Model LRA2900A
Remote Access Server (RAS)

Getting Started Guide

Radio and TV Interference

The LRA2900A Series generates and uses radio frequency energy, and if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. The LRA2900A Series has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection from such interference in a commercial installation. However, there is no guarantee that interference will not occur in a particular installation. If the LRA2900A Series causes interference to radio or television reception, which can be determined by disconnecting the cables, try to correct the interference by one or more of the following measures: moving the computing equipment away from the receiver, re-orienting the receiving antenna, and/or plugging the receiving equipment into a different AC outlet (such that the computing equipment and receiver are on different branches).

> ⚠
> **CAUTION**
> This device is not intended to be connected to the public telephone network in Europe.

Industry Canada Radio Frequency Interference Statements

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

Industry Canada Notice

The Canadian Department of Communications label identifies certified equipment. This certification means that the equipment meets certain telecommunications network protective, operational and safety requirements. The Department does not guarantee the equipment will operate to the user's satisfaction. Before installing this equipment, users should ensure that it is permissible to be connected to the facilities of the local telecommunications company. The equipment must also be installed using an acceptable method of connection. In some cases, the company's inside wiring associated with a single line individual service may be extended by means of a certified connector assembly (telephone extension cord). The customer should be aware that compliance with the above condition may not prevent degradation of service in some situations. Repairs to some certified equipment should be made by an authorized maintenance facility designated by the supplier. Any repairs or alterations made by the user to this equipment, or equipment malfunctions, may give the telecommunications company cause to request the user to disconnect the equipment. Users should ensure for their own protection that the ground connections of the power utility, telephone lines and internal metallic water pipe system, are connected together. This protection may be particularly important in rural areas

> ⚠
> **CAUTION**
> Users should not attempt to make such connections themselves, but should contact appropriate electric inspection authority, or electrician, as appropriate.

FCC Compliance

The LRA2900A has been tested and found to comply with the specifications found in Part 68 of the FCC rules and regulations. A label on the equipment bears the FCC registration number. You may be requested to provide this information to your telephone company. The telephone company may decide to temporarily dicontinue your service if they believe that the LRA2900A may cause harm to the telephone network. Whenever possible the telephone company will attempt to notify you in advance. You have a right, if you choose, to file a complaint with the FCC.

FCC Information

The LRA2900A Series has been tested and registered in compliance with the specifications in Part 68 of the FCC rules. A label on the equipment bears the FCC registration number. You may be requested to provide this information to your telephone company. Your telephone company may make changes in its facilities, equipment, operations or procedures that could affect the proper operation of the LRA2900A Series. If this happens, the telephone company should give you advance notice to prevent the interruption of your service. The telephone company may decide to temporarily discontinue your service if they believe your LRA2900A Series may cause harm to the telephone network. Whenever possible, they will contact you in advance. If you elect to do so, you have the right to file a complaint with the FCC. If you have any trouble operating the LRA2900A Series, please contact Black Box Technical Support at 724-746-5500. The telephone company may ask you to disconnect the equipment from the telephone network until the problem has been corrected or until you are certain that the LRA2900A Series is not malfunctioning. In accordance with FCC rules and regulation CFR 47 68.218(b)(6), you must notify the telephone company prior to disconnection. The following information may be required when applying to your local telephone company for leased line facilities. The Universal Service Order Code (USOC) is RJ 48C. The Facility Interface Codes (FIC) are 04DU9-BN, 04DU9-DN, 04DU9-1KN, and 04DU9-1SN. The Service Order Code (SOC) is 6.0Y.

Service	Facility Interface Code	Service Code	Network Connection
1.544 Mbps SF format without line power	04DU9-BN	6.0Y	RJ48C
1.544 Mbps SF and B8ZS without line power	04DU9-DN	6.0Y	RJ48C
1.544 Mbps ANSI ESF without line power	04DU9-1KN	6.0Y	RJ48C
1.544 Mbps ANSI ESF and B8ZS without line power	04DU9-1SN	6.0Y	RJ48C

FCC Part 68 Compliance Statement

This equipment complies with Part 68 of FCC Rules. Please note the following:

1. You are required to request service from the telephone company before you connnect the CSU to a network. When you request service, you must provide the telephone company with the following data. When you request T1 Service, you must provide the telephone company with the Facility Interface Code. Provide the telephone company with both of the following codes: 04DU9-B (1.544 MB D4 framing format) and 04DU9-C (1.544 MB ESF format). The telephone company will select the code it has available. The Service Order Code(s) (SOC): 6.0Y. The required Universal Service Order Code (USOC) jack: RJ 48C. The make, model number, and FCC Registration number of the CSU.

2. Your telephone company may make changes to its facilities, equipment, operations, or procedures that could affect the proper functioning of your equipment. The telephone company will notify you in advance of such changes to give you and opportunity to maintain uninterrupted telephone service.

3. If your CSU causes harm to the telephone network, the telephone company may temporarily discontinue your service. If possible, they will notify you in advance, but if advance notice is not practical, you will be notified as soon as possible and will be informed of your right to file a complaint with the FCC.

4. If you experience trouble with the CSU, please contact Black Box Corp. for service or repairs. Repairs should be performed only by Black Box Corp.

5. You are required to notify the telephone company when you disconnect the CSU from the network.

CE Notice

The CE symbol on your Black Box equipment indicates that it is in compliance with the Electromagnetic Compatibility (EMC) directive and the Low Voltage Directive (LVD) of the European Union (EU). A Certificate of Compliance is available by contacting Technical Support.

Trademarks Used In This Manual

All applied-for and registered trademarks are the property of their respective owners.

Normas Oficiales Mexicanas (NOM) Electrical Safety Statement

Instrucciones De Seguridad

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.

2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.

3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.

4. Todas las instrucciones de operación y uso deben ser seguidas.

5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.

6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.

7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.

8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.

11. El aparato eléctrico deberá ser connectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra fisica y la polarización del equipo no sea eliminada.

13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.

14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.

15. En caso de existir, una antena externa deberá ser localizada lejos de las lineas de energia.

16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.

17. Cuidado debe ser tomado de tal manera que objectos liquidos no sean derramados sobre la cubierta u orificios de ventilación.

18. Servicio por personal calificado deberá ser provisto cuando:

— A: El cable de poder o el contacto ha sido dañado; o

— B: Objectos han caído o líquido ha sido derramado dentro del aparato; o

— C: El aparato ha sido expuesto a la lluvia; o

— D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o

— E: El aparato ha sido tirado o su cubierta ha sido dañada.

Contents

About this guide

This guide describes installing and configuring a Black Box Model LRA2900A Remote Access Server (RAS). By the time you are finished with this guide, your RAS will be receiving calls and transferring data. The instructions in this guide are based on the following assumptions:

- The RAS will connect to a T1, E1, or PRI line
- Callers will dial-in and connect with a V.92/V.90/K56Flex/V.34 or ISDN modem using PPP
- There is a LAN connected to the Ethernet port of the RAS

Audience

This guide is intended for the following users:

- Operators
- Installers
- Maintenance technicians

Structure

This guide contains the following chapters and appendices:

- Chapter 1 describes the RAS
- Chapter 2 describes installing the RAS hardware
- Chapter 3 describes configuring the RAS for use
- Chapter 4 details how to power up and deactivate the RAS
- Chapter 5 contains troubleshooting and maintenance information

For best results, read the contents of this guide *before* you install the RAS.

Precautions

Notes and cautions, which have the following meanings, are used throughout this guide to help you become aware of potential RAS problems:

Note   Calls attention to important information.

⚠️ **WARNING**	**The shock hazard symbol and WARNING heading indicate a potential electric shock hazard. Strictly follow the warning instructions to avoid injury caused by electric shock.**

⚠️ **WARNING**	**The alert symbol and WARNING heading indicate a potential safety hazard. Strictly follow the warning instructions to avoid personal injury.**

⚠️ **CAUTION**	The shock hazard symbol and CAUTION heading indicate a potential electric shock hazard. Strictly follow the instructions to avoid property damage caused by electric shock.

⚠️ **CAUTION**	The alert symbol and CAUTION heading indicate a potential hazard. Strictly follow the instructions to avoid property damage.

Typographical conventions used in this document

This section describes the typographical conventions and terms used in this guide.

General conventions

The procedures described in this manual use the following text conventions:

Table 1. General conventions

Convention	Meaning
Futura bold type	Indicates the names of menu bar options.
Italicized Futura type	Indicates the names of options on pull-down menus.
Futura type	Indicates the names of fields or windows.
Garamond bold type	Indicates the names of command buttons that execute an action.
< >	Angle brackets indicate function and keyboard keys, such as <SHIFT>, <CTRL>, <C>, and so on.
`Are you ready?`	All system messages and prompts appear in the `Courier` font as the system would display them.
`% dir *.*`	Bold Courier font indicates where the operator must type a response or command

Mouse conventions

The following conventions are used when describing mouse actions:

Table 2. Mouse conventions

Convention	Meaning
Left mouse button	This button refers to the primary or leftmost mouse button (unless you have changed the default configuration).
Right mouse button	This button refers the secondary or rightmost mouse button (unless you have changed the default configuration).
Point	This word means to move the mouse in such a way that the tip of the pointing arrow on the screen ends up resting at the desired location.
Click	Means to quickly press and release the left or right mouse button (as instructed in the procedure). Make sure you do not move the mouse pointer while clicking a mouse button.
Double-click	Means to press and release the same mouse button two times quickly
Drag	This word means to point the arrow and then hold down the left or right mouse button (as instructed in the procedure) as you move the mouse to a new location. When you have moved the mouse pointer to the desired location, you can release the mouse button.

Chapter 1 **Introduction**

Chapter contents

Model LRA2900A Remote Access Server overview

The Model LRA2900A is a central site remote access server with integrated modems which terminate dial-up analog and digital users. The Model LRA2900A RAS combines up to 120 analog and digital modems, RAS software, a 10/100 Ethernet port, IP Routing, Frame Relay/PPP forwarding, and four T1/E1 WAN ports.

The LRA2900A RAS simultaneously consolidates analog modem and digital ISDN remote access connections (over PSTN digital trunks) using a completely digital approach. Up to four T1/E1/PRI ports provide PSTN and/or PABX connectivity and terminate up to 120 analog modem or digital ISDN calls within a single chassis. The Model LRA2900A incorporates channel bank, terminal server, router and modem functionality in a self-contained, compact package.

