

Quadro ISDN

The ISDN/VoIP Gateway



Manual I: Installation Guide

for QuadroISDN, SW-Version 4.1.x

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The Epygi Quadro has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used according to the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which is found by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and device
- Connect the equipment to an outlet different from the receiver
- Consult a dealer or an experienced Radio/TV technician for assistance

You are cautioned that any change or modification to the equipment not expressly approved by the manufacturer could void the user's authority to operate this device.

Administrative Council for Terminal Attachments (ACTA) Customer Information

This equipment complies with Part 68 of the FCC rules and the requirements adopted by the ACTA. A plug and jack used to connect this equipment to the premises wiring and telephone network must comply with the applicable FCC Part 68 rules and requirements adopted by the ATCA.

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

The telephone company may make changes in its facilities, equipment, operations or procedures that could affect the operation of the equipment. If this happens, the telephone company will provide advance notice in order for you to make necessary modifications to maintain uninterrupted service.

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

If your home has specially wired alarm equipment connected to the telephone line, ensure the installation of the Quadro!SDN does not disable your alarm equipment. If you have any questions about what will disable alarm equipment, consult your telephone company or a qualified installer.

Electrical Safety Advisory

To reduce the risk of damaging power surges, we recommend you install a quality AC surge suppressor in the AC outlet from which the Quadro!SDN is powered.

Industry Canada Statement

This product meets the applicable Industry Canada technical specifications.

Safety Information

Before using the Quadro!SDN, please review and ensure the following safety instructions are adhered to:

- To prevent fire or shock hazard, do not expose your Quadro!SDN to rain or moisture.
- To avoid electrical shock, do not open the Quadro!SDN. Refer servicing to qualified personnel only.
- Never install wiring during a lightning storm.
- Never install telephone jacks in wet locations unless the jack is specified for wet locations.
- Never touch un-insulated telephone wire or terminals unless the telephone line has been disconnected at the network interface.
- Use caution when installing or modifying cable or telephone lines.
- Avoid using your Quadro!SDN during an electrical storm.
- Do not use your Quadro!SDN or telephone to report a gas leak in the vicinity of the leak.
- An electrical outlet should be as close as possible to the unit and easily accessible.

Emergency Services

The Quadro!SDN SIP Service is intended to function as a secondary telephone service. These services are made available through the Internet and therefore are dependent upon a constant source of electricity and network availability. In the event of a power outage, the Quadro!SDN SIP Service will automatically be disabled. User understands that in the event of a power or network outage, the Quadro!SDN SIP Service will not support 911 emergency services and further that such services will only be available via the user's regular telephone line not connected to the Quadro!SDN. User further acknowledges that any interruption in the supply or delivery of electricity or network availability is beyond Epygi's control and that Epygi shall have no responsibility for losses arising from such interruption.

Table of Contents

Manual-I: Installation Guide

About This Installation Guide	5
Requirements	5
Hardware Overview	6
QuadroISDN's Rear Panel	6
QuadroISDN's Front Panel LEDs	7
Installing the QuadroISDN	8
Networking Overview	8
Configuring the Standalone Gateway QuadroISDN	9
Step 1: Connecting the Hardware	9
Step 2: QuadroISDN configuration	10
Logging in to QuadroISDN	10
Basic Configuration	11
Run the System Configuration Wizard	12
System Configuration	12
DHCP Settings for the LAN Interface	13
Regional Settings	14
Finishing the System Configuration Wizard	14
Run the Internet Configuration Wizard	16
Uplink Configuration	16
WAN IP Configuration	17
PPP/PPTP Configuration	17
WAN Interface Configuration	19
DNS Settings	19
Finishing the Internet Configuration Wizard	20
Configuring the Firewall	20
Configuring the ISDN Settings	22
Editing the ISDN Trunk	22
Run the ISDN Wizard	23
Step 3: Setting up Call Routing	28
Configuring the QuadroISDN as an IP PBX Expansion device	34
Step 1: Connecting the QuadroISDN	35
Step 2: Enable the DHCP Server on the Quadro IP PBX	35
Step 3: Sharing Mode Configuration on the Quadro IP PBX	36
Step 4: Sharing Mode Configuration on the QuadroISDN	38
Registering on Epygi's Technical Support	41
Appendix: PC DHCP Settings	42
Appendix: Changing the Admin's Password	44
Appendix: Configuring SIP NAT Traversal	45
Appendix: Checking the Connections	47

Manual II: see Administrator's Guide

Describes in detail the QuadroISDN management menus and includes all system default values at a glance, too.

About This Installation Guide

This Installation Guide explains the installation of the QuadroISDN gateway.

This Installation Guide does not provide advanced configuration information. For these features, refer to the Administrator's Guide.

The QuadroISDN is an analogue gateway that allows connectivity between the ISDN and a VoIP network. The QuadroISDN gateway can be configured to work as:

- An ISDN expansion board to supplement a Quadro IP PBXs with additional LINE ports.
- A standalone analogue gateway.

In case of using QuadroISDN as LINE expansion board it can be connected both to WAN and LAN for Quadro IP PBX to emulate additional ISDN ports on Quadro IP PBX with diverse configurations depend on usage scenarios.

This document describes how to configure the QuadroISDN as an LINE expansion board connected to the LAN interface of a Quadro IP PBX to increase the ISDN capability on the Quadro IP PBX with minimal configuration.

For the detailed information on how to install and use the QuadroISDN refer to the **QuadroISDN Manual II: Administrator's Guide**.

For the detailed information on how to install and use Quadro IP PBXs refer to the **Quadro IP PBX Manual I and II: Installation and Administrator's Guide**.

[Hardware Overview](#) shows all plugs and LEDs of the QuadroISDN

[Installing the QuadroISDN](#) explains connection of cables and devices to the QuadroISDN.

[Configuring the Standalone Gateway QuadroISDN](#) describes the configuration steps needed to establish QuadroISDN as a standalone gateway. The chapter includes information about the System and Internet Configuration Wizards to integrate the QuadroISDN in your network environment and about the basic setting up of the call routing functionality.

Please Note: The QuadroISDN configuration described in this Installation Guide describes basic configurations only. For more complex configurations, please refer to the QuadroISDN Administrator's Guide.

[Configuring the QuadroISDN as an IP PBX Expansion device](#) describes the configuration steps that might be needed to establish QuadroISDN as a LINE expansion for a Quadro IP PBX.

Please Note: For more details on this configuration, please refer to the **Quadro IP PBX Using Shared PSTN Lines** document on the Epygi WEB Support portal.

[Registering on Epygi's Technical Support](#) shows you how to gain access to the Epygi Technical Support Center and the Epygi SIP Server.

[Appendix: PC DHCP Settings](#) explains how to configure your PC to access the Quadro configuration GUI.

[Appendix: Changing the Admin's Password](#) explains how to change the default administrator password.

[Appendix: Configuring SIP NAT Traversal](#) explains configuration of the Quadro if it is placed behind a NAT enabled router.

[Appendix: Checking the Connections](#) gives hints to solve common problems.

Requirements

- One 120/240 V power outlet in close proximity to the QuadroISDN.
- One RJ-45 Ethernet 10/100 broadband Internet connection, if QuadroISDN shall be used as a standalone gateway
- One CAT 5 Ethernet cable with an RJ-45 connector to connect to the QuadroISDN LAN port
- One PC with a 10Mbps or a 10/100 Mbit/s Ethernet card or adapter installed.
- TCP/IP network protocol installed on each PC.
- For optimal results, Internet Explorer 5.5 or higher, or Netscape Navigator 4.7 or higher are recommended.)

Please Note: The QuadroISDN is shipped with one straight RJ-45 CAT 5 cable. If the LAN connector of the QuadroISDN is to be connected to a hub or switch, a crossover cable may be required.

