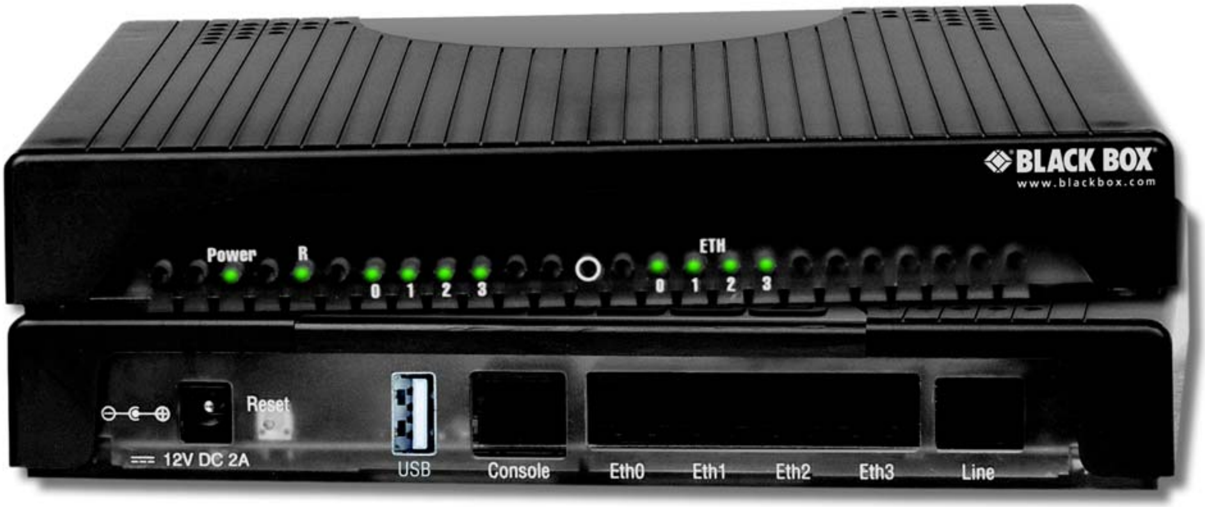
BLACK BOX

LB522A-KIT-R2, LB524A-KIT-R2, LB528A-KIT-R2

Ethernet Extender



Customer Support Information

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1 About This Guide

This guide describes the Black Box LB52XA-R2 hardware, installation and basic configuration.

1.1 AUDIENCE

This guide is intended for the following users:

- Operators
- Installers
- Maintenance technicians

1.2 STRUCTURE

This guide contains the following chapters and appendices:

- Chapter 2 on page 11 provides a general introduction to the LB52XA-R2
- Chapter 3 on page 18 provides information about installing the LB52XA-R2
- Chapter 4 on page 24 provides information on configuring the LB52XA-R2
- Chapter 5 on page 28 provides information on LB52XA-R2 bridging
- Chapter 6 on page 35 provides information on the IP context overview
- Chapter 7 on page 43 provides information about the Command Line Interface (CLI)
- Chapter 8 on page 47 provides information on accessing the CLI
- Chapter 9 on page 58 provides information on system image handling for the LB52XA-R2
- Chapter 10 on page 61 provides information about configuration file handling for the LB52XA-R2
- Chapter 11 on page 72 provides information about basic system management
- Chapter 12 on page 81 provides information about the Wizard
- Chapter 13 on page 87 provides information about IP routing
- Chapter 14 on page 92 provides information about SNMP configuration
- Appendix A on page 105 provides specifications for the LB52XA-R2

For best results, read the contents of this guide *before* you install the LB52XA-R2.

1.3 PRECAUTIONS

Notes and cautions, which have the following meanings, are used throughout this guide to help you become aware of potential Router modem problems. ***Warnings*** relate to personal injury issues, and ***Cautions*** refer to potential property damage.

Note A note presents additional information or interesting sidelights.

⚠ IMPORTANT

The alert symbol and IMPORTANT heading calls attention to important information.

⚠ CAUTION

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

⚡ 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.

⚠ WARNING

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

⚡ 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.

1.3.1 SAFETY WHEN WORKING WITH ELECTRICITY

WARNING

- **Do not open the device when the power cord is connected. For systems without a power switch and without an external power adapter, line voltages are present within the device when the power cord is connected.**
- **For devices with an external power adapter, the power adapter shall be a listed *Limited Power Source.* The mains outlet that is utilized to power the device shall be within 10 feet (3 meters) of the device, shall be easily accessible, and protected by a circuit breaker in compliance with local regulatory requirements.**
- **For AC powered devices, ensure that the power cable used meets all applicable standards for the country in which it is to be installed.**
- **For AC powered devices which have 3 conductor power plugs (L1, L2 & GND or Hot, Neutral & Safety/Protective Ground), the wall outlet (or socket) must have an earth ground.**
- **For DC powered devices, ensure that the interconnecting cables are rated for proper voltage, current, anticipated temperature, flammability, and mechanical serviceability.**
- **WAN, LAN & PSTN ports (connections) may have hazardous voltages present regardless of whether the device is powered ON or OFF. PSTN relates to interfaces such as telephone lines, FXS, FXO, DSL, xDSL, T1, E1, ISDN, Voice, etc. These are known as "hazardous network voltages" and to avoid electric shock use caution when working near these ports. When disconnecting cables for these ports, detach the far end connection first.**
- **Do not work on the device or connect or disconnect cables during periods of lightning activity**

WARNING

This device contains no user serviceable parts. This device can only be repaired by qualified service personnel.

In accordance with the requirements of council directive 2002/96/EC on Waste of Electrical and Electronic Equipment (WEEE), ensure that at end-of-life you separate this product from other waste and scrap and deliver to the WEEE collection system in your country for recycling.

WARNING

This device is NOT intended nor approved for connection to the PSTN. It is intended only for connection to customer premise equipment.

CAUTION

Electrostatic Discharge (ESD) can damage equipment and impair electrical circuitry. It occurs when electronic printed circuit cards are improperly handled and can result in complete or intermittent failures.

Do the following to prevent ESD:

- Always follow ESD prevention procedures when removing and replacing cards.
- Wear an ESD-preventive wrist strap, ensuring that it makes good skin contact. Connect the clip to an unpainted surface of the chassis frame to safely channel unwanted ESD voltages to ground.
- To properly guard against ESD damage and shocks, the wrist strap and cord must operate effectively. If no wrist strap is available, ground yourself by touching the metal part of the chassis.

2 GENERAL INFORMATION

Chapter contents

2.1 OVERVIEW

The Black Box LB52XA-R2 is a cost effective Ethernet Extender capable of achieving bandwidth rates of over 60 Mbps. The LB52XA-R2 is the ideal choice for providing internet access to bandwidth hungry small to medium size offices, wireless backhaul, Metro Ethernet, even LAN to LAN extensions.

The LB52XA-R2 is cable of bonding from 1 to 4 pairs to increase overall bandwidth. Each pair is capable of up to 5.7 Mbps to 15.3 Mbps pending your distance requirements. The ability to configure pair bonding and various line rate modes enables service providers, integrators and businesses to choose the best available rate vs. reach combination for the application.

The LB52XA-R2 supports defaults to plug-n-play mode which will allow the Extenders to pair up automatically at the best rate achievable. Should a pair be faulty the LB52XA-R2 will automatically adjust the line rate to ensure the network connection remains stable. In addition to offering all Black Box's highly regarded plug and play features, the managed series adds a higher level of network control for the more demanding applications.

The network management port is securely protected. Stateful Firewall inspection of traffic, accomplished through the creation of Access Control Lists (ACLs), enables the filtering of traffic based on numerous criteria including source and destination IP address, port, connection state and protocol.

Logical and physical ports are selectable for bridging. Features such VLANs are configurable on a per port basis. Bridged traffic can be tagged and prioritized according to user defined parameters.

The LB52XA-R2 offers easy installation. The variety of configuration options include CLI via Console (RS232), Telnet, or SSH. Also included is HTTP web based management, and SNMP.

Black Box's managed series offer the versatility and reliability demanded for the most critical network applications at an affordable price.

2.2 DO I NEED THIS GUIDE?

If you are a network administrator or a network admin associate and you have some level of complexity in your network applications, you may need this guide to get all of the value out of this feature-rich embedded operating system (OS) device can deliver. The purpose of the OS CLI guide is to give you in depth reference resource for every command supported in the OS.

2.3 TECHNICAL OVERVIEW

Ethernet extenders – "DIP SWITCH SIMPLE" You should be able to plug a Black Box Ethernet Extender 2 pack together and pass traffic immediately but if you need more features or have application requirements that don't function at a "plug-n-play" level then you might need this guide. If you are looking to understand the Traffic Flow and how to troubleshoot certain parts of your network, then this guide is for you. If you are not familiar and want to know more about the Black Box OS CLI (Command Line Interface) then this guide is for you. If you are just curious and want to experiment with the power of the OS, this guide is for you.

2.4 CONCEPTUAL OVERVIEW

This guide will break down in to a break down the configuration concepts in the picture above so the technician will know how to manipulate the dataflow at every level of the OSI. It will also give you a detailed look at the management and system level of the units. Although the units are capable of being simple plug and play Ethernet extenders. Black Box has provided a way for more advanced capabilities and extreme flexibility in configuring the units for your desired application requirements. Figure 1 is a conceptual break-down of Ethernet bridging over a twisted pair connection.

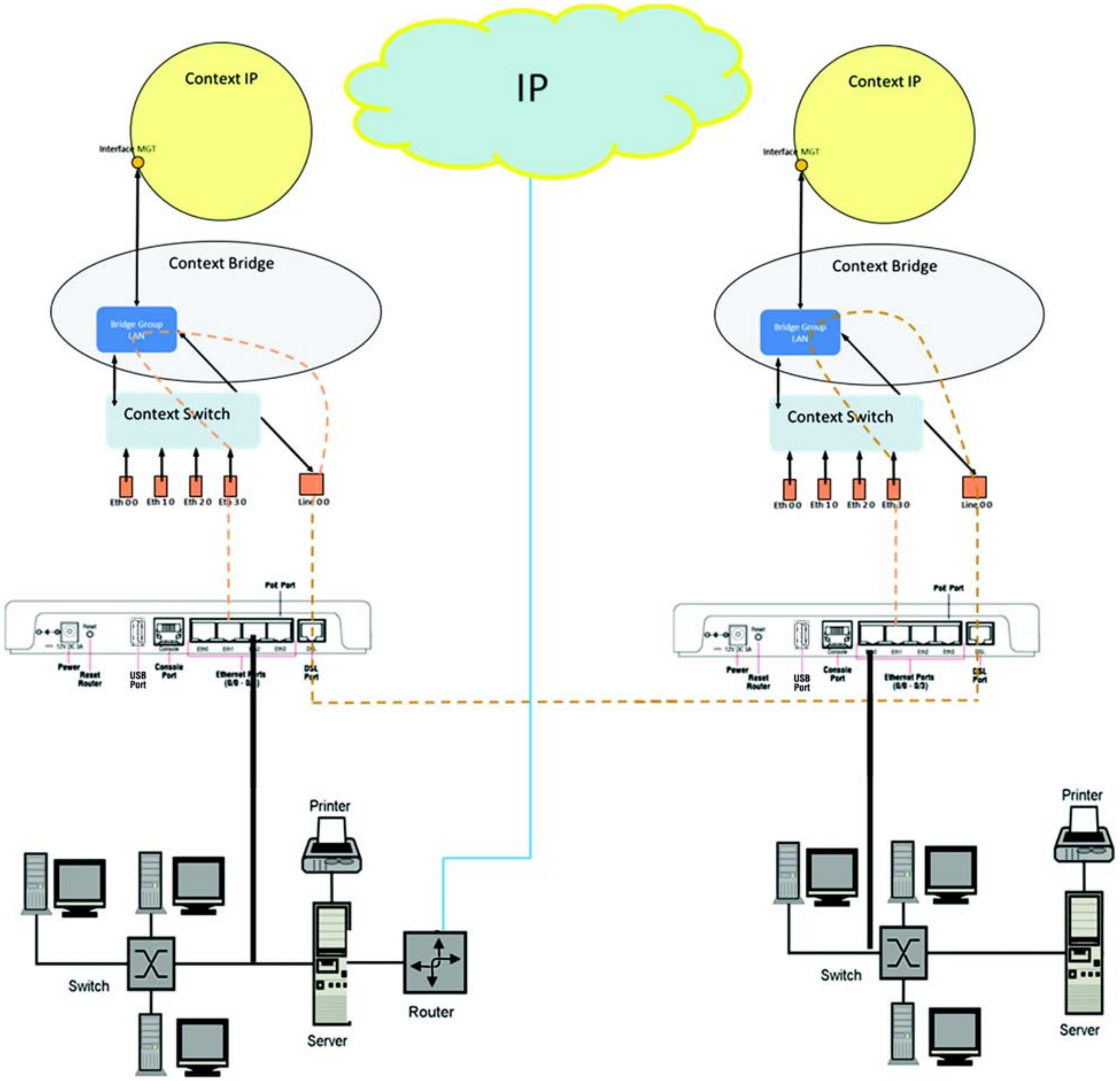
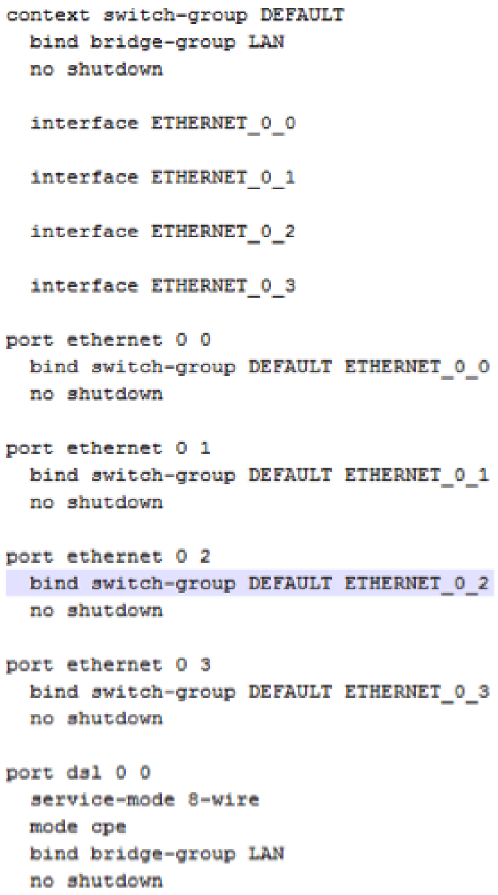


Figure 1 Twisted Pair Connection

2.5 DEFAULT CONFIGURATION

Let’s look at the data flow in combination with the conceptual view of the LB52XA-R2. This configuration is a remote/CPE configuration as shown in figure 2



```
context switch-group DEFAULT
  bind bridge-group LAN
  no shutdown

  interface ETHERNET_0_0

  interface ETHERNET_0_1

  interface ETHERNET_0_2

  interface ETHERNET_0_3

port ethernet 0 0
  bind switch-group DEFAULT ETHERNET_0_0
  no shutdown

port ethernet 0 1
  bind switch-group DEFAULT ETHERNET_0_1
  no shutdown

port ethernet 0 2
  bind switch-group DEFAULT ETHERNET_0_2
  no shutdown

port ethernet 0 3
  bind switch-group DEFAULT ETHERNET_0_3
  no shutdown

port dsl 0 0
  service-mode 8-wire
  mode cpe
  bind bridge-group LAN
  no shutdown
```

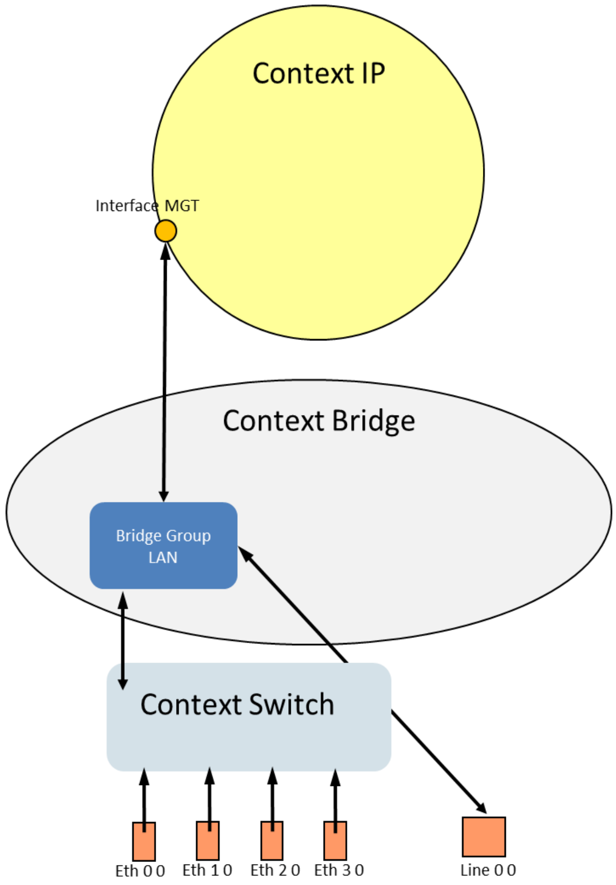


Figure 2 Remote/CPE Configuration

First let’s have a look at traffic flow. Ethernet ports are bound to Context Switch and Context Switch is bound directly to the Bridge Group LAN. Line is bound directly to the Bridge Group LAN. This is how the traffic moves from the Line ports to the Ethernet Switch.

3 INSTALLING THE LB52XA-R2

Chapter contents

3.1 LB52XA-R2 FRONT PANEL

The LB52XA-R2 features front panel LEDs that monitor power, the Ethernet signals, the line connection, and remote/local setting. Figure 3 shows the front panel location of each LED. Table 1 describes the LED functions.

Before applying power to the LB52XA-R2, please review 3.6, “Connecting Power” on page 23 to verify that the unit is connected to the appropriate power source.

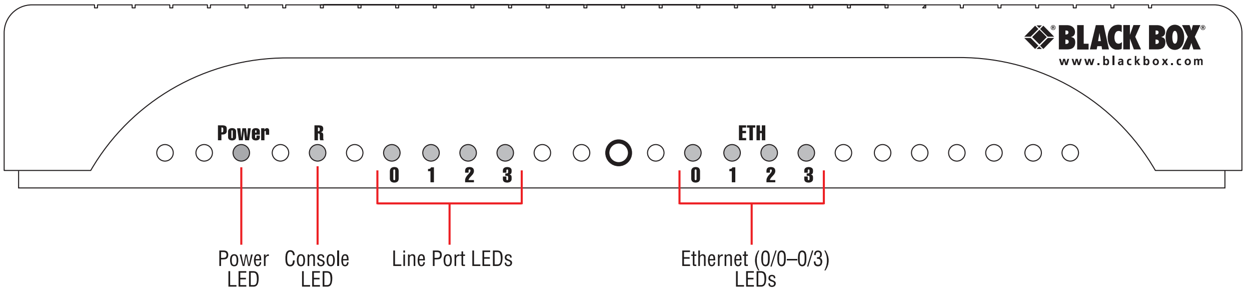


Figure 3 LB52XA-R2 front panel

Table 1. LB52XA-R2 LED descriptions

LED	Indication	Description
Power	ON	The device is powered on.
CPE	OFF ON	WAN is configured as CO. WAN is configured as CPE.
Line Pair (one LEAD for each port [1 on LB522A-R2, 2 on LB524A-R2, 4 on LB528A-R2])	OFF ON SLOW BLINK FAST BLINK	Port is configured as DOWN. Port is in data mode. Port is in handshake mode (looking for a remote signal). Port is in training mode (active communication with remote).
Ethernet (0/0-0/3)	ON OFF	Port is linked. Data is passing over the port.

3.2 PLANNING THE INSTALLATION

3.2.1 CONTENTS OF PACKAGE

- LB52XA-R2 Long Range Ethernet Extender
- External power supply for LB52XA-R2
- Ethernet cable with RJ45 plugs on each end (included)

3.2.2 WHAT YOU WILL NEED

- Default IP address: 192.168.200.10
- Default username: admin
- Default password: (no password)
- PC Computer

3.2.3 INSTALLATION

To install the LB52XA-R2 Ethernet Extender, do the following:

1. Connect the line interface between the units (refer to 3.3, “Connecting the Line Interface” on page 21).

   Note See figure 4 for the rear panel arrangements

2. Connect the Ethernet interface (refer to 3.5, “Connecting the Ethernet Interface” on page 22).
3. Connect the power plug (refer to 3.6, “Connecting Power” on page 23)

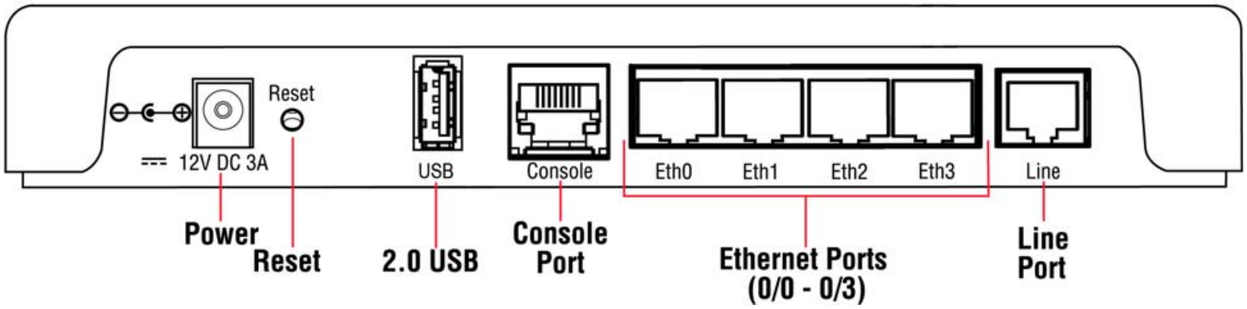


Figure 4 LB52XA-R2 rear panel options

3.3 CONNECTING THE LINE INTERFACE

Follow the steps below to connect the LB52XA-R2 interfaces.

1. To function properly, the two LB52XA-R2s must be connected together using twisted-pair, unconditioned, dry, metal wire, between 19 (0.9mm) and 26 AWG (0.4mm). Leased circuits that run through signal equalization equipment are not acceptable.
2. The Ethernet Extender is equipped with a RJ-45 interface jack (*Line*), which conforms to the T568B standard. As such, any standard Category 5e cable can be used to directly connect two extenders. Depending on the extender model, it will have a two-wire, four-wire or eight-wire interface

Observe the signal/pin relationship on the LB52XA-R2's *Line* interface jack for each pair in figure 5

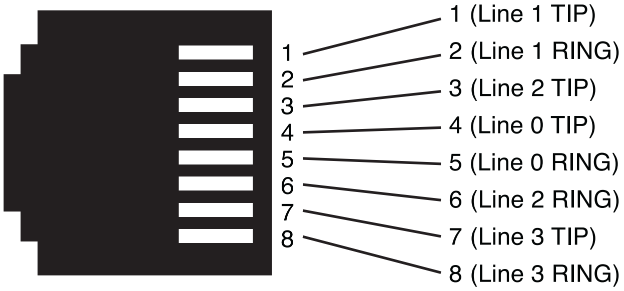


Figure 5 LB52XA-R2 (RJ-45) twisted pair line interface

Figure 6 shows the proper way to wire a cable with a RJ-45 jack on one end and four RJ-11jacks on the other.

