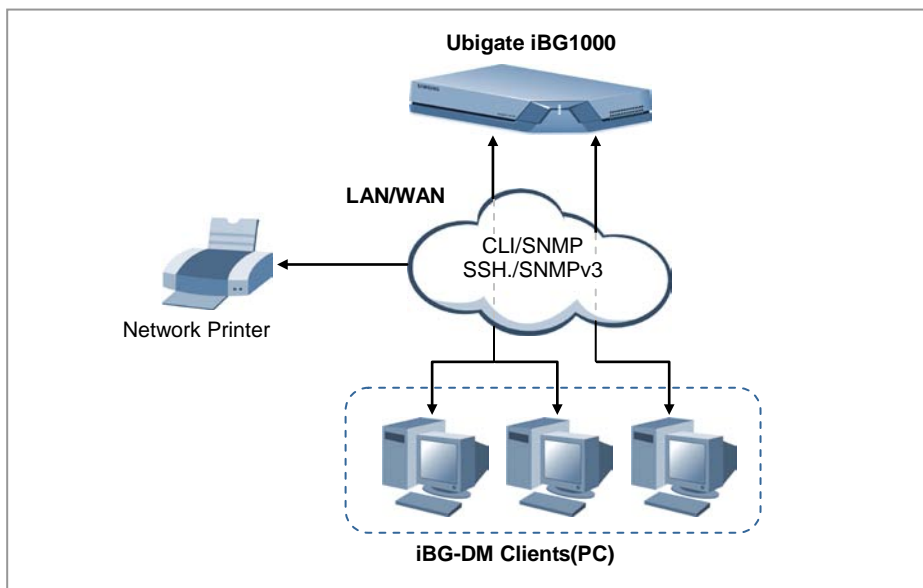


Figure 3.1 iBG-DM Management Network Diagram

Control Plane

The control plane of Ubigate iBG1000 includes routing protocols for L3 routing and spanning tree protocols for L2 packet processing, more specifically:

- L2 Control Protocol consisting of VLAN management
- Unicast Protocols, consisting of Open Shortest Path First (OSPF) and Routing Information Protocol (RIP)
- Multicast Protocols, consisting of Protocol Independent Multicast-Sparse Mode (PIM-SM), PIM-Source Specific Multicast (PIM-SSM), and Distance Vector-Multicast Routing Protocol (DVMRP)
- WAN Protocols, consisting of PPP, Frame Relay, PPP over Frame Relay, High-level Data Link Control procedure (HDLC) and ISDN

Unicast Routing Protocols

Interior Gateway Protocols such as RIP and OSPF are supported in Ubigate iBG1000.

Unicast Routing Protocols	Description
RIP v1/v2: Routing Information Protocol	<p>Routing Information Protocol (RIP) is a classical distance-vector routing protocol. It is simple to implement and performs good for small networks. Distance Vector Routing requires that each node maintain the distance from itself to each possible destination. The distances are computed using the information in neighbor's distance vectors.</p> <p>RIP version 1 (defined in RFC 1058) has been later augmented by RIP version 2 (RFC 2453) to increase its usefulness. RIP 2 enabled RIP messages to carry more information, which permitted the use of a simple authentication mechanism to secure table updates. More importantly, RIP 2 supported subnet masks, a critical feature that was not available in RIP.</p>

(Continued)

Unicast Routing Protocols	Description
OSPFv2: The Open Shortest Path First	<p>The Open Shortest Path First (OSPF) protocol is an interior gateway protocol (IGP) that routes packets within a single autonomous system (AS). OSPF uses link-state information to make routing decisions, making route calculations using the shortest path first (SPF) algorithm (also referred to as the Dijkstra algorithm). Each router running OSPF floods link-state advertisements throughout the AS that contain information about that router's attached interfaces and routing metrics. Each router takes the information in these link-state advertisements and creates a complete routing table for the network.</p> <p>OSPF was designed for the TCP/IP environment and as a result explicitly supports IP sub netting and the tagging of externally derived routing information. OSPF also provides for the authentication of routing updates.</p> <p>OSPF routes IP packets based solely on the destination IP address contained in the IP packet header.</p> <p>OSPF quickly detects topological changes, such as when router interfaces become unavailable, and calculates new loop-free routes quickly and with a minimum of routing overhead traffic.</p>

Multicast Routing Protocols

The following Multicast routing modules are supported.