Hardware Overview

QuadroISDN's Rear Panel

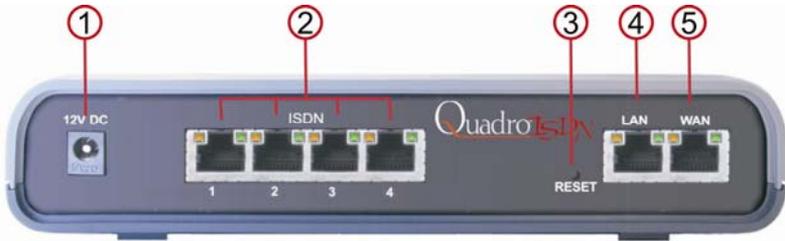


Fig. I-1: QuadroISDN's backplate

- 1 Power supply socket. **Use only the power adapter delivered with the QuadroISDN.**
- 2 ISDN sockets to connect the Quadro to the ISDN network using standard analog phone service.
- 3 The Reset button may be used in two ways: (1) to initiate a normal reset, (2) to carry out a factory reset. A normal reset is executed by pressing the Reset button with a paper clip for an instant.

Pressing the reset button and holding it down for 7 seconds or more will execute a factory reset. This will restore the factory defaults and clear all settings including the IP address and the administration password you entered.

Please Note: A Factory Reset forces the default LAN IP address of 172.28.0.1 and default administrator's password of 19.

- 4 RJ-45 socket to attach a Local Area Network (LAN) via an Ethernet CAT 5 cable. If a Quadro IP PBX or a PC is connected directly to this socket, a straight cable is used. If an Ethernet hub, router or switch is used, a crossover cable may be required.
- 5 RJ-45 socket to attach the Internet Uplink (WAN) via an Ethernet CAT 5 cable.

QuadroISDN's Front Panel LEDs

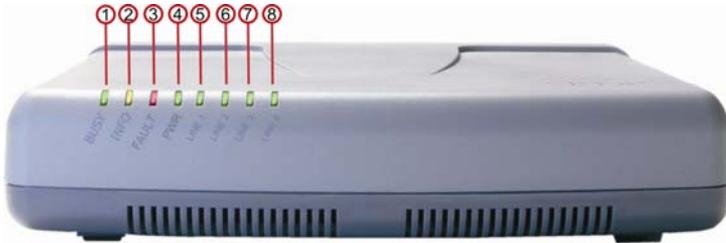


Fig. I-2: QuadroISDN's Front Panel LEDs

1	Busy green Status of CPU	off: no power on or blinking: normal activity
2	Info yellow System information	on: device is booting off: no information blinking: an event occurred; details specified in the System Event section of the Management interface
3	Fault red System status	on either an error or the device is booting off: no error blinking: system unusable
4	PWR green Status of the power supply	on: power supply ok off: no power supply or device is still booting
5	Line 1 green Status of the ISDN1 line	on: all channels on the Line 1 are busy off: no call in progress or one active call flickering: ISDN Line 1 is disconnected
6	Line 2 green Status of the ISDN2 line	on: all channels on the Line 2 are busy off: no call in progress or one active call flickering: ISDN Line 2 is disconnected
7	Line 3 green Status of the ISDN3 line	on: all channels on the Line 3 are busy off: no call in progress or one active call flickering: ISDN Line 3 is disconnected
8	Line 4 green Status of the ISDN4 line	on: all channels on the Line 4 are busy off: no call in progress or one active call flickering: ISDN Line 4 is disconnected

LED Indication during a firmware update

A firmware update is indicated by the red (**Fault**) and yellow (**Info**) LEDs. Both will blink simultaneously for about two minutes while the firmware is being updated. The QuadroISDN will then reboot automatically showing the boot LED sequence.

LED indication during a boot sequence

A boot sequence is indicated as follows: The red **Fault** LED will glow for a few seconds, then the yellow **Info** LED will glow for another four or five minutes while the green **Busy** LED is blinking. Once the **Info** LED is off, the boot sequence has been completed successfully.

LED indication during emergency firmware upload

The red **Fault** LED and the yellow **Info** LEDs will stop blinking alternately and start blinking in parallel. This shows that Quadro has accepted the emergency firmware and is loading it. After a few seconds, Quadro will boot, indicated as follows: The red **Fault** LED will glow for a few seconds, then the yellow **Info** LED will glow for another few seconds while the green **Busy** LED is jittering. When the yellow **Info** LED extinguishes, the boot sequence has been completed successfully.

Installing the QuadroISDN

Networking Overview

To establish a connection between the PSTN (or your PBX) and the Internet, a gateway is needed. The QuadroISDN, used as a standalone gateway, will perform the task of connecting your PSTN (or PBX) via its WAN port to a Private Data Network that includes Quadro IP PBXs (Quadro-2x, -4x and/or -16x) or the Internet. The QuadroISDN will process and regulate the voice traffic between these networks by means of Call Routing paths that are specified by the administrator according to a dial plan. The QuadroISDN has one LAN port that is used to connect a PC for management purposes. The WAN port transmits up to 10 Mbps, and the LAN port transmits at 10 Mbps or 100 Mbps.



Fig. I-3: Standalone gateway: Connection overview

Every device within an IP network requires a unique IP address to identify itself. Since the QuadroISDN, used as a standalone gateway, connects to both the LAN (Admin PC) and the WAN (Private Data Network or Internet), it has to be part of both networks, and must have two IP addresses: one for the WAN side and one for the LAN side. The QuadroISDN's integrated firewall/NAT functionality will hide the LAN IP address from the WAN (Internet) side. (As the firewall is switched off per default, you need to enable it.)

There are two ways of assigning an IP address: statically or dynamically. The QuadroISDN can be configured with a static IP address on the WAN interface. You also can use a DHCP server assigned IP address on the WAN side.

Please Note: A DHCP client is software that requests an IP address from a DHCP server. A DHCP server assigns on request a unique IP address to a device. The QuadroISDN acts as a DHCP client on its WAN interface and as a DHCP server on its LAN interface.

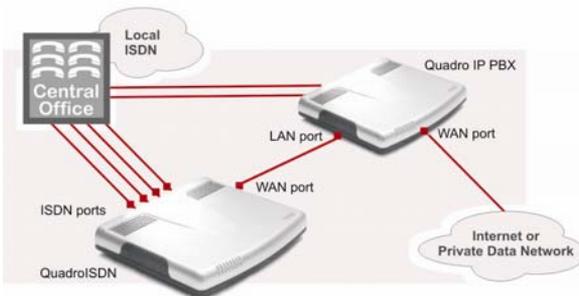


Fig. I-4: LINE expansion: Connection overview

Besides acting as a standalone gateway, QuadroISDN may serve as a LINE expansion for Quadro IP PBXs. In this case, QuadroISDN needs only a LAN IP address which it gets from the DHCP server of the attached Quadro IP PBX (see [Configuring the QuadroISDN as an IP PBX Expansion device](#)).

Configuring the Standalone Gateway QuadroISDN

To configure the standalone gateway QuadroISDN basically, two steps are needed:

Step1: Connecting the Hardware – used to connect the QuadroISDN in the network

Step2: Basic Configuration using the System Configuration Wizard and the Internet Configuration Wizard

Step3: Setting up Call Routing according to your dial plan

Step 1: Connecting the Hardware



Fig. I-5: Connecting the Hardware

- Verify the product package contents are complete. Refer to the contents sheet included in the packaging to determine if all the items were shipped in the box.
- Connect the QuadroISDN's LINE ports to your PBX or the trunk from the PSTN Central Office.
- If the QuadroISDN is used as a standalone gateway, a PC may be connected via a straight CAT 5 cable with an RJ45 connector to the LAN socket of the QuadroISDN. If a hub or switch shall be connected, use a crossover cable from the LAN interface of the QuadroISDN to the hub or switch.

The LAN port is not needed, if QuadroISDN shall be used as a LINE expansion.

- If the QuadroISDN shall be used as a standalone gateway, connect its WAN port to the Internet service via a cable or DSL modem. In this case, you should enable the firewall, as it is disabled by default).

Connect the WAN port of the QuadroISDN to the LAN port of the Quadro IP PBX to use the QuadroISDN as an LINE expansion for the Quadro IP PBX.

- When using a DSL or Cable modem, power up the modem before the Quadro.
- Connect the power adapter to the POWER port on the QuadroISDN's rear panel and plug the power adapter into a power outlet. Only use the original power adapter and plug it into a power strip with surge protection or to a UPS if available.