Figure 1. Model LRA2900A RAS

Hardware overview

The Model LRA2900A RAS is a fully integrated remote access server for central site concentration of analog and digital modem calls. The RAS (see figure 2) comprises a 1U-high 17-inch wide chassis that contains a motherboard and two dual-redundant power supplies. A full set of LEDs are present on the chassis front panel, while connections for WAN, LAN, and control ports are present on the rear of the chassis. Two IEC-320 receptacles provide for AC power input. Optional DC power supplies with 32 to 72 VDC are available.
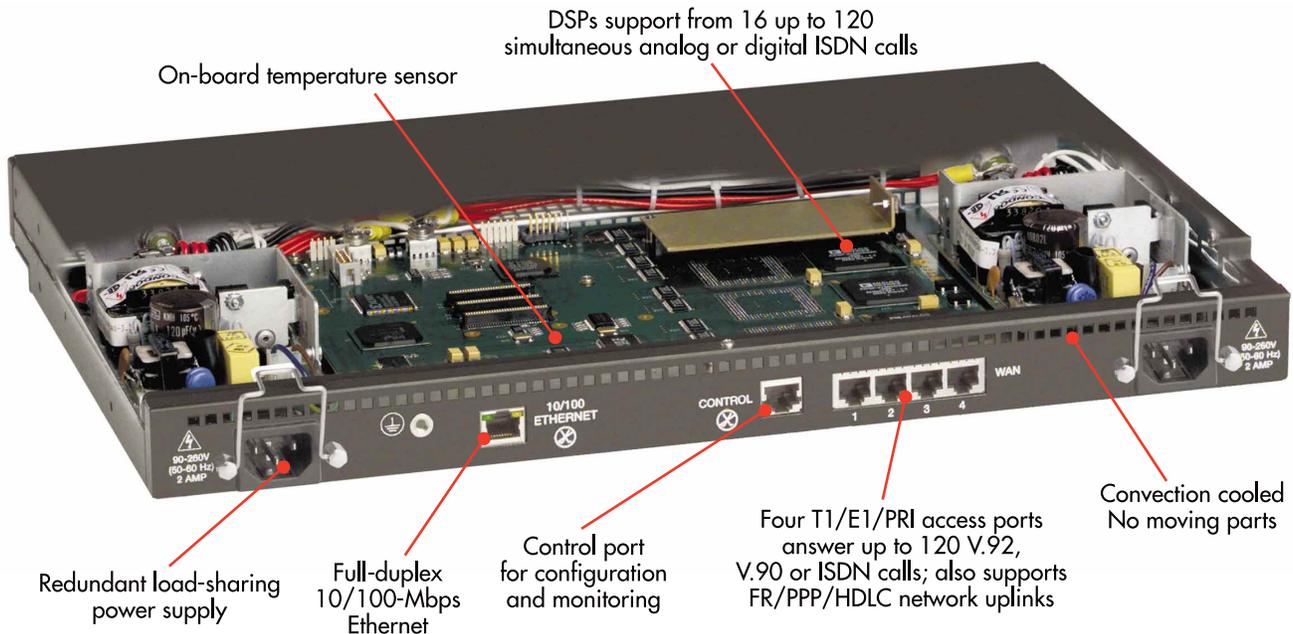
Figure 2. Model LRA2900A RAS features

WAN

The RAS includes four WAN ports, each of which is software-selectable for T1, E1 or PRI operation. These WAN ports are provided via balanced RJ-48C interfaces. They also include:

- Built-in T1/E1 CSU/DSU
- T1 1.544 Mbps with: D4 or ESF framing, AMI or B8ZS, FCC part 68 compliant
- E1 2.048 Mbps with: Double frame or CRC4 framing, AMI/HDB3, CTR-4, and CTR-12 compliant

LAN

The 10/100-Mbps Ethernet LAN port is presented on an RJ-45 connector with an auto-sensing/full-duplex 10Base-T or 100Base-T interface. It also includes:

- 100Base-TX half-/full-duplex operation (100 + 100)
- 10Base-T half-/full-duplex operation (10 + 10)
- Auto detection and fallback
- 10/100 Mbps link and status indicators

Signaling
Robbed-bit, R1, R2, Q.921/Q.931

Modems
Up to 120 V.92, V.90, K56Flex, V.34+, or ISDN B-channel digital calls (additional ports/functionality can be added by installing optional PMC expansion modules)

RS-232 control port
An RS-232 port provides for initial configuration of the RAS. The RS-232 port also supports:

- Asynchronous data at 19.2 kbps

- An RJ-45 connector with EIA-561 pinout

- A VT-100 console management interface

- Hardware CD and DTR signals for external modem support

Power system
- Fixed internal dual-redundant, load-sharing power supplies

- Universal-input voltage range, 90 to 260 VAC, 50/60 Hz

- Optional DC power supply with 36 to 72 VDC

- Power consumption: less than 35 watts.

Central processing unit
The LRA2900A is powered by a RISC-based Intel model i80960VH processor operating at 100 MHz. The CPU executes the LAN protocol, IP routing, WAN protocol, management and authentication software. It also sup-ports:

- 4 Mbytes of FLASH memory

- 32 Mbytes of EDO DRAM

Temperature
Operating range: 32 to 104 °F (0 to +40 °C)

Altitude
Maximum operating altitude: 15,000 feet (4,752 meters)

Humidity
5 to 95% relative humidity (RH) at 122 °F (50 °C)

Physical dimensions

Weight: 8.94 lbs (20.12 kg)

Refer to figure 3 for height, width, and depth dimensions.

11.75 in.
(29.85 cm)

Top View

1.75 in. (1U)
(4.44 cm)

Rear View

90–264V
(50–60 Hz)
2 AMP

10/100

ETHERNET

EXPANSION MODULE

RS-232

CONFIG

T1/E1/PRI WAN PORTS

1 2 3 4

90–264V
(50–60 Hz)
2 AMP

17 in.
(43 cm)
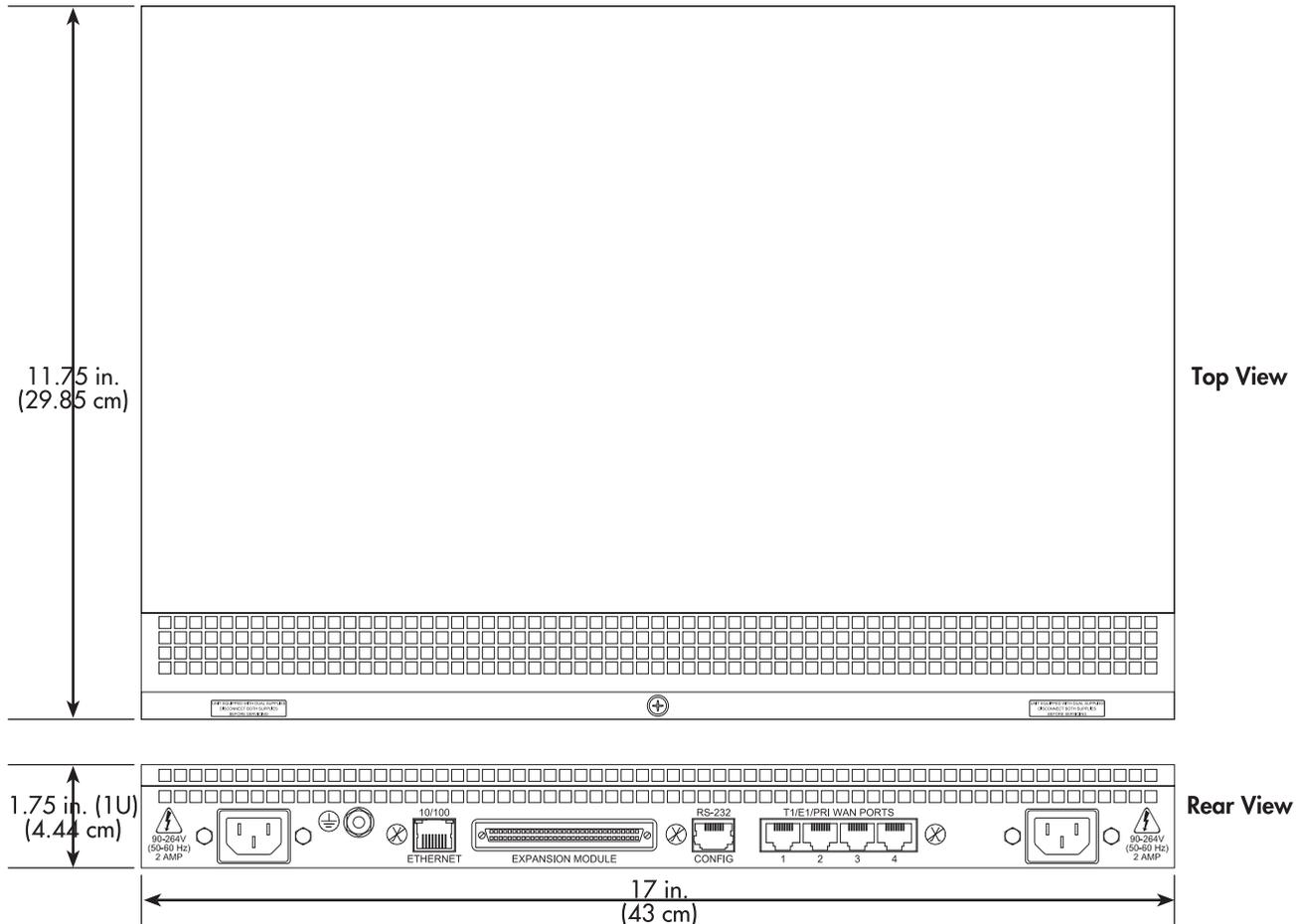
Figure 3. Model LRA2900A RAS chassis physical dimensions

Security

- Internal database of over 111 static users
- RADIUS Client supporting dual Authorization and Accounting servers
- Framed connections: PPP PAP & CHAP
- Unframed connections: User name login and password
- Dual SNMP/HTTP passwords for monitor and superuser access levels

Management services

- Out-of-Band RS-232 configuration port for management and control
- Remote software upgrade via FTP to internal FLASH memory
- SNMP version 1 configuration management

- Support for MIB-II (RFC-1213), DS1 MIB (RFC-1406), RIPv2 MIB (RFC 1389), Ethernet MIB (RFC-1643), Frame Relay DTE MIB (RFC-1315) and Black Box's enterprise MIB (1768)
- System logging to configuration port, non-volatile FLASH, volatile RAM, SYSLOG Daemon, and SNMP trap
- RADIUS Accounting
- Dial-in dynamic IP address pool management
- User configurable login prompts and banners
- Status reporting of all access server parameters
- Built in HTTP server for complete configuration and control using a standard Web browser
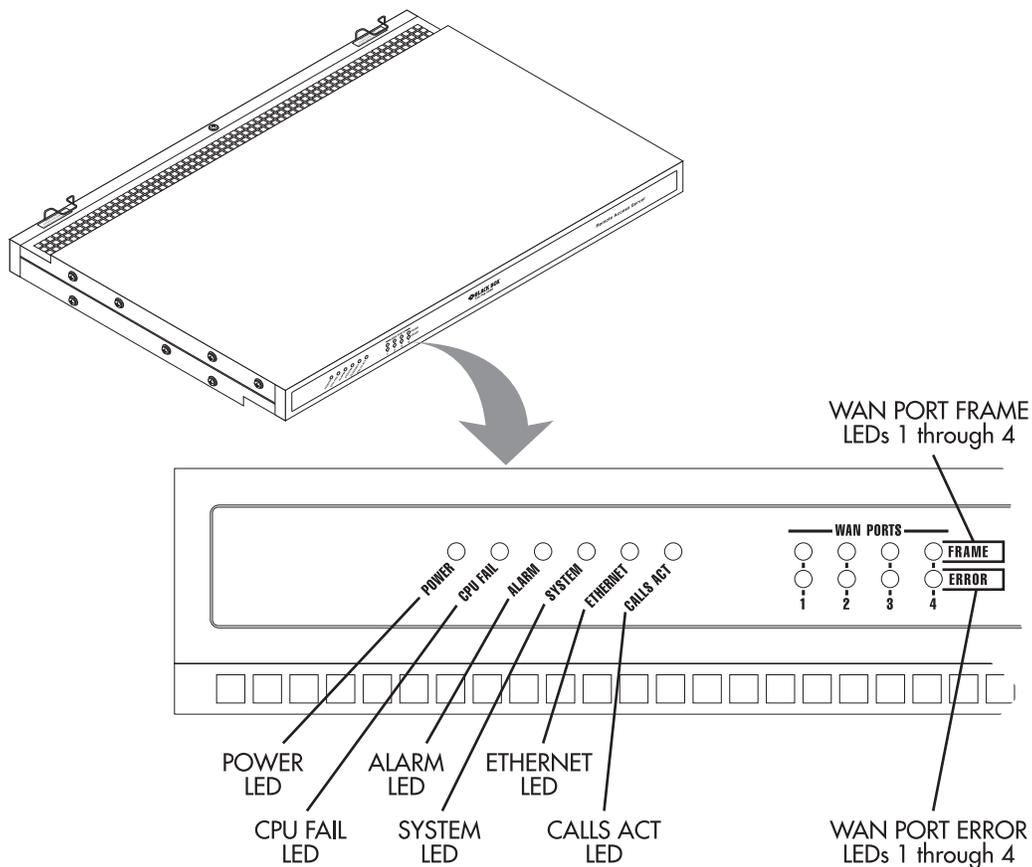
Figure 4. Model LRA2900A front panel LEDs

LED display

The front panel (see figure 4) includes LEDs for:

- POWER: Green if power is being applied. Flashing if a power supply has failed.
- CPU FAIL: Red if the CPU has failed.
- ALARM: Red if the Model LRA2900A is in an alarm state.
- SYSTEM: Green if the RAS is operating normally.