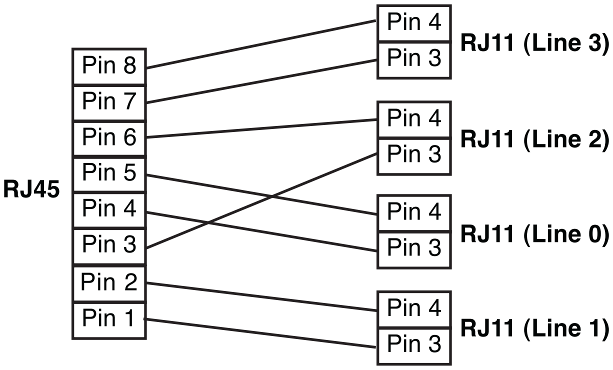


Figure 6 Pin-out for two devices

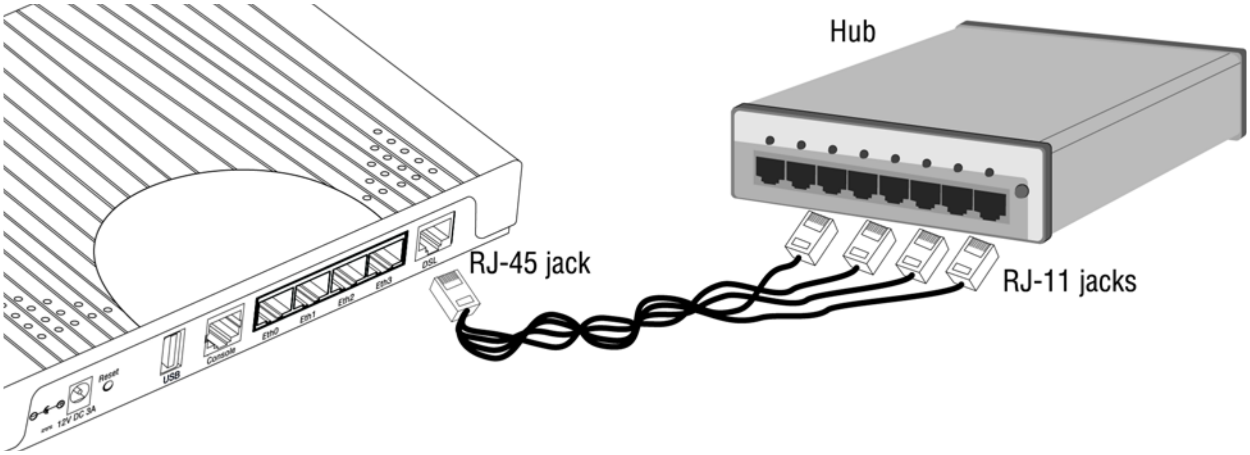
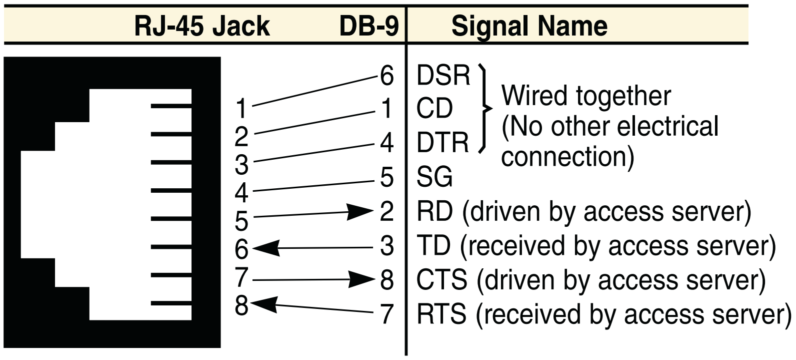


Figure 7 RJ-45 to RJ-11 cable

3.4 CONNECTING CONSOLE INTERFACE

Install the supplied RJ-45-to-RJ-45 cable with the DB9-RJ45 adapter between the LB52XA-R2 RS-232 port and an open serial port on your computer. If you need to assemble your own cable, refer to the pin-out diagram in figure 8.



RJ-45 Jack	DB-9	Signal Name
1	6	DSR
2	1	CD
3	4	DTR
4	5	SG
5	2	RD (driven by access server)
6	3	TD (received by access server)
7	8	CTS (driven by access server)
8	7	RTS (received by access server)

Figure 8 DB-9-to-RJ-45 cable diagram

3.5 CONNECTING THE ETHERNET INTERFACE

The Ethernet Extender has four unshielded RJ-45 Auto-MDIX10/100Base-T interfaces. These ports are designed to connect directly to a 10/100Base-T device or network. You may connect this port to a hub or PC using a straight through or crossover cable that is up to 328 ft. long.

3.6 CONNECTING POWER

The Ethernet Extender does not have a power switch, so it powers up as soon as it is plugged in.

The power connection is made via the barrel jack on the rear panel of the LB52XA-R2. No configuration is necessary for the power supply.

An external AC or DC power supply is available separately. This connection is made via the barrel jack on the rear panel of the LB52XA-R2. No configuration is necessary for the power supply.

DC power (supplied via the power supply jack to the LB52XA-R2) must meet the following requirements; DC power supplied must be regulated 12VDC ±5%, 1.0A minimum. Center pin is +12V. The barrel type plug has a 2.5/5.5/10mm I.D./O.D./Shaft Length dimensions.

4 CONFIGURATION AND OPERATION

Chapter contents

4.1 INTRODUCTION

You can connect a PC to configure the LB52XA-R2 using the CLI.

4.2 CONNECT WITH SSH

1. Connect the Ethernet cable.
2. Connect the power supply.
3. Connect via SSH to the default address 192.168.200.10
4. Login with the default username *admin* and no password.

4.3 CONNECT WITH CONSOLE

1. Connect the RS232 Console cable.
2. Connect the power supply.
3. Login with the default username *admin* and no password.

4.4 CHANGE THE IP ADDRESS (DEFAULT: 192.168.200.10)

Follow the command sequence below.

```
node~>enable
node~#configure
node~(cfg)#context ip router
node~(ctx-ip)[router]#interface LAN
node~(if-ip)[router.LAN]#no ipaddress 192.168.200.10/24
node~(if-ip)[router.LAN]#ipaddress <new address>/<new mask>
```

4.5 CHANGE THE DEFAULT USERNAME

The default username will be removed once a new one is created.

Follow the command sequence below.

```
node~>enable
node~#configure
node~(cfg)#superuser <username> password <password>
```

4.6 SAVE THE CONFIGURATION

Follow the command sequence below.

```
node~>enable
node~#configure
node~(cfg)#copy running-config startup-config
```

4.7 LINE PORT COMMANDS

4.7.1 LOCAL AND REMOTE

This will set the Ethernet Extender as Local or Remote.   Local is typically used at the network, Remote is typically used at the remote device or remote network. Your Black Box LB52XA-R2 when received in a 2pk is already configured one LB52XA-R2 as Local and one LB52XA-R2 as Remote.

```
node(cfg) (prt-line) [0/0]#mode {local|remote}
```

4.7.2 ANNEX TYPE

Please consult support before changing this setting.

```
    node~(pf)[<name>]# annex-type { b-g | a-f }
```

4.7.3 LINE RATE CONFIGURATION

This will increase the line rate of the LB52XA-R2. Your LB52XA-R2, by default, automatically selects the optimal rate based on the distance (adaptive).

```
    node(prt-line)[0/0]# payload-rate {adaptive [max <192..15296>] | <192..15296>}
```

4.7.4 MODULATION SCHEME

Note higher TC-PAM rates will increase maximum payload rates available but will decrease distance. Your LB52XA-R2 is defaulted to automatically select the optimal setting. Please consult manual for rate reach chart to determine your optimal setting if you choose to hard set this value. Higher TC-PAM rates are ideal for shorter cable runs offering max symmetrical (upstream/downstream) speeds of 11.4 Mbps (TCPAM64) and 15.3 Mbps (TCPAM128) per pair.

```
    node(prt-line)[0/0]# tcpam {auto(16/32) | auto(64/128) | 16 | 32 | 64 | 128}
```

4.7.5 LINE PORTS

The configurations below are used to configure various aspects of the line port(s).

```
    node~(cfg)# port line 0 0
```

4.7.6 SIGNAL TO NOISE RATIO

Configures the acceptable noise margin for adaptive rate. SNR is the relative strength of the line signal to Noise ratio. 6dB is generally the lowest dB recommended in order for the modem to be able to sync. Generally speaking, as overall bandwidth increases, your signal to noise ratio decreases. The higher the number the better. Your LB52XA-R2 is defaulted at 6 giving you the highest likelihood to connect.

```
    node(prt-line)[0/0]# snr-margin <-10..22>
```

Below 6dB	bad
6dB-10dB	fair
11dB-20dB	good

4.7.7 DESCRIPTION

This is the description of the port/line (line connection). (Ex: "This line goes to building 4") When entering a description with spaces in the text, the description must be in quotations.

```
    node~(prt-line)[0/0]# description <description>
```

4.7.8 USE PROFILE

Configures the acceptable noise margin for adaptive rate. SNR is the relative strength of the line signal to Noise ratio. 6dB is generally the lowest dB recommended in order for the modem to be able to sync.

```
    node~(prt-line)[0/0]# use profile <name>
```

4.7.9 SERVICE MODE

Configures the number of pairs (wires) you want to use. The LB52XA-R2 will default to the maximum number of wires available on your version of the LB522A-R2 (2-wire); LB524A-R2 (4-wire); LB528A-R2 (8-wire).

```
    node~(prt-line)[0/0]# service-mode { 2-wire | 4-wire | 6-wire | 8-wire }
```

4.7.10 SHUTDOWN

Disables or Enables port(s).

```
node~(prt-line)[0/0]# [no] shutdown
```

4.7.11 EXIT

Goes back to parent mode.

```
node~(prt-line)[0/0]# exit
```

4.7.12 SHOW

Displays all the configured options of the LB52XA-R2 line port(s)

```
node(cfg)# show prt-line 0
```

5 LB52XA-R2 BRIDGING CONTEXTS

Chapter contents

5.1 CONFIGURATION TASK LIST

To properly configure the LB52XA-R2, perform the tasks described in the following sections:

- **Configure Ports:** All your line and Ethernet ports must be configured (see page 33)
- **Configure Context Switch:** Is it a VLAN application or unmanaged switch application (see page 29)
- **Configure Context Bridge:** All traffic must run through the SW bridge (see page 30)
- **Configure Bridge Groups:** Context Bridge must have at least one bridge group (see page 33)
- **Configure Bindings:** Make sure ports, interfaces, and contexts are bound (see page 30)

5.2 OPTIONAL TASKS

- **Configure Context IP**. See chapter 6, "IP Context Overview" on page 35
- **Configure IP Interface for Management Only**. See chapter 6, "IP Context Overview" on page 35

5.3 CONTEXT SWITCH: HW BRIDGE

Context Switch is the hardware MAC switching (conceptual entity) support for the ***Embedded OS Device****.* This functionality allows the unit to function as a managed or unmanaged layer 2 VLAN switch. Managing your traffic flow with Context Switch commands will significantly enhance the performance especially when handling the tagging/untagging of VLAN traffic. The switch is set by default as layer two unmanaged switch with no VLAN support for passing transparent traffic.

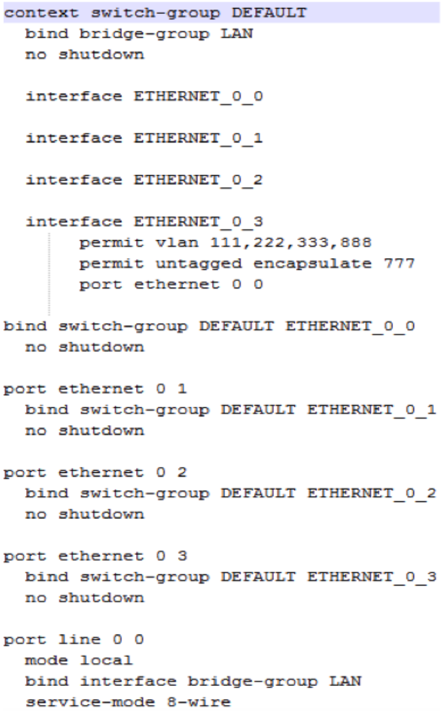
	Description
Switch Mode Groups	Allows you to put Ethernet ports into isolation groups at the HW layer
Switch Mode VLANS	Allows you to put the Ethernet ports into 802.1q VLAN trunk mode

5.3.1 SWITCH MODE GROUPS

By default the Switch mode is set for all Ethernet Ports to be in same isolation group on in the same switch. This means that all of the Ethernet Ports are one switch and all traffic flow on all ports will follow the same path. Switch mode groups also allow you to divide the switch into more than one switch device and this can be used for traffic isolation. This is the best way to setup your device if you are not using VLAN traffic.

5.3.2 SWITCH MODE VLANS

If your network design includes the use of VLAN traffic it's best to the put the switch into VLAN mode. This mode allows you to decide if you want the port to be used as an "access port" or "trunk port" and the tagging/untagging can be performed at the HW layer. Tagging and Untagging of VLANS is an ideal way to isolate your traffic for purposes of higher level of security, QoS and or network monitoring for management purposes



```
context switch-group DEFAULT
  bind bridge-group LAN
  no shutdown

  interface ETHERNET_0_0

  interface ETHERNET_0_1

  interface ETHERNET_0_2

  interface ETHERNET_0_3
       permit vlan 111,222,333,888
       permit untagged encapsulate 777
       port ethernet 0 0

bind switch-group DEFAULT ETHERNET_0_0
  no shutdown

port ethernet 0 1
  bind switch-group DEFAULT ETHERNET_0_1
  no shutdown

port ethernet 0 2
  bind switch-group DEFAULT ETHERNET_0_2
  no shutdown

port ethernet 0 3
  bind switch-group DEFAULT ETHERNET_0_3
  no shutdown

port line 0 0
  mode local
  bind interface bridge-group LAN
  service-mode 8-wire
```

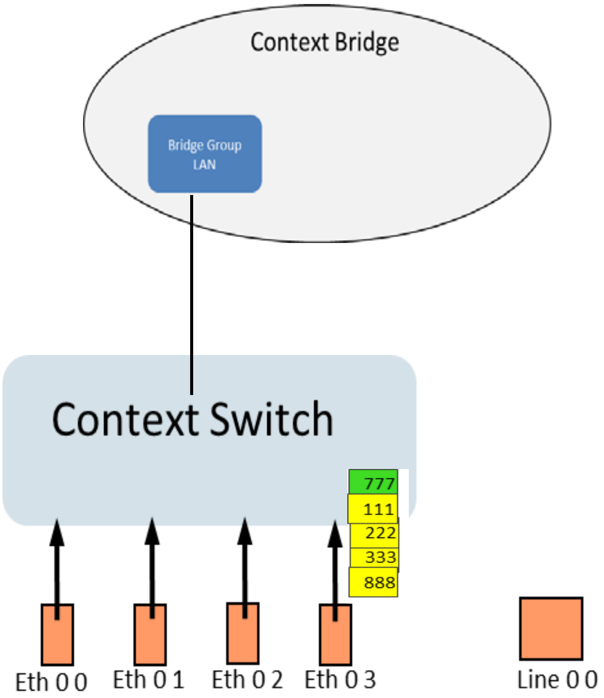


Figure 9 Switch mode VLANS

5.3.3 PORT CONFIGURATION

	Description
Configure Port	
Arp	Enable ARP
Interface	Enter 'interface' configuration mode • **Permit untagged**- permit all traffic • **Permit untagged encapsulate-** permit all untagged traffic and tag with VLAN ID • **Permit VLAN-** Allow traffic tagged with VLAN ID • **Deny VLAN**- Deny traffic tagged with VLAN ID • **Permit ALL-** Permit all untagged traffic
Multicast	Enable Multicast
VLAN	Not supported (bind VLAN's directly to the interface or port)
Shutdown	
Session	Create PPPoE session
No	Disable features or reset to default behavior

5.3.4 BINDINGS

Bindings form the association between circuits or ports and the interfaces configured on a context. No user data can flow on a circuit or Ethernet port until some higher-layer service is configured and associated with it. Bindings are configured statically in the port configuration.

5.4 CONTEXT BRIDGE: SW BRIDGE INTRODUCTION

Context Bridge is the software MAC switching (conceptual entity) side of the ***Embedded OS Device.*** This allows the configuration of the unit to be highly flexible and perform all the switching level functions that any normal switch can do but at a software or CPU level. This can be used like the context switch-group entity to perform the same functions such as isolate, manage or dictate the traffic flow of all IP traffic at the MAC layer. If you are unable or need a more complex configuration than the Context switch-group can perform then you may need the flexibility of using software enabled bridge functions to get the job done.

When setting up the device you must decide the best and most efficient way to pass traffic from the Ethernet Ports to the WAN (EFM) ports. In routed modes the traffic path will always be routed at layer 3 from one interface to the other before it passes correctly. In the bridging mode all traffic will pass transparently though either a context switch or context bridge. Context Bridge can be used in combination with Context IP as you can see the in the example below. Bridging traffic is more efficient and easier to maintain when you need to pass the traffic between two Embedded OS Devices that are on the same network, such as the diagram below

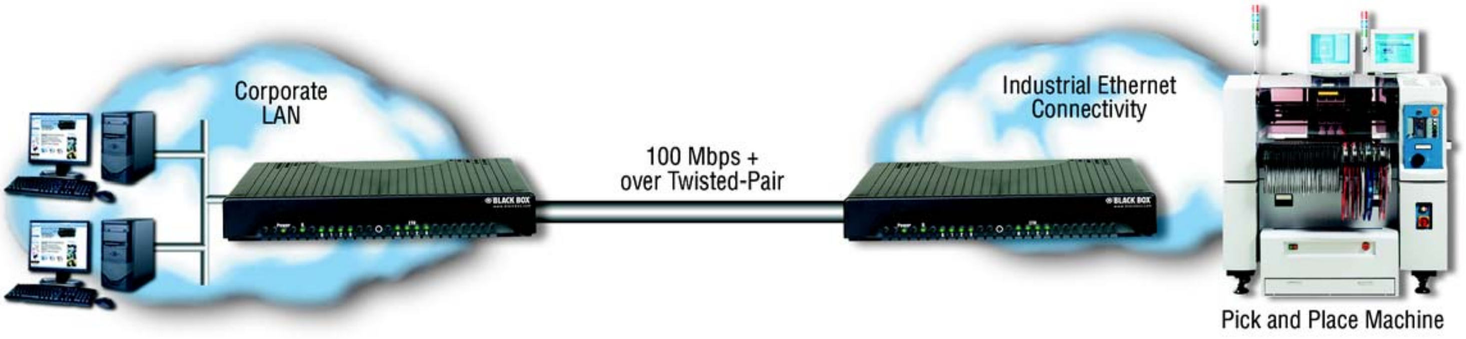
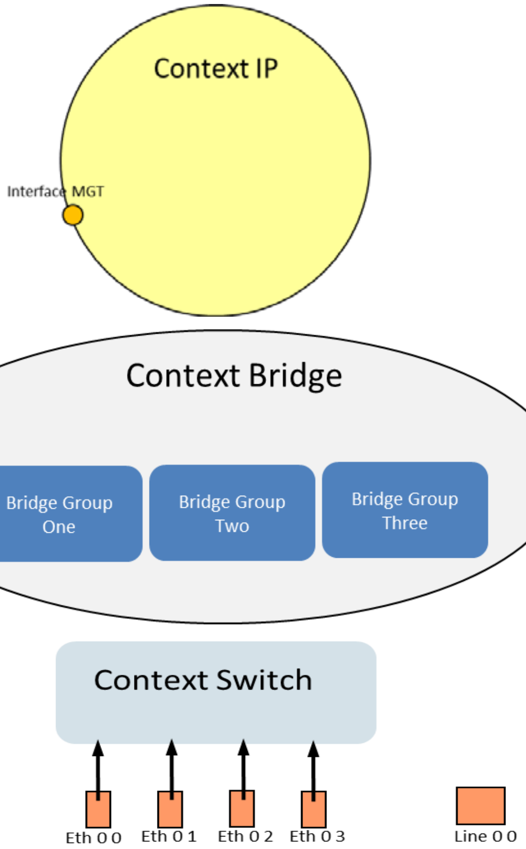

Corporate LAN
100 Mbps + over Twisted-Pair
Industrial Ethernet Connectivity
Pick and Place Machine

Figure 10 Bridge Network



Context IP is your routing core. You may configure as many interfaces as needed. Remember to bind to the correct interface

You are not limited to how many bridge-groups you can create inside of the Context bridge.

If you have VLAN's on your network, remember to configure "switch mode vlans"

Figure 11 Breaking down OS concepts

5.4.1 BRIDGE GROUPS

	Description
Bridge Group	Enters or creates a bridge-group
No	Disable features or reset to default behaivior
Aging	MAC table aging value in seconds
Arp	Arp Enable
Filter	Filter Command for MAC • Permit{src I any}{dest I any}[VLAN ID]
Mulitcast	Enable Multicast
Session	Create PPPoE session
Settap	configure a bridge tap
Shutdown	Shutdown the selected interface
STP	Configure spanning tree
VLAN	Enter a VLAN Configuration

5.5 LINE: OVERVIEW

Configuration details for creating a DSL or Line Connection. Connections can only be made between two modems. These modems must have manual configurations to create a link.

	Description
Annex-type	Must match on both modems
Mode	Must be opposites • Example: Local <–> Remote
Payload Rate	Local Payload Configuration
Service-mode	Local Service-mode configuration

5.5.1 LINE CONFIGURATION PARAMETERS

	Description
Annex-type	Configure annex (must match peer)
Bind	Interface, bridge-group
Description	text information
Mode	local and remote
Payoad-rate	“adaptive” “max”
Service-mode	4 wire (2–4–8 wire support)
Snr-margin	Max for line connection quality
Tcpam	16/32 64/128
VLAN	Configures VLAN interface

5.5.2 MANDATORY CONFIGURATION LIST (LOCAL SETS PAYLOAD RATE)

	Description
Mode	Local or Remote
Annex	type (must match other side)
Bind	Must bind line port to bridge-group or interface
Service-mode	Must match
Shutdown	

6 IP CONTEXT OVERVIEW

Chapter contents

6.1 INTRODUCTION

This chapter outlines the OS *Internet protocol (IP) context* and its related components. You will get the fundamental understanding on how to set up your LB52XA-R2 to make use of IP related services.

The following sections describe the configuration steps necessary to put together certain IP services and the references to the related chapters that explain the issue in more detail.

The IP context in the OS is a high level, conceptual entity that is responsible for all IP-related protocols and services for data and voice. The IP context performs much of the same functions as a standalone IP router, and since every context is defined by a name, the IP context is named *ROUTER* by default.

In figure 12 below, the IP context with all its related elements is contained within the area on the left, which has a gray fill (find a short description of those elements below). The right side displays the related CS context, which communicates with the IP context via gateways. Since the CS context and its related components are not the subject of this chapter, they are illustrated in figure 12 with gray lines instead of black ones.