The red LED (Fault) will glow for several seconds followed by the yellow LED (Info), which will glow for several minutes. As soon as Info is off, the QuadroISDN is operational.

- Check the LEDs: The green Busy LED should glow continuously. The green LAN and WAN LEDs will blink when cables are connected to these ports and all devices are powered up. If the green LAN and WAN LEDs do not blink, verify cabling and ensure that all devices are powered up.

Please Note: CAT 5 cables can be faulty without visual indication. The LAN and WAN LEDs verify that the Ethernet connection is established between the end points. If these

LEDs are not illuminated, there is a connection problem between the QuadroISDN and the other device. Some modems, hubs, switches and routers will require the use of crossover cables.

Step 2: QuadroISDN configuration

The most important settings are:

Static IP address for the WAN interface. If you use a DHCP server, please configure it to deliver a static IP address. In this case, QuadroISDN will get its IP address automatically, as it acts as a DHCP client on the WAN side.

Bandwidth - used to regulate a number of calls allowed by the QuadroISDN to avoid degradation in low bandwidth conditions.

Regional Settings - if your QuadroISDN is located outside the United States, it is important to properly configure your line connections to the PSTN in your location

Firewall - enable and configure the firewall to make the QuadroISDN safe and accessible for management.

ISDN Settings – used to configure the ISDN trunks and properties.

To customize these settings, connect a PC to QuadroISDN's LAN port, log in and complete the **Basic Configuration** as described in the following sections.

Logging in to QuadroISDN

Start a browser (MS Internet Explorer, Netscape, Opera) on a PC connected to QuadroISDN's LAN port. Enter **http://172.28.0.1** (QuadroISDN's default LAN IP address) into the address field. The **Login** page of the QuadroISDN will be displayed:



Fig. I-6: QuadroISDN's login page

Enter **admin** as Username and **19** as Password to log in as administrator.

After logging in, the **QuadroISDN Management** page will be displayed.

Please Note: If you enter a wrong password and/or username five times, the device will become unavailable for login during the next five minutes.



Fig. I-7: QuadroISDN's Management page

Basic Configuration

Two Configuration Wizards are available to accomplish the basic configuration of Quadro devices:

- **The System Configuration Wizard** - a tool for the administrator to define the Quadro's Local Area Network settings and to specify regional configuration settings to make Quadro operational in its LAN. It must be run upon Quadro first startup.
- **The Internet Configuration Wizard** - a tool for the administrator to configure the WAN settings and to adjust Quadro's connectivity in the global network. It must be run if Quadro is desired to be connected to the Internet.

Please Note: It is strongly recommended that factory default settings are left unchanged if their meanings are not completely clear.

Run the System Configuration Wizard

Open the **System Configuration Wizard** by selecting the corresponding menu item on the **System** menu. The page **Getting Started** will be displayed:



Fig. I-8: System Configuration Wizard

This first page of the System Configuration Wizard is for information only and lists the items to be configured, Click on the **Next** button to get to the **System Configuration** page.

System Configuration

Enter into the **Host Name** field a unique name for the QuadroISDN. This is useful when many Quadro's are part of a network and one administrator has remote access to all of them. All Web Management pages show this **Host Name** in the top right corner. Define the LAN side **Domain Name** in the same named text field.

For a basic configuration, the **LAN IP address** needn't be changed. If you have to change it (e.g. to integrate the device into an existing LAN), enter a new LAN IP address and have it handy. You need it to re-access Quadro management.

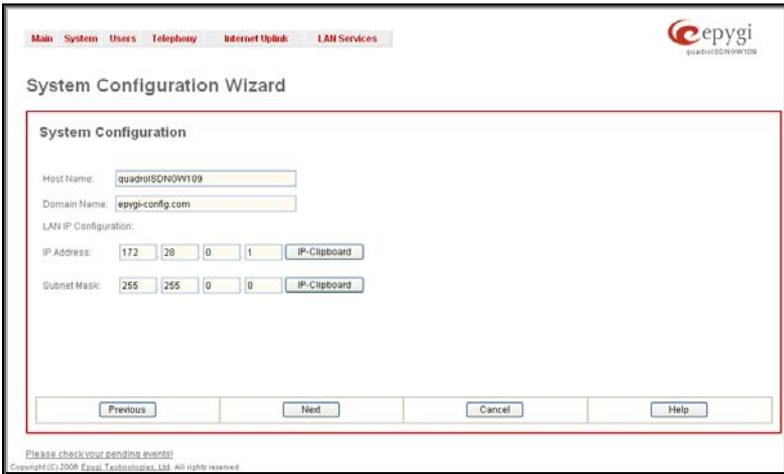


Fig. I-9: System Configuration page

Clicking **Next** will show the page DHCP Settings for the LAN Interface.

DHCP Settings for the LAN Interface

If the DHCP server is enabled, the QuadroISDN will assign dynamic IP addresses to the Admin PC connected to its LAN port.

If you didn't change the default IP address of the QuadroISDN, you may also leave the default values for **IP Address Range**. Make sure your connected Admin PC belongs to the same network as the LAN port of your QuadroISDN.

Please Note: Make sure there is only one DHCP server on the LAN. Otherwise, unpredictable network behavior can occur.

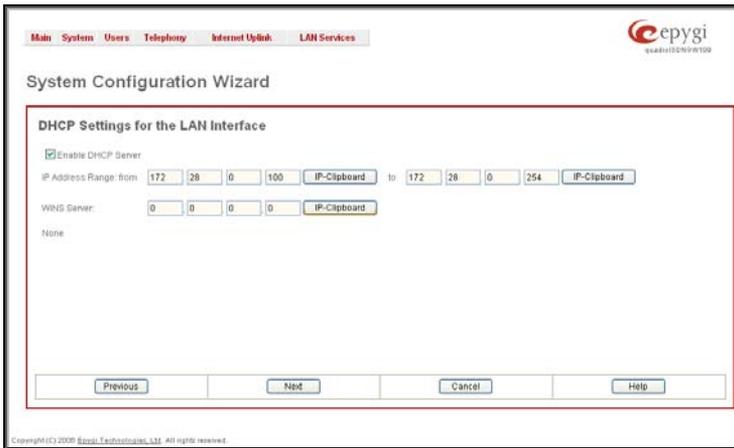


Fig. I-10: DHCP Settings for the LAN Interface page

Click on **Next** to display the **Regional Settings** page.

Regional Settings

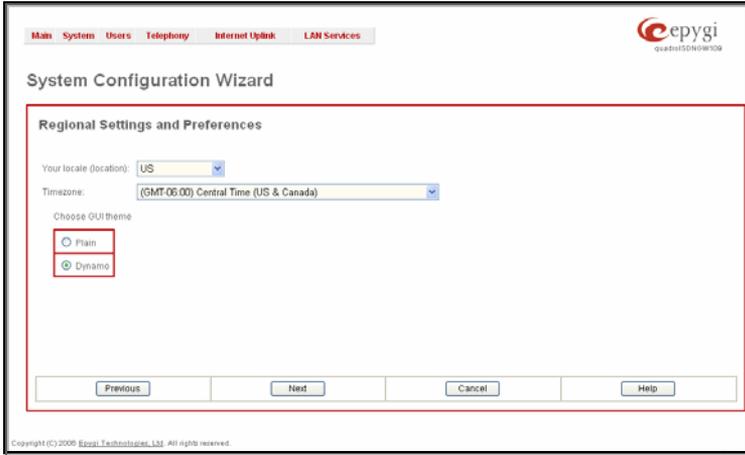


Fig. I-11: Regional Settings page

Proper configuration of **Regional Settings** is important to the functionality of the voice sub-system. The Regional Settings determine the proper telephony parameters for the specified country. Select the country where the QuadroISDN is located. If you do not find your country in the list, pick the closest. If this setting does not work, issue a request to Epygi technical support under the Support section of www.epygi.com.

The Quadro gets the correct time automatically over the Internet from a time server. If you are not located in US/Central Standard Time Zone, you will need to change the **Timezone** to your region.