Multicast Routing Protocols	Description
IGMPv2: Internet Group Membership Protocol	<p>The Internet Group Management Protocol (IGMP) is used between IP hosts and IP routers. IP Host reports their multicast group membership to the neighboring multicast routers expressing their desire to receive multicast traffic destined for the group. Multicast routers use IGMP to learn, for each of their attached physical networks, which groups have members. IGMP should be enabled on both hosts and routers that want to receive multicast traffic.</p>

(Continued)

Multicast Routing Protocols	Description
PIM-SM: Protocol Independent Multicast-Sparse Mode	Protocol Independent Multicast (PIM) protocol routes multicast packets to multicast groups. PIM is protocol independent because it can leverage whichever unicast routing protocol is used to populate unicast routing table. PIM-SM tries to send multicast data only to networks that have active receivers. This is achieved by having a common Rendezvous Point (RP) known to the senders and receivers and forming shared trees from the RP to the receivers.
DVMRP: Distance Vector Multicast Routing Protocol	Distance Vector Multicast Routing Protocol (DVMRP) is a multicast routing protocol that provides an efficient mechanism for connectionless datagram delivery to a group of hosts across an inter-network. It is a distributed protocol that dynamically generates IP multicast delivery trees using a technique called Reverse Path Multicasting.

WAN Protocols

Ubigate iBG1000 can use four T1/E1 interfaces for providing WAN connectivity. The protocols such as PPP, Frame Relay, and PPP over Frame Relay (including their multilink variations) are supported in Ubigate iBG1000 to provide link layer connectivity. Also, the ISDN PRI is supported through T1/E1 ports.

WAN Protocols	Descriptions
Frame Relay	<p>Frame Relay (FR) is one of the widely used transport protocols for Wide Area Networking (WAN) community. The objective of FR is to provide WAN connectivity to both remote routers and FR switches.</p> <p>The protocol stack can provide both RFC 1490 based multi-protocol encapsulation as well as PVC switching. Also, standard frame relay congestion management procedures based on frame relay traffic parameters-Bc, Be and CIR-(ingress policing, egress shaping/rate limiting) are supported.</p> <p>The following LMI types are supported-LMI Rev 1, Stratacom/Cisco LMI, T1.617 Annex D, Q.933 Annex A and alternately, the LMI can be disabled (None). Apart from these, fragmentation and inverse ARP are supported over FR PVCs.</p>

(Continued)

WAN Protocols	Descriptions
HDLC	<p>High-Level Data Link Control (HDLC) is a bit-oriented synchronous data link layer protocol developed by the International Organization for Standardization (ISO). The original ISO standards for HDLC were:</p> <ul style="list-style-type: none"> - ISO 3309 - Frame Structure - ISO 4335 - Elements of Procedure - ISO 6159 - Unbalanced Classes of Procedure - ISO 6256 - Balanced Classes of Procedure <p>The current standard for HDLC is ISO 13239, which replaces all of those standards. HDLC provides both connection oriented and connectionless service. HDLC can be used for point to multipoint connections, but is now used almost exclusively to connect one device to another, using what is known as Asynchronous Balanced Mode (ABM). The other modes are Normal Response Mode and Asynchronous Response Mode.</p>
PPP	<p>The Point-to-Point Protocol (PPP) provides a standard method for transporting multi-protocol datagram over point-to-point links. These links provide full-duplex simultaneous bi-directional operation and are assumed to deliver packets in order. PPP is comprised of 3 main components:</p> <p>A method for encapsulating multi-protocol datagram. In Ubigate iBG1000, PPP is used on the links that use HDLC-like framing (on the WAN side over T1 physical interfaces). The details of the encapsulations can be found in RFC1662 and RFC2516.</p> <p>A Link Control Protocol (LCP) for establishing, configuring and testing the data-link connection. The details of this can be found in RFC 1661.</p> <p>A family of Network Control Protocols (NCPs) for establishing and configuring different network layer protocols. There is a NCP for each network protocol for example, IPCP for IP networks. Optionally, before PPP NCP is established, peers may need to authenticate themselves and any failure during this can result in the link termination.</p> <p>There are two authentication protocols: Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP). In addition to the above, PPP will also interface with AAA for username/password validations.</p> <p>The PPP is the most ubiquitous WAN protocol today for internet access and/or leased line connectivity to a remote office.</p> <p>When the bandwidth requirements go beyond a single T1 (and DS3 being expensive or unavailable) multilink PPP can be used to create a bigger bandwidth pipe.</p>