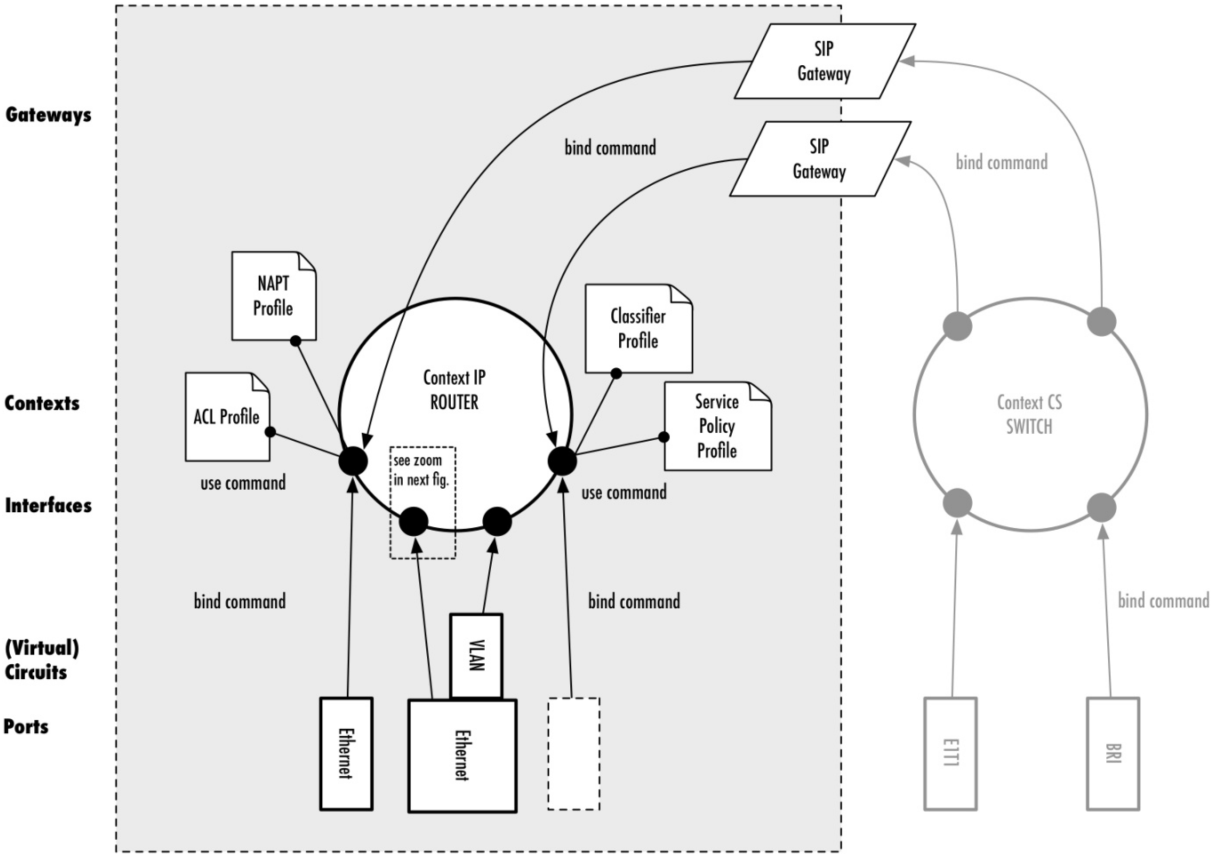


Figure 12 IP context and related elements

The IP context contains the following entities:

- Routing tables
- Logical IP interface
- Links to service profiles

Since the IP context represents a virtual IP4 and IPv6 dual-stack router, it contains up to 251 routing tables for static routes (not depicted in figure 12 on page 36). The routing tables decide whether received packets are delivered to a local application (example, CLI, web server, SIP gateway) or routed via another IP interface to a remote network host.

The IP context may contain an arbitrary number of logical interfaces. Unlike other operating systems where a network interface is identical to a physical port, we distinguish physical ports from logical interfaces. A logical interface contains all IP-related configuration parameters that are common to all ports, such as the IP address, for example. As depicted in figure 12 on page 36, a physical port or circuit is bound bottom-up to one logical IP interface. Hence, each IP interface reflects the IP-protocol of a physical port or circuit.

Applications such as SIP gateways may also be bound to an IP interface. A top-down binding defines over which IP interface (and hence over which physical port or circuit) an application communicates.

6.2 PACKET PROCESSING IN THE IP CONTEXT

Several IP service profiles can be assigned to the individual logical interfaces in the context (see figure 12). These profiles control the flow of packets through the router. They classify packet streams, control which packets may enter/leave the device via Access Control Lists (ACL), perform Network and Port Address Translation (NAPT) and deal with Quality-of-Service (QoS) information in packet headers.

Note that there is a different packet-processing chain for each interface depending on its configuration, i.e., each interface maintains its own configuration of how the packets are classified, a different ACL, etc. However, to make having the same configuration on multiple interfaces easier, we moved the configuration parameters to profiles. The **use** command attaches a profile to an interface, such that the same profile can be used by different interfaces.

Figure 13 shows the journey of a packet through the IP context and the order in which the attached profiles process the packet.

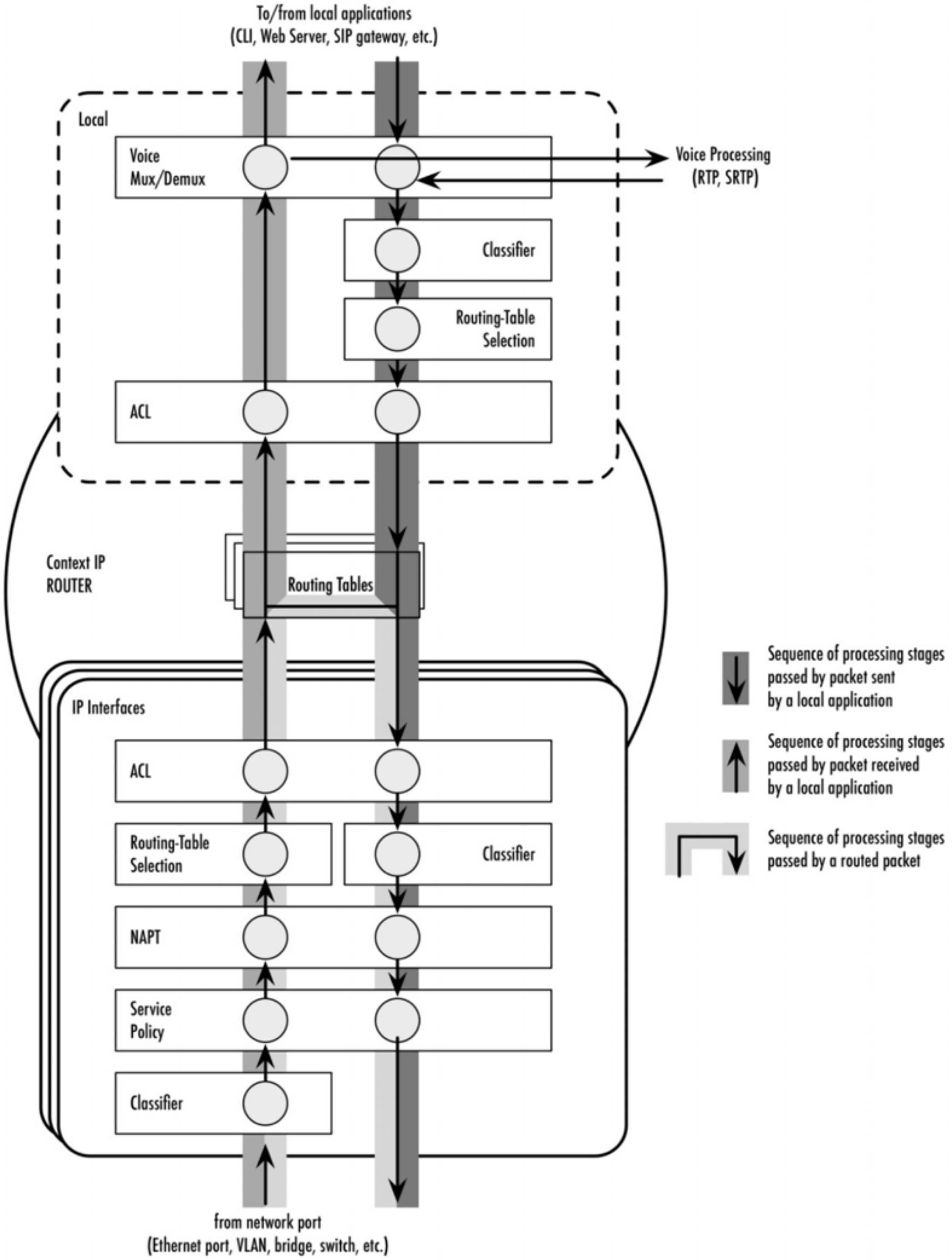


Figure 13 Processing order of IP services attached to an IP interface

6.2.1 CLASSIFIER

The classifier is the first profile that inspects an incoming packet. The classifier assigns a traffic class to each packet. You can think of the traffic-class as if every packet in the router has a tag attached to it, on which the classification can be noted. The traffic-class tags exist only inside the router, but layer 2 priority bits (802.1pq class-of-service) and IP header type-of-service bits (TOS field) can be used to mark a specific packet type for the other network devices. By default the traffic-class tag is *default*.

A powerful packet-matching filter in the classifier profile lets you inspect any combination of IP, UDP, TCP or ICMP header fields and assign a traffic-class to the matching packet flow. For example, you may configure to tag all UDP packets to a destination port between 5000 and 8000, and shorter than 500 bytes with the traffic-class *VOICE.* The traffic-class tag can later be used in other IP service profiles, e.g., to filter packets in the ACL or to do policy routing by selecting a routing-table based on the traffic-class.

6.2.2 NETWORK ADDRESS PORT TRANSLATION (NAPT)

After classification is done, the packet is handed over to the NAPT profile-if one is used on the current interface. Network Address Port Translation (NAPT), which is an extension to NAT, uses TCP/UDP ports in addition to network addresses (IP addresses) to map multiple private network addresses to a single outside address. Thus the NAPT profile may change the destination address and port of an incoming packet.

6.2.3 ROUTING-TABLE SELECTION

You may configure policy routing by selecting a different routing table based on some header fields of the incoming packet. You may also use the traffic-class (tagged before in the Classifier) to make a routing-table decision. For example, you may direct all packets tagged with the VOICE traffic-class to a separate routing table while processing the other traffic with the default routing table.

Note The routing-table selection for an incoming packet is performed after NAPT, i.e., you will see the translated (private) addresses and ports

6.2.4 ACCESS CONTROL LISTS (ACL)

An access control list is a sequential collection of permit and deny conditions that apply to packets on a certain interface. You can use the same packet-matching mechanism as in the classifier and the routing-table selection to decide whether the specified packet flow is permitted to enter the router or is rejected.

The ACL filter is passed after the routing decision has been made. This allows you to apply an ACL to an input-output interface pair. For example, you may use a specific profile for all packets entering the router via the LAN interface and leaving it over the DMZ interface.

6.2.5 ROUTING

Once a packet traversed all ingress packet filters (controlled by the attached profiles), the router decides whether the packet is destined to an application of the gateway itself or shall be routed to a remote host. For this purpose it performs a best-prefix match on the destination IP address in the routing-table, which was previously selected. If no routing-table has been selected explicitly, the DEFAULT table is consulted.

If the packet is to be sent to a remote host, it traverses the egress filters of the IP interface (depicted in figure 13), an egress ACL, another possibility to classify the packet, NAPT translations and finally, a service-policy profile, which can be used to map an internal traffic-class to IP TOS field values.

6.2.6 PACKET PROCESSING TO/FROM LOCAL APPLICATIONS

If the packet is not sent to a remote host, and is destined for a local application (e.g. CLI, the web server, or SIP signaling packets), another set of packet-processing filters is traversed after the routing decision has been made. In particular, another ACL profile dedicated only for locally-terminated flows is passed. This allows you to create specific ACL profiles to protect the local device while having different ACL profiles for routed traffic.

After passing the ACL, voice data packets (RTP/SRTP) are diverted to the voice processing engine whereas the remaining traffic reaches one of the running service applications.

Packets that have been generated by applications on the device also traverse a set of packet-processing filters-a classifier to tag packets with a traffic-class, routing-table selection, and another outbound ACL for locally-generated traffic.

As shown at the top of figure 13 on page 38, the local packet-processing filters are not attached to a specific logical IP interface. All packets to/from a local application rather pass the same set of filters. There is a special local mode within the IP context in which classifier and ACL profiles for local applications can be attached. The local mode also hosts routing-selection commands for locally-generated traffic (see chapter 13, "IP Routing" on page 87 for more information).

6.3 IP CONTEXT OVERVIEW CONFIGURATION TASK LIST

The following sections describe the basic tasks involved in IP context configuration. Many parameters have acceptable default values, which in most cases do not need to be explicitly configured. Hence not all of the configuration tasks below are required. Depending on your application scenario, some tasks are mandatory while others are optional. The following tasks use a bottom-up approach, starting from the ports, followed by the interfaces and up to the services running on the device. Read through the tasks in order to learn a general understanding of the whole network before moving onto more detailed instructions.

- Planning your IP configuration (see page 40)
- Configuring physical ports (see page 41)
- Creating and configuring IP interfaces (see page 41)
- Configuring packet classification (see page 41)
- Configuring Network Address Port Translation (NAPT) (see page 41)
- Configuring static IP routing (see page 41)
- Configuring Access Control Lists (ACL) (see page 42)
- Configuring quality of service (see page 42)

6.4 PLANNING YOUR IP CONFIGURATION

The following subsections provide network connection considerations for Ethernet ports. Black Box recommends that you draw a network overview diagram displaying all neighboring IP devices. Do not begin configuring the IP context until you have completed the planning of your IP environment.

6.4.1 IP INTERFACE RELATED INFORMATION

Setting up the basic IP connectivity for your device requires at least the following information:

- IP addresses used for Ethernet LAN and WAN ports
- IP Subnet mask used for Ethernet LAN and WAN ports
- Length for Ethernet cables
- IP addresses of the central SIP registrar
- IP addresses of the central PSTN gateway for SIP-based calls

6.4.2 QOS RELATED INFORMATION

Check with your access service provider if there are any QoS-related requirements, which you need to know prior to configuring OS QoS management. Check the following with your access service provider:

- What is the dedicated bandwidth, which you have agreed with your access service provider?
- How does your provider perform packet classification, e.g. which ToS bits have to be used to define the supported classes of service?

6.4.3 CONFIGURING PHYSICAL PORTS

Port configuration includes parameters for the physical and data link layer, such as framing and encapsulation formats or media access control. Before any higher-layer user data can flow through a physical port, you must associate that port with an interface within the IP context. This association is referred to as a binding. For information and examples on how to configure ports, refer to the respective port type's chapter.

6.4.4 CREATING AND CONFIGURING IP INTERFACES

The number and names of IP interfaces depend upon your application scenario. An interface is a logical construct that encapsulates network-layer protocol and service information, such as IP addressing. Therefore, interfaces are configured as part of the IP context (the virtual router) and represent logical entities that are only usable if a physical port (Ethernet) or circuit (VLAN) is bound to them.

An interface name can be any arbitrary string, but for ease of identification use self-explanatory upper-case names that describe the use of the interface, e.g. LAN, WAN.

Several IP-related configuration parameters are necessary to define the behavior of such an interface. The most obvious parameters are one or multiple IP addresses and the IP net masks that belong to them. Several profile types can also be attached to an IP interface to define how packets arriving on the interface or leaving over it are processed.

6.4.5 CONFIGURING PACKET CLASSIFICATION

A classifier profile can be attached to each IP interface. It contains rules to match packet flows based on the header fields of the packets and tag them with an internal traffic-class. This traffic-class is usually used in conjunction with other services. For example, an ACL may have filter rules that drop all packets tagged with a certain traffic-class, or policy routing may be configured to select a dedicated routing-table for a packet flow of a given traffic-class. The OS tests packets against the classifier rules one by one. The first match determines the traffic-class. Because the OS stops testing rules after the first match, the order of the classifier rules is critical. If no conditions match or if there is no classifier profile attached to an interface, the software tags receive packets with the DEFAULT traffic-class, whereas all packets generated by local applications are tagged with the LOCAL-DEFAULT traffic-class, except generated RTP/SRTP packets, which are tagged as LOCAL-VOICE.

Classifier profiles can be attached to several entities in the OS–on any local IP interface and in the local mode of the IP context. In both places classifier profiles can be attached separately for inbound and outbound packets.

6.4.6 CONFIGURING NETWORK ADDRESS PORT TRANSLATION (NAPT)

You can configure NAPT by creating a profile that is afterwards used on an explicit IP interface. In OS terminology, an IP interface uses a NAPT profile, as shown in figure 12 on page 36.

6.4.7 CONFIGURING STATIC IP ROUTING

The OS allows you to define static routing entries, which are destination-address-to-egress-interface mappings established by the network administrator prior to the beginning of routing. These mappings do not change unless the network administrator alerts them. Algorithms that use static routes are simple to design, and work well in environments in which network traffic is relatively predictable and where network design is relatively simple.

Routing entries are grouped in routing-tables. A set of route commands in the IP interface can be used to select the routing-table for inbound traffic for different packet-header fields. The route command in the local mode, within the IP context configures the routing-table to consult for locally-generated traffic. The OS tests packets against the routing-table-selection rules one by one. The first match determines the routing-table to use. Because the OS stops testing rules after the first match, the order of the routing-selection rules is critical. If no conditions match or if there is no route command in the interface, the software uses the DEFAULT routing table.

6.4.8 CONFIGURING ACCESS CONTROL LISTS (ACL)

Packet filtering helps to control packet movement through the network. Such control can help to limit network traffic and restrict network use by certain users or devices. An access control list is a sequential collection of permit and deny conditions that apply to packets on a certain interface. Access control lists can be configured for all routed network protocols (IP, ICMP, TCP, UDP, and SCTP) to filter the packets of those protocols as the packets pass through a device. The OS tests packets against the conditions in an access list one by one. The first match determines whether the OS accepts or rejects the packet. Because the OS stops testing conditions after the first match, the order of the conditions is critical. If no conditions match, the software rejects the address.

6.4.9 CONFIGURING QUALITY OF SERVICE (QOS)

A service-policy profile can be attached to an IP interface to manage QoS for network traffic, as shown in figure 12 on page 36. QoS refers to the ability of a network to provide improved service to selected network traffic over various underlying technologies including Ethernet and 802.x type networks, as well as IP-routed networks. In particular, QoS features provide improved and more predictable network service by providing the following features:

- Supporting dedicated bandwidth
- Improving loss characteristics
- Avoiding and managing network congestion
- Shaping network traffic
- Setting traffic priorities across the network

7 COMMAND LINE INTERFACE (CLI)

Chapter contents

7.1 INTRODUCTION

The primary user interface to the LB52XA-R2 is the command line interface (CLI). You can access the CLI via the Black Box device console port or through a Telnet or SSH session. The CLI lets you configure the complete LB52XA-R2 functionality. You can enter CLI commands online or as a configuration script in the form of a text file. The CLI also includes monitoring and debugging commands. CLI commands are simple strings of keywords and user-specified arguments.

This chapter gives an overview of the CLI and the basic features that allow you to navigate the CLI and edit commands effectively. The following topics are covered:

- Command Modes
- Command Editing (see page 45)

7.2 COMMAND MODES

The CLI is composed of modes. There are three *mode groups*: the operator, the *administrator mode* and the *configure mode*. The configuration mode group contains all of the remaining modes. A command mode is an environment within which a group of related commands is valid. All commands are mode-specific, and certain commands are valid in more than one mode. A command mode provides command line completion and context help within the mode. The command modes are organized hierarchically.

7.2.1 CLI PROMPT

For interactive (online) sessions, the system prompt is displayed as:

```
devicename>
```

In the operator exec mode, the system prompt is displayed as:

```
devicename#
```

In the administrator exec mode and in the different configuration modes, the system prompt is displayed as:

```
devicename(mode)device#
```

Where:

- *devicename* is the currently configured name of the Black Box device, the IP address or the hardware type of the device that is being configured
- *mode* is a string indicating the current configuration mode, if applicable.
- *name* is the name of the instance of the current configuration mode

Example: the prompt in radius-client mode, assuming the devicename *device* and the instance *deepblue* is:

```
device(radius)[deepblue]#
```

7.2.2 NAVIGATING THE CLI

- **Initial mode**: When you initiate a session, you can log in with operator or administrator privileges. Whichever login you use, the CLI is always set to operator exec (non-privileged exec) mode by default upon startup. This mode allows you to examine the state of the system using a subset of the available CLI commands.
- **System changes**: In order to make changes to the system, the administrator exec (privileged exec) mode must be entered. The enable user interface command is used for this purpose (the enable com-

mand is only accessible if you are logged in as an administrator). Once in administrator exec mode, all of the system commands are available to you.

- **Configuration**: To make configuration changes, the configuration mode must be entered by using the configure command in the administrator exec mode.
- **Changing Modes**: The exit command moves the user up one level in the mode hierarchy (the same command works in any of configuration modes). For example, when in *pvc* configuration mode, typing exit will take you to *framerelay* configuration mode.

The exit command terminates a CLI session when typed from the operator exec mode.

A session can also be terminated by using the logout command within any mode.

7.3 COMMAND EDITING

7.3.1 COMMAND HELP

To see a list of all CLI commands available within a mode, type a question mark **<?>** or the **<tab>** key at the system prompt in the mode of interest. A list of all available commands is displayed. Commands that have become available in the current mode are displayed at the bottom of the list, separated by a line. Commands from higher hierarchy levels are listed at the top.

You can also type the question mark or the **<tab>** key while in the middle of entering a command. Doing so displays the list of allowed choices for the current keyword in the command. Liberal use of the question mark functionality is an easy and effective way to explore the command syntax.

7.3.2 THE NO FORM

Almost every command supports the keyword no. Typing the no keyword in front of a command disables the function or “deletes” a command from the configuration. For example, to enable the DHCP server trace tool, enter the command debug dhcp-server. To subsequently disable the DHCP server trace, enter the command no debug dhcp-server.

7.3.3 COMMAND COMPLETION

You can use the **<tab>** key in any mode to carry out command completion. Partially typing a command name and pressing the **<tab>** key causes the command to be displayed in full up to the point where a further choice has to be made. For example, rather than typing configure, typing conf and pressing the **<tab>** key causes the CLI to complete the command at the prompt. If the number of characters is not sufficient to uniquely identify the command, the CLI will provide a list with all commands starting with the typed characters. For example, if you enter the string *co* in the configure mode and press **<tab>**, the selections configure, copy, and context are displayed. The CLI may be configured to automatically complete commands without pressing the <tab> key. This will only happen if a unique completion option exists.

Command	Purpose
[no] cli auto-completion	Enable or disable CLI automatic command completion.

7.3.4 COMMAND HISTORY

The OS maintains a list of previously entered commands that you can go through by pressing the **<up-arrow>** and **<down-arrow>** keys, and then pressing **<enter>** to enter the command. The show history command displays a list of the commands you can go through by using the arrow keys.