- ETHERNET: Green if link status is nominal for the Ethernet port.

- CALLS ACT: Green to indicate call activity on the Model LRA2900A.

- WAN STATUS: Green indicates normal status at each of the four T1/E1/PRI links. Red indicates an error.

Approvals

The Model LRA2900A RAS has achieved the following approvals:

- FCC Part 15, Class A

- FCC Part 15, Class B

- FCC Part 68

- Complies with UL1950 (MET)

- Canadian cMET

- Canadian CS-03

- EMC Directive 89/336/EEC

- Low Voltage Directive 73/23/EEC (EN60950)

- ITU-T CTR-4 and CTR-12

Software overview

The Black Box Model LRA2900A supports all common remote access services as well as integrated routing and forwarding (see table 3). Authentication and network management offer control and detailed monitoring from any web browser. From the PSTN, the Model LRA2900A RAS will accept either T1/E1 or PRI connections, with support for both channel associated or common channel signaling.

Table 3. Software overview

Parameter	Modem Support
WAN Protocols	V.92/V.90 (28,000–56,000) • K56 Flex (32,000–56,000) • V.34 Annex 12 (2,400–33,600) • V.34 (2,400–28,800) • V.8bis (capabilities negotiations) • V.32bis (7,200–14,400 with trellis encoding) • V.32 (4,800 & 9,600) • V.22 (600, 1,200, & 2,400) • V.22bis (600, 1,200, & 2,400) • V.21 (300 bps) • Bell 212A (1,200 bps) • Bell 103 (300 bps) • Bell 202 (75/1,200 bps) • EIA PN-2330 and low-speed data modem automode procedures • Modulation supervision for automatic rate selection • Bit error performance monitoring for automatic fallback and fall-forward • V.14 synch to async con-version (buffered/direct) • V.42 sync to async conversion with error correction • V.42bis compression • 64K HDLC Digital ISDN • User-selectable modulation and speeds
LAN Protocols	SLIP • Sync/Async PPP with dial-up auto-detection • Multilink PPP & Multichassis MultiLink with L2TP tunneling • LCP • IPCP with MS extensions • Frame Relay RFC 1490 IP Encapsulation • User configurable PVCs • User-selectable 2-, 3-, or 4-byte DLCI address field formats • Congestion recognition and management • Individual DLCI statistics • Current throughput indication (10-second average) • Online help • 802.3 Ethernet, ARP, RARP, IP over Ethernet
PSTN Connectivity	T1/CT1 • Robbed Bit with Ground Start, Loop Start, E&M Wink, E&M Immediate, Taiwan R1 • Office Side Robbed Bit • PRI/Q.931 Switch Support: NI1, AT&T/Lucent, DMS •T1/E1 Near- and Far-end Statistics • User Selectable Time Slot allocation • E1/CE1 with MFR2 with user configurable inter-register codes • PRI Switch Support: NET5/CTR-4, TS014, INS1500 • Drop & Insert with signaling conversion • Digital Cross Connect with multiple clock source fail-over protection • NFAS
IP Services	TCP/IP suite with extensive protocol statistics • ICMP with redirect enable/disable • TFTP • FTP • RLOGIN • TELNET • Proxy ARP • IP over Point-to-Point Protocol • IP over Ethernet • Van Jacobson TCP Header Compression • PPP address and protocol compression • RIP and RIPv2 dynamic route distribution with support for Multiple RIP interfaces • User configurable static routes with gateway/host/interface routes • TCP clear connection (TCPRAW) • Dial-in NetBIOS UDP broadcast enable/disable • IP Encapsulation within IP (RFC 2003)
Management	HTTP • SNMPv2 with MIB II • TELNET • RS232 Console port • SYSLOG client • Remote software upgrade via FTP • Complete dial-in statistics including the viewing of active calls, previous 15 dead calls, administrative call termination • Selectable login time limit • Selectable idle time limit • Selectable session total time limit • Dial-in dynamic IP address pool management • Dial-out via Telnet with user configurable port numbers • Layer 3 & Layer 4 IP Filters with auto-default for dial-in users
Authentication	RFC 2138 & RFC 2139 RADIUS client with packet format selection and authentication statistics with user configurable timeout/retry parameters • PAP & CHAP • CLID/ANI/DNIS • ASCII Username & Password • Internal Static Users Database (111 entries)

Chapter 2   Hardware installation

Chapter contents

Introduction

This chapter contains the following procedures for installing the Model LRA2900A RAS:

- "Unpacking the Model LRA2900A RAS"—lists the contents of the RAS shipping container

- "RAS chassis installation"—describes installing the RAS on a flat surface or in a standard 19–inch rack.

- "Cable installation" on page 24—describes installing the power and network interface cables

- "Completing the hardware installation" on page 27—describes testing the RAS hardware to verify that it is ready for software configuration.

Unpacking the Model LRA2900A RAS

Inspect the shipping carton for external damage. Note any damage before removing the container contents. Report equipment damage to the shipping carrier immediately for claim purposes. Save all packing materials in case you need to return an item to the factory for servicing.

The RAS comes with the following items:

- The LRA2900A Series Remote Access Server (RAS)

- A DB-9-to-RJ-45 (EIA-561) cable, 10 foot (3 meters)

- Control port interface cable, 10 foot (3 meters), standard CAT-5 cable

- Two WAN connection cables, 10 foot (3 meters) each

- Rack mounting kit with rack ears and mounting hardware

- CD-ROM containing product literature and the following documentation:

  Remote Access Server Administrator's Reference Guide
  Model LRA2900A RAS Getting Started Guide

> **Note**   Power cables are shipped separately from the Model LRA2900A RAS.

RAS chassis installation

Do the following:

1.   If you have not done so already, remove the RAS from its shipping container.

> **Note**   The RAS should be placed as close as possible to the termination jack provided by the Telco. Avoid installing the RAS in a location where the power cords or network interface cables could be accidentally disconnected. The location should be well ventilated. Do not block the RAS's cooling vents.

2.   If you are installing the RAS in a 19-inch rack, go to step 3. Otherwise, place the RAS at the desired location, then go to "Cable installation" on page 24.

3.   Install the rack mounting ears onto the RAS using the mounting hardware provided.

4.   Place the RAS at the desired position in the rack.

5. Secure the RAS in position with the mounting screws.

Cable installation

This section describes installing the power, ground, and network interface cables.

Installing the power cables

This section describes installing the female end of the power cables into the IEC-320 connectors on the RAS. *Do not connect the male end of the power cables to the power outlet at this time*. Do the following:

1. Install a power cable into an IEC-320 connector (see figure 5).

Power cable retainer clip

10/100
ETHERNET

Grounding stud

90-264V
(50-60 Hz)
2 AMP

IEC-320 connector
(2 places)
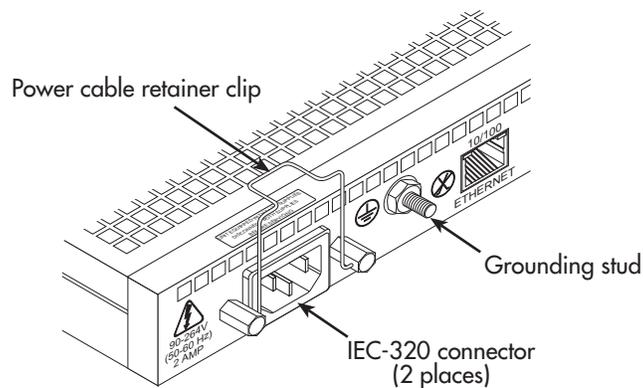
Figure 5. IEC-320 connector and grounding stud locations

WARNING

To avoid the risk of injury from electric shock, the power cords connected to the IEC-320 connectors must be grounded power cords.

2. Rotate the power cable retainer clip so it secures the power cable plug in the IEC-320 connector as shown in figure 6.

10/100
ETHERNET

Grounding stud

Power cable retainer clip

90-264V
(50-60 Hz)
2 AMP
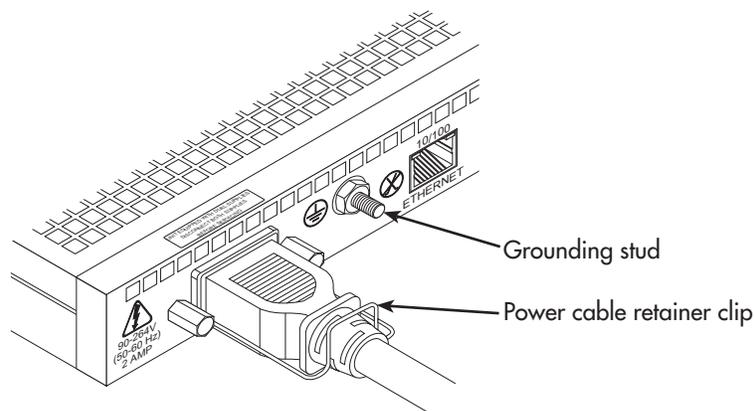
Figure 6. Power cable retainer clip

3. Repeat steps 1 and 2 to install the remaining power cable.

Grounding the Model LRA2900A

Do the following:

1. Assemble a ground wire using #10 AWG wire with green-colored insulation and two ring terminals. Make the wire long enough to reach one of the following ground sources:

– The building ground rod (generally located at the site's main service entrance)

– A sprinkler system pipe

– A cold-water pipe

– Building structural steel

> ⚠️ **WARNING** **To avoid the risk of personal injury, the distance between ground and the equipment rack must not exceed the distance specified in either local electrical codes or the National Electrical Code.**

2. Install the ground wire between the grounding stud (see figure 6) and the grounding source.

Connecting the Ethernet ports

The RAS has a single 10/100 Ethernet interface for connection to your LAN (see figure 7). The Ethernet port will autosense the correct speed of the local LAN and automatically negotiate half- or full-duplex operation. This section describes connecting the RAS to the Ethernet LAN via an Ethernet hub, switch, or workstation.
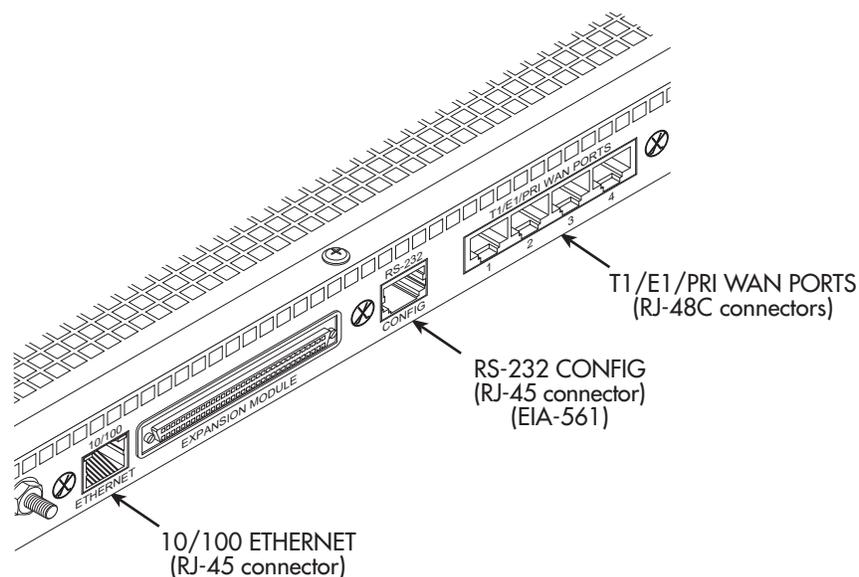
Figure 7. Model LRA2900A network and configuration ports

Connecting the 10/100Base-T Ethernet port to an Ethernet switch or hub
The 10/100Base-T Ethernet port (see figure 7 on page 25) is designed to connect to an Ethernet switch or hub. Connect a straight-through CAT-5 cable (one wired as shown in figure 8) between the RAS and the hub/switch.