Click **Next** to show the summary page.

Finishing the System Configuration Wizard

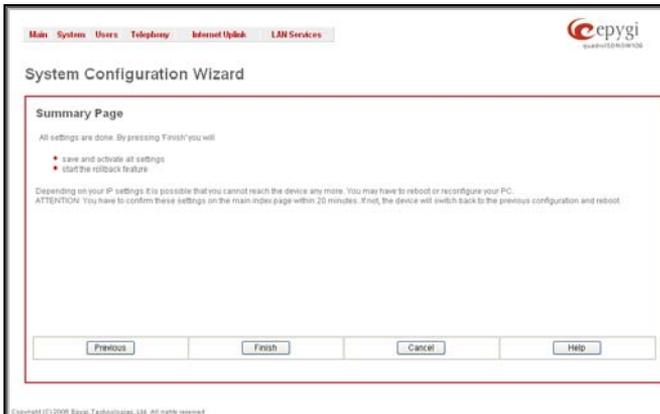


Fig. I-12: System Configuration Wizard finishing page

Click the **Finish** button to complete the System Configuration Wizard. The QuadroISDN will then stop internal functions and apply the changes made in the wizard.

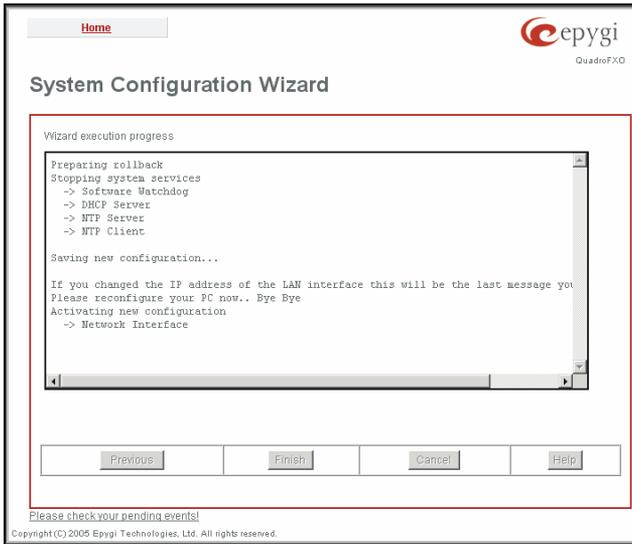


Fig. I-13: Wizard execution process

After this is complete, the QuadroISDN will reply with the **Confirm Settings** page requesting confirmation of the changes. Press the **OK** button to confirm the settings.



Fig. I-14: Confirm Settings page

Please Note: you must confirm the settings within 20 minutes. If not, the device will **revert back to the previous configuration and reboot**.

Please Note: If you do not use DHCP for your LAN and you have changed your LAN settings, make sure that the IP address of the PC connected to Quadro is still within the specified IP address range. Otherwise, your PC might be unable to establish a connection to Quadro.

If you changed the network configuration of the LAN, you may have to reboot your PC to get a new IP address from the new network. You can then access the Web Management of the Quadro on the new IP address you assigned to the Quadro.

Run the Internet Configuration Wizard

Open the **Internet Configuration Wizard** by selecting the corresponding menu item on the **System** menu. The page **Getting Started** will be displayed:

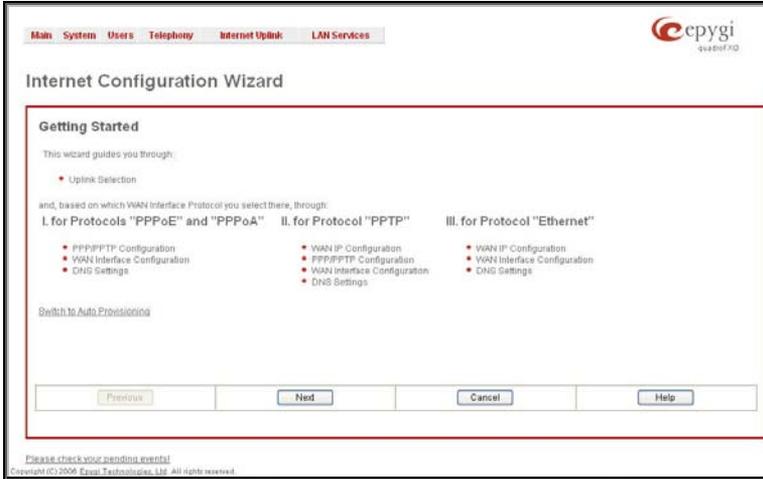


Fig. I-15: Internet Configuration Wizard

This first page of the Internet Configuration Wizard is for information only and lists the items to be configured. Click on the **Next** button to get to the **Uplink Configuration** page.

Uplink Configuration

Select here the **WAN Interface Protocol** required by you ISP: **PPPoE** (Point to Point Protocol over Ethernet) **PPTP** (Point to Point Tunneling Protocol) or **Ethernet**.

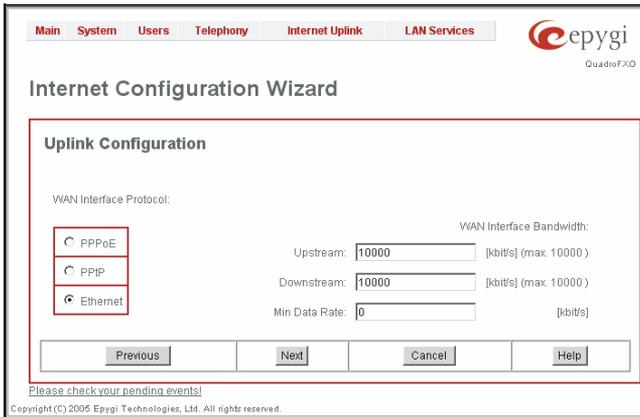


Fig. I-16: Uplink Configuration

Enter **WAN Interface Bandwidth** to assure the quality of IP calls. If available bandwidth is used to the point of which the quality of an additional IP call would suffer, new IP calls are rejected.

The bandwidth provided by your ISP must be specified for both **Upstream** and **Downstream** fields. The default entry in both fields is **10000**, the maximum bandwidth of the 10 MB uplink module.

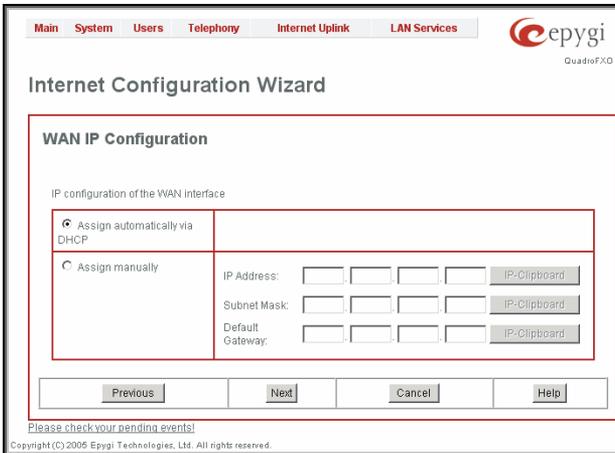
The **Min Data Rate** text field is used to specify the amount of bandwidth reserved for data applications. The value entered here has to be smaller than the value specified for **Upstream Bandwidth**. Specify the **WAN Interface Protocol** by choosing between **PPPoE** (Point to Point over Ethernet) and **Ethernet**. Use Ethernet for DHCP or static IP.

Clicking **Next** shows **WAN IP Configuration** page. If **PPPoE** is the selected WAN Interface Protocol, the next page will be [PPP/PPTP Configuration](#).

WAN IP Configuration

Your Internet Service Provider (ISP) should provide this information.

- **Assign automatically via DHCP** - The parameters are set automatically by the ISP. This is common with cable modem and DSL service.
- **Assign Manually** requires the administrator to enter the external **IP Address**, the corresponding **Subnet Mask**, and the IP address of the **Standard Gateway**. This is common when you have a static IP address with your ISP.