7.3.5 COMMAND EDITING SHORTCUTS

The OS CLI provides a number of command shortcuts that facilitate editing of the command line. Command editing shortcuts are summarized below. The syntax <**Ctrl>-<p>** means press the <**p>** key while holding down the keyboard's control key (sometimes labeled *Control, Ctl*, or *Ctrl*, depending on the keyboard and operating system of your computer). **<Esc>-<f>** is handled differently; press and release the escape key (often labeled *Esc* on many keyboards) and then press the <**f>** key.

Keyboard	Description
<Ctrl>-<p> or **<up-arrow>**	Recall previous command in the command history.
<Ctrl>-<n> or **<down-arrow>**	Recall next command in the command history.
<right-arrow>	Move cursor forward one character.
<left-arrow>	Move cursor backward one character.
<Esc>-<f>	Move cursor forward one word.
<Esc>-<b>	Move cursor backward one word.
<Ctrl>-<a>	Move cursor to beginning of line.
<Ctrl>-<e>	Move cursor to end of line.
<Ctrl>-<k>	Delete to end of line.
<Ctrl>-<u>	Delete to beginning of line.
<Ctrl>-<d>	Delete character.
<Ctrl>-<c>	Quit editing the current line.
<Ctrl>-<v>	Insert a code to indicate to the system that the keystroke immediately following should be treated as normal text, not a CLI command. For example, pressing the question mark **<?>** character in the CLI prints a list of possible tokens. If you want to use the "?" in a configuration command, e.g. to enter a regular expression, press **Ctrl-v** immediately followed by the question mark <**?**>.

8 ACCESSING THE CLI

Chapter contents

8.1 INTRODUCTION

The LB52XA-R2 is designed for remote management and volume deployment. The management and configuration of LB52XA-R2 is therefore based on IP network connectivity. Once an LB52XA-R2 is connected to, and addressable in, an IP network, you can remotely perform all configuration, management, and maintenance tasks.

This chapter describes the procedures for entering commands via the command line interface (CLI), to obtain help, to change operator mode, and to terminate a session. You can access the LB52XA-R2 as follows:

- Directly, via the console port (if available)
- Remotely, via the IP network (by using a Telnet or SSH application)

The ports available for connection and their labels are shown in the getting started guide that came with your unit. Remember that the CLI supports a command history and command completion. By scrolling with the **up** and **down** arrow keys, you can find many of your previously entered commands. Another time-saving tool is command completion. If you type part of a command and then press the **<tab>** key, the OS shell will present you with either the remaining portion of the command or a list of possible commands. These features are described in chapter 7, “Command Line Interface (CLI)” on page 43. The telnet and SSH server can be disabled if desired.

IMPORTANT

Although the OS supports concurrent sessions via SSH or the console port, we do not recommend working with more than one session to configure the LB52XA-R2. However, using one session for configuration and another for debugging is a good idea.

8.2 ACCESSING THE CLI TASK LIST

The following sections describe the basic tasks involved in accessing the command line interface. Depending on your application scenario, some tasks are mandatory while others could be optional.

- Accessing via the console port (see page 49)
- Accessing via a SSH session (see page 50)
- Using an alternate TCP listening port for the SSH server (see page 50)
- Disabling the SSH server (see page 50)
- Logging on (see page 50)
- Selecting a secure password (see page 51)
- Configuring operators and administrators (see page 52)
- Displaying the CLI version (see page 54)
- Switching to another log-in account (see page 54)
- Checking identity and connected users (see page 54)
- Ending a SSH or console port session (see page 56)

8.3 ACCESSING VIA THE CONSOLE PORT

If a console port is available, the host computer can be connected directly to it with a serial cable (see figure 14). The host must use a terminal emulation application that supports serial interface communication.

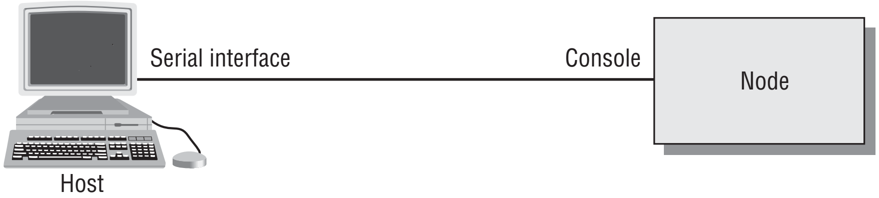


Figure 14 Setup for initial configuration via the console port

Note You do not need to configure IP settings if you access the Black Box device via the console port.

8.3.1 CONSOLE PORT PROCEDURE

Before using the CLI to enter configuration commands, do the following:

1. Set up the hardware as described in the getting started guide.
2. Configure your serial terminal as described in the getting started guide.
3. Connect the serial terminal to your Black Box device. Use a serial cable according to the description in the getting started guide included with your Black Box device.
4. Power on your device. A series of boot messages are displayed on the terminal screen. At the end of the boot sequence, press the **<return>** key and the login screen will be displayed. Proceed with logging in.

8.4 ACCESSING VIA A SECURE CONFIGURATION SESSION OVER SSH

SSH is the most commonly used and recommended method for connecting to a Black Box device. A partial implementation of secure shell according RFC 4251, RFC 4252, RFC 4253 and RFC 4254 is provided. It is possible to open a secure configuration session over SSH to a Black Box device.

Note The copy tftp and http functions are still insecure!

The SSH Transport Layer supports the following Algorithms: “ssh-rsa” or ‘ssh-dsa” public key for signing, “diffie-hellmann-group1-sha1” and “diffie-hellmann-group14-sha1” for key exchange, “3des-cbc”, “aes256-cbc” and “aes128-cbc” for encryption, “hmac-sha1” and “hmac-md5” for data integrity. For user authentication, only the method “password” is supported. On the Connection Layer, only the request for an interactive command shell is supported. After the first startup of the OS, the RSA or DSA server host key is going to be calculated. The RSA or DSA server host key is calculated only once and always remains the same.

Mode: Configure

Step	Command	Purpose
1	device(cfg)#terminal ssh use auth <AAA profile name>	Set the AAA profile which is going to be used for user authentication. The AAA profile “default” is used when another profile is not specified.

8.4.1 ACCESSING VIA A TELNET SESSION

It is way faster than console access. The Telnet host accesses the LB52XA-R2 via its network interface.

> **Note** If the IP configuration of the Ethernet port (LAN port) is not known or is incorrectly configured, you will have to use the console interface.

8.4.2 TELNET PROCEDURE

Before you begin to use the CLI to input configuration commands, do the following:

1. Set up the Black Box device as described in the getting started guide included with your device.
2. Connect the host (PC) or hub to the Black Box device as described in the getting started guide.
3. Power on your device and wait until the *Run* LED lights.
4. Open a Telnet session to the IP address shown in the getting started guide.
5. Proceed with logging in.

8.5 USING AN ALTERNATE TCP LISTENING PORT FOR THE TELNET OR SSH SERVER

The following command defines an alternate listening port for the telnet or SSH server.

Mode: Configure

Step	Command	Purpose
1	device(cfg)# terminal [telnet I ssh] port <port>	Uses TCP port <port> for accepting telnet or SSH connections

8.6 DISABLING THE TELNET OR SSH SERVER

The telnet or SSH server can be disabled using the following command.

Mode: Configure

Step	Command	Purpose
1	device(cfg)# no terminal [telnet I ssh]	Disables the telnet or SSH server

8.7 LOGGING ON

Accessing the LB52XA-R2 via the local console port or via a Telnet session opens a login screen. The following description of the login process is based on a Telnet session scenario but is identical to that used when accessing via the local console port.

The opening Telnet screen you see resembles that shown below. The window header bar shows the IP address of the LB52XA-R2.

A factory preset superuser account with name *admin* and an empty password is available when you first access the unit. For that reason, use the name *admin* after the login prompt and simply press the **<enter>** key after the password prompt.

```
$ telnet 172.16.54.79
Trying 172.16.54.79…
Connected to 172.16.54.79.
Escape character is '^]'.

Release: 3.1.0 2013/01/20

OS login: admin
Password:

OS >
```

Upon logging in you are in operator execution mode, indicated by the “>” as command line prompt. Now you can enter system commands.

Note Details on the screen, such as the IP address in the system prompt and window header bar, may be different on your unit.

IMPORTANT

You are responsible for creating a new administrator account to maintain system security. Black Box accepts no responsibility for losses or damage caused by loss or misuse of passwords. Please read the following sections to secure your network equipment properly.

8.8 SELECTING A SECURE PASSWORD

It is not uncommon for someone to try to break into (often referred to as *hacking*) a network device. The network administrator should do everything possible to make the network secure. Carefully read the questions below and see if any applies to you:

- Do your passwords consist of a pet’s name, birthdays or names of friends or family members, your license plate number, social security number, favorite number, color, flower, animal, and so on?
- Do you use the same password repeatedly? (Example: Your ATM PIN, cell phone voice mail, house alarm setting code, etc.)
- Could your password or a portion thereof be found in the dictionary?
- Is your password less than six characters long?

To prevent unauthorized access, you should select passwords that are not dictionary words or any of the above-mentioned examples. Every password should be at least 6 characters long and include at least one capital letter, one number, and one lowercase letter.

A good example of a password is: *3Bmshtr*

You are probably asking yourself, “How am I going to remember that?” It’s easy, the password above is an acronym taken from: “three blind mice, see how they run.” Making a good password is that easy—but please, don’t use the above example password for your LB52XA-R2!

8.9 PASSWORD ENCRYPTION

Unencrypted passwords can be stolen by hackers using protocol analyzers to scan packets or by examining the configuration file—to protect against that type of theft, the OS encrypts passwords by default. Encryption prevents the password from being readable in the configuration file.

- Plain text
- Encrypted text (for example, the password mypassword always appears in encrypted form as *HUAvCYeILWZz3hQvS0IEpQ== encrypted* when doing a show command)

The command show running-config always displays the passwords in encrypted format. To encrypt a password, enter the password in plain format and retrieve the encrypted format from the running-config or store it permanently into the startup-config (with the command copy running-config startup-config).

8.9.1 FACTORY PRESET SUPERUSER ACCOUNT

The OS contains a factory preset superuser account with the name *admin* (no passwords). When a new superuser account has been defined in the configuration, the preset admin account will delete after reboot. You can create more than one superuser account, but there has to be at least one superuser account defined. If, for some reason, the last superuser account is deleted, the factory preset administration account with the name *admin* and an empty password is automatically recreated.

8.10 CONFIGURING OPERATORS, ADMINISTRATORS, AND SUPERUSERS

8.10.1 CREATING AN OPERATOR ACCOUNT

Operators do not have the privileges to run the enable command and therefore cannot modify the system configuration. Operators can view partial system information.

Creating a new operator account is described in the following procedure:

Mode: Operator execution

Step	Command	Purpose
1	*device*>enable	Enters administration execution mode
2	*device*#configure	Enters configuration mode
3	*device(cfg)#* operator *name* password *password*	Creates a new operator account *name* and password *password*
4	copy running-config startup-config	Saves the change made to the running configuration of the Black Box device, so that it will be used following a reload

Example: Create an operator account

The following example shows how to add a new operator account with a login name *support* and a matching password of *s4DF&qw*. The changed configuration is then saved.

```
device>enable
device#configure
device(cfg)#operator support password s4DF&qw
device(cfg)#copy running-config startup-config
```

8.10.2 CREATING AN ADMINISTRATOR ACCOUNT

Administrators can run the enable command and access additional information within the OS configuration modes. Therefore administrators can modify the system configuration, as well as view all relevant system information.

Creating a new administrator account is described in the following procedure:

Mode: Operator execution

Step	Command	Purpose
1	*device*>enable	Enters administration execution mode
2	*device*#configure	Enters configuration mode
3	*device(cfg)#* administrator *name* password *password*	Creates a new administrator account *name* and password *password*
4	*device(cfg)#*copy running-config startup-config	Permanently stores the new administrator account parameters.

Example: Create an administrator account

The following example shows how to add a new administrator account with a login name *super* and a matching password *Gh3*Ke4h*.

```
device>enable
device#configure
device(cfg)#administrator super password Gh3*Ke4h
device(cfg)#copy running-config startup-config
```

8.10.3 CREATING A SUPERUSER ACCOUNT

Superusers can run the enable command and access additional information within the OSOS configuration modes. Therefore, superusers can modify the system configuration, as well as view all relevant system information. Superusers can also create new users (whereas administrators do not have that functionality).

Creating a new superuser account is described in the following procedure:

Mode: Operator execution

Step	Command	Purpose
1	*device*>enable	Enters administration execution mode
2	*device*#configure	Enters configuration mode
3	*device(cfg)#* superuser *name* password *password*	Creates a new superuser account *name* and password *password*
4	*device(cfg)#*copy running-config startup-config	Permanently stores the new superuser account parameters.

Example: Create a superuser account

The following example shows how to add a new superuser account with a login name *super* and a matching password *Gh3*Ke4h*.

```
device>enable
device#configure
device(cfg)#superuser super password Gh3*Ke4h
device(cfg)#copy running-config startup-config
```

8.11 DISPLAYING THE CLI VERSION

This procedure displays the version of the currently running CLI.

Mode: Operator execution

Step	Command	Purpose
1	*device*>show version cli	Displays the CLI version

Example: Displaying the CLI version

The following example shows how to display the version of the current running CLI on your device, if you start from the operator execution mode.

```
device>show version cli
CLI version: 3.00
```

8.12 DISPLAYING ACCOUNT INFORMATION

You can use the **show** command to display information about existing administrator and operator accounts. This command is not available for an operator account.

The following procedure describes how to display account information:

Mode: Administrator execution

Step	Command	Purpose
1	*device*#show accounts	Displays the currently-configured administrator and operator accounts.

Example: Display account information

The following example shows how to display information about existing administrator and operator accounts.

```
device#show accounts
# UserName AccessLevel Status
0 super superuser (logged out:0)
1 admin administrator (logged out:0)
2 op operator (logged out:0)
```

8.13 CHECKING IDENTITY AND CONNECTED USERS

The who command displays who is logged in or gives more detailed information about users. Depending on the execution mode, the command displays varying information. In administrator execution mode, the command output is more detailed and shows information about the ID, user name and location. In operator execution mode, only the user name being used at the moment is reported, which helps checking the identity.

Mode: Administrator or operator execution

Step	Command	Purpose
1	*OS(cfc)*#who	Shows more detailed information about the users ID, name, state, idle time and location
or		
	OS>who	Shows the user login identity

Example: Checking identity and connected users

The following example shows how to report who is logged in or more detailed information about users, depending on the execution mode in which you are working.

Used in administrator execution mode:

```
OS(cfg)#who
# User Name          Login Time                Location
0 admin                 01/01/2000 00:08:59     console
1 admin                 01/01/2000 00:11:36     telnet 172.16.54.135:55404
```

Used in operator execution mode:

```
OS>who
You are operator support
```

8.14 COMMAND INDEX NUMBERS

A command index number (indicated by the boldface **1**, **2**, and **3** index numbers in the example below) indicates the position of a command in a list of commands (that is, a command with index *1* will appear higher in the configuration file than one with index *3*).

```
192.168.1.1(pf-voip)[default]#show running-config
...
profile voip default
codec 1 g711ulaw64k rx-length 20 tx-length 20
codec 2 g711alaw64k rx-length 20 tx-length 20
codec 3 g723-6k3 rx-length 30 tx-length 30
dejitter-max-delay 200
...
```

Commands that make use of index numbers always show the index in the running config. However, the index can be omitted when entering the command. If you enter such a command with an index, it is inserted into list at the position defined by the index. If you enter such a command without an index, it is placed at the bottom of the list. Also, you can change a commands position in a listing (moving it up or down in the list) by changing its index number.

Example 1: Moving the G.723 codec from position *3* in the list to position *1* at the top of the list.

Listing before changing the G.723 codec index number:

```
profile voip default
    codec 1 g711ulaw64k rx-length 20 tx-length 20
    codec 2 g711alaw64k rx-length 20 tx-length 20
    codec 3 g723-6k3 rx-length 30 tx-length 30
    dejitter-max-delay 200
...
```

Listing after changing index number:

```
192.168.1.1(pf-voip)[default]#codec 3 before 1
192.168.1.1(pf-voip)[default]#show running-config
...
profile voip default
codec 1 g723-6k3 rx-length 30 tx-length 30
codec 2 g711ulaw64k rx-length 20 tx-length 20
codec 3 g711alaw64k rx-length 20 tx-length 20
dejitter-max-delay 200
...
```

Note Succeeding indexes are automatically renumbered.

Example 2: Moving the G.723 codec back position 3
This command moves the G.723 codec from the top to third place. As a result, the other two codecs move up in the list as their indexes are automatically renumbered to accommodate the new third-place codec.

```
192.168.1.1(pf-voip)[default]#codec 1 after 3
192.168.1.1(pf-voip)[default]#show running-config
...
profile voip default
codec 1 g711ulaw64k rx-length 20 tx-length 20
codec 2 g711alaw64k rx-length 20 tx-length 20
codec 3 g723-6k3 rx-length 30 tx-length 30
dejitter-max-delay 200
...
```

Example 3: Inserting a codec at a specific position in the list.
This command assigns the G.729 codec the index number 1 so the codec appears at the top of the list.

```
192.168.1.1(pf-voip)[default]#codec 1 g729 tx-length 30 rx-length 30 silence-sup-
    pression
192.168.1.1(pf-voip)[default]#show running-config
...
profile voip default
codec 1 g729 rx-length 30 tx-length 30 silence-suppression
codec 2 g711ulaw64k rx-length 20 tx-length 20
codec 3 g711alaw64k rx-length 20 tx-length 20
     codec 4 g723-6k3 rx-length 30 tx-length 30
dejitter-max-delay 200
...
```

8.15 ENDING A TELNET, SSH OR CONSOLE PORT SESSION

Use the logout command in the operator or administration execution mode to end a Telnet or console port session. To confirm the logout command, you must enter **yes** on the dialog line as shown in the example below.

Mode: Operator execution

Step	Command	Purpose
1	*device*>logout	Terminates the session after a confirmation by the user.

Example: End a Telnet or console port session

The following example shows how to terminate a session from the administrator execution configuration mode.

```
device>logout
Press 'yes' to logout, 'no' to cancel:
```

After confirming the dialog with “yes”, the Telnet session is terminated.

Note Using the command exit in the operator execution mode also terminates a Telnet or console port session, but without any confirmation dialog.

8.16 SHOWING COMMAND DEFAULT VALUES

If a command is set to its default value, it is not displayed in the running-config in order to make it more readable. There are a few exceptions to this rule. The command cli config defaults makes commands also appear in the running-config that are set to default values. no cli config defaults turns it off.

Step	Command	Purpose
1	*device*>enable	Enters administration execution mode
2	*device*#configure	Enters configuration mode
3	*device(cfg)#* superuser *name* password *password*	Creates a new superuser account *name* and password *password*
4	device(cfg)# cli config defaults	Generate a command even if it reflects the default setting (Default: Disabled)

9 SYSTEM IMAGE HANDLING

Chapter contents

9.1 INTRODUCTION

System image handling management is a complex and feature rich system allowing a user to perform various upgrades on the devices. It allows a user to perform full upgrades and partial upgrades. It allows to upgrade system configuration seamlessly. The upgrades tasks are supported both from the CLI and WMI. You can copy files to flash from TFTP and local flash space. You can also upgrade from HTTP.

9.2 SYSTEM IMAGE HANDLING TASK LIST

To load and maintain system images, perform the tasks described in the following sections:

- Displaying system image information
- Copying system images from a network server to the Flash memory
- Copying system configuration files to flash memory

9.2.1 DISPLAYING SYSTEM IMAGE INFORMATION

This procedure displays information about system images and driver software.

Mode: Administrator execution

Step	Command	Purpose
1	# show system info	Lists the system software release version, information about optional interface cards mounted in slots and other information that is the currently running system software. If you have just completed a download of new system software from the tftp server, you must execute the reload command in order to be running with the new system software. This applies equally to driver software. In some cases, the device may reboot itself.

```
# show system info
Product Description
===============================================
Company Name:Black Box
Company Url:http://www.blackbox.com
Model:LB52XA-R2
Model Description: Ethernet Extender
Serial Number:00A0BA09094A
Enterprise Oid :1.3.6.1.4.1.1768
Product Oid:1.3.6.1.4.1.1768.300.3
Version :3.3-sandrianov@poseidon/19
Build Date :2013/07/09
Build Host:sandrianov@poseidon
Build Number:19
Build Type:Branch
Source Revision:57124ec
Host Name:00A0BA09094A
System Description:
System Contact:
System Location:
System Provider:
System Subscriber:
System Supplier:
Banner:Black Box LB52XA-R2
Branch:3.3-sandrianov@poseidon/19 2013/07/09
```

9.2.2 COPYING SYSTEM IMAGES FROM A NETWORK SERVER TO FLASH MEMORY

As mentioned previously, the system image file contains the application software that runs the OS; it is loaded into the flash memory at the Black Box factory. Since most of the voice and data features of the LB52XA-R2 are defined and implemented in the application software, upgrading to a new release might be necessary if you want to have additional voice and data features available. A new system image file must be stored permanently into the flash memory of your LB52XA-R2 to be present when booting the device. Since the system image file is preloaded at the Black Box factory, you will have to download a new OS application software only if a major software upgrade is necessary or if recommended by Black Box. Under normal circumstances, downloading a system image file should not be needed.

Downloading a new system image file means storing it permanently at a defined location within the Black Box device flash memory. To store the system image file, you must use a special download image bundle file. This bundle file contains directions for the system that describe how to handle the system image file and where to store it. The direction for the system upgrade contained in a file called manifest which is a part of the upgrade image.

Mode: Administrator access

Step	Command	Purpose
1	***device*(cfg)# copy tftp:/**/*server-ip-address*>/<*deliveryfile*>**.tar flash:**	Downloads the image file from the TFTP server at address <address> and starts the system image download process. This progress is visualized with a progress bar, printing dots according to the time elapsed since the start of each upgrade operation
2	***device*(cfg)# copy tftp://**<*address*>**/upgrade-image.tar flash-cfg:**	Does the same as the command above. But it will also erase the flash partition. Think of this as a factory erase.

10 CONFIGURATION FILE HANDLING

Chapter contents

10.1 INTRODUCTION

This chapter describes how to upload and download configuration files to and from an LB52XA-R2. A configuration file is a batch file of OS commands used in the software modules that perform specific functions of the LB52XA-R2. This chapter also describes some aspects of configuration file management. Refer to chapter 9, “System Image Handling” on page 58 for more information.

This chapter includes the following sections:

- Shipping configuration (see page 64)
- Configuration file handling task list (see page 64)

All Black Box devices are shipped with a configuration file installed in the factory, which is stored in their flash memory.

A configuration file is like a script file containing the OS commands that can be loaded into the system. Configuration files may also contain only partial configurations. This allows you to keep a library of command sequences that you may want to use as required. By default, the system automatically loads the shipping configuration from the flash memory if no user-specific configuration is defined as the startup configuration.

Changing the current running configuration is possible as follows:

You may change the running configuration interactively. Interactive configuring requires that you access the CLI by using the enable command to enter administrator execution mode. You must then switch to the configuration mode with the command configure. Once in configuration mode, enter the configuration commands that are necessary to configure your LB52XA-R2.