RJ-45 Jack	Signal Name	Direction
1	(TX+) Transmit Data +	Output
2	(TX-) Transmit Data -	Output
3	(RX+) Receive Data +	Input
4		
5		
6	(RX-) Receive Data -	Input
7		
8		
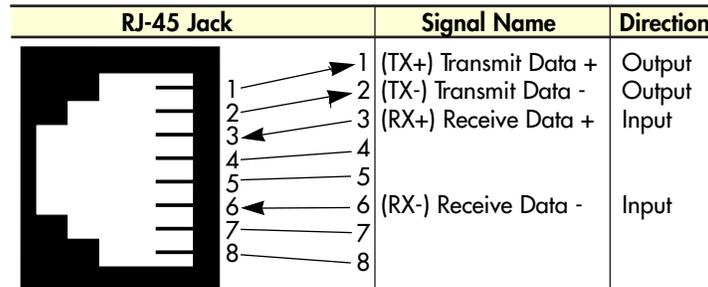
Figure 8. Straight-through RJ-45-to-RJ-45 Ethernet cable diagram

Connecting the 10/100Base-T Ethernet port to an Ethernet-capable workstation
The 10/100Base-T Ethernet port can connect to a single Ethernet-capable workstation by means of a cross-over cable. Refer to figure 9 to assemble a cross-connect cable that will connect between the NIC Ethernet port in the workstation and the RAS 10/100Base-T Ethernet port.

10Base-T Workstation
RJ-45 Pin No.

RAS 10/100Base-T Port
RJ-45 Pin No.

1 (TX+) ← 3 (RX+)
2 (TX-) ← 6 (RX-)

3 (RX+) → 1 (RX+)
6 (RX-) → 2 (TX-)
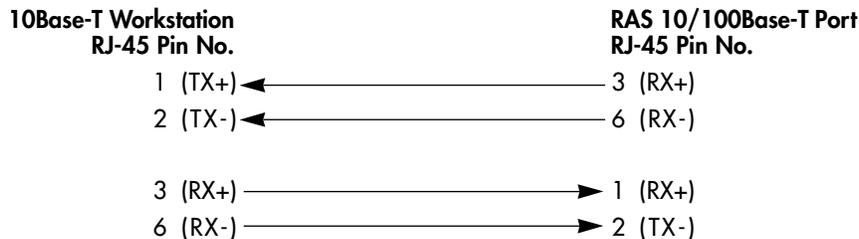
Figure 9. Cross-over RJ-45-to-RJ-45 Ethernet cable diagram

Connecting the EIA-561 RS-232 configuration port
Install the supplied DB-9-to-RJ-45 cable between the RAS RS-232 port (see figure 7 on page 25) and an open serial port on your computer. If you need to assemble your own cable, refer to the pinout diagram in figure 10.

RJ-45 Jack	DB-9	Signal Name
	6	DSR ⎫
1	1	CD ⎬ Wired together
2	4	DTR ⎭ (No other electrical
3	5	SG connection)
4	2	RD (driven by access server)
5	3	TD (received by access server)
6	8	CTS (driven by access server)
7	7	RTS (received by access server)
8		
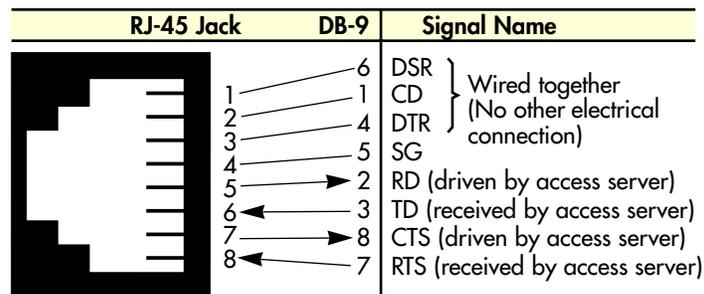
Figure 10. DB-9-to-RJ-45 cable diagram

Connecting to the T1/E1/PRI WAN ports

An active T1/E1/PRI is not necessary to configure the RAS. However, an active T1/E1/PRI connection is required to receive or make calls. The factory-set default configuration of the access server has the T1/E1 ports disabled.

> **Note**   The cable connecting the T1/E1/PRI WAN ports to the RJ-48C termination jack should be CAT-3 or higher and extend no farther than 1 mile from the digital services termination.

1. Refer to figure 11 for the T1/E1/PRI RJ-48C pinout diagram.

RJ-45 Jack	Signal Name
1	1 (RX) Receive (RING)
2	2 (RX) Receive (TIP)
3	3
4	4 (TX) Transmit (RING)
5	5 (TX) Transmit (TIP)
6	6
7	7
8	8
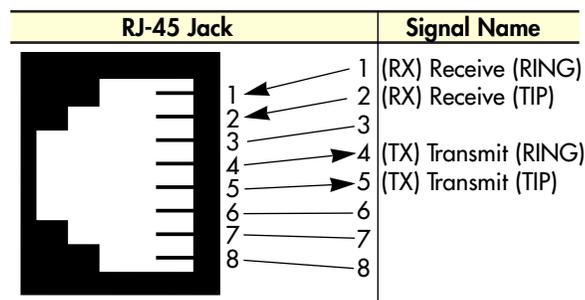
Figure 11. T1/E1/PRI RJ-48C pinout diagram

2. Attach the network cable from the telephone network demarc to the Primary T1/E1/PRI port (RJ-48C) on the RAS.

> **Note**   For 75-ohm twin-coax E1 connections, use the Black Box Model MT 242A E1 120-ohm/75-ohm adapter to convert from a 75-ohm dual-coax to the 120-ohm twisted-pair interface the RAS uses.

Completing the hardware installation

This section verifies that the RAS hardware is operational to the point where you can begin configuring the software settings.

> ⚠ **CAUTION**   The RAS power supply automatically adjusts to accept an input voltage of from 90 to 260 VAC (50 to 60 Hz).
>
> Verify that the proper voltage is present before plugging the power cord into the receptacle. Failure to do so could result in equipment damage.

1. Verify that the AC power cord included with your RAS is compatible with local standards.

2. Connect the male end of the power cord to an appropriate power outlet.

3. Verify that the green *POWER* LED is lit. If the *POWER* LED is flashing green, refer to Chapter 5, "Troubleshooting and maintenance".

Hardware installation is complete. Refer to Chapter 3, "Configuring the RAS for operation".

Chapter 3 Configuring the RAS for operation

Chapter contents

Introduction

This chapter contains the following procedures for configuring the Model LRA2900A Remote Access Server for operation:

- "Configuration prerequisites"—lists the items you need to have on hand before configuring the RAS.

- "Preparing the RAS for configuration"—describes setting up the RAS IP address and netmask parameters.

- "Configuring the RAS with a Web browser" on page 33—describes installing the power and network inter-face cables

- "Saving your configuration" on page 47—tells you how to save the configuration settings.

- "Completing the installation" on page 49—describes testing the RAS to verify that it is fully operational

Configuration prerequisites

You will need the following to configure the RAS:

- A PC with a serial port and a VT-100 terminal program

- A PC with an Ethernet port and a WWW browser (Microsoft Internet Explorer or Netscape Communica-tor) connected to the remote access server's local LAN

- The IP address and subnet mask for the RAS's Ethernet port

- A range of IP addresses to be assigned to the dial-in users (IP pool)

- The IP addresses of the domain name servers (DNS)

- The IP address of the default gateway

> **Note** Before installing the RAS, you will need the following information from your local telephone company (telco):
>
> - The line type and encoding of the T1/E1 line
>
> - The signalling of the E1 (ISDN or MFCR2) line or the signalling of the T1 line. If the signalling for E1 is MFCR2, you will need the number of digits the telco will send over the line for the called number and the calling number
>
> - The voice channels that are active on the T1/E1 line

Preparing the RAS for configuration

Before the RAS can be configured the IP address and the netmask needs to be set up. This setup is done through the RS-232 CONFIG port on the RAS.

1. If you have not done so already, install the supplied DB-9-to-RJ-45 cable between the RAS RS-232 port (see figure 7 on page 25) and an open serial port on your computer.

2. Start a new VT-100 terminal session configured with the following characteristics:

   – Direct connection to COM port

   – 19.2 kbps

– 8 bits

– No Parity

– 1 Stop bit

– No flow control

3. Set up HyperTerminal™ as follows:

– Open a HyperTerminal session.

– Enter a name for this connection.

– Click on the *Connect using:* pop-up menu and choose the *Direct to Com*X option (where *X* is the number of the COM port onto which you connected the cable in step 1) (see figure 12).

Figure 12. Hyperterminal properties

– Configure the COM port settings as shown in figure 13.
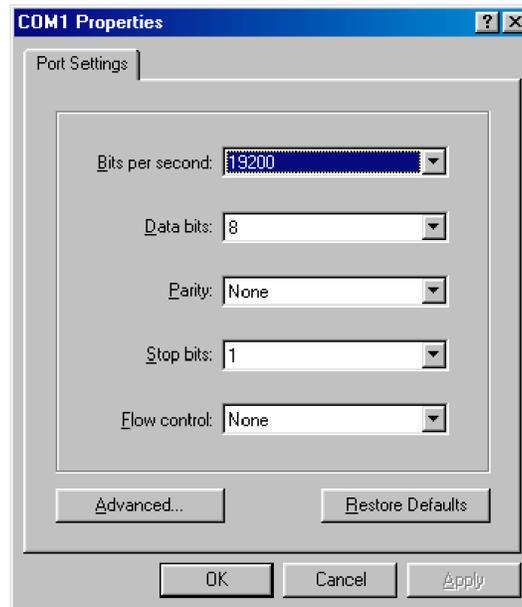
Figure 13. COM properties
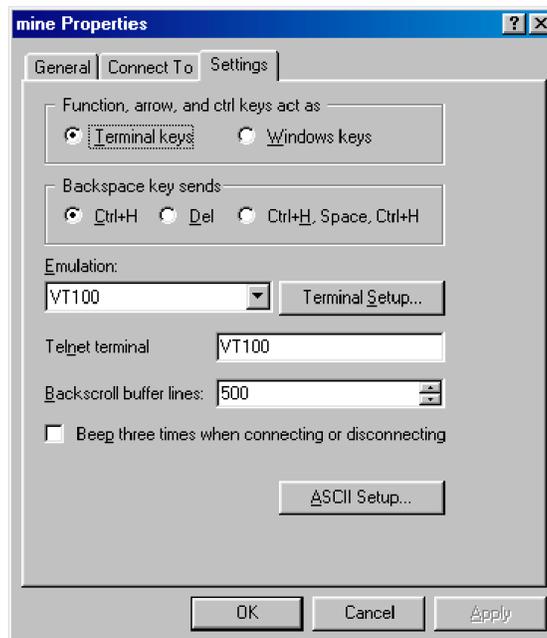
Figure 14. Terminal keys configuration

– Configure the Settings for *Function, arrow and ctrl keys act as* to *Terminal keys* as shown in figure 14.