(Continued)

WAN Protocols	Descriptions
ISDN	<p>WAN interfaces are connected typically using leased lines such as T1/E1, but there are chances that the T1/E1 links goes down due to various reasons thereby resulting in the loss of wan connectivity. The wan connectivity comes up only when the T1/E1 links are restored. Hence there is a need to have an alternate connectivity till the T1/E1 links are restored.</p> <p>When the primary connectivity (T1/E1) links go down, ISDN can be used as a secondary connection. ISDN can be used as a dial up connection to connect to Internet or a remote server for certain amount of time until the primary T1/E1 links are restored. ISDN can also exist as an independent interface to provide remote connectivity to Headquarters and/or for Internet connectivity in a very similar way to the other interfaces like T1/E1. In certain countries the ISDN connections are not so expensive that they can be used as the primary connections as well. ISDN PRI is also supported via T1 and E1 interfaces.</p>

Packet Forwarding Plane

The Router Subsystem is a software-based router that can flexibly support a variety of routing protocols. Packet headers may be examined and modified as required to support routing between links supporting different protocols.

Received packets are moved into the main memory by the source interface using DMA. The routing processor on the main board examines each packet header in the main memory, makes the routing decision, modifies the packet as required, and inserts the packet into the transmit queue for the appropriate destination. The destination interface then copies the packet from main memory using DMA and transmits the packet.

Packet data is stored in data buffers that are separate from the descriptor structures used by the source and destination DMA Controllers. This allows the processor to get a packet ready for transmission without copying it from one buffer to another.

The forwarding plane consists of the following software components:

- Layer 2 Forwarding component: This component performs layer 2 forwarding functions such as VLAN trunking.
- Layer 3 Forwarding component: This component performs IPv4 unicast, and IPv4 multicast forwarding functions.
- Firewall/VPN component: This component performs the firewall and IPSec based VPN functions in conjunction with Layer 3 Forwarding component.
- ACL component: This component performs ACL based stateless firewall function for packets received on the WAN and main board Fast Ethernet interfaces.
- QoS component: This component performs the QoS functions for packets received from WAN interfaces as well as packets transmitted to WAN interfaces.
- Tunneling component: This component performs the GRE and IPIP tunneling functions.





ANNEX A. Cable Specifications

Console Port Cable

Cable Shape

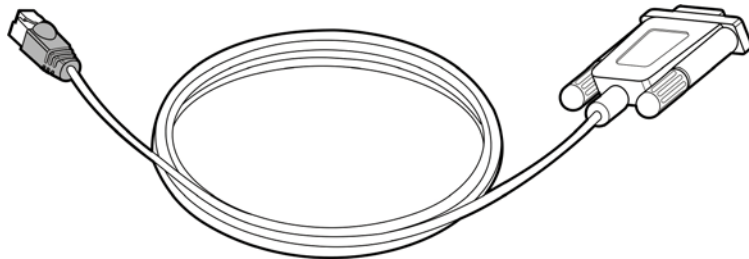


Figure A.1 Console Port Cable

Cable Signaling and Pinout

Console Port (DTE)	RJ-45 to RJ-45 Rollover Cable	RJ-45 to DB-9 Terminal Adapter (connected to Rollover Cable)	Console Device
Signal	RJ-45 Pin	DB-9 Pin	Signal
RTS	1	8	CTS
DTR	2	6	DSR
TxD	3	2	RxD
GND	4	5	GND
GND	5	5	GND
RxD	6	3	TxD
DSR	7	4	DTR
CTS	8	7	RTS