- You can also create a new configuration file or modify an existing one offline. You can copy configuration files from the flash memory to a remote server. Transferring configuration files between the flash memory and a remote system requires the Trivial File Transfer Protocol (TFTP). The TFTP server must be reachable through one of the LB52XA-R2 network interfaces.

See chapter 8, "Accessing the CLI" on page 47 for information concerning access to the CLI.

The following sections focus on OS memory regions and software components that can be copied within the memory or uploaded/downloaded between a TFTP server and the memory of the LB52XA-R2. Refer to chapter 9, “System Image Handling” on page 58 for a brief description of how the OS uses system memory.

10.2 UNDERSTANDING CONFIGURATION FILES

Configuration files contain commands that are used to define the functionality of the OS. During system startup, the command parser reads the factory or startup configuration file command-by-command, organizes the arguments, and dispatches each command to the command shell for execution. If you use the CLI to enter a command during operation, you alter the running configuration accordingly. In other words, you are modifying a live, in-service system configuration.

Figure 15, shows the characteristics of a configuration file. It is stored on a TFTP server in the file *myconfig.cfg* for later download. The command syntax used to enter commands with the CLI and add commands in configuration files is identical. For better comprehension, you can add comments in configuration files. To add a line with a comment to your configuration file, simply begin the line with the hash (#) character. The command parser skips everything after the hash character to the end of the line.

```
#------------------------------------------------------------------#
#   My Configuration File
#------------------------------------------------------------------#

# SNTP configuration used for time synchronization
```

```
cli version 3.00
sntp-client
sntp-client server primary 172.16.1.10 port 123 version 4
sntp-client poll-interval 600
sntp-client gmt-offset + 01:00:00

# system definitions
system
clock-source 1 2
hostname device

# IP context configuration
context ip router
route 0.0.0.0 0.0.0.0 172.19.32.2 1
route 172.19.41.0 255.255.255.0 172.19.33.250
route 172.19.49.0 255.255.255.0 172.19.33.250

# interface LAN used for connection to internal network
interface lan
ipaddress 172.19.33.30 255.255.255.0
mtu 1500

# interface WAN used for connection to access network
interface wan
ipaddress 172.19.32.30 255.255.255.0
mtu 1500

# CS context configuration
context cs switch
  no shutdown

# routing table configuration
routing-table called-e164 rtab
      route 2. dest-interface telecom-operator

# interface used to access the PSTN telecom operator
interface isdn telecom-operator
route call dest-interface sip

# interface used to access the VoIP telecom provider
interface sip voip-provider
route call dest-table rtab
remoteip 172.19.33.60
  bind gateway sip

# SIP gateway primarily used
gateway sip
  faststart
no ras
gatekeeper-discovery auto
bind interface lan router
  no shutdown

port ethernet 0 0
medium auto
encapsulation ip
bind interface lan router
no shutdown

port ethernet 0 1
medium 10 half
encapsulation ip
bind interface wan router
no shutdown
```

Figure 15 Sample configuration file

Each configuration file stored in the flash memory needs a unique name. The user has to assign a file name to any user-specific configuration. The OS predefines some names for configuration files. These are the shipping configuration (*shipping-config*), startup configuration (*startup-config*), minimal configuration (*minimal-config*) and running configuration (*running-config*) file names.

10.3 SHIPPING CONFIGURATION

The LB52XA-R2 is delivered with a *shipping configuration* in the logical region *config:.* This shipping configuration initially parameterizes the most useful network and component settings of the OS.

Once a user-specific configuration is created and stored as the startup configuration, the shipping configuration is no longer used, but still remains in the persistent memory. It is possible to switch back to the shipping configuration at any time during the operation of an LB52XA-R2 configuration. The getting started guide describes the restoration procedure for restoring the default settings.

10.4 CONFIGURATION FILE HANDLING TASK LIST

This section describes how to create, load, and maintain configuration files. Configuration files contain a set of user-configured commands that customize the functionality of your LB52XA-R2 to suit your own operating requirements.

The tasks in this chapter assume that you have at least a minimal configuration running on your system. You can create a basic configuration file by using the configure command; see section “Modifying the Running Configuration at the CLI” on page 69 for details.

To display, copy, delete, and download or upload configuration files, perform the tasks described in the following sections:

- Copying configurations within the local memory (see page 64)
- Replacing the startup configuration with a configuration from the Flash memory (see page 66)
- Copying configurations to and from a remote storing location (see page 66)
- Replacing the startup configuration with a configuration downloaded from the TFTP server (see page 67)
- Displaying configuration file information (see page 68)
- Modifying the running configuration at the CLI (see page 69)
- Modifying the running configuration offline (see page 69)
- Deleting a specified configuration (see page 71)

10.4.1 COPYING CONFIGURATIONS WITHIN THE LOCAL MEMORY

Configuration files may be copied into the local memory in order to switch between different configurations. Remember the different local memory regions in the OS as shown in figure 16 on page 65.

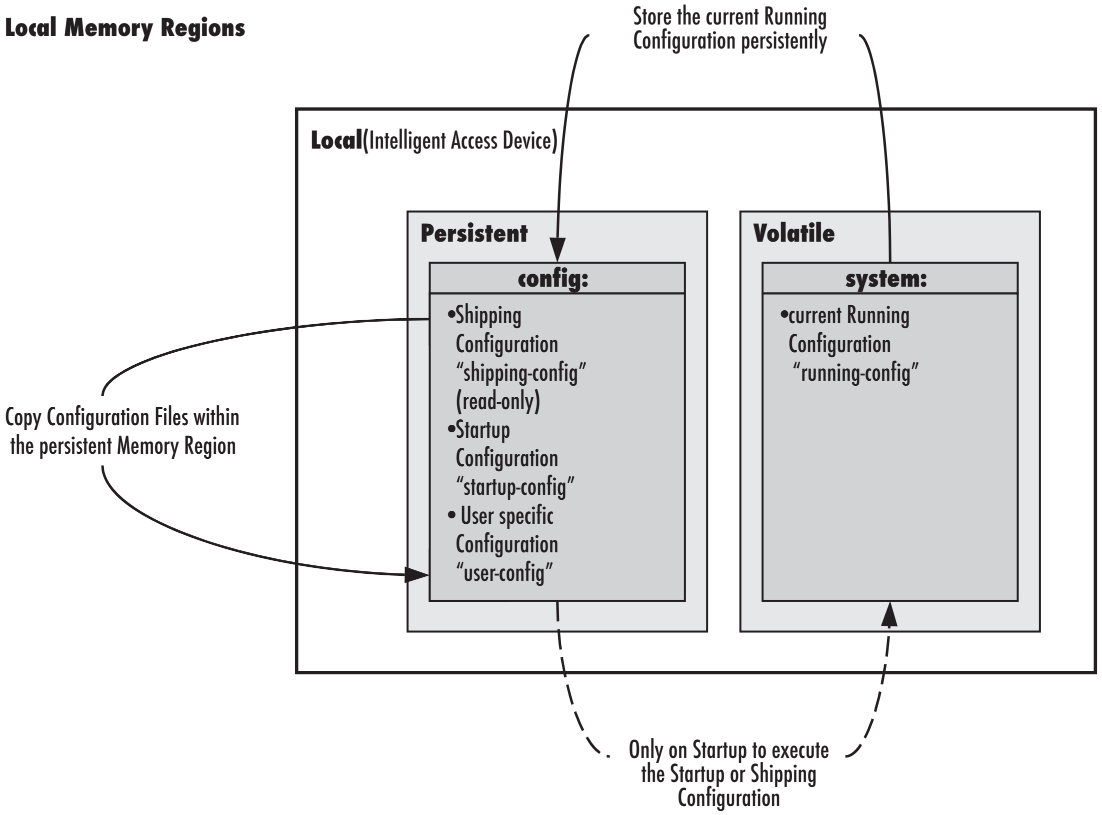

Local Memory Regions
Store the current Running Configuration persistently
Local(Intelligent Access Device)
Persistent
config:
•Shipping Configuration "shipping-config" (read-only)
•Startup Configuration "startup-config"
• User specific Configuration "user-config"
Volatile
system:
•current Running Configuration "running-config"
Copy Configuration Files within the persistent Memory Region
Only on Startup to execute the Startup or Shipping Configuration

Figure 16 Local memory regions

In most cases, the interactively modified running configuration known as the *running-config*, which is located in the volatile memory region *system:*, is copied into the persistent memory region *config*. This running config is stored under the name *startup-config* and replaces the existing startup configuration.

You can copy the current running configuration into the persistent memory region *config*: under a user-specified name, if you want to preserve that configuration.

In addition, an already existing configuration is usually copied into the persistent memory region *config:* by using a user-specified name, for conservation or later activation.

As shown in figure 16 the local memory regions are identified by their unique names, like *config:,* which is located in flash memory, and *system*:, which is the system RAM, i.e. the volatile memory. As already mentioned, configuration files in the same memory region need a unique name. For example, it is not possible to have two configuration files with the name *running-config* in the memory region *config:*.

As you might expect, the copy command does not move but replicates a selected source to a target configuration file in the specified memory region. Therefore the source configuration file is not lost after the copy process. There are four predefined configuration file names for which it is optional to specify the memory region, namely *shipping-config*, *startup-config, minimal-config* and *running-config*.

Mode: Administrator execution

Step	Command	Purpose
1	***device#*copy {shipping-config | startup-config | minimal-config | running-config | config:** *source-name* } **config:** *target-name*	Copies the selected source configuration file *source-name* as target configuration file *target-name* into the local memory.

Example: Backing up the startup configuration

The following example shows how to make a backup copy of the startup configuration. It is copied under the name backup into the flash memory region *config*:.

```
device#copy startup-config config:backup
```

10.4.2 REPLACING THE STARTUP CONFIGURATION WITH A CONFIGURATION FROM FLASH MEMORY

It is possible to replace the startup configuration by a configuration that is already present in the flash memory. You can do so by copying it to the area of the flash memory where the startup configuration is stored.

Mode: Administrator execution

Step	Command	Purpose
1	*device#* copy config:*backup* startup-config	Replaces the existing persistent startup configuration with the startup configuration *backup* already present in flash memory.

Note The configuration *backup* can be a previously backed up configuration or previously downloaded from a TFTP server.

10.4.3 COPYING CONFIGURATIONS TO AND FROM A REMOTE STORAGE LOCATION

Configuration files can be copied from local memory (persistent or volatile region) to a remote data store. From within the OS, the remote TFTP server is represented by the memory region *tftp:* in combination with the IP address of the TFTP server and the name and path of the configuration file. We will explain the usage of the remote memory region *tftp:* in the following section more detailed. Another typical task is uploading the current running configuration to the remote data store for backup purpose, or if an extensive configuration file is to be edited on the remote host. In this case the running configuration, named *running-config*, which is to be found in the volatile memory region *system:* is transferred to the TFTP server. On the TFTP server the running configuration is stored to a file whose name is defined as one of the arguments of the copy command.

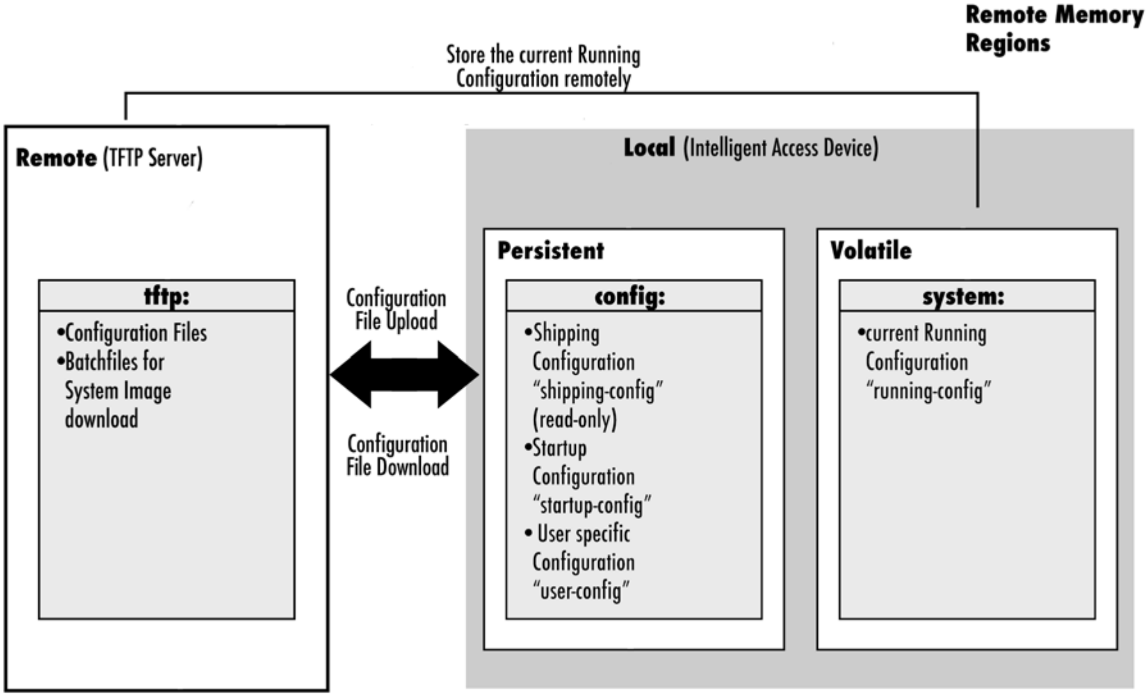

Remote Memory Regions
Store the current Running Configuration remotely
Remote (TFTP Server)
tftp:
•Configuration Files
•Batchfiles for System Image download
Configuration File Upload
Configuration File Download
Local (Intelligent Access Device)
Persistent
config:
•Shipping Configuration "shipping-config" (read-only)
•Startup Configuration "startup-config"
• User specific Configuration "user-config"
Volatile
system:
•current Running Configuration "running-config"

Figure 17 Remote memory regions for the OS

Finally, configuration files, i.e. the startup configuration or a user-specific configuration that is stored in the persistent memory region *config:* are often uploaded to the remote data store for backup, edit or cloning purposes. The latter procedure is very helpful when you have several Black Box devices, each using a configuration which does not greatly differ from the others, or which is the same for all devices. During the configuration of the LB52XA-R2 according to your requirements, the running configuration of this device, named *running-config* and located in the volatile memory region *system:,* is edited. Next, the configuration is tested and if everything is as required, the running configuration is copied as startup configuration, named *startup-config*, into the persistent memory region *config:* of the target device. After this, the startup configuration is transferred to the TFTP server, where it can be distributed to other Black Box devices. These devices therefore get clones of the starting system if the configuration does not need any modifications.

10.4.4 REPLACING THE STARTUP CONFIGURATION WITH A CONFIGURATION DOWNLOADED FROM TFTP SERVER

From within the administration execution mode, you can replace the startup-configuration by downloading a configuration from the TFTP server into the flash memory area where to store the startup configuration.

Mode: Administrator execution

Step	Command	Purpose
1	***device*(cfg)# copy tftp:***//*ip-address[:port]*/*new-startup* **config:startup-config**	Downloads the configuration file *new-startup* from the TFTP server at address *ip-address* replacing the existing persistent startup configuration. Optionally you can enter the UDP *port* where the TFTP server listens. If the port is not specified, the default port 69 is used. This progress is visualized with a counter, counting up from 0 to 100% according to the downloaded amount of the file size. Should the download fail, an error message *% File Transfer - Get failed* is displayed.

Example: Sample configuration download from the TFTP server

The following example shows how to replace the persistent startup configuration in the flash memory of a Black Box device by overwriting it with the configuration contained in the file *new-startup* located on the TFTP server at IP address 172.16.36.80.

1. Download the startup configuration with the copy command into the flash memory area where to store the startup configuration.

```
device>enable
device#configure
device(cfg)#copy tftp://172.16.36.80/user/new-startup config:startup-config
Download...100%
device(cfg)#
```

2. Check the content of the persistent startup configuration by listing its command settings with the show command.

```
device#show config:startup-config
```

10.4.5 DISPLAYING CONFIGURATION FILE INFORMATION

This procedure describes how to display information about configuration files

Mode: Administrator execution

Command	Purpose
show config:	Lists all persistent configurations
show running-config	Displays the contents of the running configuration file
show startup-config	Displays the contents of the startup configuration file
show running-config current-mode	Displays only the running-config of the current mode.
show running-config "<some mode>"	Displays the running-config of any named mode

IMPORTANT

It is recommended that you *never* save a configuration in startup-config or a user-specific configuration with the cli config defaults command because the additional list of default commands consumes significant portions of the *config:* memory.

Note Application files can be very long when displayed (by using the show command). To make them easier to read, many default commands are not displayed when executing the show running-config command. However, the administrator may want to see the entire configuration, including these normally “hidden” default commands. To see all commands, execute the cli config defaults command. By issuing a show running-config command afterwards, you will see all the commands, a list which is significantly longer. To hide these hidden commands again, issue the no cli config defaults command.

10.4.6 MODIFYING THE RUNNING CONFIGURATION AT THE CLI

The OS accepts interactive modifications on the currently running configuration via the CLI. Interactive configuring needs access to the CLI. Use the enable command to enter administrator execution mode, and then switch to the configuration mode by typing the command configure. Once in configuration mode, you can enter the configuration commands that are necessary to your Black Box device’s operation. When you configure the OS by using the CLI, the shell executes the commands as you enter them.

When you log in using the CLI, all commands you enter directly modify the running configuration located in the volatile memory region *system:* (or RAM) of your device. Because it is located in volatile memory, to be made permanent, your modifications must be copied to the persistent (non-volatile) memory. In most cases you will store it as the upcoming startup configuration in the persistent memory region *config:* under the name *startup-config*. On the next start-up the system will initialize itself using the modified configuration. After the startup configuration has been saved to persistent memory, you have to restart the device by using the reload command to cause the system to initialize with the new configuration.

The execution command reload accepts with the following option:

- forced—reloads the system without prompting for confirmation or for saving the running-configuration (no need to type *yes* or *no*). The question whether to save the running-configuration is automatically answered with *no*, the question whether to reload or not with *yes*.

Mode: Administrator execution

Step	Command	Purpose
1	*device*#configure	Enters administrator configuration mode
2	Enter all necessary configuration commands.	
3	*device*(cfg)#copy running-config startup-config	Saves the running configuration file as the upcoming startup configuration
4	*device*(cfg)#reload	Restarts the system

Example: Modifying the running configuration at the CLI

The following example shows how to modify the currently running configuration via the CLI and save it as the startup configuration.

```
device#configure
device(cfg)#…
device(cfg)#copy running-config startup-config
device(cfg)#reload
Press 'yes' to restart, 'no' to cancel: yes
The system is going down
```

10.4.7 MODIFYING THE RUNNING CONFIGURATION OFFLINE

In cases of complex configuration changes, which are easier to do offline, you may store a configuration on a TFTP server, where you can edit and save it. Since the LB52XA-R2 is acting as a TFTP client, it initiates all file transfer operations.

First, upload the running configuration, named *running-config*, from the LB52XA-R2 to the TFTP server. You can then edit the configuration file located on the TFTP server by using any regular text editor. Once the configuration has been edited, download it back into the device as upcoming startup configuration and store it in the persistent memory region *config:* under the name *startup-config*. Finally, restart the LB52XA-R2 by using the reload command to activate the changes.

Mode: Administrator execution

Step	Command	Purpose
1	***device*#copy running-config tftp:**//*device-ip-address[:port]***/current-config***	Uploads the current running configuration as file current-config to the TFTP server at address *device-ip-address*. Optionally you can enter the UDP *port* where the TFTP server listens. If the port is not specified, the default port 69 is used. This progress is visualized with a counter, counting up from 0 to 100% according to the downloaded amount of the file size. If the upload should fail an error message "% File Transfer - Put failed" is displayed.
2		Offline editing of the configuration file current-config on the TFTP server using any regular text editor.
3	***device*#copy tftp:**//*device-ip-address/current-config* **config: *startup-config***	Downloads the modified configuration file current-config from the TFTP server at address device-ip-address into the persistent memory region config: by using the name startup-config. This progress is visualized with a counter, counting up from 0 to 100% according to the downloaded amount of the file size. Should the download fail, an error message "% File Transfer - Get failed" is displayed.
4	*device*#reload	Restarts the system

Example: Modifying the running configuration offline

The following example shows how to upload the running configuration from the LB52XA-R2 to the file *current-config* on a TFTP server at IP address 172.16.36.80. The uploaded configuration file is written into the root directory specified by the TFTP server settings, and overwrites any existing file with the same name. Read your TFTP server manual to get a thorough understanding of its behavior. After this, the configuration file is available for offline editing on the TFTP server. Once the configuration file *current-config* has been modified, it is downloaded from the TFTP server, at IP address 172.16.36.80, into the persistent memory region *config:* using the name *startup-config*. It will become active after a reload.

```
device#copy running-config tftp://172.16.36.80/user/current-config
Upload...100%
```

At this point in time, the offline editing of the configuration file *current-config* on the TFTP server takes place.

```
device#copy tftp://172.16.36.80/user/ current-config config:startup-config
Download...100%
device#reload
Press 'yes' to restart, 'no' to cancel: yes
The system is going down
```

10.4.8 DELETING A SPECIFIED CONFIGURATION

This procedure describes how to delete configuration files from the LB52XA-R2 flash memory region *config:*.

Mode: Administrator execution

Step	Command	Purpose
1	*device*#show config:	Lists the loaded configurations
2	*device*#erase config:name	Deletes the configuration *name* from the flash memory.

Example: Deleting a specified configuration

The following example shows how to delete a specific configuration from among a set of three available configurations in Flash memory. The configuration named *minimal* is to be deleted, since it is no longer used.

1. Use the command show config: to list all available configurations.

```
device#show config:
Persistent configurations:
backup
minimal
startup-config
shipping-config
```

2. Delete the configuration named *minimal* explicitly.

```
device#erase config:minimal
```

3. Enter again the command show config: to check if the selected configuration was deleted successfully from the set of available configurations.

```
device#show config:
Persistent configurations:
backup
startup-config
shipping-config
```

11 BASIC SYSTEM MANAGEMENT

Chapter contents

11.1 INTRODUCTION

This chapter describes parameters that report basic system information to the operator or administrator, and their configuration. The following are basic parameters that can be established when setting up a new system:

- Defining the system's hostname
- Setting the location of the system
- Providing reference contact information
- Setting the clock

Additionally, the following tasks are described in this chapter:

- Setting the system banner
- Enabling the embedded web server

11.2 BASIC SYSTEM MANAGEMENT CONFIGURATION TASK LIST

All tasks in the following sections are optional, though some such as setting time and calendar services and system information are highly recommended.

To configure basic system parameters, perform the tasks described in the following sections.

- Managing feature license keys (see page 73)
- Setting system information (see page 74)
- Setting the system banner (see page 75)
- Setting time and date (see page 76)
- Displaying clock information (see page 77)
- Displaying time since last restart (see page 77)
- Configuring and starting the web server (see page 77)
- Restarting the system (see page 78)
- Displaying the system event log (see page 78)
- Identifying a unit by flashing all LED’s (see page 79)

11.2.1 MANAGING FEATURE LICENSE KEYS

Several features of the firmware require a system specific license key to be installed to enable the feature.

This section describes how to install the feature license keys on your equipment.