The screenshot shows the 'WAN IP Configuration' page of the 'Internet Configuration Wizard'. At the top, there are navigation tabs: 'Main', 'System', 'Users', 'Telephony', 'Internet Uplink', and 'LAN Services'. The 'Epygi' logo and 'QuadroFXO' are in the top right. The main title is 'Internet Configuration Wizard'. Below it, the section is 'WAN IP Configuration'. The text reads 'IP configuration of the WAN interface'. There are two radio button options: 'Assign automatically via DHCP' (which is selected) and 'Assign manually'. The 'Assign manually' option is expanded to show three input fields: 'IP Address', 'Subnet Mask', and 'Default Gateway', each followed by an 'IP-Clipboard' button. At the bottom of the form area, there are four buttons: 'Previous', 'Next', 'Cancel', and 'Help'. Below the buttons, there is a small text note: 'Please check your pending events!' and a copyright notice: 'Copyright (C) 2005 Epygi Technologies, Ltd. All rights reserved.'

Fig. I-17: WAN IP Configuration page

Click the **Next** button to display the **WAN Interface Configuration** page.

PPP/PPTP Configuration

Enter the IP address of the PPTP server into the **PPTP Server** text field.

Choose the encryption for the traffic over the PPTP interface from the **Encryption** drop down list.

Authentication Settings require the Username and the Password used for the authentication on the ISP server.

Dial Behavior radio buttons:

- **Dial Manually** - if this radio button is activated, a button will be displayed in the main management window that serves to switch the Internet connection on/off. When accessing the Internet, every station of the connected LAN has to connect to Quadro first.
- **Always connected** - Quadro stays in the always connected mode. This will allow Quadro always remain online in the network.

The **IP Address Assignment** field is used to specify the external IP address given to the Quadro. Usually it is a dynamic address but in some cases you may be given a static IP address.

The screenshot shows the 'Internet Configuration Wizard' window with the 'PPP / PPTP Settings' tab selected. The 'Dial behaviour' section has 'Always connected' selected. The 'IP Address Assignment' section has 'Dynamic IP Address' selected. The 'Keep connection alive' checkbox is checked. The 'Next' button is highlighted.

Fig. I-18: PPP/PPTP Configuration page

If your ISP assigns a dynamic IP address, activate the **Dynamic IP Address** radio button, otherwise activate the **Fixed IP Address** radio button and enter the IP address you were assigned by your ISP.

Keep Connection alive checkbox enables keeping the connection alive by sending control packets dedicated for the link state verification.

Click the **Next** button to display the **WAN Interface Configuration** page.

WAN Interface Configuration

If your ISP requires a specific MAC address (e.g., for authentication), it can be entered on this page. The required MAC address can be entered into the **User defined** field. If a specific MAC address is not required, leave the default selection **This device** selected.

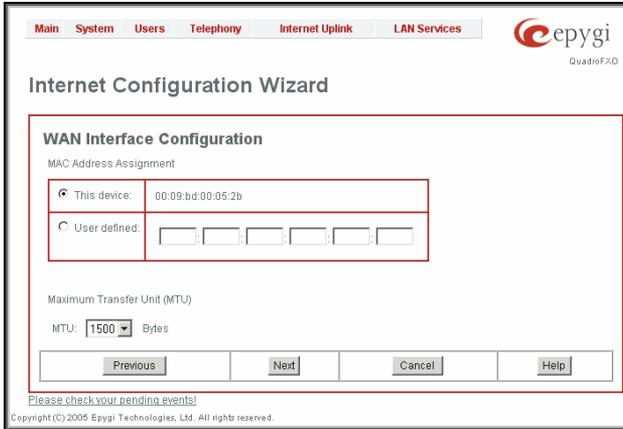


Fig. I-19: WAN Interface Configuration page

Click **Next** to display the **DNS Settings for the LAN Interface** page.

DNS Settings

Select **Fixed Nameserver** and enter its IP address. If you use your DHCP server and if it will deliver a DNS server, you may select **Dynamically by Provider**. When using a static IP address, fixed values must be entered.

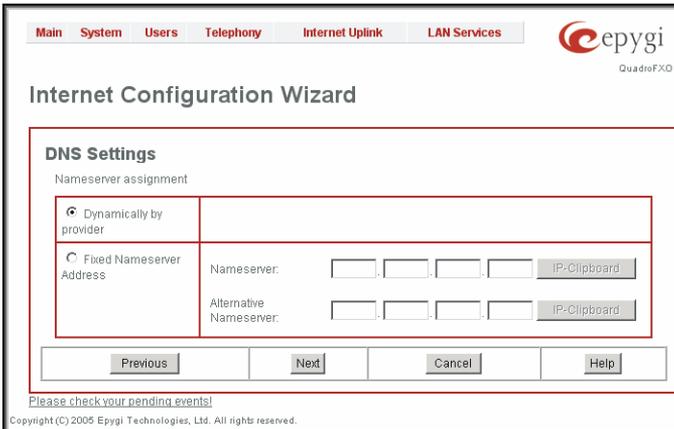


Fig. I-20: DNS Settings page

Click **Next** to show the summary page of the Internet Configuration Wizard:

Finishing the Internet Configuration Wizard

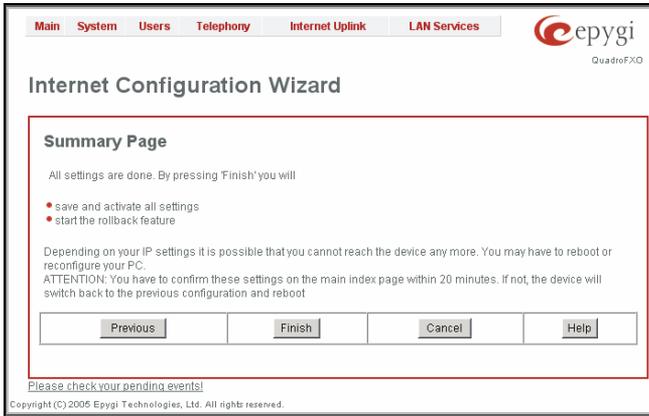


Fig. I-21: Internet Configuration Wizard Summary page

Click the **Finish** button to complete the Internet Configuration Wizard. The Quadro will then stop internal functions and apply the changes made in the Wizard. After this is complete, the Quadro will reply with the **Confirm Settings** page requesting confirmation of the changes. Press the **OK** button to confirm the settings.

Please Note: you must confirm the settings within 20 minutes. If not, the device will **revert back to the previous configuration and reboot**.

Please Note: If you do not use DHCP for your LAN and you have changed your LAN settings, make sure that the IP address of the PC connected to the QuadroISDN is still within the specified IP address range. Otherwise, your PC might be unable to establish a connection to the QuadroISDN.

If you changed the network configuration of the LAN, you may have to reboot your PC to get a new IP address from the new network. You can then access the Web Management of the QuadroISDN on the new IP address you assigned to the QuadroISDN.

Configuring the Firewall

Select **Firewall/NAT** from the **Internet Uplink** menu to open the **Firewall Configuration** page. By default, the Firewall configuration is disabled on the Quadro, which allows any incoming traffic from the WAN.

It is recommended to leave the firewall disabled if QuadroISDN acts as a ISDN expansion board.

If QuadroISDN acts as a standalone board, it is recommended to configure the firewall on the QuadroISDN. To do so, check the **Enable Firewall** checkbox and select an adequate security level to protect your QuadroISDN:

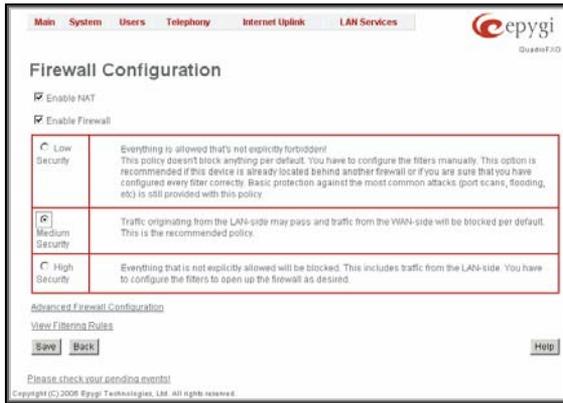


Fig. I-22: Firewall Configuration page

If you have enabled the firewall and if the QuadroISDN shall be managed through the WAN port, a configuration of the filtering rules is needed. Open **View Filtering Rules** from the **Firewall Configuration** page and configure the rule **Management Access** accordingly.