Auxiliary Port Cable

Cable Shape

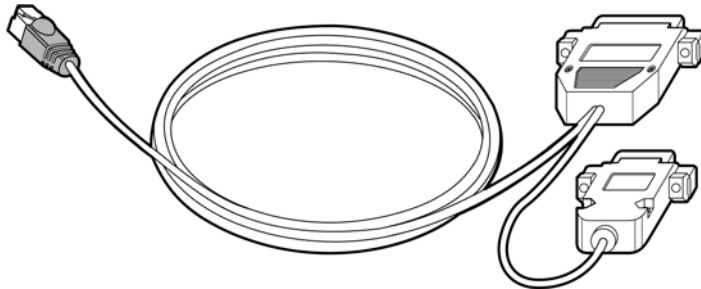


Figure A.2 Auxiliary Port Cable

Cable Signaling and Pinout

Auxiliary Port (DTE)	-	-	RJ-45 to DB-25 Modem Adapter	Modem
Signal	RJ-45 Pin	DB-9 Pin	DB-25 Pin	Signal
RTS	1	7	4	RTS
DTR	2	4	20	DTR
TxD	3	3	2	TxD
GND	4	5	7	GND
GND	5	5	7	GND
RxD	6	2	3	RxD
DSR	7	6	8	DCD
CTS	8	8	5	CTS

Ethernet Cable

Cable Shape

- Cable Length: 6/10 feet
- Standard, Straight-Through Wiring (both ends are the same)
- 10/100/1000Base-T interfaces

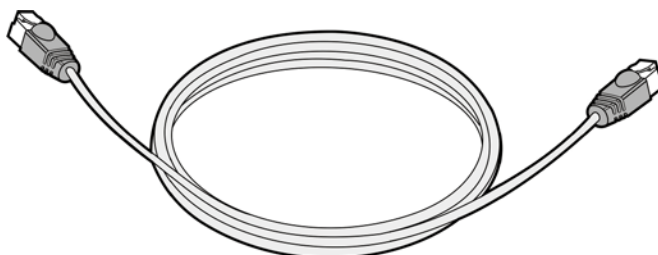


Figure A.3 Ethernet LAN Interface Cable

Cable Signaling and Pinout

RJ45 Pin #	Wire Color (T568A)	1000Base-T Signal
1	White/Green	BI_DA+
2	Green	BI_DA-
3	White/Orange	BI_DB+
4	Blue	BI_DC+
5	White/Blue	BI_DC-
6	Orange	BI_DB-
7	White/Brown	BI_DD+
8	Brown	BI_DD-

T1/E1 Cable

Cable Shape

- RJ-48C to RJ-48C Cable

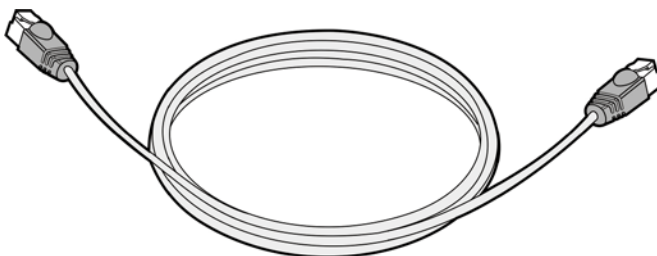


Figure A.4 T1/E1 WAN Interface Cable

Cable Signaling and Pinout

1	RXRING	←	4	TXRING
2	RXTIP	←	5	TXTIP
4	TXRING	→	1	RXRING
5	TXTIP	→	2	RXTIP



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ABBREVIATION

A

AES Advanced Encryption Standard

C

CHAP Challenge Handshake Authentication Protocol

CLI Command Line Interface

CPE Customer Premises Equipment

D

DDR SDRAM Double Data Rate Synchronous Dynamic Random Access
Memory

DMA Direct Memory Access

DVMRP Distance Vector-Multicast Routing Protocol

F

FR Frame Relay

FTP File Transfer Protocol

G

GRE Generic Routing Encapsulation

GUI Graphic User Interface

ABBREVIATION

H

HDLC High-level Data Link Control

I

IGMP Internet Group Management Protocol
IP Internet Protocol
IPSec Internet Protocol Security

L

L2TP Layer 2 Tunneling Protocol
LAN Local Area Network
LLQ Low-Latency Queuing

M

MAC Media Access Control

N

NCP Network Control Protocol

O

OSPF Open Shortest Path First

P

PAP Password Authentication Protocol
PDU Packet Data Unit
PIM Protocol Independent Multicast
PIM-SM Protocol Independent Multicast-Sparse Mode
PIM-SSM Protocol Independent Multicast-Specific Source Multicast
PPP Point to Point Protocol

Q

QoS Quality of Service

R

RIP	Routing Information Protocol
RP	Rendezvous Point

S

SNMP	Simple Network Management Protocol
SODIMM	Small Outline Dual In-line Memory Module