4.   Press <RETURN> to display the login window, which will resemble that shown in figure 15.

```
Black Box Corporation
Model LRA2900A Remote Access Server
Software Revision 3.0.3 May 19 2000   16:48:45


Username: _
```

Figure 15. Login window

5. Type **superuser** as the default username and password, then press <RETURN>. The *Top Level Management* window displays (see figure 16).

```
TOP_LEVEL_MANAGEMENT                    Server
-----------------------------------------------

    a   HOME
    b   Authentication
    c   Dial In
    e   DSP
    f   Ethernet
    g   ICMP
    h   Interfaces
    i   IP
    j   MFR Version 2
    k   RIP Version 2
    l   SNMP
    m   System
    n   System Log
    o   T1/E1 Link
    p   TCP
    q   UDP
    r   About
    z   Easy Install


>
```

Figure 16. VT-100 Top Level Management window

6. Select option *f Ethernet.*

7. Select *a PrimaryIpAddress* to set the Ethernet IP address.

8. Type the IP address at the > prompt, then press <RETURN>.

9. Use the left arrow key to return to the previous menu.

10. Select *b PrimaryIpMask* to set the Ethernet IP subnet mask.

11. Type the IP netmask at the > prompt, then press <RETURN>.

The RAS is now prepared for configuration using a Web browser.

Note   The default gateway has not been configured at this time. You can access the web pages with a PC located on the same network as the RAS or you must configure the default gateway using HyperTerminal. Select *i IP* then *2 Default Gateway*.

Configuring the RAS with a Web browser

This section describes configuring the following:

• User authentication

• Dial-in user configuration

• Default gateway

Opening the RAS Web Administration Pages

Do the following:

1. Connect the RAS to the LAN.

2. Start a Web browser session and go to the URL:

   `http://<the.ras.ip.address>`

   where the *<the.ras.ip.address>* is the IP address of the RAS entered in Step 8.

3. When the username and password window displays, type **superuser** as the username and password, then press <RETURN>. The Administration Pages Home window appears (see figure 17).
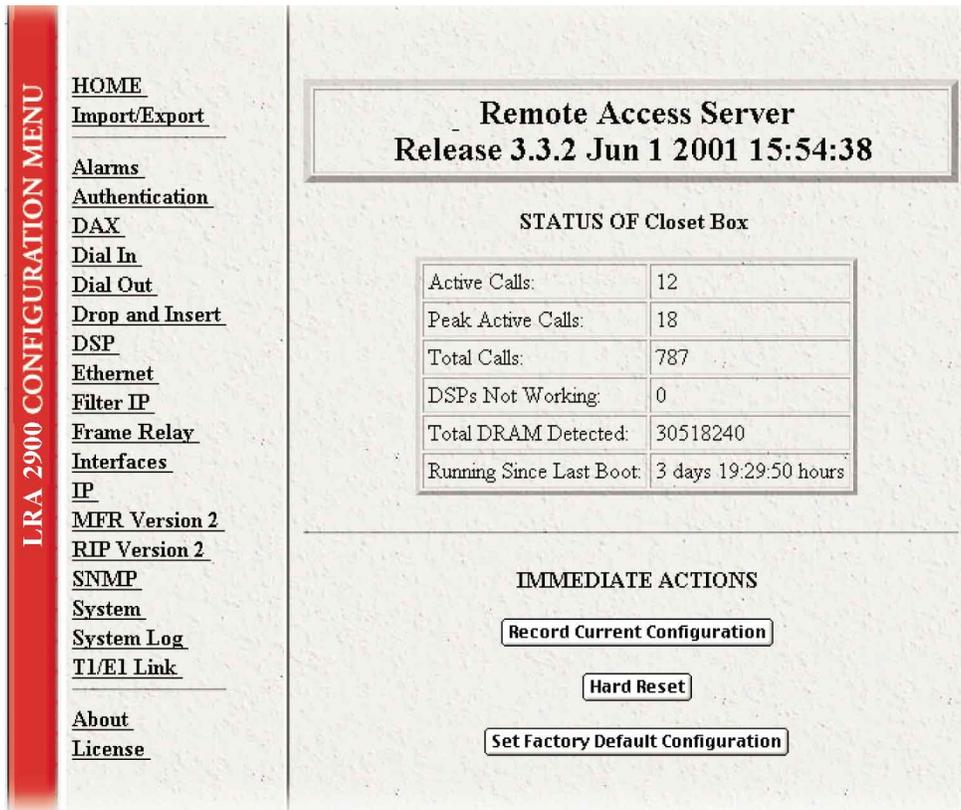
Figure 17. Home page

Home page overview

The HOME window is divided into two *panes*: the Configuration Menu pane and the configuration/information pane (see figure 18). The Configuration Menu contains the links to the various RAS subsystems, while the configuration/information pane is where you can view status and other information, or make changes to the system configuration. Unlike the Configuration Menu pane, which looks the same no matter which subsystem page you may move to, the configuration/information pane contents will change as you move from one subsystem page to another.
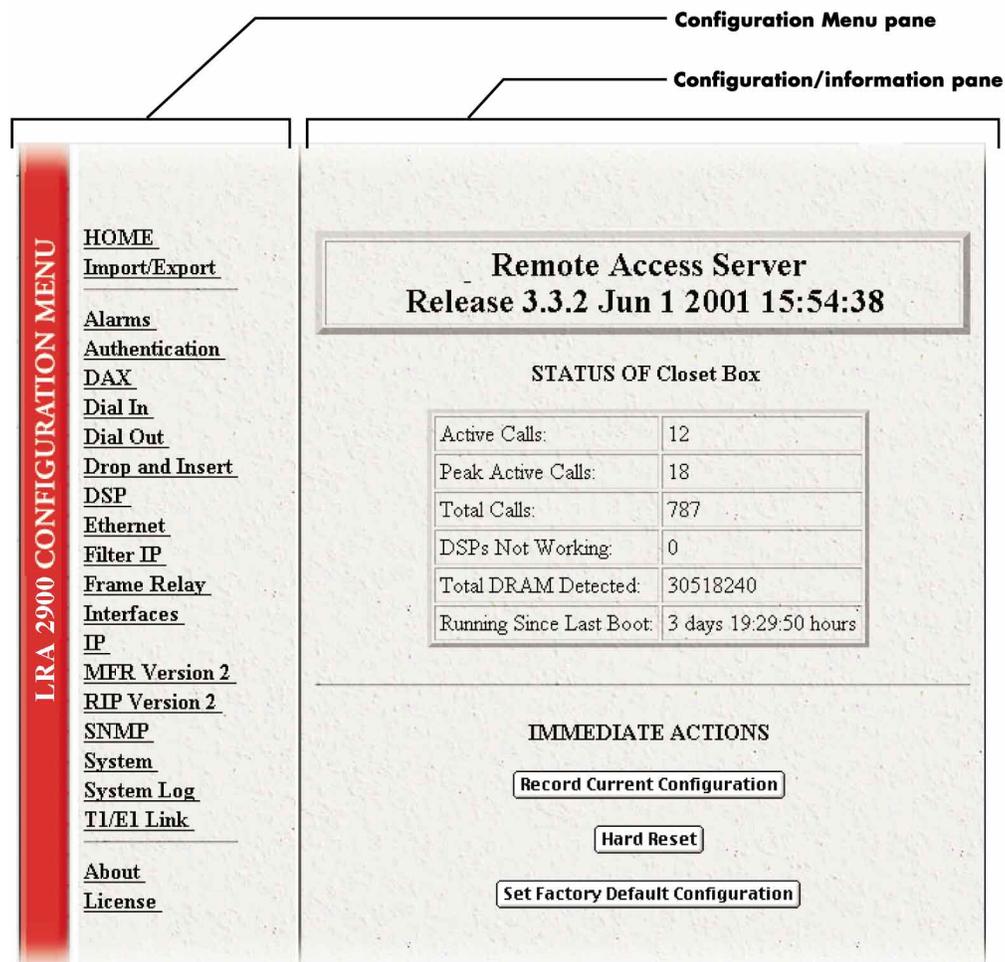
Figure 18. HOME page window panes

From the Home page, the following actions can be performed:

• **Record Current Configuration**—clicking on this button (figure 19) causes the current configuration to be stored in FLASH memory. Any changes made to the RAS configuration are stored in non-volatile RAM first. This allows the user to set the box up with a working configuration before committing it to FLASH. Configuration changes become permanent when you select **Record Current Configuration**. You will *lose* all changes *not* stored to FLASH the next time the RAS is re-booted.
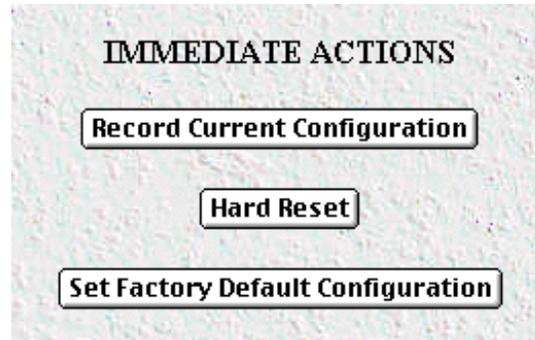
Figure 19. Immediate Actions buttons

• **Hard Reset**—this button (figure 19) causes the RAS to perform a cold restart. When you select **Hard Reset**, the RAS confirms that you want to execute this command. Then, the RAS will disconnect all current sessions, re-initialize the interfaces, and re-load configuration parameters from FLASH.

• **Set Factory Default Configuration**—this button (figure 19) clears out the configuration in FLASH and loads the factory default parameters into FLASH memory. The factory default settings *will not* execute on the RAS until it is re-booted.

> **Note**   **Set Factory Default Configuration** (figure 19) will delete any routing information, the RAS's Ethernet IP address, and any other site specific settings made for your particular installation. You will have to re-enter the RAS's Ethernet IP address and netmask using the front panel control port in order to use the HTTP/HTML Management pages.

Configuring simple authentication

The following sections describe two methods for configuring simple authentication to test the setup.

No Validation

A *No Validation* authentication setting means that the user will be able to log in without requiring a username or password.

1. Select Authentication on the Configuration Menu. The Authentication window displays (see figure 20).
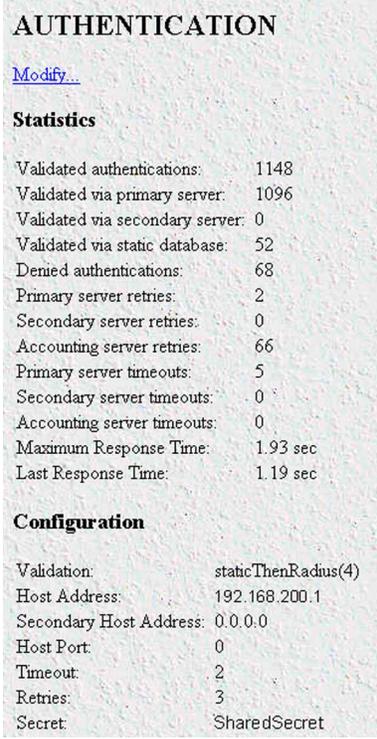
AUTHENTICATION

Modify...

Statistics

Validated authentications:	1148
Validated via primary server:	1096
Validated via secondary server:	0
Validated via static database:	52
Denied authentications:	68
Primary server retries:	2
Secondary server retries:	0
Accounting server retries:	66
Primary server timeouts:	5
Secondary server timeouts:	0
Accounting server timeouts:	0
Maximum Response Time:	1.93 sec
Last Response Time:	1.19 sec

Configuration

Validation:	staticThenRadius(4)
Host Address:	192.168.200.1
Secondary Host Address:	0.0.0.0
Host Port:	0
Timeout:	2
Retries:	3
Secret:	SharedSecret

Figure 20. Authentication main window

Figure 21. Authentication Configuration window

2. Click on Modify. The Authentication Configuration window appears (see figure 21).

3. Change *Validation* to *noValidation(0).*

4. Click on the **Submit Query** button.

A Static User

The *Static User* authentication setting means that the user will have to use the static username and password you create to log in.

