

PRI (T1/E1) ISDN Simulators



This user manual is applicable to the following products:
SIM-2PRI, SIM-2PRI-PCI, SIM-4PRI, SIM-8PRI, MOD-2PRI



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5.1. Upgrading PRI firmware 11

1. Chapter 1: Important information

1.1 General Disclaimer

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1.4 Patent Information

The accompanying product is protected by one or more U.S. and foreign patents and patents pending held by Virtual Console, LLC

1.5 Warranty

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The warranty is limited to the original purchaser and is not transferable. Any liability of Virtual Console or its suppliers with respect to the product or the performance thereof under any warranty, negligence, strict liability or other theory will be limited exclusively to product repair or replacement as provided above.

Except for the foregoing, the product is provided "as is" without warranty of any kind including without limitation, any warranty of merchantability or fitness for a particular purpose.

The entire risk of the quality and performance of the software programs contained in the system is with you.

1.6 Limitation of Remedies and Damages

Virtual Console, LLC, its agents, employees, suppliers, dealers and other authorized representatives shall not be responsible or liable with respect to the product or any other subject matter related thereto under

any contract, negligence, strict liability or other theory for any indirect, incidental, or consequential damages, including, but not limited to loss of information, business, or profits. The law of certain states or nations does not permit limitation or exclusion of implied warranties and consequential damages, so the above limitations, disclaimers, or exclusion may not apply to you. This warranty gives you special legal rights. You may also have other rights that vary by state and nation.

1.7 Important Safeguards

Read and understand the following instructions before using the system:

Close supervision is necessary when the system is used by or near children.
Do not leave unattended while in use.

Always disconnect the system from power before cleaning and servicing and when not in use.

Do not spray liquids directly onto the system when cleaning.
Always apply the liquid first to a static free cloth.

Do not place this product onto unstable desk, cart or table.
The product may fall causing serious damage to the product.

Do not immerse the system in any liquid or place any liquids on it.

Do not disassemble this system (except as instructed in the manufacturer's instructions).
To reduce the risk of shock and to maintain the warranty on the system, a qualified technician must perform service or repair work.

Connect this appliance to a grounded outlet.

Connect the system only to surge protected power outlets.

Keep ventilation openings free of any obstructions.

Unplug this product from the wall outlet and refer servicing to qualified service personnel under the following conditions:

1. When the power supply adapter or plug is damaged or frayed.
2. If liquid has been spilled into the product.
3. If the product has been exposed to rain or water.
4. If the product has been dropped or the enclosure has been damaged.
5. If the product exhibits a distinct change in performance.

SAVE THESE INSTRUCTIONS

2. Chapter 2: Introduction. Overview of PRI simulators

2.1. Functional Overview

PRI (Primary Rate Interface) simulator provides digital call switching services eliminating the expense of real PRI lines for testing or demonstrating of the devices that require ISDN PRI line. PRI Simulator gives an access to rich set of configurable parameters from electrical to line impairments making it a valuable tool for telecom designers and developers.

PRI simulator comes with 2, 4 or 8 ports (depends on the model) and allows interconnection of 2, 4 or 8 PRI CPE devices, such as routers, RAS servers, VoIP gateways, H.320 ISDN Video-conferencing equipment, and Digital Fax servers as if they were connected through real ISDN network.

2.2. DB9 port (Console Port)

DB9 port on ISDN Simulator provides communication between simulator and Win32 Management application (ISDN Manager). DB9 port has to be connected to a COM port on your PC via standard RS-232 straight cable.

COM port has to be configured with the following settings:

Baud rate:	115200 bps
Stop bits:	1
Data Bits:	8
Parity:	None

2.3. Power Adapter

ISDN simulator is shipped with an AC or DC power adapter with a 2.5mm output jack. Please be aware that power adapter can get warm during normal operation and require proper ventilation to operate. Do not block airflow to and from power adapter.

Power adapter can be anything from 9V to 20V AC or DC with a minimum of 500mA current rating.

2.4. ISDN Manager

Standard ISDN simulator kit includes a floppy or CD with Win32 ISDN Manager application.

ISDN Manager is the only way of configuring ISDN simulator.

ISDN Manager is a Win32 application that can be installed on the following operating systems: Windows 2000 and XP.

2.5. Typical applications for ISDN simulator.

Typical applications for PRI ISDN simulator includes cisco router interconnection for data or voice calls, Digital PBX trunk simulation, digital Fax server interconnection, conversion of PRI-T1 to PRI-E1, use in conjunction with Bulk Call Generators and many more..

3. Chapter 3: Getting started with ISDN Simulator

3.1. Connecting ISDN simulator to a PC

After unpacking your ISDN simulator, connect DB9 port on a simulator to a COM port on your PC with a standard RS-232 cable. Cable is provided with every simulator.

3.2. Powering up ISDN simulator

Make sure that Power switch is in OFF position.

Connect power adapter to a power jack on a simulator labeled "Power"

Turn ON the power switch on simulator. If power is present you should see a Green LED light up on the front panel of simulator.