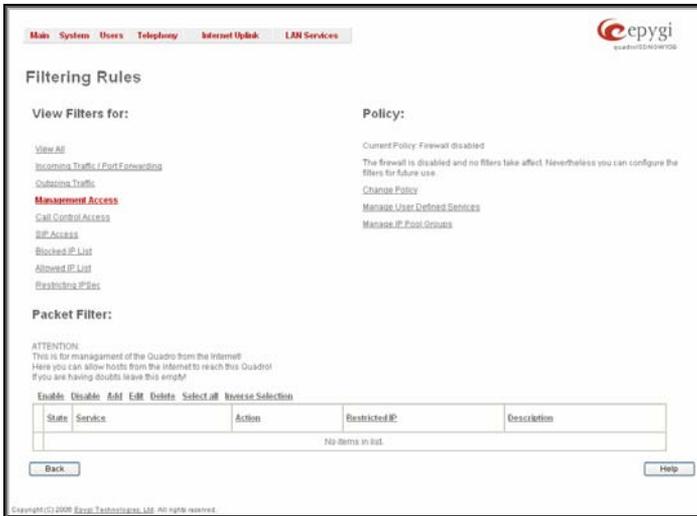


Fig. I-23: Filtering Rules page

Configuring the ISDN Settings

The QuadroISDN can be connected to a PBX or to the PSTN via ISDN trunks. The QuadroISDN may be connected to act as a **User** (if connected to directly to the PSTN) or as a **Network** (if connected to a PBX).

Further, you are required to enter the ISDN settings your PSTN provider requires regarding framing, clocking, signaling used and so on. All these settings must be entered on the management page **Trunk Settings** that is displayed when you select **ISDN Settings** from the **Telephony** menu:

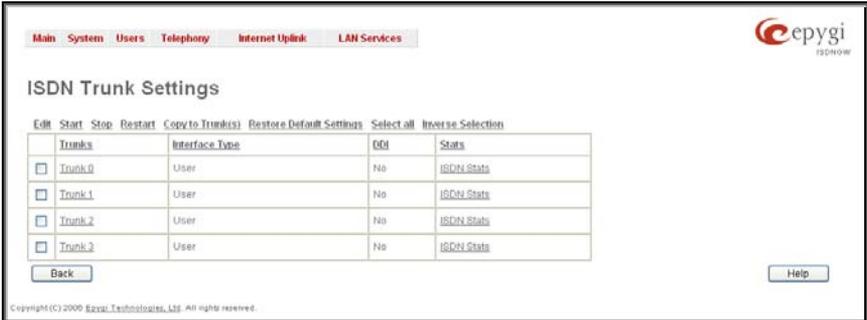


Fig. I-24: ISDN Settings page

The **Trunk Settings** page is used to configure the ISDN trunk settings. The table lists the available ISDN trunks of Quadro and their settings (trunk name, interface and DDI mode). Clicking on the trunk will open its **ISDN Wizard** page. Selecting the corresponding trunk's checkbox and pressing **Edit** will open the **Trunk - Edit Entry** page. The **ISDN Stats** link is displayed for every active ISDN trunk and leads to the page where the ISDN trunk and the traffic statistics can be viewed.

Editing the ISDN Trunk



Fig. I-25: Trunk Edit page

Select **Network** as your **Interface Type** if your QuadroISDN is connected to a PBX, otherwise choose **User**.

Next, you are required to choose the **Coding Type** (**a-law** or **u-law**) and specify the settings of the selected trunk, like **LoopBackMode** and **Passive Mode** configuration. The appropriate parameters should be requested from the service provider or in case of connecting to a PBX - according to the settings in the PBX manual.

Please Note: Modifying the ISDN trunk settings may lead to some broken routes in the Local Call Routing Table.

Run the ISDN Wizard

Run the ISDN Wizard for each of the ISDN trunks supposed to be used on the Quadro gateway. To do so, press on the appropriate trunk in the **ISDN Trunk Settings** table. ISDN Wizard starts.

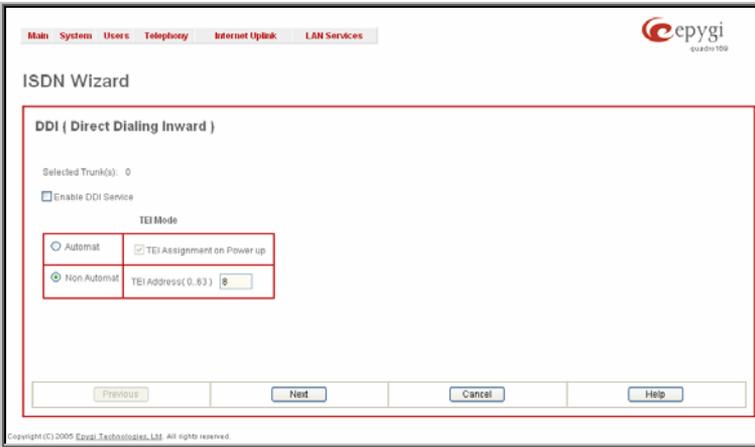


Fig. I-26: ISDN Wizard – DDI configuration page

The following settings should be defined on the first page of the **ISDN Wizard**:

The **Enable DDI Service** checkbox is only available for trunks in the User mode. It activates the **DDI (Direct Dialing Inward) Service** on the trunk.

The **TEI Mode** (Terminal Endpoint Identifier) manipulation radio buttons are used to select the TEI selection mode. In the User mode, this selection is only available when DDI Service is disabled on the trunk. The selection offers the following options:

- The **Automat** mode requires ISDN connection to be established on the first available TEI channel. If **TEI Assignment on Power up** checkbox is selected Quadro tries to get TEI value after Power UP, otherwise Quadro tries to get TEI value on incoming or outgoing calls.
- The **Non Automat** mode enables the TEI Address text field that requires the channel number (digit values from 0 to 63) for connection establishment between the CO and the ISDN client. In this mode, a private channel may be reserved for the connection. Both call partners need to specify the same channel in their settings.

Press **Next** to move forward to the **MSN Settings** page of the ISDN Wizard.

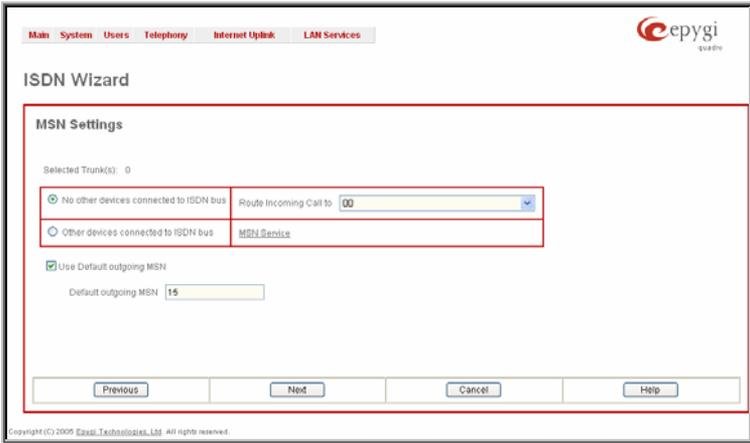


Fig. I-27: ISDN Wizard – MSN Settings

The following settings should be defined on the second page of ISDN Wizard:

The manipulation radio buttons are present only for ISDN trunk acting in the user mode and when **DDI Service** is disabled from the previous page. This selection is used to choose whether or not other devices are connected to the ISDN bus. It also allows you to switch the MSN (Multiple Subscriber Number) service. This service offers the option of having multiple ISDN numbers provided by the CO (Central Office). It is used to route incoming calls to the Quadro extensions, to the Auto Attendant or routing agent (depending on the subscribed number the call was received on).