1. Select Authentication on the Configuration Menu. The Authentication window displays (see figure 20 on page 37).

2. To add an entry in the static user database (see figure 22), fill in the ID with a number not currently in use.

Figure 22. Static User Identification window

3. Add the desired username and password.

4. Click on the **Submit Query** button.

5. Click on Modify. The Authentication Configuration window appears (see figure 21 on page 38).

6. Change *Validation* to *StaticUsers(1)*.

7. Click on the **Submit Query** button.

> **Note**   Static Users or RADIUS are not used if validation is set to *noValidation(0)*.

Configuring dial-in user information
1. Click on Dial-in in the Configuration Menu. The Dial-In main window appears (see figure 23).

Figure 23. Dial-in main window

2. Click on Modify. The Modify Dial-In window appears (see figure 24).

Figure 24. Modify Dial-In window, Login section

3. The IP address pool contains the IP addresses that are assigned dynamically to the dial-in connections. Type the IP address pool in the space provided. The IP addresses can be non-contiguous addresses configured as follows:

– Blocks of IP addresses are designated with a dash (-) separating the first and last host in the block (for example, *192.49.110.151-155*)

– The addresses can be from a subnet other than the local network the RAS is on

– The IP address pool can have IP addresses from multiple subnets. The subnets must be separated by a semi-colon (for example, *192.155.155.1-6; 192.155.160.41-46*)

> **Note**   The IP address pool is limited to 39 characters.

4. Click the **Submit Query** button under the section.

> **Note**   Each section in the Modify Dial-In window has its own **Submit Query** button. In order for a change in a particular section to take place, that section's submit query button must be selected before making changes elsewhere.

5. Scroll down to the Domain Name Server section of the Modify Dial-In window (see figure 25).

Figure 25. Modify Dial-In window, Domain Name Server section

6. Enter in the IP Address of the primary and secondary domain name servers (DNS). The DNS enables users to find locations on the Internet.

7. Click on **Submit Query**.

Configuring the default gateway

Do the following to add the default gateway (if it was not already configured through HyperTerminal):

1. Select IP on the Configuration Menu, then click on Routing Info…(see figure 26).

Figure 26. IP Routing Information window

2. Type the IP address of the router forwarding packets to the Internet in the Gateway box. This is the default gateway.

3. Click on the **Add Route** button.

Configuring line settings and signaling for E1

1. Select T1/E1 Link on the Configuration Menu. The T1/E1 Link Activity window appears (see figure 27).
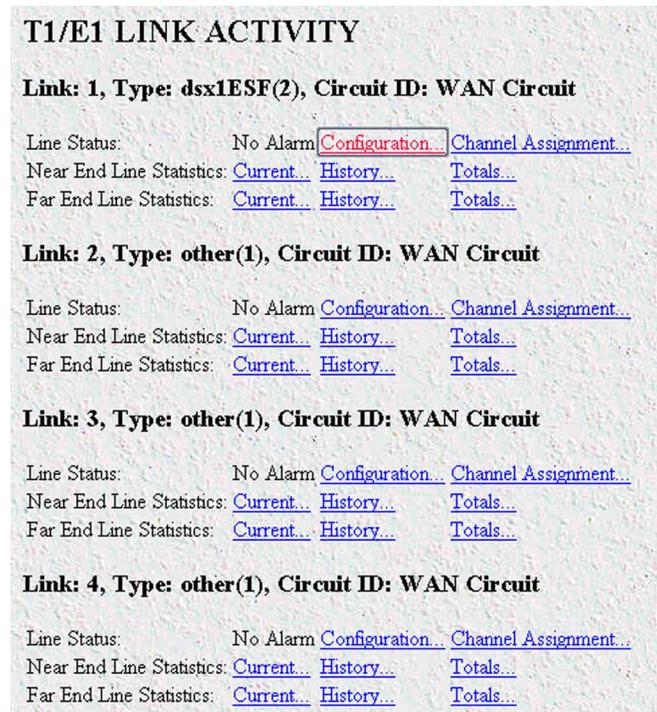
Figure 27. T1/E1 Link Activity window

2. Link: 1 corresponds to Line 1 on the RAS. This is the primary link for dial-in callers. Under Link 1, Click on Configuration then Modify. The Line Interface Settings section of the WAN Circuit Configuration window appears (see figure 28).
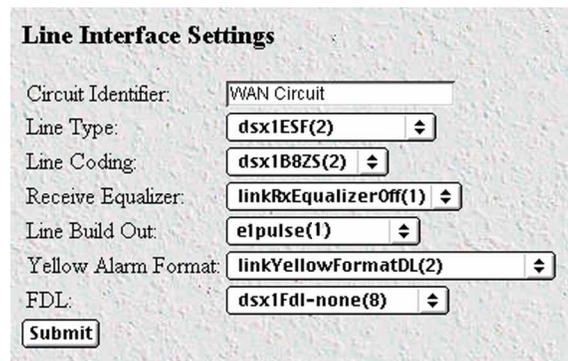
Figure 28. WAN Circuit Configuration window, Line Interface Settings section

Configuring the line settings

1. Click on the Line Type pop-up menu (see figure 28 on page 42) and choose from the following options:

   – For an E1/PRI line your options will be either dsx1E1(4) or dsx1E1-CRC(5)

   – For an E1/R2 line your options will be either dsx1E1-MF(6) or dsx1E1-CRC-MF(7)

2. Click on the Line Coding pop-up menu (see figure 28 on page 42) and choose either dsx1AMI(5) or dsxHDB3(3). Most installations will use HDB3.

3. Click on the Line Build Out pop-up menu (see figure 28 on page 42) and select e1pulse(1).

4. Click on Yellow Alarm Format pop-up menu (see figure 28 on page 42) and choose from the following options:

   – For an E1/PRI line choose linkYellowFormatDL(2)

   – For an E1/R2 line choose linkYellowAlarmFormatBit2(1)

5. Click on **Submit Query**.

At this point, the WAN front panel LEDs will become active. A solid green *FRAME* light indicator means that the RAS has synchronized with the E1 line.

If you have an E1/PRI (ISDN) line, refer to "Setting the line signaling for an E1/PRI (ISDN) line". Otherwise, refer to "Setting the line signaling for an E1/R2 line".

Figure 29. WAN Circuit Configuration window, signaling Settings section

Setting the line signaling for an E1/PRI (ISDN) line
Do the following:

1. Scroll down the WAN Circuit Configuration window, until the Signaling Settings section appears (see figure 29).

2. Click on the Signal Mode pop-up menu and choose messageOriented(4).

3. Click on the Message Oriented Switch Type pop-up menu (see figure 29) and choose CTR4(3).

4. Click on **Submit Query**.

Signaling is now configured for E1/PRI.

Setting the line signaling for an E1/R2 line
Do the following:

1. Scroll down the WAN Circuit Configuration window, until the Signaling Settings section appears (see figure 29).

2. Click on the Signal Mode pop-up menu and choose bitOriented(3).

3. Click on **Submit Query**.

4. Select MFR Version 2 on the Configuration Menu, then click on Modify. The MFR Version 2 Modify window appears (see figure 30).

Figure 30. MFR Version 2 Modify window

5. Click on the Country pop-up menu. If your country is not available, select ituStandard(1).

6. Click on **Submit**.

7. Scroll down to the Interregister signaling section.

8. Type the Called Number Total Digits in the box provided. This setting tells the RAS how many digits to expect from the phone company. The called Number is the number a user dials to call into the RAS.

9. Set the First/Middle and Last Response Codes. These are the codes the switch expects after each digit sent by the switch.

10. Click on **Submit**.

11. Type the Calling Number Total Digits in the box provided. This setting tells the RAS how many digits to expect from the phone company. This number is the calling party's phone number or Caller-ID information.

12. Set the First/Middle and Last Response Codes. These are the codes the switch expects after each digit sent by the switch.

13. Click on **Submit**.

signaling is now configured for MFC-R2.

> **Note**   The information entered into the Interregister Signaling section must match the information the telco provided. If the information entered is not the same, the RAS may not answer calls. In some installations, the phone company will send a special tone to alert that it is done sending the Calling Number. In this case, the value in the Total Digits box does not have to match the telephone company's exactly.

Channel assignment
This section describes configuring the RAS so it will know which channels are active. Do the following:

1. Select T1/E1 Link on the Configuration Menu. The T1/E1 Link Activity window appears (see figure 27 on page 42).

2. Click on Channel Assignment. The WAN Circuit Channel Assignment window appears (see figure 31).

Figure 31. WAN Circuit Channel Assignment window

3. Click on the **Dialin** button located under Set all channels to:.

4. Click on **Submit Query**.

Configuring line settings and signaling for T1

1. Select T1/E1 Link on the Configuration Menu. The T1/E1 Link Activity window appears (see figure 27 on page 42).

2. Link: 1 corresponds to Line 1 on the RAS. This is the primary link for dial-in callers. Under Link 1, Click on Configuration then Modify. The Line Interface Settings section of the WAN Circuit Configuration window appears (see figure 28 on page 42).

Configuring the line settings

1. Click on the Line Type pop-up menu (see figure 28 on page 42) and choose from the following options:

   – dsx1ESF Extended SuperFrame DS1

   – dsx1D4 AT&T D4 format DS1

   – For ISDN PRI service, set the line type to dsx1ESF

2. Click on the Line Coding pop-up menu (see figure 28 on page 42). The most common options are: dsx1B8ZS and dsx1AMI. For ISDN PRI service, set the line coding to dsx1B8ZS.

3. Click on the Line Build Out pop-up menu (see figure 28 on page 42) and select t1pulse0dB(1).

4. Click on the Yellow Alarm Format pop-up menu and choose linkYellowFormatBit2(1).

5. Click on **Submit Query**.

At this point, the WAN front panel LEDs will become active. A solid green *FRAME* light indicator means that the RAS has synchronized with the T1 line.

If you have an T1/PRI (ISDN) line, refer to "Setting the line signaling for an ISDN/PRI line". Otherwise, refer to "Setting the line signaling for a robbed-bit T1 line".

Setting the line signaling for an ISDN/PRI line

Do the following:

1. Scroll down the WAN Circuit Configuration window, until the signaling Settings section appears (see figure 29 on page 43).

2. Click on the Signal Mode pop-up menu and choose messageOriented(4).

3. Click on the Message Oriented Switch Type pop-up menu (see figure 29 on page 43) and choose either ni1(National ISDN 1), dms(Nortel Switch) or att(AT&T Customer).

4. Click on **Submit Query**.

Signaling is now configured for ISDN/PRI.

Setting the line signaling for a robbed-bit T1 line

Do the following:

1. Scroll down the WAN Circuit Configuration window, until the signaling Settings section appears (see figure 29 on page 43).

2. Click on the Signal Mode pop-up menu and choose robbedBit(3).

3. Click on **Submit Query**.

4. Click on the Robbed-Bit signaling Protocol pop-up menu and choose LinkGroundStart, LinkLoopStart, or LinkEMWinkStart.

5. Click on **Submit Query**.

6. Click on the Yellow Alarm Format pop-up menu and choose one of the following options:

    – For T1 lines with D4/AMI settings, this should be set to linkYellowFormatBit(1).

    – For T1 lines with ESF/B8ZS this should be set to linkYellowFormatDL(2).

7. Click on **Submit Query**.

Channel assignment

This section describes configuring the RAS so it will know which channels are active. Do the following:

1. Select T1/E1 Link on the Configuration Menu. The T1/E1 Link Activity window appears (see figure 27 on page 42).

2. Click on Channel Assignment. The WAN Circuit Channel Assignment window appears (see figure 31 on page 45).

3. Click on the **Dialin** button under the Set all channels to: section. Channels 25 through 30 are ignored for T1/PRI lines.