T

TCP	Transmission Control Protocol
TFTP	Trivial File Transfer Protocol

U

UDP	User Datagram Protocol
UTP	Unshielded Twisted Pair

V

VLAN	Virtual Local Area Network
VPN	Virtual Private Network

W

WAN	Wide Area Network
-----	-------------------



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INDEX

A

Auxiliary Port..... 2-7

B

Branch Office
Configuration Example 1-2

C

CLI Omnipresent
Commands 3-6
CLI Privilege Levels 3-4
Command Line
Interface 3-4
Community-based
Authentication 3-1
Console Port 2-7

E

E1 WAN Interface 1-5
Ethernet LAN Interface 1-6

I

Interfaces.....1-5

M

MIB Information3-1
Multicast Routing
Protocols3-8

P

Packet Forwarding
Plane 3-13
Performance and
Scalability1-1
Power Supply1-7
Product Specifications1-4

S

Security1-2
SNMP3-1

T

T1 WAN Interface 1-5
TRAPS 3-2

U

Ubigate iBG1000
Boot Sequence 2-3
Ubigate iBG1000
Chassis 2-2
Ubigate iBG1000
Rear Side 2-7
Ubigate iBG1000
Routing Engine 2-1
Ubigate iBG1000
Top Side 2-4

Unicast Routing 3-7
User-Based Security
Model 3-2

V

Versatility 1-2
View-based Access
Control Model 3-2

W

WAN Protocols 3-10
Web GUI (HTTP Server) . 3-6

WEEE SYMBOL INFORMATION



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This marking on the product, accessories or literature indicates that the product and its electronic accessories (e.g. charger, headset, USB cable) should not be disposed of with other household waste at the end of their working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, please separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources.

Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take these items for environmentally safe recycling.

Business users should contact their supplier and check the terms and conditions of the purchase contract. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

BATTERY SYMBOL INFORMATION



Correct disposal of batteries in this product

(Applicable in the European Union and other European countries with separate battery return systems.)

This marking on the battery, manual or packaging indicates that the batteries in this product should not be disposed of with other household waste at the end of their working life. Where marked, the chemical symbols Hg, Cd or Pb indicate that the battery contains mercury, cadmium or lead above the reference levels in EC Directive 2006/66.

If batteries are not properly disposed of, these substances can cause harm to human health or the environment.

To protect natural resources and to promote material reuse, please separate batteries from other types of waste and recycle them through your local, free battery return system.

Ubigate iBG1000™ System Description

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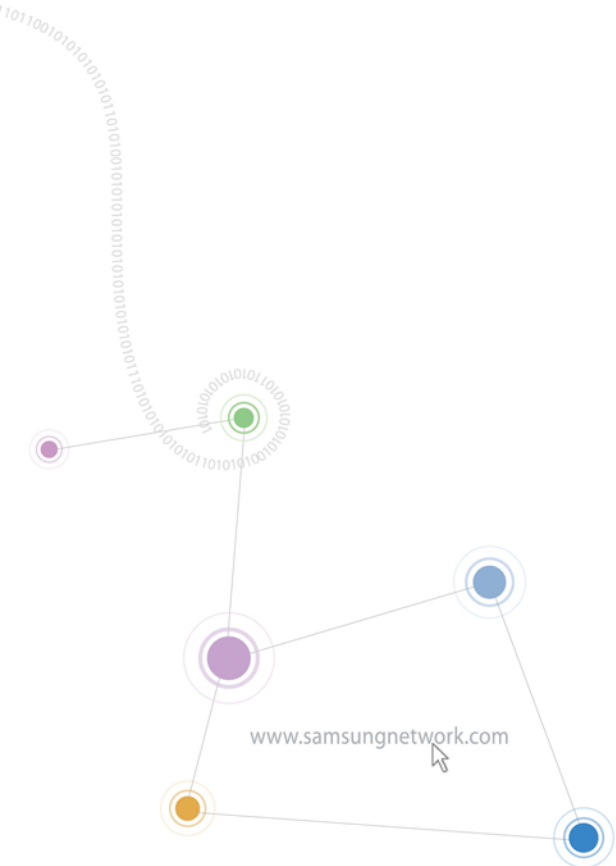
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System Description



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EQBD-000121 Ed.02