If power LED is turned RED, please contact technical support as it indicates a hardware error.

3.3. Installing ISDN Manager software

Install ISDN Manager application from the floppy or CD which came with a simulator kit.

ISDN Manager requires 2MB of free space on your hard drive and can be installed on any Windows platform.

By default ISDN Manager is configured to use a COM port 1 to connect to a simulator.

You can change COM port number in ISDN Manager if you wish to use different port.

To change COM port go to "Main menu -> Settings -> COM port Selection"

3.4. Connecting PRI devices to simulator

After powering up your simulator you can connect CPE devices with PRI interfaces to simulator and start making calls.

You need to use a straight-through CAT3 or CAT5 twisted-pair cable with RJ-45 connectors.

Note: Simulator is always considered as a PRI Network side, and a CPE device is always considered a PRI User side. You should always use a straight-through cable to connect User Side to Network Side.

In cases when Network side had to be connected to Network side or User side has to be connected to User side you should use a T1/E1 crossover cable.

Please note that T1/E1 crossover cable is different from Ethernet crossover cable and cannot be substituted.

3.5. Placing calls through ISDN Simulator

ISDN Simulator can't originate or terminate calls. It can only switch calls among the ports.

It is CPE's responsibility to generate calls.

Once ISDN simulator receives a call from connected CPE, it performs a called phone number table lookup to determine which outgoing PRI port it should use to forward this call.

Once outgoing PRI port is determined, simulator forwards the SETUP packet out of that port and follows the Q.931 logic to complete the call.

4. Chapter 4: Configuring PRI ports

Using ISDN Manager is the only way of configuring the simulator. Any changes that you make in ISDN Manager do not take an effect until you save the configuration to simulator. Some of the changes can be applied "on the fly" and some requires a reboot of the simulator. ISDN Manger will determine if the Reboot is required and automatically reboot the simulator if needed. Please note that all established calls will be lost if simulator is rebooted.

You can save your simulator's current configuration to a file on the disk by accessing a "Main Menu -> File-> Save Config" interface.

You can load previously saved configuration back to a simulator at any time. This is convenient way of creating multiple configurations for different scenarios.

ISDN Manager includes a set of configuration Tabs for Global (applicable to all ports) and Local (port specific) parameters. The actual set of parameters is based on firmware version and firmware feature set installed and activated on a particular ISDN simulator. Some features are available in "advanced" firmware only and require purchase of firmware or activation code. Consult your local sales office for details.

4.1. Overview of PRI ports

PRI ports support audio/video/data calls switching among any B-channels and support T1 and E1 modes. All PRI ports can be used at a full transfer rate of T1 or E1 interface and support 23 (T1) or 30(E1) simultaneous calls per each PRI port.

ISDN simulator can be configured to act as one of the following PRI switch:

- National NI-2
- 5ESS
- DMS-100
- NET5 (European ETSI)
- Q.SIG

T1 or E1 selection is done on the fly and does not require any hardware upgrades. PRI ports are equipped with a standard RJ45 jack for T1 and balanced E1 connection.

4.2. RJ48/45 pin-out for PRI Ports

ISDN simulator is equipped with a standard RJ45 jacks for PRI ports and connects to a PRI end-devices with straight-through CAT3 or CAT5 twisted pair cable.

Following cable pin-out is being used at the simulator side:

Pin	Description
1	RX Tip
2	RX Ring
3	RX SHIELD
4	TX TIP

5	TX RING
6	TX SHIELD
7	Not used
8	Not used

Note: For connecting ISDN simulator to a Cisco router with a balanced 120-ohm E1/PRI interface with a DB15 connector, you need to use Cisco cable P/N: CAB-E1-PRI/NT

4.3. Integrated LEDs.

Each PRI port has two integrated LEDs: Left LED is Yellow and Right LED is Green. When Yellow (left) LED is ON, it indicates that a Remote (Yellow) alarm is present. When Green (right) LED is ON it indicates that the interface is activated. When Green (right) LED is blinking, it indicates that one or more calls are active on that port.

4.4. Selecting Interface type: T1 or E1

In most cases first step in configuring ISDN Simulator is PRI interface type selection. PRI Ports can be configured as T1 or E1. Default is T1. ISDN simulator does not support fractional operation of PRI ports. Only full rate is supported. To configure interface type go to "Interface configuration" Tab in ISDN Manager.

4.5. Selecting User side or Network side

By default ISDN Simulator act as a telephone company switch hence it has to be configured as Network side. Network side is a default setting for PRI ports.

In some cases you may wish to use simulator as a User side. Please note that User side differs from Network side in RJ45 pin-out so you have to change cabling accordingly. Use T1 crossover cable if you connecting User side to User side Or Network side to Network side. Use straight cable if you connecting User side to Network side

Note: In Bulk Call Generators internal Relay does pin-out adjustment based on Network/User side settings therefore it is not required to use crossover cables in any combination of User/Network sides. ISDN Simulators does not have internal relay so it is your task to use the right cable based on topology.