4. Click on **Submit Query**.

Saving your configuration

The basic configuration for the RAS is now finished. Do the following to save your configuration settings:

1. Select Home on the Configuration Menu. The Home window appears (see figure 17 on page 34).

2. Click on the **Record Current Configuration** button (see figure 19 on page 36).

> **Note**   Failing to click on the **Record Current Configuration** button before you power down or reset the RAS will cause your changes to be lost.

3. The Import/Export function enables you to make a backup (or *export*) copy of your access server's configuration parameters. By exporting the configurations, the saved files can quickly be loaded (or *imported*) into a replacement access server—greatly speeding up the installation process should an access server need replacing.

> **Note**   All actions for Import/Export require superuser access privileges.

4. To import or export a configuration, click on Import/Export under the Configuration Menu to display the Import/Export main window (see figure 32).

Figure 32. Import/Export main window

5. To export the flash configuration, click on the Export Flash link on the Import/Export main page. The access server will display text configuration information resembling that shown in figure 33.

Figure 33. Typical access server flash memory configuration data

To save the displayed data as a text file, select the **Save** option on your browser (see figure 34). For example, under Netscape, select **File** > **Save As**. A dialog box will display enabling you to save the contents of the export parameters to a text file. Select the location where you want the file stored, type a file name, and click **Save**.

Figure 34. Saving the access server flash memory configuration data as a text file

Completing the installation

This section verifies that the RAS is fully operational.

1. Temporarily disconnect the male ends of both power cords from the power outlet. Wait 30 seconds, then plug the power cords in again.

2. Verify that the green *POWER* LED is lit. If the *POWER* LED is flashing green, refer to Chapter 5, "Troubleshooting and maintenance".

3. Verify that the *Link 1 Frame* LED illuminates, indicating that the RAS is synchronizing with the T1/E1/ PRI signal.

4. Verify that after 5 seconds, the *Link A Error* LED begins flashing, indicating that the RAS is satisfied with the quality of the T1/E1/PRI signal.

5. Verify that after 10 seconds, the *Link A Error* LED extinguishes, indicating that the RAS is satisfied with the network signal and that the link is ready for use.

Note   If the RAS does not respond as described, the most likely cause is that the RAS default settings are not compatible with the T1/E1 line. If this is the case, use the RS-232 CONFIG port to correct the RAS settings. You will have to examine the T1/E1 Link section in the configuration pages in the RAS.

6. There are two LEDs on the RAS 10/100 Ethernet port: a green LED that indicates line speed, and a yellow LED that indicates link status and activity.

Verify that the yellow LED is either flashing yellow (meaning that packets are being received at the Ethernet port) or solid yellow (meaning that the link is valid but no packets are being received).

Congratulations! Your RAS is now installed. For more in-depth information about configuring your RAS settings, refer to the *Access Server Administrator's Reference Guide* included on your RAS CD-ROM. Otherwise, refer to Chapter 4, "Operation and shutdown" for information on activating and de-activating your remote access server.

Chapter 4   **Operation and shutdown**

Chapter contents

Introduction

This chapter describes how to start or power-down the RAS.

Activating the RAS

Once the RAS has been installed, no operator action is required under normal conditions; the RAS is designed for unattended operation. The RAS does not have a power switch. When either power supply is connected to power, the RAS will immediately begin its boot-up cycle. However, both power supplies must be connected to power for the redundancy feature to work.

When power is applied to the RAS the following should occur:

1. The *POWER* LED illuminates.

2. The *Link 1 Frame* LED illuminates, indicating that the RAS is synchronizing with the T1/E1/PRI signal.

3. After 5 seconds, the *Link A Error* LED flashes, indicating that the RAS is satisfied with the quality of the T1/E1/PRI signal.

4. After 10 seconds, the *Link A Error* LED extinguishes, indicating that the RAS is satisfied with the network signal and that the link is ready for use.

5. There are two LEDs on the RAS 10/100 Ethernet port: a green LED that indicates line speed, and a yellow LED that indicates link status and activity.

    The yellow LED is either flashing yellow (meaning that packets are being received at the Ethernet port) or solid yellow (meaning that the link is valid but no packets are being received).

    The green LED is either lit (indicating 100 Mbps operation) or off (indicating 10 Mbps operation).

    > **Note** The green LED reflects the speed of the last valid Ethernet connection.

The RAS is operational.

De-activating the RAS

Perform the following procedure to deactivate the RAS.

1. Disconnect the male ends of both power cords from the power distribution strip or to a wall outlet.

2. Verify that the *POWER* LED extinguishes.

Chapter 5   Troubleshooting and maintenance

Chapter contents

Introduction

This chapter describes troubleshooting and fault analysis that can be performed by the operator. If you require more help, contact Black Box technical support at **724-746-5500**. Refer to table 4 for a list of common symptoms and suggested remedies.

Note   The following information assumes that there is only one failure involving the RAS and that if you perform the corrective action listed, it will solve the problem.

Table 4. Symptoms

Problem	Corrective Action
POWER LED is extinguished	Verify that power is being supplied to the RAS.
POWER LED is flashing	One of the power supplies has malfunctioned. The RAS will function normally indefinitely with one power supply, so you can wait until a low traffic time, then refer to "Replacing the RAS" on page 58 to replace the RAS.
CPU FAIL LED is lit	CPU has failed. As soon as possible, unplug both power cables from the RAS, wait 30 seconds, then plug the cables back into the RAS to see if the problem disappears. If the CPU FAIL LED is still lit after the RAS completes the power-up cycle, refer to "Replacing the RAS" on page 58 to replace the RAS.
ALARM LED is lit	Indicates that an alarm condition has been detected.
SYSTEM LED is extinguished	The RAS is not functioning properly. As soon as possible, unplug both power cables from the RAS, wait 30 seconds, then plug the cables back into the RAS to see if the problem disappears. If the SYSTEM LED is still lit after the RAS completes the power-up cycle, refer to "Replacing the RAS" on page 58 to replace the RAS.
10/100 ETHERNET yellow LED is extinguished	• A valid link has not been detected. Verify that the cable is plugged into the hub, switch, or workstation and the RAS. • Verify that the hub, switch, or workstation is powered on. • Replace the cable. If the problem still exists, refer to "Replacing the RAS" on page 58 to replace the RAS. If the problem still exists, troubleshoot the hub, switch, or workstation.

Fault analysis

The following procedures outline steps you should follow when troubleshooting a RAS malfunction.

1. If possible, talk to the person who filed the trouble complaint and determine the operational symptoms. Record the symptoms on the appropriate trouble report form (include the front panel LED indications).

2. Refer to table 5 for LED definitions and compare the recorded results from the trouble report against those in the table, then refer to the section recommended in the table for the maintenance procedure that will repair the malfunction.

Table 5. LED definitions

LED	Location	Color	Status	Meaning
POWER	Front panel	Green	On solid	Power is being applied. No action recommended.
			Flashing	A power supply has failed. One of the power supplies has malfunctioned. The RAS will function normally indefinitely with one power supply, so you can wait until a low traffic time, then refer to "Replacing the RAS" on page 58 to replace the RAS.
			Off	No input power is being applied. Verify that power is being supplied to the RAS.
CPU FAIL	Front panel	Red	On solid	The CPU has failed. As soon as possible, unplug both power cables from the RAS, wait 30 seconds, then plug the cables back into the RAS to see if the problem disappears. If the CPU FAIL LED is still lit after the RAS completes the power-up cycle, refer to "Replacing the RAS" on page 58 to replace the RAS.
			Off	The CPU is operating normally. No action recommended.
ALARM	Front panel	Red	On solid	A minor alarm condition has been detected.
			Flashing	A major alarm condition has been detected.
			Off	The RAS is operating normally. No action recommended.
SYSTEM	Front panel	Green	Flashing	The RAS is operating normally. No action recommended.
			Off	The RAS has malfunctioned. The RAS is not functioning properly. As soon as possible, unplug both power cables from the RAS, wait 30 seconds, then plug the cables back into the RAS to see if the problem disappears. If the SYSTEM LED is still lit after the RAS completes the power-up cycle, refer to "Replacing the RAS" on page 58 to replace the RAS.

Table 5. LED definitions

LED	Location	Color	Status	Meaning
ETHERNET	Front panel	Green	Off	• A valid link has not been detected. • Verify that the cable is plugged into the hub, switch, or workstation and the RAS. • Verify that the hub, switch, or workstation is powered on. Replace the cable. If the problem still exists, refer to "Replacing the RAS" on page 58 to replace the RAS. If the problem still exists, troubleshoot the hub, switch, or workstation.
			On solid	Link status is nominal for the Ethernet port. No action recommended.
CALLS ACT	Front panel	Green	On solid	Indicates call activity on the RAS. No action recommended.
			Flashing	A call is incoming. No action recommended.
			Off	No active calls on the RAS. No action recommended.
WAN PORT— FRAME	Front panel	Green	On solid	Indicates normal activity at each of the four T1/E1/PRI links. No action recommended.
			Flashing	Indicates that the RAS is detecting the network, but is unable to synchronize with it.
			Off	Indicates an error.
WAN PORT— ERROR	Front panel	Red	On solid	Indicates signal from WAN is not present.
			Flashing	Intermittent errors on the WAN port are recognized.
			Off	Indicates normal activity at each of the four T1/E1/PRI links. No errors recognized.
10/100 ETHERNET	Rear panel	Yellow	On solid	Link is valid but no packets are seen. No action recommended.
			Off	• A valid link has not been detected. • Verify that the cable is plugged into the hub, switch, or workstation and the RAS. • Verify that the hub, switch, or workstation is powered on. • Replace the cable. If the problem still exists, refer to "Replacing the RAS" on page 58 to replace the RAS. If the problem still exists, troubleshoot the hub, switch, or workstation.
			Flashing	Packets are detected at the Ethernet port. No action recommended.
10/100 ETHERNET	Rear panel	Green	On solid	100 Mbps speed. No action recommended.
			Off	10 Mbps speed. No action recommended.

Periodic maintenance

Other than using a lint-free cloth to clean dust off the RAS chassis, the RAS requires no periodic maintenance.

Calibration

The RAS requires no calibration.

Maintenance

This section describes replacing the RAS.

Replacing the RAS

If you isolate a problem to the a RAS component, the entire RAS must be replaced as follows:

Exporting the current RAS configuration

The Import/Export function enables you to make a backup (or *export*) copy of your access server's configuration parameters. By exporting the configurations, the saved files can quickly be loaded (or *imported*) into a replacement access server—greatly speeding up the installation process should an access server need replacing.

1. If you already have a recently exported backup of your configuration, go to "Removing the defective RAS" on page 60.

2. To export a configuration, connect your Web browser to the Administration Pages, then click on Import/ Export under the Configuration Menu to display the Import/Export main window (see figure 35).

Figure 35. Import/Export main window

Note   The parameters that will be exported are the power-up settings as they are stored in flash memory and *may not* be the current operating parameters. To ensure that you export the most current parameters, go to HOME, then click on the **Record Current Configuration** button under Immediate Actions.

3. To export the flash configuration, click on the Export Flash link on the Import/Export main page. The access server will display text configuration information resembling that shown in figure 36.