Mode: Configure

Step	Command	Purpose
1	***device*(cfg)#install license** *license-key*	Install the license key
2		Repeat step 1 for any additional license keys

Example: Installing license keys from the console

The following example shows the command used to install license keys manually on the console.

```
device(cfg)#install license 10011002R1Ws63yKV5v28eVmhDsVGj/JwKqIdpC4Wr1BHaN-
    tenXUYF/2gNLoihifacaTPLKcV+uQDG8LJis6EdW6uNk/GxVObDEwPFJ5bTV3bIIfUZ1eUe+8c5Op-
    CCd7PSAe83Ty2c/
    CnZPSlEjIrVlJrr8VhOr1DYxkEV9evBp+tSY+y9sCeXhDWt5Xq15SAPlznTLQmym7fDa-
    kvm+zltzswX/KX13sdkR0ub9IX4Sjn6YrvkyrJ2dCGivTTB3iOBmRjV1u
```

After installing license keys, you can check if the license keys have been added successfully to your system using the following command.

Mode: Configure

Step	Command	Purpose
1	*device*(cfg)#show licenses	Display all installed licenses

Example: Displaying installed licenses

The following example shows the command used to display all installed licenses on a system and a sample of its output.

```
device(cfg)#show licenses
VPN [vpn]
License serial number: 14343534
Status: Active
device(cfg)#
```

11.2.2 SETTING SYSTEM INFORMATION

The system information includes the following parameters:

- Contact
- Hostname
- Location
- Provider
- Subscriber
- Supplier

By default there is no information specified for any of the above parameters.

System contact information tells the user how to contact the information service, e.g. the help line of the service provider. The contact information may be any alphanumeric string, including spaces, that is no longer than one line. This entry corresponds to the MIB II system sysContact object.

The system name, also called the hostname, is used to uniquely identify the LB52XA-R2 in your network. The selected name should follow the rules for ARPANET hostnames. Names must start with a letter, end with a letter or digit, and have as interior characters only letters, digits, and hyphens. Names must be 63 characters or fewer. For more information, refer to RFC 1035. This entry corresponds to the MIB II system sysName object. After setting the hostname of the LB52XA-R2 the CLI prompt will be replaced with the chosen name.

Assigning explanatory location information to describe the system physical location of your device (e.g. server room, wiring closet, 3rd floor, etc.) is very supportive. This entry corresponds to the MIB II system sysLocation object.

The system provider information is used to identify the provider contact for the LB52XA-R2, together with information on how to contact this provider. The provider is a company making services available to subscribers. The provider information may be any alphanumeric string, including spaces, that is no longer than one line. This entry corresponds to the Black Box enterprise-specific MIB provider object.

The system subscriber information is used to get in touch with subscriber for the LB52XA-R2, together with information on how to contact this subscriber. The subscriber is a company or person using one or more services from a provider. The subscriber information may be any alphanumeric string, including spaces, that is no longer than one line. This entry corresponds to the Black Box enterprise-specific MIB subscriber object.

The system supplier information is used to get in touch with the supplier for the LB52XA-R2, together with information on how to contact this supplier. The supplier is a company delivering Black Box devices to a provider. The supplier information may be any alphanumeric string, including spaces, that is no longer than one line. This entry corresponds to the Black Box enterprise-specific MIB supplier object.

Mode: Configure

Step	Command	Purpose
1	***device*(cfg)#system contact** *information*	Sets the contact information to *information*
2	***device*(cfg)#system hostname** *information*	Sets the hostname to *information*
3	***device*(cfg)#system location** *information*	Sets the location information to *information*
4	***device*(cfg)#system provider** *information*	Sets the provider information to *information*
5	***device*(cfg)#system subscriber** *information*	Sets the subscriber information to *information*
6	***device*(cfg)#system supplier** *information*	Sets the supplier information to *information*

Note If the system information must have more than one word, enclose it in double quotes.

Example: Setting system information

The following example shows the commands used to configure the contact information for the LB52XA-R2, if you start from the operator execution mode.

```
device(cfg)#system contact "Bill Anybody, Phone 818 700 1504"
device(cfg)#system hostname device
device(cfg)#system location “Wiring Closet, 3rd Floor”
device(cfg)#system provider “Best Internet Services, contact@bis.com, Phone 818 700
    2340”
device(cfg)# system subscriber “Mechanical Tools Inc., jsmith@mechtool.com, Phone
    818 700 1402”
device(cfg)# system supplier “WhiteBox Networks Inc., contact@whitebox.com, Phone
    818 700 1212”
```

11.2.3 SETTING THE SYSTEM BANNER

The system banner is displayed on all systems that connect to your LB52XA-R2 via Telnet, SSH, or a serial connection. It appears at login and is useful for sending messages that affect administrators and operators, such as scheduled maintenance or system shutdowns. By default no banner is present on login.

To create a system banner use the banner command followed by the message you want displayed. If the banner message has to be formed out of more than one word the information is enclosed by double quotes. Adding the escape sequence “\n” to the string forming the banner creates a new line on the connected terminal screen. Use the no banner command to delete the message.

```
Mechanical Tools Inc.
jsmith@mechtool.com
Phone 818 700 1402

login:
```

Mode: Configure

Step	Command	Purpose
1	***device*(cfg)#banner** *message*	Sets the message for the system banner to *message*

Example: Setting the system banner

The following example shows how to set a message for the system banner for the LB52XA-R2, if you start from the configuration mode.

```
device(cfg)#banner \n#\n# The password of all operators has changed\n# please con-
   tact the administrator\n#"
```

11.2.4 SETTING TIME AND DATE

All Black Box devices provide time-of-day and date services. These services allow the products to accurately keep track of the current time and date. The system clock specifies year, month, day, hour, minutes, and optionally seconds. The time is in 24-hour format *yyyy-mm-ddThh:mm:ss* and is retained after a reload.

Mode: Configure

Step	Command	Purpose
1	***device*(cfg)#clock set** *yyyy-mm-ddThh:mm:ss*	Sets the system clock to *yyyy-mm-ddThh:mm:ss*

Example: Setting time and date

The following example shows the commands used to set the system clock of your device to August 6, 2001 at 16:55:57, if you start from the operator execution mode.

```
device(cfg)#clock set 2001-08-06T16:55:57
```

11.2.5 CONFIGURING DAYLIGHT SAVINGS TIME RULES

The OS allows configuring daylight saving time rules, which affect the local clock offset without changing the configuration. After booting up and loading the configuration, the daylight saving rules are checked and applied automatically. The rules consist of a default-offset and one or multiple dst-rules. The offset of a dst-rule is active if the local clock is between the specified start and stop time of the rule. If the local clock is outside the specified start and stop time of all specified rules, then the default-offset is active.

Mode: Configure

Step	Command	Purpose
1	*device*(cfg)#clock local default-offset (+hh:mm | -hh:mm)	Configures the offset of your time zone from GMT. This offset is used if no other dst rule is currently active. Default: +00:00

11.2.6 DISPLAY CLOCK INFORMATION

This procedure describes how to display the current date and time

Mode: Both in operator and administrator execution

Step	Command	Purpose
1	*device*>show clock	Display the local time.

Example: Display clock information

The following example shows the commands used to display the time and date settings of your device in local time, if you start from the operator execution mode.

```
device>show clock
2001-08-06T16:55:57
```

11.2.7 DISPLAY TIME SINCE LAST RESTART

This procedure describes how to display the time since last restart

Mode: Operator execution

Step	Command	Purpose
1	*device*>show uptime	Display the time since last restart.

Example:

The following example shows how to display the uptime of your device, if you start from the configuration mode.

```
device>show uptime
The system is up for 54 days, 23 hours, 44 minutes, 18 seconds
```

11.2.8 CONFIGURING THE WEB SERVER

The embedded web server has two parameters that are configurable.

Note Changing the language parameter does not affect the language of the web configuration pages.

Mode: Configure

Step	Command	Purpose
1	*device*(cfg)#webserver [http | https] port *port-number*	Start the http or https server, and set the listening port number. The default port number for the http web server is 80, and the default port number for the https web server is 443.

Example: Configuring and starting the Web server

The following example shows how to set the web server language and the listening port of your device, if you start from the configuration mode.

```
device(cfg)#webserver http port 80
device(cfg)#webserver http
```

11.2.9 RESTARTING THE SYSTEM

In case the LB52XA-R2 has to be restarted, the reload command must be used. The reload command includes a two-dialog, where the user is allowed to store any unsaved configuration data and finally confirms the system restart.

IMPORTANT

Restarting the system interrupts running data transfers and all voice calls.

The execution command reload has been enhanced with the following option:

- forced—reloads the system without prompting for confirmation or for saving the running-configuration (no need to type *yes* or *no*). The question whether to save the running-configuration is automatically answered with *no*, the question whether to reload or not with *yes*.

Mode: Administrator execution

Step	Command	Purpose
1	*device*#reload	Restarts the system

Example: Restarting the system

The following example shows how to restart the currently running system, if you start from the administrator execution mode.

```
device#reload
System configuration has been changed.
Press 'yes' to restart, 'no' to cancel: yes
The system is going down
```

11.2.10 DISPLAYING THE SYSTEM LOGS

The system logs contain warnings and information from the system components of the OS. In case of problems it is often useful to check the event or the supervisor logs for information about malfunctioning system components. The event log stores general events such as flash full, DSP failed etc., comparable with the event log on Windows NT. The supervisor log stores information from the system supervisor such as memory full, task failed etc.

System resets may have a number of reasons, the most prominent being a manual reset issued on the Telnet/console (‘reload’). Other reset reasons include power off failures and system failures. In order to pinpoint the problem, the reset log contains the reset cause.

Mode: Administrator execution

Step	Command	Purpose
1	*device*#show log event	Show event log.
2	*device*#show log supervisor	Show log of the system supervisor. Used For example, after an unexpectedly reboot.
3	*device*#show log reset	Output a list of reset reasons (with date and time).
4	*device*#show log boot	Displays the console and log messages captured during startup of the unit.

11.2.11 DISPLAYING REPORTS

The show reports command is used to dump combined system information. The show reports command sequentially executes the following log commands:

```
show version
show clock
show uptime
show log reset
show log boot
show log event
show log supervisor
show factory-config
show startup-config
show running-config
```

Mode: Administrator execution

Step	Command	Purpose
1	*device*#show reports	Dumps the combined system information.

11.2.12 CONFIGURING THE BLINK INTERVAL

When there are many embedded OS devices in the same location, use this command to flash all the LED's on a specific unit for a specified period of time. This makes identification of the physical unit very easy.

Step	Command	Purpose
1	*device* #blink <seconds>	Enter an integer for the period of time you want the LED's to flash on the physical unit.

11.2.13 CONFIGURING THE SYSLOG CLIENT

Syslog is a protocol for sending event notification messages across IP networks to message collectors (Syslog server). It uses transport protocol UDP on port 514. A syslog-message exits on the three main part Priority, Header and Message whereas the header is split into Facility and Severity and the header into Timestamp and Hostname. The whole syslog-message (Priority, Header and Message) contains only printable characters and the maximum length is 1024 bytes.

Mode: Configure

Step	Command	Purpose
1	*device*(cfg)#syslog-client	Enters syslog client configuration mode.

Mode: Syslog Client

Step	Command	Purpose
1	*device*(syslog-client)#[no] remote { <ipv4 host> | <ipv6 host> } [tcp | udp] [<port>]	Creates a new remote destination and enters its configuration mode. The 'no' form of the command removes an existing remote destination. The protocol type and port are optional. If not included, the default UDP port 512 will be used.

Mode: Remote

Step	Command	Purpose
1	*device*(syslog-client)(remote)#[no] facility <service name> <severity>	Creates a new log expression for a remote destination. It exists on a facility that determines from which source messages must be accepted and a severity that defines up to which level the messages of the given facility must be sent. The 'no' form of the command disables sending of messages from the given facility.

12 WIZARD INTERFACE

Chapter contents

12.1 INTRODUCTION

The Embedded Operating System (OS) Devices are designed with an intuitive Command Line Management Interface. They also have a limited or basic Web Management Interface for easy firmware support and access to the XML Wizard function. This Chapter will give you a quick walk through how to use the Wizard that has been loaded on to the device from the Black Box Factory. These Wizards can be both imported and exported and modified easily by using your favorite color code or text editor. The wizard is a simple XML script that loads your new graphical changed into the startup configuration file saves and reboots. This means that the Wizard changes don't affect any running configurations. These changes are simply static and do not affect your running configuration until the unit is rebooted.

12.2 BROWSER NOTES

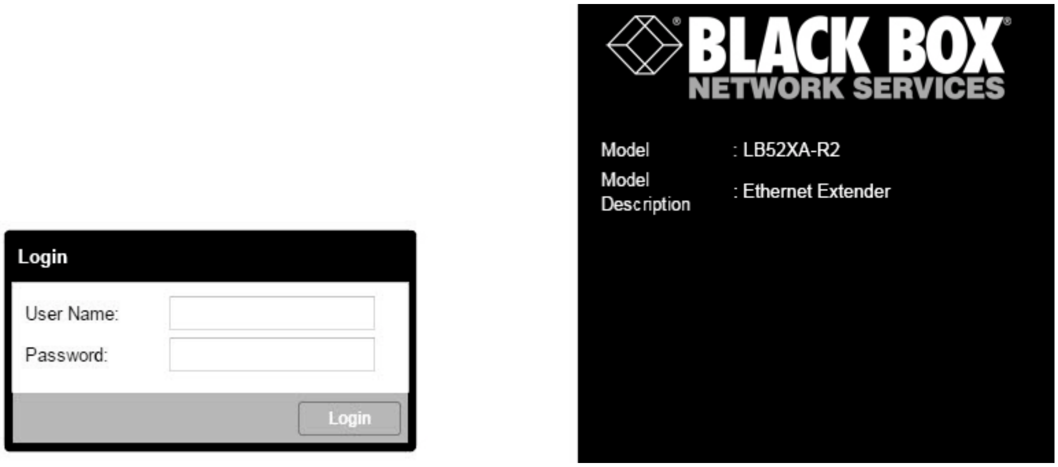
Recommended that you use the most recent browser with the latest security updates. You may find the XML scripting does not work well with older outdated browsers. We have tests with Chrome 39, MS IE 9, and Firefox 33. If you are experiencing page display problems please update your browser with the latest update. Once you have updated your favorite browser you can access the device with the newly configured IP address or the Factory Default IP: 192.168.200.10/24

12.3 CONNECT WITH WEB GUI

1. Connect the Ethernet cable.
2. Connect the power supply.
3. Connect via web browser to the default address 192.168.200.10 OR connect to 192.168.200.11 for 2 pack local units.
4. Login with the default username *admin* without a password.

Once the network connection is established, you will be able to reach the LB52XA-R2 Web GUI. Login to the Web GUI using the following credentials in figure 18.

- Username: *admin*
- Password: [blank]



Model : LB52XA-R2
Model Description : Ethernet Extender

Figure 18 Login

The LB52XA-R2 includes a Wizard within the GUI. The icon to the wizard is in the top right corner of your browser as it displays in figure 19.

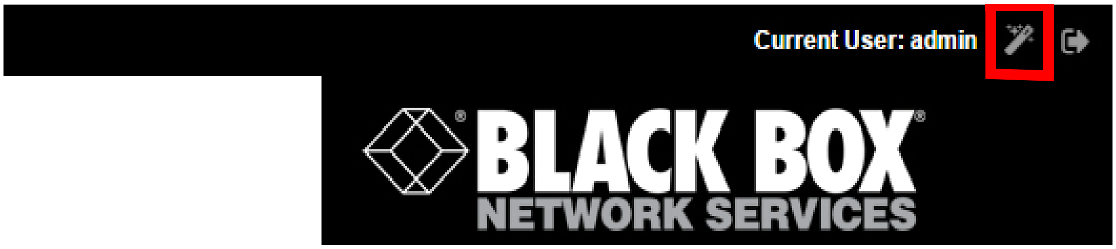
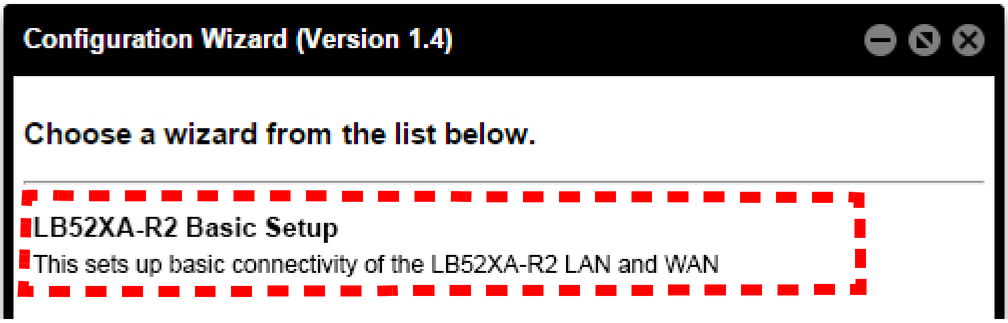


Figure 19 Wizard Homepage.

Once the wizard icon is selected, you will have the options of supported set ups as shown in figure 20. Click on LB52XA-R2 Basic Setup.


Configuration Wizard (Version 1.4)

Choose a wizard from the list below.

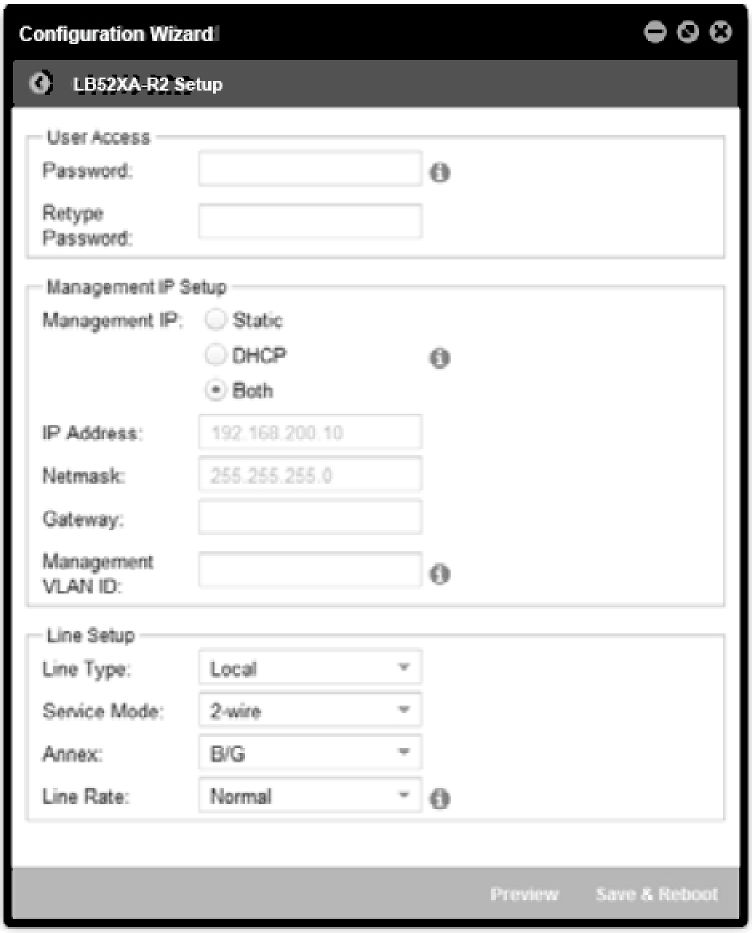
LB52XA-R2 Basic Setup

This sets up basic connectivity of the LB52XA-R2 LAN and WAN

Figure 20 Choose Wizard

Clicking on the LB52XA-R2 Basic Setup will bring up the most common configurations used on the Ethernet Extenders.

Figure 21 on page 84 depicts options to configure through the Basic Setup Wizard.



User Access

Password:

Retype Password:

Management IP Setup

Management IP: ○ Static ○ DHCP ● Both

IP Address: 192.168.200.10

Netmask: 255.255.255.0

Gateway:

Management VLAN ID:

Line Setup

Line Type: Local

Service Mode: 2-wire

Annex: B/G

Line Rate: Normal

Figure 21 Basic Setup

User Access: (optional configuration) Users may change the password for the admin user.

12.3.1 MANAGEMENT IP SETUP

- **Static:** create your own IP address, netmask and gateway (optional: the gateway is required for remote management).
- **DHCP:** The LB52XA-R2 management port will accept an IP address from a DHCP server.
- **Both:** This choice will assign two IP addresses (one static and one DHCP to the management port.)
- **Management VLAN ID:** (optional) define a VLAN ID for management traffic.

12.3.2 LINE SETUP

This is where you can manually set your line port options.

Note The Ethernet Extenders by default are set to plug-and-play operation

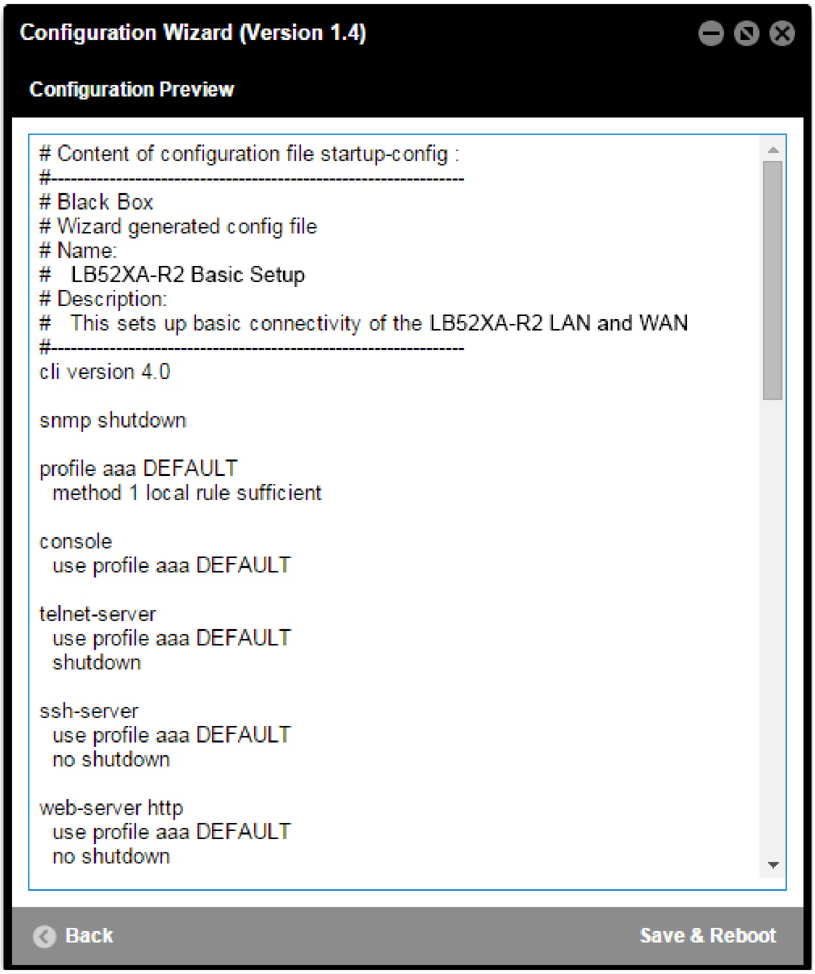
- **Line Type (Local or Remote):** This will set the Ethernet Extender as Local or Remote. Local is typically used at the network, Remote is typically used at the remote device or remote network. Your

LB52XA-R2 when received in a 2-pack is already configured one LB52XA-R2 as Local and one LB52XA-R2 as Remote.