4.6. Line Code and Framing

There are several different linecodes and framings available for T1 or E1 interfaces

Linecode for T1: AMI, B8ZS
Framing for T1: SF, ESF

Linecode for E1: AMI, HDB3
Framing for E1: CRC4, no-CRC4

Linecode and framing must be identical on CPE and simulator. If you experience a large number of CRC errors, packet loss or connectivity problems, always check linecode and framing first and ensure that it matches on both ends.

4.7. Line build-out

Line build-out ensures signal attenuation compensation for long cable runs. If you connect to a simulator with a cable grater than 100 ft. long, select the appropriate line build-out.

4.8. Clock source

Clock source is the one of the most important parameters in ensuring flawless operation of T1 or E1 lines. ISDN simulator is always configured to supply a clock to connected devices. Configure CPE device to be a clock-slave and use a clock provided by simulator for synchronization purposes.

Note: Bulk Call Generators allows more flexibility in regards to a clock source selection. Bulk Call Generator can be a clock-slave and sync to a clock provided by CPE device. Current models of ISDN simulators can't sync to an external clock.

4.9. Configuring PRI Switch type

ISDN simulator conforms to a different PRI signaling options:

National ISDN 2	(NI-2)
ATT/Lucent 5ESS	(5ESS)
Nortel DMS-100	(DMS-100)
NET5 (Euro ETSI PRI ISDN)	
Q.931 Q.SIG	(Q.SIG)

Please refer to specific standards for detailed information about differences in these switch types.

4.10. Scan Order

"Scan Order" parameter defines the B-channel selection order for outbound calls. When simulator places a call to the CPE device it has to select an outgoing B-channel. If the "ascending" order is configured simulator selects the lowest B-channel available. It selects a highest B-channel if the "descending" order is configured. With a high call rate it is statistically possible that the CPE device and the simulator will try to seize the same B-channel resulting in the event called "glare". To prevent glare from occurring it is recommended that the CPE and the Simulator use different B-channel selection orders.

4.11. Configuring PRI Phone numbers

You can configure up to 30 phone numbers per PRI port on the "Phone numbers" tab in ISDN Manager.

In PRI B-channels are not associated with any particular phone number and being allocated based on "Scan Order" parameter value.

4.12. Simulating Network Delays

To add transmission delays to B-channels, similar to the ones existing in satellite based links, select desired delay timer from 0ms to 500ms in "Options" tab.

Delay applies to B-channels only, and not to D-channel.

Default value is: 0 ms (no delays)

You can configure two independent delay timers for each PRI port.

Rx Delay is the delay for incoming traffic (from CPE device to simulator), Tx Delay is the delay for outgoing traffic (from simulator to CPE)

In scenario when you have two CPE devices communicating via simulator with enabled delays on both PRI ports, the resulting delay for a packet sent from CPE1 to CPE2 will be a sum of all delays on both PRI ports .

4.13. Configuring Load Balancing (Global Tab)

When simulator receives an inbound call it retrieves the Called Number from the Q.931 SETUP packet and performs a global phone table lookup to determine which PRI port it should use for forwarding this call out. By assigning the same phone numbers to multiple PRI ports you can distribute calls made to that phone number among multiple PRI ports. This feature is called Load-Balancing.

Note that load balancing is a PRI port selection policy, and does not affect a B-channel selection process within given PRI port.

There are several slightly different load balancing policies that can be used:

First available among matching - this policy selects the PRI port with a lowest port number and matching phone number.

This policy will result that a PRI port with a lowest port number and matching phone number has to be filled with calls in full before next PRI port with matching number will be used.

The least busiest among matching - this policy will always search for a PRI port with a matching phone number and the least number of active calls.

When none of the load balancing policy is turned on, simulator assumes that none of the PRI Ports have overlapping phone numbers. If you assign identical phone numbers to multiple ports and do not enable any of the load balancing policies, simulator will perform table lookup until the first PRI port with matching phone number is found. If all B-channels on that port are busy, simulator will not continue search.

4.14. Generating Yellow alarms

It is possible to generate Yellow (remote) alarm on each PRI port by pressing a Start button on Tools tab.

4.15. Configuring phone numbers on PRI ports.

Each PRI port can have up to 30 phone numbers for up to 16 digits long each.

It is possible to use wild cards * and # inside the phone numbers. * - matches any single digit, # matches any substring of digits.

5. Chapter 5: Upgrading ISDN simulator firmware

Virtual Console, LLC is constantly working on adding new features to its products. Please check <http://www.vconsole.com> for the latest firmware updates for your simulator. After upgrading a firmware always use a latest Manager application which is available for downloading from www.vconsole.com. In most cases valid support contract is required to access a latest firmware. Please contact your local sales office for details.

To determine the current version firmware use ISDN Manager log window output:

```
* Log started 1-May-04 19:21:55
* Hardware version: "VH.2.2.1.1"
* Serial Number:    "0000000000"
* Firmware version: "V01.03 (Apr 30 2004)" <- Firmware version
* AVR version:      "V01.01 (Apr 14 2004)"
* Configuration version: "00040100"
* Codec revision:    "15/15/15/15"
```

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