- Selecting **No other devices are connected to ISDN bus** disables the MSN service on the Quadro and all incoming calls will be routed to the selected destination. The **Route Incoming call** to drop down list is always present independent on the mode the ISDN trunk acts in. It contains the default Attendant extension (00) and a Routing agent selection and all extensions of Quadro. It allows you to select the destination where the incoming calls should be routed to. Choosing the **Routing with inbound destination number** selection will automatically use the initially dialed number to connect the destination without additional dialing.
- The **Other devices are connected to ISDN bus** selection enables the MSN service on the Quadro. It allows you to configure the incoming MSN table. The **MSN Service** link leads to the **MSN Service** pages where MSN numbers can be created and modified.

Please Note: It is recommended that you choose **Other devices are connected to ISDN bus** if there are several subscribed numbers and multiple ISDN devices within the network.

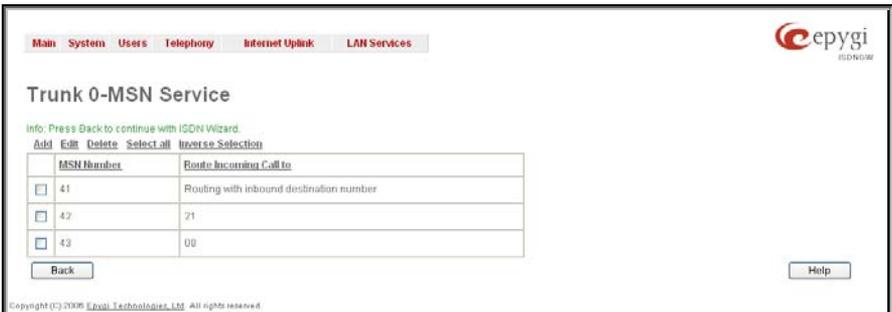


Fig. I-28: ISDN Wizard – MSN Service configuration

The **MSN Service** page lists all existing MSN numbers on the Quadro. It allows you to assign MSNs to the Quadro extensions, including default Attendant extension (00), or to the routing client, where incoming calls will be routed.

The **Add** functional button opens an **Add Entry** page where a new MSN number can be created. The field contains the following components:

- The **MSN Number** text field requires the MSN number.
- The **Route Incoming Call to** drop down list allows you to select the destination where the incoming call to the certain MSN number will be routed. Choosing the **Routing with inbound destination number** selection will automatically use the initially dialed number to connect the destination without any additional dialing.

Selecting **Use Default outgoing MSN** allows you to overwrite the source caller information with the one specified in the **Default outgoing MSN** text field when placing outgoing calls toward the CO. The **Default outgoing MSN** text field requires the Quadro identification number that should be registered and recognized at the CO for outgoing calls. If this checkbox is enabled but no value is defined in **Default outgoing MSN**, empty caller information will be sent to the CO. If this checkbox is disabled, the source caller information will be forwarded to the CO.

Press **Next** to move forward to the next page of the ISDN Wizard. If the trunk is configured in the Network mode, the next page will be **ISDN Low Level Settings** page, otherwise if the trunk is configured in the User mode, this page will be skipped and the next page will be **L2&L3 Settings** page.

The **ISDN Low Level Settings** page offers a **Power Source** selection option. When this option is selected, the QuadroISDN device will act as a power supply for the ISDN phones connected to it. Otherwise when this checkbox is not selected, ISDN phones should have their own power supplies.

Please Note: This checkbox should be always disabled when the ISDN gateway has a PBX or Telecom connected.

The screenshot shows a web-based configuration interface for the ISDN Wizard. At the top, there is a navigation menu with the following items: Main, System, Users, Telephony, Internet Uplink, and LAN Services. The 'ISDN Wizard' title is prominently displayed. Below the title, the 'ISDN Low Level Settings' section is visible, containing the text 'Selected Trunk: 1' and a checkbox labeled 'Power Source' which is currently unchecked. At the bottom of the form, there are four buttons: 'Previous', 'Next', 'Cancel', and 'Help'. A small copyright notice for Epygi Technologies, Ltd. is located at the bottom left of the window.

Press **Next** to move forward to the last page of the ISDN Wizard:

The screenshot shows the 'ISDN Wizard' interface with the 'L2 & L3 Settings' tab selected. The 'Selected Trunk(s)' is 0. The 'ISDN L2 Timers' section has the following values: Excessive Ack. Delay T200 (4000), Idle Timer T203 (10000), T302 Timer (4000), T309 Timer (0), and T310 Timer (60000). The 'ISDN L3 Timers' section has the following values: T302 Timer (4000), T309 Timer (0), and T310 Timer (60000). The 'Alert Guard Timeout' is 34. The 'Switch Type' is 'basic_dcs1', 'Channel Selection' is 'preferred', and 'Bearer Establishment Procedure' is 'on call acceptance'. The 'Called Party Type of Number' is 'International number', 'Calling Party Type of Number' is 'National number', 'Called Party Numbering Plan' is 'ISDN/telephony numbering plan', and 'Calling Party Numbering Plan' is 'ISDN/telephony numbering plan'. The 'Incoming Called Digits Size' is 22. There are checkboxes for 'Generate Progress Tone to IP', 'Enable CLIR Service', 'Alternative Disconnection Mode', 'B1 Channel', and 'B2 Channel', all of which are checked. At the bottom, there are buttons for 'Previous', 'Next', 'Cancel', and 'Help'.

Fig. I-29: ISDN Wizard – L2&L3 Settings

The following settings should be defined on this page:

Two groups of timers need to be provided. These settings are adjusted according to the Service Provider requirements.

ISDN L2 Timers:

- **Excessive Ack. Delay T200** configures the period in milliseconds (numeric values from 500 to 9999) between the transmitted signaling packet and its acknowledgement received.
- **Idle Timer T203** configures the period in milliseconds (numeric values from 1000 to 99999) for the ISDN client idle timeout.

ISDN L3 Timers:

- The **T302 Timer** text field requires the value for the T302 timer in milliseconds (digit values from 0 to 15000). It indicates that the time frame system is waiting for a digit to be dialed. When the timer expires, it initiates the call.
- **T309 Timer** requires the value for the T309 timer in milliseconds (numeric values from 0 to 90000). It is responsible for call steadiness during link disconnection within the period equal to this timer value. If the value in this field is zero (0), the T309 timer will be disabled.
- **T310 Timer** requires the value for the T310 timer in milliseconds (numeric values from 1000 to 120000). It is responsible for the outgoing call steadiness when CALL PROCEEDING is already received from the destination but call confirmation (ALERT, CONNECT, DISC or PROGRESS) has not yet arrived.
- **Alert Guard Timeout** requires the value for the Alert Guard Timer in milliseconds (numeric values from 0 to 500) between CALL PROC and ALERT messages. Alert Guard Timer it is used when Quadro is connected to a slow ISDN-PBX. Recommended values are:
 - fast connection (0ms);
 - normal (150ms), default;
 - slow ISDN-PBX (350ms);
 - very slow ISDN-PBX (500ms).

Switch Type is another configuration parameter that depends on the Service Provider.

Channel Selection is used to select between the **Preferred** and **Exclusive** B channel selection methods. For **Preferred** channel selection, the CO answers to the call request by the first available timeslot. With the **Exclusive** channel selection, the CO should feedback only by the timeslot used for the call request.

The **Bearer Establishment Procedure** drop down list allows selecting the session initiation method on the B channel. One of the following options can be selected for the transmission path completion prior to receipt of a call acceptance indication:

- on channel negotiation at the destination interface
- on progress indication with in-band information
- on call acceptance

The **Calling Party Type of Number** drop down list allows you to select the type identifying the origin of call.

The **Called Party Type of Number** drop down list allows you to select the type identifying the subaddress of the called party of the call.

The **Called Party Numbering Plan** and **Calling Party Numbering Plan** drop down lists correspondingly indicate the numbering plan of the called party's and calling party's number.

The **Incoming Called Digits Size** text field indicates the number of received digits (in a range from 0 to 255) required to establish a call. When this field has a "0" value, the system uses either the timeout defined in the T302 field or the **Sending Complete Information element** messages to establish a call. Independent on the value in this field, **Sending Complete Information element** and the pound sign always result in call establishment.