Figure 36. Typical access server flash memory configuration data

4. To save the displayed data as a text file, select the **Save** option on your browser (see figure 37). For example, under Netscape, select **File** > **Save As**. A dialog box will display enabling you to save the contents of the export parameters to a text file. Select the location where you want the file stored, type a file name, and click **Save**.
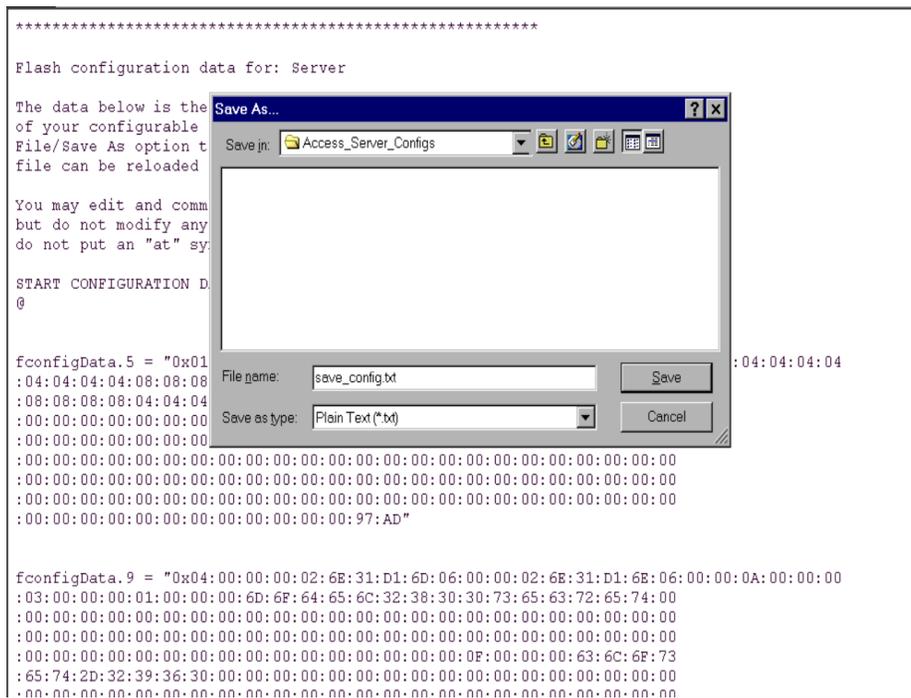
Figure 37. Saving the access server flash memory configuration data as a text file

Removing the defective RAS

1. Remove the replacement RAS from its shipping container and place it near where the malfunctioning RAS is located.

2. Unplug both male power cable connectors from their outlets.

3. Rotate the power cord retainer clips out of the way, then remove both power cables from the malfunctioning RAS.

4. Disconnect and label the following cables from the malfunctioning RAS:

– the T1/E1/PRI WAN cables

– the RS-232 CONFIG cable

– the 10/100 ETHERNET cable

5. Disconnect the ground wire from the grounding stud.

6. If the RAS is mounted in a rack, remove it from the rack.

7. Place the malfunctioning RAS in the container that the replacement RAS came in so you can return the RAS for repair.

Installing the replacement RAS

1. If you are installing the replacement RAS in a 19-inch rack, go to step 2. Otherwise, place the RAS at the desired location, then go to step 5.

2. Install the rack mounting ears onto the RAS using the mounting hardware provided.

3. Place the RAS at the desired position in the rack.

4. Secure the RAS in position with the mounting screws.

5. Install the ground wire onto the grounding stud.

6. Connect the following cables onto the RAS:

   – the T1/E1/PRI WAN cables

   – the RS-232 CONFIG cable

   – the 10/100 ETHERNET cable

7. Install the power cable into their IEC-320 connectors.

8. Rotate the power cable retainer clips so they secure the power cable plugs in the IEC-320 connectors.

Verifying the hardware installation

1. Connect the male end of the power cord to a power distribution strip or to a wall outlet.

2. Verify that the green *POWER* LED is lit.

Importing a saved configuration

Before the RAS can be configured the IP address and the netmask needs to be set up. This setup is done through the RAS RS-232 CONFIG port on the RAS.

1. Install the supplied DB-9-to-RJ-45 cable between the RAS RS-232 port (see figure 7 on page 25) and an open serial port on your computer.

2. Start a new VT-100 terminal session configured with the following characteristics:

   – Direct connection to COM port

   – 19.2 kbps

   – 8 bits

   – No Parity

   – 1 Stop bit

   – No flow control

3. Set up HyperTerminal™ as follows:

– Open a HyperTerminal session.

– Enter a name for this connection.

– Click on the *Connect using:* pop-up menu and choose the *Direct to Com*X option (where *X* is the number of the COM port onto which you connected the cable in step 1) (see figure 38).

Figure 38. HyperTerminal properties

– Configure the COM port settings as shown in figure 39.
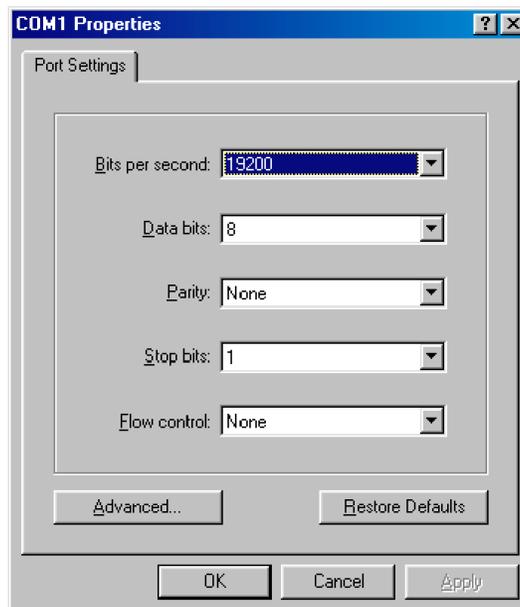
Figure 39. COM properties

– Configure the Settings for *Function, arrow and ctrl keys act as* to *Terminal keys* as shown in figure 40.
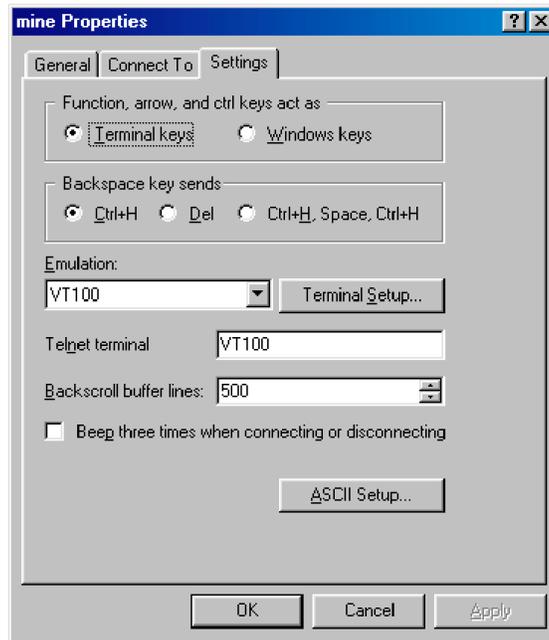
Figure 40. Terminal keys configuration

4.   Press <RETURN> to display the login window (see figure 41).

```
Black Box Corporation
Model LRA2900A Remote Access Server
Software Revision 3.0.3 May 19 2000  16:48:45


Username: _
```
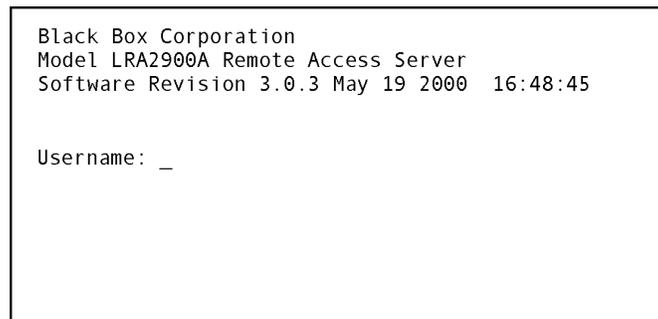
Figure 41. Login window

5. Type **superuser** as the default username and password, then press <RETURN>. The *Top Level Management* window displays (see figure 42).

```
TOP_LEVEL_MANAGEMENT                    Server
---------------------------------------------
    a   HOME
    b   Authentication
    c   Dial In
    e   DSP
    f   Ethernet
    g   ICMP
    h   Interfaces
    i   IP
    j   MFR Version 2
    k   RIP Version 2
    l   SNMP
    m   System
    n   System Log
    o   T1/E1 Link
    p   TCP
    q   UDP
    r   About
    z   Easy Install


>
```
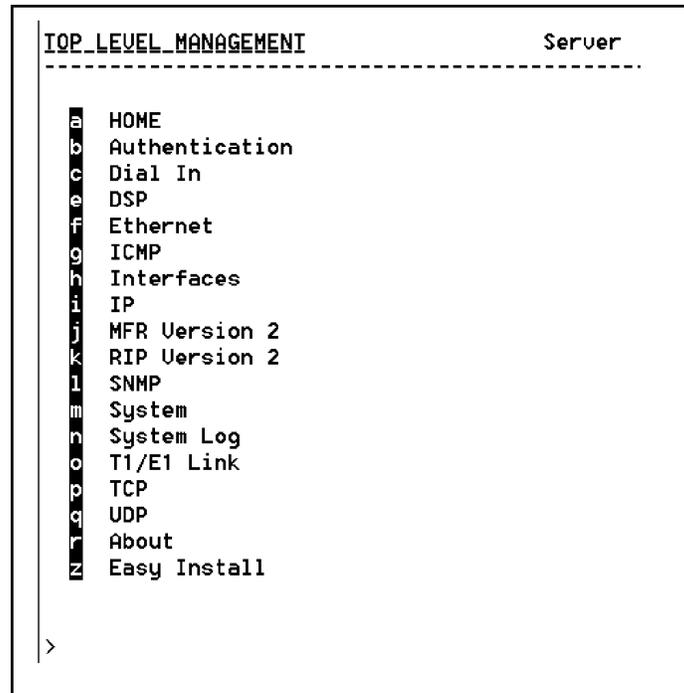
Figure 42. VT-100 Top Level Management window

6. Select option *m System.*

7. Select option *1 Details.*

8. Select *g Lan Address* to set the IP address for the Ethernet port.

9. Type the IP address at the > prompt, then press <RETURN>.

10. Use the left arrow key to return to the previous menu.

11. Select *option h Lan Mask* to set the netmask.

12. Type the netmask at the > prompt, then press <RETURN>. The RAS is now prepared for configuration using a Web browser.

13. To import a saved configuration, connect your Web browser to the Administration Pages, then click on Import/Export under the Configuration Menu to display the Import/Export main window (see figure 35 on page 58).

14. To import a configuration file into the RAS, type the complete path and filename for the configuration file you wish to load or click on the **Browse…** button to select the desired file, then click on the **Submit Query** button (see figure 35 on page 58).

Upon successfully importing the file, the access server will display *Configuration Load Complete*, indicating that the new operating parameters have been loaded into flash memory.

15. Click on HOME under the Configuration Menu, then click on the **Hard Reset** button under Immediate Actions.

> **Note**   *Do not* select **Record Current Configuration** after importing configuration parameters.

Completing the installation

This section verifies that the RAS is fully operational.

1. Temporarily disconnect the male ends of both power cords from the power distribution strip or to a wall outlet. Wait 30 seconds, then plug the power cords in again.

2. Verify that the green *POWER* LED is lit. If the *POWER* LED is flashing green, refer to Chapter 5, "Troubleshooting and maintenance".

3. Verify that the *Link 1 Frame* LED illuminates, indicating that the RAS is synchronizing with the T1/E1/PRI signal.

4. Verify that after 5 seconds, the *Link A Error* LED begins flashing, indicating that the RAS is satisfied with the quality of the T1/E1/PRI signal.

5. Verify that after 10 seconds, the *Link A Error* LED extinguishes, indicating that the RAS is satisfied with the network signal and that the link is ready for use.

6. There are two LEDs on the RAS 10/100 Ethernet port: a yellow LED that indicates link status and activity, and a green LED that indicates line speed.

Verify that the yellow LED is either flashing yellow (meaning that packets are being received at the Ethernet port) or solid yellow (meaning that the link is valid but no packets are being received).

The RAS is operational.

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NETWORK SERVICES

1000 Park Drive • Lawrence, PA 15055-1018 • 724-746-5500 • Fax 724-746-0746