- **Service Mode:** Configures the number of pairs (wires) you want to use. The LB52XA-R2 will default to the maximum number of wires available on your version of the LB522A-R2 (2-wire); LB524A-R2 (4-wire); LB528A-R2 (8-wire).
- **Annex:** Please consult support before changing this setting.
- **Line Rate Configuration:** This will increase the potential line rate of the LB52XA-R2. Your LB52XA-R2 is defaulted to automatically select the optimal rate based on the distance (adaptive).

Note There are two mates: Normal (TCPAM16|32) and Extended (TCPAM64|128). Selecting the Extended mode will double the bandwidth, but will reduce the reach (distance) in half. Default is normal.

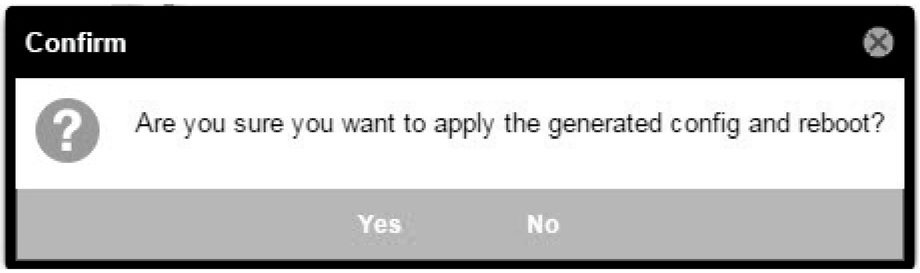
On the bottom right corner of the LB52XA-R2 Basic Configuration wizard page to preview configurations and reboot. Figure 22 depicts what you can expect to see if you click on the preview tab.



```
# Content of configuration file startup-config :
#-----------------------------------------------------------------
# Black Box
# Wizard generated config file
# Name:
#   LB52XA-R2 Basic Setup
# Description:
#   This sets up basic connectivity of the LB52XA-R2 LAN and WAN
#-----------------------------------------------------------------
cli version 4.0

snmp shutdown

profile aaa DEFAULT
  method 1 local rule sufficient

console
  use profile aaa DEFAULT

telnet-server
  use profile aaa DEFAULT
  shutdown

ssh-server
  use profile aaa DEFAULT
  no shutdown

web-server http
  use profile aaa DEFAULT
  no shutdown
```

Figure 22 Configure Preview Option

When the user chooses the save and reboot option, a prompt will ask you to confirm. If the configuration is correct, select “Yes” as shown in figure 23.



Confirm

Are you sure you want to apply the generated config and reboot?

Figure 23 Confirmation

Typically the time to reboot and reestablish a line link and pass traffic once again will be under 2 minutes.

13 **IP ROUTING**

Chapter contents

13.1 INTRODUCTION

The OS IP Routing facility consists of the two major functionalities: Basic Routing and Policy Routing.

13.2 BASIC ROUTING

Under Basic Routing is to be understood the destination IP address based next-hop determination. The next-hop or gateway selection is done by matching a set of routing rules entered by the user (static-route), received through a routing-protocol (dynamic-route) or added by the system (system-route). Routing entries which specify a gateway as next-hop are also called gateway-routes. Networks that are directly reachable through a device's network-port are specified through interface-routes. Instead of a gateway they specify an outgoing interface.

In the context ip configuration mode exists a system created routing-table called DEFAULT. This table contains all Basic Routing information and cannot be deleted by the user. Actually it is possible to created additional routing-tables with a user defined name but such user-created tables are part of the Policy Routing and do not have any use in Basic Routing.

All Basic Routing features are available for IPv4 as well as for IPv6.

13.3 STATIC ROUTES

These are user managed gateway and interface routes and are getting exported in the running-config. In the output of the show route command they are flagged with an "R". Another flag "U" indicates if the route is up or not. A static gateway-route is becoming active (up) if the gateway is reachable. For this we need the following conditions:

- At least one IP address in the gateway's network has to be configured.
- The IP interface which owns the IP address has to be bound from a network-port.
- The network-port's link state has to be up.

A static interface-route is becoming active (up) if:

- The specified outgoing interface is bound from a network-port.
- The specified outgoing interface has at least one IP address configured.
- The network-port's link state has to be up.

13.4 CONFIGURING STATIC ROUTES

A route is clearly identified by its destination address/mask combination and the metric. That means it is allowed to configure several time the same destination, using the same or different gateways, but with a different metric value. The metric in a static route has the meaning of a priority where lower value means higher priority.

Static route differentiation by metric is useful if a destination network is reachable through different gateways. Usually gateways are located in the same network as the device itself. If the link to the gateway with lowest metric is going down, this static-route is becoming unavailable. In that case the device's router will select the route to the destination with the next higher metric and another gateway is going to be used.

Mode: Administrator execution

Step	Command	Purpose
1	[device](cfg)#context ip [ROUTER]	Enters the context IP ROUTER configuration mode.
2	[device](ctx-ip)[ROUTER]#routing-table [DEFAULT]	Enters the routing-table DEFAULT configuration mode.
3	[device][ROUTER.DEFAULT]#route { <network>/<mask-size> | <network><mask> |default | default-v6 } { gateway <gw-address> | interface <if-name> } [metric <metric>] OR **[device][ROUTER.DEFAULT]#no route** *<network>/<mask-size>* **[metric** *<metric>* **]**	Adds a static route. Removes a static route.

Syntax:

Parameter	Explanation
network	The destination network address in the dot-format a.b.c.d for IPv4 and in the colon-format a:b:c::x for IPv6.
mask-size	Number of mask-bits defining the destination network.
mask	The destination network mask in the dot-format a.b.c.d for IPv4 and in the colon-format a:b:c::x for IPv6.
default	Short form for defining a default IPv4 route. It configures network/mask-size with 0.0.0.0/0.
default-v6	Short form for defining a default IPv6 route. It configures network/mask-size with ::/0.
gw-address	The address of the next-hop router that can access the destination network. In the dot-format a.b.c.d for IPv4 and in the colon-format a:b:c::x for IPv6.
interface	The name of the outgoing interface to be used for reaching the destination network.
metric	Metric value of the route. Default: 0

Note To configure a default static IP route, use 0.0.0.0 for the network number and mask (or ::/0 for a default IPv6 route). A valid next-hop address or interface is required.

13.5 SYSTEM ROUTES

For each assigned IP address the system automatically creates route entries for the belonging network into the DEFAULT routing-table. That means, all directly available networks are known by the system and don't have to be configured. The system-routes are of type interface-route means, only the outgoing interface is specified and do not have the gateway parameter. In the output of the show route command they are flagged with an "S".

13.6 DYNAMIC ROUTES

This kind of routes is assigned to the system either by a routing-protocol (RIP, BGP) or through a device configuration protocol (DHCP, PPP). In the output of the show route command they are flagged with a D. A dynamic-route is active under the same condition as a static-route.

13.7 SHOW ROUTES

Execution of show running-config command only displays the static-routes which have been added to the system. Neither dynamic-routes nor system-routes are shown there. To get an overview of all routes actually known by the system the show route command has to be executed.

Mode: Operator execution

Step	Command	Purpose
1	[device]#show route [*<details>*]	Displays route information Default: 0

Output:

```
Routing Tables
===============================================
Flags: C - dhCp, D - Dynamic, G - use Gateway, H - target is a host
       R - useR, U - route is Up, S - System

Routing Table DEFAULT, ID = 254
Destination         Gateway             Flags Metric Interface     Source
172.16.32.0/19                          SU    0      WAN           172.16.45.7
30.30.30.0/24       172.16.45.4         RU    0
172.16.32.0/19                          SU    0      WAN           172.16.60.7
0.0.0.0/0           172.16.32.1         CDGU  0                    eth0
```

13.8 BASIC STATIC ROUTING EXAMPLE

The picture below shows an Internetwork consisting of three routers, an LB52XA-R2 in the middle, and the four autonomous networks, with network addresses 10.1.5.0/16, 172.16.40.0/24, 172.17.100.0/24 and 10.2.5.0/16. The LB52XA-R2 shall be configured for the following IP routing scenario:

All packets for the Workstation with IP address 10.1.5.10 shall be forwarded to the next-hop router Calvin. All packets for network 10.2.5.0/16 shall be forwarded to the next-hop router Hobbes.

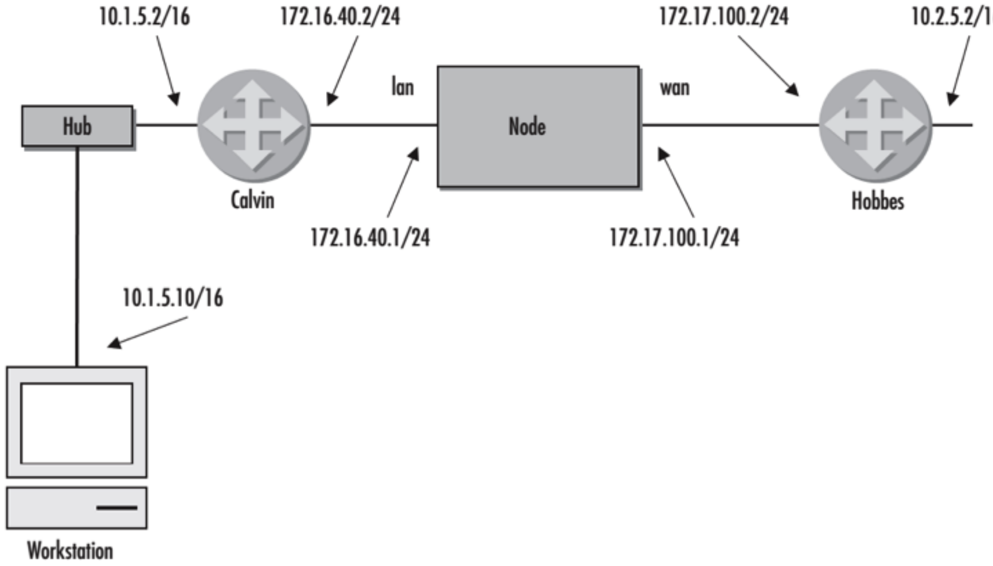


Figure 24 Static route example

Example Configuration:

```
context ip ROUTER

  routing-table DEFAULT
    route 10.1.5.10/32 gateway 172.16.40.2 metric 0
    route 10.2.0.0/16 gateway 172.17.100.2 metric 0
```

Show Route Output:

```
Routing Tables
===============================================
Flags: C - dhCp, D - Dynamic, G - use Gateway, H - target is a host
       R - useR, U - route is Up, S - System

Routing Table DEFAULT, ID = 254
Destination         Gateway             Flags Metric Interface     Source
172.16.40.0/24                          SU    0      LAN           172.16.40.1
172.17.100.0/24                         SU    0      WAN           172.17.100.1
10.1.5.10/32        172.16.40.2         RU    0
10.2.0.0/16         172.17.100.2        RU    0
```

14 SNMP CONFIGURATION

Chapter contents

14.1 INTRODUCTION

This chapter provides overview information about Simple Network Management Protocol (SNMP) and describes the tasks used to configure those of its features supported.

This chapter includes the following sections:

- Simple Network Management Protocol (SNMP)
- SNMP tools (see page 95)
- SNMP configuration task list (see page 95)
- Using the ManageEngine SNMP utilities (see page 99)
- Standard SNMP version 1 traps (see page 103)

14.2 SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)

The Simple Network Management Protocol (SNMP) is an application-layer protocol that facilitates the exchange of management information between network devices. It is part of the Transmission Control Protocol/Internet Protocol (TCP/IP) suite. SNMP enables network administrators to manage network performance, find and solve network problems, and plan for network growth.

14.2.1 SNMP BASIC COMPONENTS

An SNMP managed network consists of three key components: managed devices, agents, and network-management systems (NMSs).

A managed device is a network SN that contains an SNMP agent and resides on a managed network. Managed devices collect and store management information and make this information available to NMSs using SNMP. Managed devices, sometimes called network elements, can be routers and access servers, switches and bridges, hubs, computer hosts, or printers.

An agent is a network-management software module that resides in a managed device. An agent has local knowledge of management information and translates that information into a form compatible with SNMP.

An NMS executes applications that monitor and control managed devices. NMSs provide the bulk of the processing and memory resources required for network management. One or more NMSs must exist on any managed network.

14.2.2 SNMP BASIC COMMANDS

Managed devices are monitored and controlled using four basic SNMP commands: read, write, trap, and traversal operations.

- The read command is used by an NMS to monitor managed devices. The NMS examines different variables that are maintained by managed devices.
- The write command is used by an NMS to control managed devices. The NMS changes the values of variables stored within managed devices.
- The trap command is used by managed devices to asynchronously report events to the NMS. When certain types of events occur, a managed device sends a trap to the NMS.
- Traversal operations are used by the NMS to determine which variables a managed device supports and to sequentially gather information in variable tables, such as a routing table.

14.2.3 SNMP MANAGEMENT INFORMATION BASE (MIB)

A Management Information Base (MIB) is a collection of information that is organized hierarchically. MIBs are accessed using a network-management protocol such as SNMP. They are comprised of managed objects and are identified by object identifiers.

Managed objects are accessed via a virtual information store, termed the Management Information Base or MIB. Objects in the MIB are defined using the subset of abstract syntax notation one (ASN.1) defined in the SMI. In particular, an *object identifier*, an administratively assigned name, names each object type. The object type together with an object instance serves to uniquely identify a specific instantiation of the object. For human convenience, a textual string, termed the descriptor, to refer to the object type, is often used.

An object identifier (OID) world-wide identifies a managed object in the MIB hierarchy. The MIB hierarchy can be depicted as a tree with a nameless root, the levels of which are assigned by different organizations.

14.2.4 NETWORK MANAGEMENT FRAMEWORK

This section provides a brief overview of the current SNMP management framework. An overall architecture is described in RFC 2571 “An Architecture for Describing SNMP Management Frameworks.” The SNMP management framework has several components:

- Mechanisms for describing and naming objects and events for the purpose of management. The first version, Structure of Management Information (SMIv1) is described in RFC 1155 “Structure and Identification of Management Information for TCP/IP-based Internets,” RFC 1212 “Concise MIB Definitions,” RFC 1213 “Management Information Base for Network Management of TCP/IP-based Internets: MIB-II,” and RFC 1215 “A Convention for Defining Traps for use with the SNMP.” The second version, SMIv2, is described in RFC 2233 “The Interfaces Group MIB using SMIv2,” RFC 2578 “Structure of Management Information Version 2 (SMIv2),” RFC 2579 “Textual Conventions for SMIv2,” and RFC 2580 “Conformance Statements for SMIv2.”
- Message protocols for transferring management information. The first version, SNMPv1, is described in RFC 1157 “A Simple Network Management Protocol (SNMP).” The second version, SNMPv2, which is not an Internet standards track protocol, is described in RFC 1901 “Introduction to Community-Based SNMPv2” and RFC 1906 “Transport Mappings for Version 2 of the Simple Network Management Protocol (SNMPv2).”
- Protocol operations for accessing management information. The first set of protocol operations and associated protocol data unit (PDU) formats is described in RFC 1157. The second set of protocol operations and associated PDU formats is described in RFC 1905 “Protocol Operations for Version 2 of the Simple Network Management Protocol (SNMPv2).”
- A set of fundamental applications described in RFC 2573 “SNMP Applications” and the view-based access control mechanism described in RFC 2575 “View-Based Access Control Model (VACM) for the Simple Network Management Protocol (SNMP).”

14.3 IDENTIFICATION OF AN LB52XA-R2 VIA SNMP

All product models have assigned sysObjectID.

Refer to the getting started guide of your product, or see the MIB definition file (.my) for sysObjectIDs.

IMPORTANT

The SNMP agent running in the OS is SNMP version 1 (SNMPv1) and SNMP version 2 (SNMPv2) compliant. SNMP version 3 (SNMPv3) is not currently supported.

14.4 SNMP TOOLS

Black Box recommends the ManageEngine.

Refer to section “Using the ManageEngine SNMP Utilities” on page 99 for more detailed information on how to use these tools.

14.5 SNMP CONFIGURATION TASK LIST

To configure SNMP, perform the tasks described in the following sections. The tasks in the first three sections are required; the tasks in the remaining sections are optional, but might be required for your application.

- Setting basic system information (required) (see page 95)
- Setting access community information (required) (see page 97)
- Setting allowed host information (required) (see page 98)
- Specifying the default SNMP trap target (optional) (see page 98)
- Displaying SNMP related information (optional) (see page 99)

14.6 SETTING BASIC SYSTEM INFORMATION

The implementation of the MIB-II system group is mandatory for all systems. By default, an SNMP agent is configured to have a value for any of these variables and responds to get commands from a NMS.

The following MIB II panels should be set:

- sysContact
- sysLocation
- sysName

The system sysContact object is used to define the contact person, together with information on how to contact that person.

Assigning explanatory location information to describe the system physical location (e.g. server room, wiring closet, 3rd floor, etc.) is very supportive. Such an entry corresponds to the MIB II system sysLocation object.

The name used for sysName should follow the rules for ARPANET host names. Names must start with a letter, end with a letter or digit, and have as interior characters only letters, digits, and hyphens. Names must be 63 characters or fewer. For more information, refer to RFC 1035.

This procedure describes how to set these MIB-II system group objects.

Mode: Administrator execution

Step	Command	Purpose
1	***device*(cfg)#system contact** *name*	Sets the contact persons name
2	***device*(cfg)#system location** *location*	Sets the system location
3	***device*(cfg)#system hostname** *hostname*	Sets the system hostname and command line prompt

If any of the command options *name*, *location*, or *hostname* has to be formed out of more than one word, the information is put in “double quotes”.

Note Enter an empty string “” to get rid of any of the system settings.

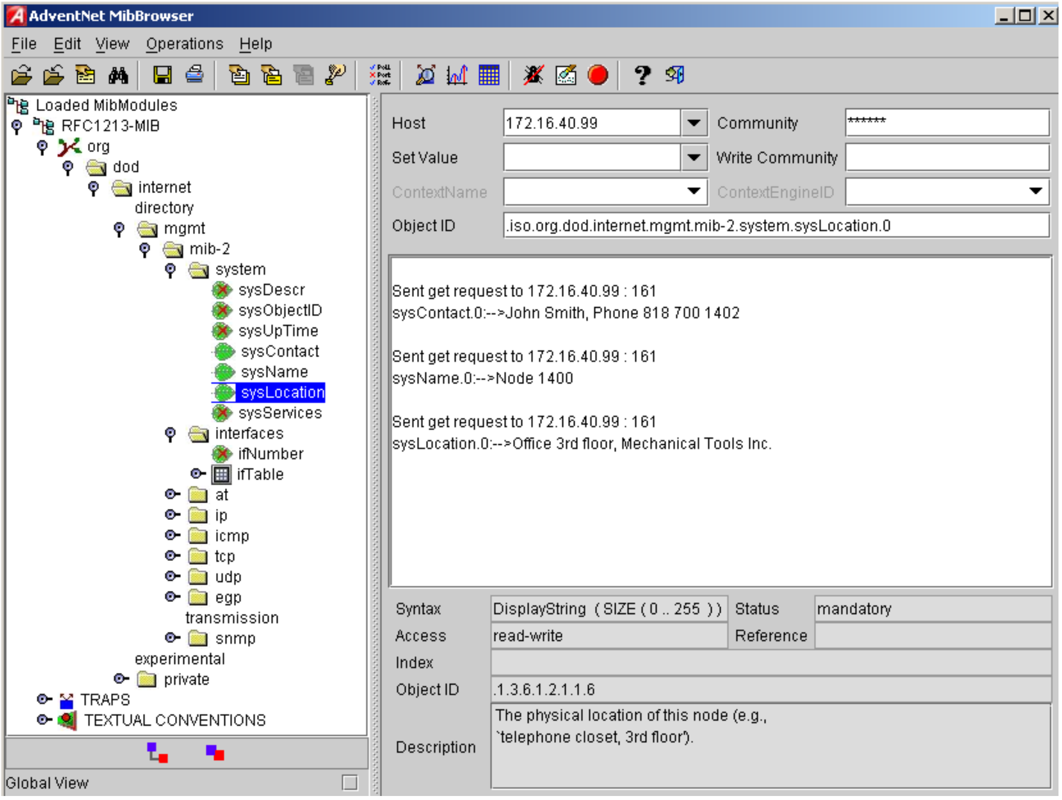
The MIB-II system group values are accessible for reading and writing via the following SNMP objects:

- .iso.org.dod.internet.mgmt.mib-2.system.sysContact
- .iso.org.dod.internet.mgmt.mib-2.system.sysName
- .iso.org.dod.internet.mgmt.mib-2.system.sysLocation

After setting these values according to 1 through 3 any SNMP MIB browser application should read the values using a get or get-next command as shown in figure 25.

The procedure to use the SNMP MIB browser is:

- Enter the community string public into the Community field in the upper right corner of the window. For safety reasons each entered character is displayed with a “*”.
- Access any of the supported MIB system group object by using the GetNext button from the button bar of the window.



Host 172.16.40.99 Community ******

Set Value Write Community

ContextName ContextEngineID

Object ID .iso.org.dod.internet.mgmt.mib-2.system.sysLocation.0

```
Sent get request to 172.16.40.99 : 161
sysContact.0:-->John Smith, Phone 818 700 1402

Sent get request to 172.16.40.99 : 161
sysName.0:-->Node 1400

Sent get request to 172.16.40.99 : 161
sysLocation.0:-->Office 3rd floor, Mechanical Tools Inc.
```

Syntax DisplayString (SIZE (0 .. 255)) Status mandatory

Access read-write Reference

Index

Object ID .1.3.6.1.2.1.1.6

Description The physical location of this node (e.g., `telephone closet, 3rd floor').

Figure 25 ManageEngine MibBrowser displaying some of the System Group objects

Example: Setting the system group objects

In the following example the system information is set for later access via SNMP. See figure 25 for a typical MIB browser application accessing these MIB-II system group objects representing the system information.

```
device>enable
device#configure
device(cfg)#system contact "Bill Anybody, Phone 818 700 1504"
device(cfg)#system location "Wiring Closet, 3rd floor"
device(cfg)#system hostname "device"
(cfg)#
```

After entering a host name the prompt on the CLI no longer displays the IP address of the Ethernet port over which the Telnet session is running but shows the newly entered host name.

14.7 SETTING ACCESS COMMUNITY INFORMATION

SNMP uses one or more labels called *community strings* to delimit groups of *objects* (variables) that can be viewed or modified on an LB52XA-R2. The SNMP data in such a group is organized in a tree structure called a Management Information Base (MIB). A single device may have multiple MIBs connected together into one large structure, and various community strings may provide read-only or read-write access to different, possibly overlapping portions of the larger data structure. An example of a read-only variable might be a counter showing the total number of octets sent or received through an interface. An example of a read-write variable might be the speed of an interface, or the hostname of an LB52XA-R2.

Community strings also provide a weak form of access control in earlier versions of SNMP version 1 and 2. SNMP version 3 provides much improved access control using strong authentication and should be preferred over SNMP version 1 and 2 wherever it is supported. If a community string is defined, then it must be provided in any basic SNMP query if the requested operation is to be permitted by the LB52XA-R2. Community strings usually allow read-only or read-write access to the LB52XA-R2. In some cases, a given community string will be limited to one group of read-only or read-write objects described in an individual MIB.

In the absence of additional configuration options to constrain access, knowledge of the single community string for the LB52XA-R2 is all that is required to gain access to all objects, both read-only and read-write, and to modify any read-write objects.

Note Security problems can be caused by unauthorized individuals possessing knowledge of read-only community strings so they gain read access to confidential information stored on an affected device. Worse can happen if they gain access to read-write community strings that allow unauthorized remote configuration of affected devices, possibly without the system administrators being aware that changes are being made, resulting in a failure of integrity and a possible failure of LB52XA-R2 availability. To prevent these situations, define community strings that only allow read-only access to the MIB objects should be the default.

Choosing community names is like choosing a password. Do not use easily guessed ones; do not use commonly known words, mix letters and other characters, and so on. If you do not intend to allow anyone to use SNMP write commands on your system, then you probably only need one community name.

This procedure describes how to define your own SNMP community.

Mode: Configure

Step	Command	Purpose
1	*device*(cfg)#snmp community *name* { ro | rw }	Configures the SNMP community name with read-only or read/write access

Use the no command option to remove a SNMP community setting.

Example: Setting access community information

In the following example the SNMP communities for the default community public with read-only access and the undisclosed community Not4evEryOne with read/write access are defined. Only these valid communities have access to the information from the SNMP agent.

```
device(cfg)#snmp community public ro
device(cfg)#snmp community Not4evEryOne rw
```

Note If no community is set on the LB52XA-R2, accessing any of the MIB objects is not possible!

14.8 SETTING ALLOWED HOST INFORMATION

If a host has to access SNMP MIB objects on the LB52XA-R2, it explicitly needs the right to access the SNMP agent. Therefore a host needs an entry, which allows accessing the LB52XA-R2. The host is identified by its IP address and has to use a certain community string for security precautions.

Note The community which is to be used as security name to access the MIB objects has to be defined prior to the definition of allowed hosts.

This procedure describes adding a host that is allowed to access the MIB of this system.

Mode: Configure

Step	Command	Purpose
1	***device*(cfg)#snmp host** *IP-address-of-device* **security-name** *community*	Configures a host that with IP address *IP-address-of-device* can access the MIB, using the security name *community*.

Use the no command option to remove a SNMP allowed host setting.

Example: Setting allowed host information

In the following example the host with IP address *172.16.224.45* shall be able to access the MIB using community *public* as security name.

```
device(cfg)#snmp host 172.16.224.45 security-name public
```

14.9 SPECIFYING THE DEFAULT SNMP TRAP TARGET

An SNMP trap is a message that the SNMP agent sends to a network management station. For example, an SNMP agent would send a trap when an interface's status has changed from up to down. The SNMP agent must know the address of the network management station so that it knows where to send traps. It is possible to define more than one SNMP trap target.

The SNMP message header contains a *community* field. The SNMP agent uses a defined community name, which is inserted in the trap messages header sent to the target. In most cases the target is a NMS, which only accepts a SNMP message header of a certain community.

This procedure describes how to define a SNMP trap target and enter community name.

Mode: Configure

Step	Command	Purpose
1	***device*(cfg)#snmp target** *IP-address-of-device* **security-name** *community*	Configures a SNMP trap target with IP-address-of-host-name *device* that receives trap messages using the security name *community* on the target.

Use the no command option to remove s SNMP trap target setting.

Example: Specifying the default SNMP trap target

In the following example the NMS running on host with IP address 172.16.224.44 shall be defined as SNMP trap target. Since the NMS requires that SNMP message headers have a community of *Not4evEry-One* the security-name argument is set accordingly.

```
device(cfg)#snmp target 172.16.224.44 security-name Not4evEryOne
```

14.10 DISPLAYING SNMP RELATED INFORMATION

Displaying the SNMP related configuration settings is often necessary to check configuration modifications or when determining the behavior of the SNMP agent.

This procedure describes how to display information and configuration settings for SNMP.

Mode: Configure

Step	Command	Purpose
1	*device*(cfg)#show snmp	Displays information and configuration settings for SNMP

Example: Displaying SNMP related information

This example shows how to display SNMP configuration information.

```
device(cfg)#show snmp

 Hosts:
   172.16.224.44 security-name public

 Targets:
   172.16.224.44 security-name Not4evEryOne

 Communities:
   public access-right ro
   Not4evEryOne access-right rw
```

14.11 USING THE MANAGEENGINE SNMP UTILITIES

The ManageEngine SNMP utilities are a set of cross-platform applications and applets for SNMP and Web-based network management. These utilities can be used for device, element, application and system management. The following tools are the most useful:

- MibBrowser—used to view and operate on data available through a SNMP agent on a managed LB52XA-R2
- TrapViewer—used to parse and view the received traps

The ManageEngine is a complete SNMP MibBrowser that enables the loading of MIBs, MIB browsing, walking a MIB tree, searching MIBs and performing all other SNMP-related functions to users.

Viewing and operating the data available through an SNMP agent on a managed device, e.g. a router, switch, hub etc., is made possible by using the MibBrowser.

The TrapViewer is a graphical tool to view the Traps received from one or more SNMP agents. The Trap viewer can listen to one or more port at a time and the traps can be sent from any host. Moreover the TrapViewer contains a Trap parser editor, which is a tool to create a trap parser file. The Trap viewer parses the file created using Trap parser editor to match each incoming traps with certain criteria. Since Traps typically contain cryptic information, which is not easily understandable to the users, trap parsers are required to translate or parse traps into understandable information.

14.11.1 USING THE MIBBROWSER

Figure 26 on page 100 depicts the primary window of the ManageEngine MibBrowser. It consists of a menu bar, a toolbar, a left frame and a right frame.

The operations that can be performed by the MibBrowser are available in a series of buttons in the toolbar on top of the MibBrowser's main window. The toolbar can be hidden or made visible using the options available.

The menu bar has various options that perform the same operations as the options available in the toolbar.

The left frame holds the MIB tree. A MIB tree is a structure through which all the MIBs loaded can be viewed. The MIB tree component enables us to traverse through the tree, view the loaded MIBs and learn the definition for each SN. The ManageEngine MibBrowser allows loading additional MIB files in the text format (the “my” file contains enterprise specific MIB definitions).

The right frame has labeled text fields to specify the basic parameters like host, community etc. and a Result text area display to view the results.

There are three ways in which the primary window of the MibBrowser can be viewed. It can be viewed with the result display, MIB description panel or multi-variable bind panel in the right frame. The view can be altered in three ways.

- The desired view can be set by the options provided in the display menu item under the view menu. (View → Display →).
- The other way of altering the view is through the general settings panel in the settings menu item in the edit menu. (Edit → Settings)
- The same can be done through clicking the MibBrowser settings button on the toolbar. See figure 26.

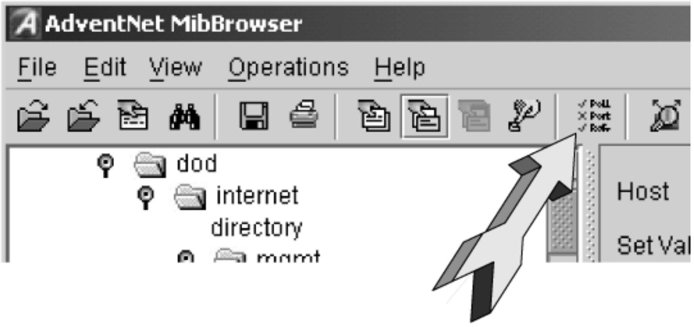


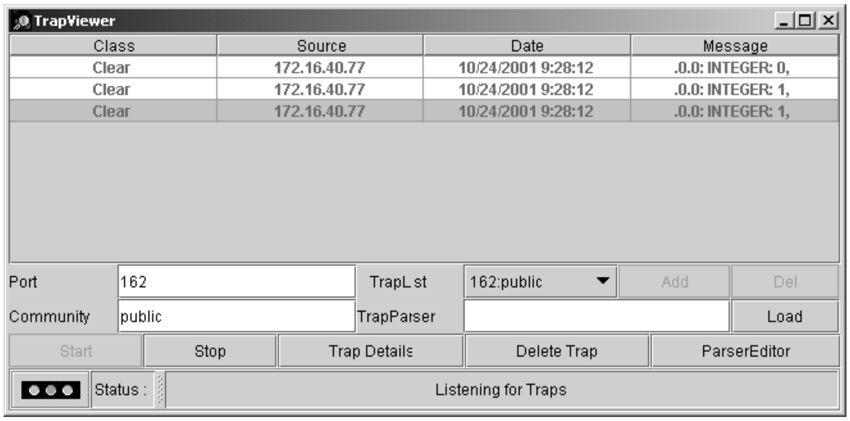
Figure 26 ManageEngine MibBrowser Settings Button on the Toolbar

By default the MIB description display and the result display are visible in the MibBrowser.

14.11.2 USING THE TRAPVIEWER

TrapViewer is a graphical tool to view the traps received from one or more SNMP agents. The TrapViewer can listen to one or more port at a time and the traps can be sent from any host.

Invoke the TrapViewer through the usage of the MibBrowser. To get to know more about the MibBrowser refer to section “Using the MibBrowser” on page 100. Figure 27 is a screen shot of the TrapViewer.



Class	Source	Date	Message
Clear	172.16.40.77	10/24/2001 9:28:12	.0.0: INTEGER: 0,
Clear	172.16.40.77	10/24/2001 9:28:12	.0.0: INTEGER: 1,
Clear	172.16.40.77	10/24/2001 9:28:12	.0.0: INTEGER: 1,

Port 162

TrapList 162:public

Community public

TrapParser

Status : Listening for Traps

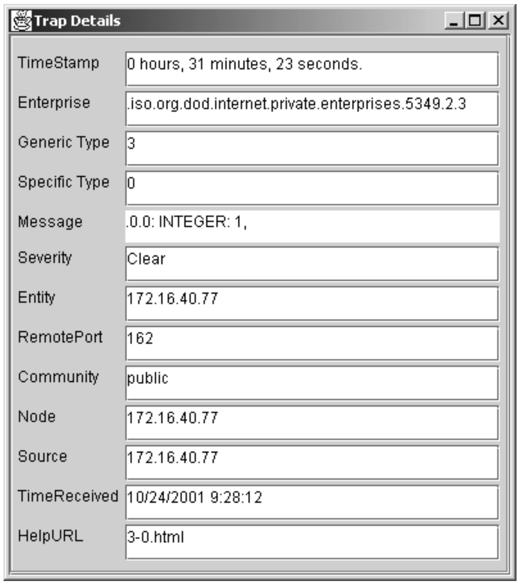
Figure 27 ManageEngine TrapViewer displaying received traps

The TrapViewer has a table that displays the trap information, the common parameters text fields where necessary information has to be entered and other options such as Start, Stop, Trap Details, Delete Trap and ParserEditor.

Follow these steps to work on the Trap Viewer and to know more about the available options:

- By default the value in the *Port* text field is 162. Enter the desired port in the field on which the viewer will listen.
- The default value in the *Community* text field is public. Set the community of the incoming traps as desired, depending on the SNMP configuration.
- Click on *Add* button to add the port and community list on which the trap has to listen to. This is visible in the *TrapList* combo box.
- The port and community list can be deleted by clicking on the *Del* button.
- When you need to load a trap parser file, click on the *Load* button, which will open up a dialog box, from which you can load the parser file.
- In order to receive the traps now, click on the *Start* button. Upon clicking this button, TrapViewer begins to receive traps according to the as-specified port and community.
- Once received, the traps are listed in the trap table of the TrapViewer. By default, the trap table has the following four columns:
  - *Class* that defines the severity of the trap.
  - *Source* that displays the IP address of the source from where the traps were sent.
  - *Date* that shows the date and time when the trap was received.
  - *Message* that by default has the object identifier format (sequence of numeric or textual labels on the SNs along a path from the root to the object) of the trap if any, or it is blank.

- The details of the traps can be viewed by clicking the *Trap Details* button or right click the trap in the trap table and select the option *View Trap Details*. figure 28 show the screen of such a trap details window.



TimeStamp: 0 hours, 31 minutes, 23 seconds.
Enterprise: .iso.org.dod.internet.private.enterprises.5349.2.3
Generic Type: 3
Specific Type: 0
Message: .0.0: INTEGER: 1,
Severity: Clear
Entity: 172.16.40.77
RemotePort: 162
Community: public
Node: 172.16.40.77
Source: 172.16.40.77
TimeReceived: 10/24/2001 9:28:12
HelpURL: 3-0.html

Figure 28 ManageEngine Trap Details window of TrapViewer

The various details available in the Trap Details window are listed in table 2:

Table 2. Details available in the Trap Details window

Trap Details	Description
TimeStamp	The TimeStamp is a 32-bit unsigned value indicating the number of hundredths-of-a-second that have elapsed since the (re)start of the SNMP agent and the sending of the trap. This field shows the value stored in the MIB-II sysUpTime variable converted into hours, minutes and seconds.
Enterprise	This field shows the OID of the management enterprise that defines the trap message. The value is represented as an OBJECT IDENTIFIER value and has a variable length.
Generic Type	The Generic type value is categorized and numbered 0 to 6. They are 0-coldStart, 1-warmStart, 2-linkDown, 3-linkUp, 4-authenticationFailure, 5-egpNeighborLoss. The trap type value 6 is identified as enterprise-specific value. This field shows the value based on the type of trap.
Specific Type	The specific trap type indicates the specific trap as defined in an enterprise-specific MIB. If the Generic type value is 6, then this field shows a value greater than 0. If the generic type value is a value other than 6, then the field shows a value 0. This field can have values from 0 to 2147483647.
Message	This is a text field. By default, this field will always contain the Varbinds in the Trap PDU. This can be substituted with text.
Severity	This field shows the Severity or the intensity of the trap. They could be 0-All, 1-Critical, 2-Major, 3-Minor, 4-warning, 5-Clear and 6-info.
Entity	The source IP address from which the Trap was sent is displayed here.
RemotePort	This field reveals the port on which the Trap was sent by the originator.
Community	The Community string is displayed here.
device	Source
TimeReceived	This displays the Date and Time when the trap was received.

Table 2. Details available in the Trap Details window (Continued)

Trap Details	Description
HelpURL	The URL shown here gives more details of the received trap. By default, the URL file name is <generic-type value> - <specific-type value>.html

You can stop the listening by clicking the *Stop* button.

When you need to delete the trap, select the trap to be deleted and click the *Delete Trap* button or right click on the trap in the trap table and select option *Delete the Selected Rows*.

Yet another option in the Trap Viewer is the *ParserEditor*. The TrapViewer can filter incoming traps according to certain criteria called the parser criteria. The configuration of the criteria is made possible by using the parser editor. Refer to the ManageEngine SNMP Utilities documentation for a detailed description of the parser editor configuration and its use.

14.12 STANDARD SNMP VERSION 1 TRAPS

The following standard SNMP version 1 traps are supported. The descriptions are taken from RFC 1215 “Convention for defining traps for use with the SNMP”.

```
warmStart TRAP-TYPE
ENTERPRISE snmp
DESCRIPTION
"A warmStart trap signifies that the sending protocol entity is reinitializing
    itself such that neither the agent configuration nor the protocol entity imple-
    mentation is altered."
::= 1

linkDown TRAP-TYPE
ENTERPRISE snmp
VARIABLES   { ifIndex }
DESCRIPTION
"A linkDown trap signifies that the sending protocol entity recognizes a failure in
    one of the communication links represented in the agent's configuration."
::= 2
```

Note The linkDown trap is not sent if any of the ISDN ports has gone down.

```
linkUp TRAP-TYPE
ENTERPRISE snmp
VARIABLES   { ifIndex }
DESCRIPTION
"A linkUp trap signifies that the sending protocol entity recognizes that one of
    the communication links represented in the agent's configuration has come up."
::= 3
```

Note The linkUp trap is not sent if any of the ISDN ports has come up.

```
authenticationFailure TRAP-TYPE
ENTERPRISE snmp
DESCRIPTION
"An authenticationFailure trap signifies that the sending protocol entity is the
    addressee of a protocol message that is not properly authenticated. While
    implementations of the SNMP must be capable of generating this trap, they must
    also be capable of suppressing the emission of such traps via an implementa-
    tion-specific mechanism."
```

```
::= 4
```

Note The authenticationFailure trap is sent after trying to access any MIB object with a SNMP community string, which does not correspond to the system setting.

```
coldStart TRAP-TYPE
ENTERPRISE snmp
DESCRIPTION
"A coldStart trap signifies that the sending protocol entity is reinitializing
    itself such that the agent's configuration or the protocol entity implementa-
    tion may be altered."
::= 0
```

Note The standard SNMP version 1 trap coldStart as listed below is *not* supported. After powering up, a warmStart trap message is sent if any trap target host is defined.

14.13 SNMP INTERFACE TRAPS

The LB52XA-R2 sends Interface Traps (*linkUp*, *linkDown*) when the status of logical or physical interfaces change. Logical interfaces are interfaces defined in the IP context and CS context. Physical interfaces are ports.

The LB52XA-R2 adds an entry to event log for each Interface Traps it sends:

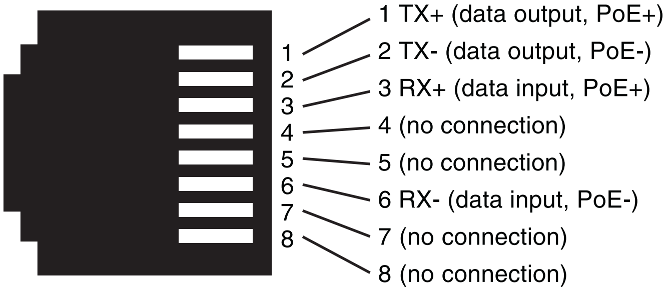
```
device(cfg)#show log event

...
2002-09-06T14:54:35 : LOGINFO  : Link up on interface sip_60.
2002-09-06T14:54:35 : LOGINFO  : Link up on interface sip_30.
2002-09-06T14:54:35 : LOGINFO  : Link up on interface isdn20.
2002-09-06T14:54:38 : LOGINFO  : Link up on interface ETH00.
2002-09-06T14:54:38 : LOGINFO  : Link up on interface ETH01.
2002-09-06T14:54:39 : LOGINFO  : Link up on interface eth00.
2002-09-06T14:54:39 : LOGINFO  : Link up on interface eth01.
2002-09-06T14:56:02 : LOGINFO  : Link up on interface SLOT2:00 ISDN D
2002-09-10T14:21:20 : LOGINFO  : Link down on interface SLOT2:00 ISDN
...
```

A Specifications

Chapter contents

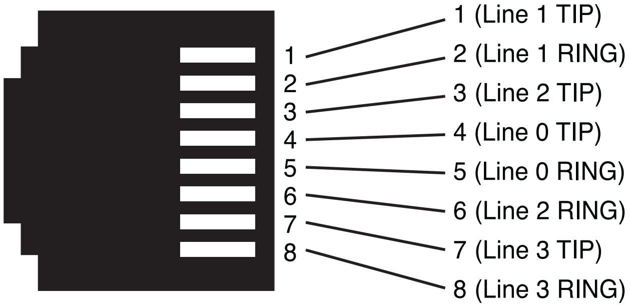
A.1 LAN CONNECTION

Four RJ-45, 10/100Base-T, IEEE 802.3 Ethernet



A.1.1 LINE CONNECTION

RJ-45



A.2 LINE RATE AND DISTANCE

A.2.1 LINE RATE

Up to 60 Mbps asymmetrical

A.2.2 DISTANCE

Approximately 34,000 ft (10.4km)

Line Rate	K Feet	Miles	km
192K	33972	6.4	10.4
512K	33188	6.3	10.1
1024K	29453	5.6	9.0
2048K	23332	4.4	7.1
4096K	16093	3.0	4.9
5696K	12098	2.3	3.7
8192K	9710	1.8	3.0
15296K	3844	0.7	1.2

Note As a rule of thumb, when using the LB524A-R2 (2 pair/4 wire) extender, a user can expect 30.6 Mbps at 3,844 feet. The LB528A-R2 (4 pair/8 wire) extender can reach 61.2 Mbps at 3,844 feet.

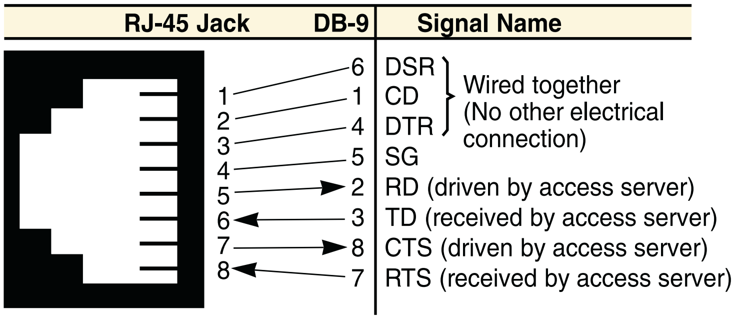
A.3 LED STATUS INDICATORS

Power, Local and Remote—Green

Ethernet—Link (Green) and Activity (Flashing Green)

A.4 CONSOLE

RJ-45


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

A.5 POWER SUPPLY

A.5.1 EXTERNAL AC

100 to 240 VAC

Power consumption: 750mA (7 Watts); 400mA at 12 VDC

A.5.2 EXTERNAL DC

-12 VDC, -24 VDC and -48 VDC

Power consumption—400mA at 12 VDC

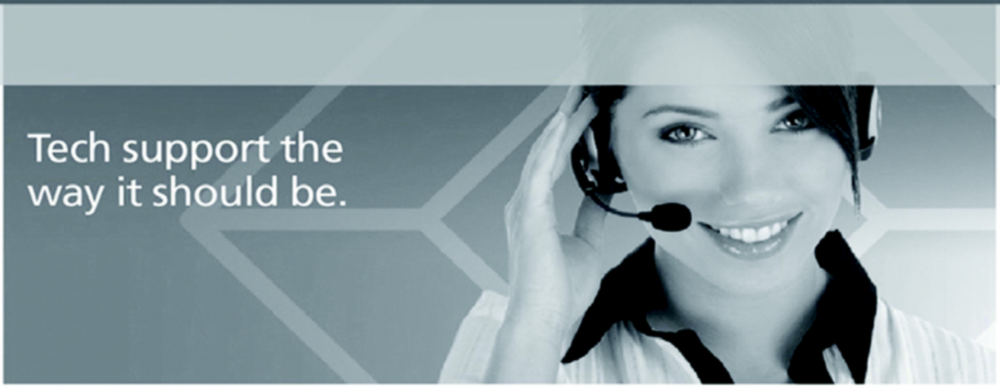
A.6 PHYSICAL

Dimensions: 8.0 x 6.72 x 2.09 inch (203.2 x 170.76 x 53.09mm)

Operating temperature: 32–122°F (0–50°C)

Humidity: 5 to 95% non-condensing

Black Box Tech Support: FREE! Live. 24/7.



Great tech support is just 60 seconds away at
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