The **Generate Progress tone on IP** checkbox selection will generate the progress tone to IP.

Enable CLIR Service checkbox selection enables Calling Line Identification Restriction (CLIR) service which displays the incoming caller ID only if Presentation Indication is allowed on the remote side. Otherwise, if CLIR service is disabled, caller ID will be unconditionally displayed.

When the **Alternative Disconnection Mode** checkbox is not selected, Quadro will disconnect the call as soon as the disconnect message has been received from the peer. When the checkbox is selected, Quadro's user may hear a busy tone when peer has been disconnected.

The **B1 Channel** and **B2 Channel** checkboxes enables/disables timeslots for voice transfer. Disabling the timeslot will prevent both incoming and outgoing calls.

Step 3: Setting up Call Routing

The Call Routing service allows you to specify the communication structure between all involved devices by developing a dialing plan and setting the call routing paths accordingly. For the Quadro extension users, the call procedure should be simple and familiar for all kinds of calls (PBX, IP, ISDN or IP-PSTN).

The possibilities Call Routing offers are numerous. The following configuration just a single and simple example used to explain the setup of the QuadroISDN as a gateway:

In this example, the QuadroISDN is connected within a protected Private Data Network built of a Quadro2x with the extensions 11, 12 and a Quadro4x with the extension 21, 22, 23 and 24. Each of these extensions will be configured such that they all shall reach the ISDN using the prefix 9. All extensions also shall be reached by calls from the ISDN.

Please Note: The QuadroISDN will function with Quadro IP PBX devices independent on the interface type running on them. It will work either with Quadro IP PBXs with ISDN interface available (like Quardo2xi, Quardo4xi and Quardo16xi) or with Quadro IP PBXs with ISDN interface available (like Quardo2x, Quardo4x and Quardo16x).

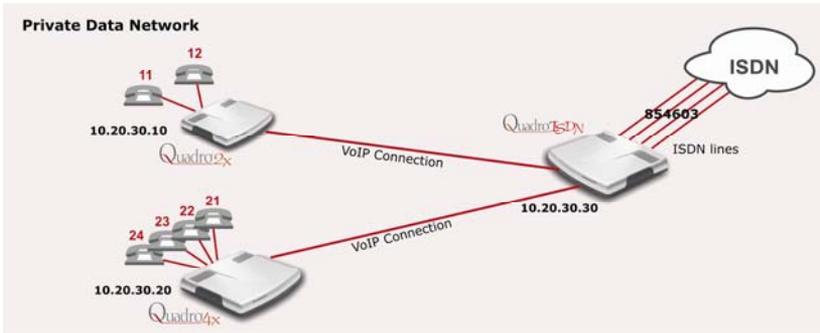


Fig. I-30: Call Routing example

Your PSTN Service Provider supplies you with a telephone number for the ISDN lines connected to the QuadroISDN. If you want to allocate the incoming calls of that number, you need to:

- Create a dial plan to define **Call Routing paths** on the QuadroISDN and on each of the other Quadro devices.
- Modify the QuadroISDN's Auto Attendant welcome message inform the callers about the extension numbers to enable them to reach the desired destination.

To illustrate the dial plan with an example, we will assume that you have got the phone number 854603 and you want to offer connections assigned the numbers as follows:

Quadro 2x (IP: 10.20.30.10)		Quadro4x (IP: 10.20.30.20)		QuadroISDN (IP: 10.20.30.30)
Extension 11	-11	Extension 21	-21	All incoming calls from the PSTN will be caught in the Auto Attendant: The welcome message of the Auto Attendant may inform the callers about the extension numbers.
Extension 12	-12	Extension 22	-22	
		Extension 23	-23	
		Extension 24	-24	

In this case, the following call routes are needed:

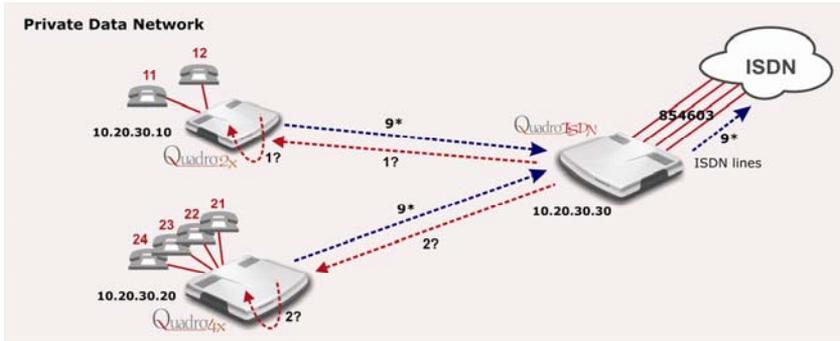


Fig. I-31: Call Routing example; dialing plan

QuadroISDN

Pattern	NDS	Prefix	Call Type	Destination Address	Description
1?			SIP	10.20.30.10	path to Quadro2x
2?			SIP	10.20.30.20	path to Quadro4x
9*			ISDN		path for all outgoing calls to ISDN

Quadro2x

Pattern	NDS	Prefix	Call Type	Destination Address	Description
1?			PBX		path to the single extensions
9*			ISDN	10.20.30.30	path for all outgoing calls to ISDN

Quadro4x

Pattern	NDS	Prefix	Call Type	Destination Address	Description
2?			PBX		path to the single extensions
9*			ISDN	10.20.30.30	path for all outgoing calls to ISDN

To define the call routing paths needed on QuadroISDN, open **Call Routing** in the **Telephony** menu and select **Local Routing Table**. The **Call Routing - Local Routing** page will be displayed:

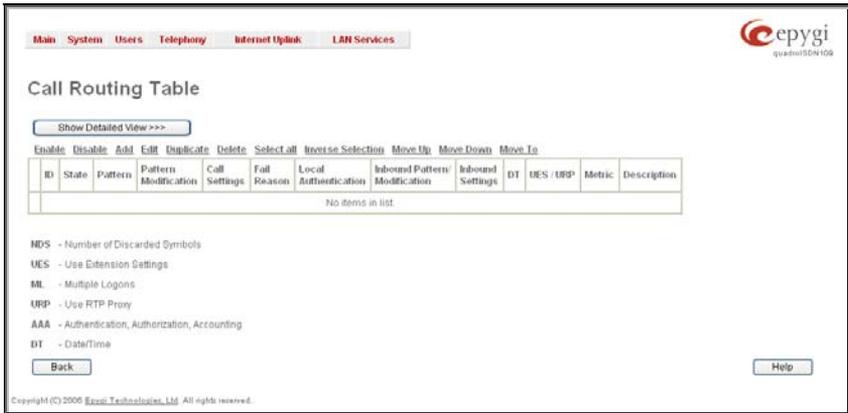


Fig. I-32: Call Routing table

Per default, the **Call Routing** table contains no defined entries. So the routing rules should be configured manually.

Select **Add** to set the **1?** route that leads the incoming ISDN calls to the Quadro2x:

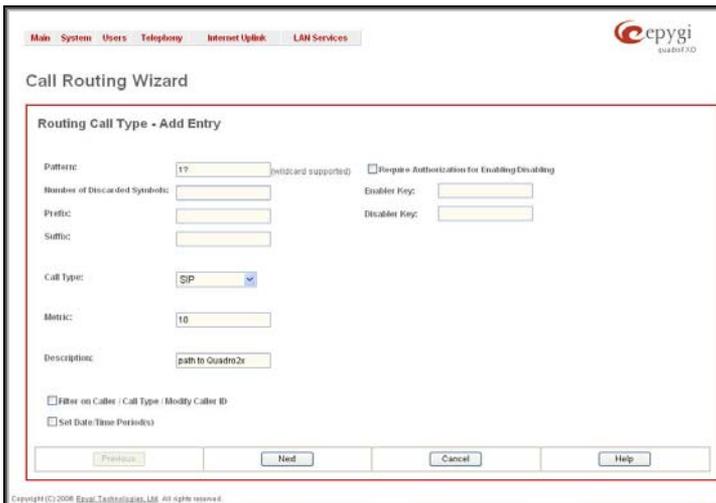


Fig. I-33: Local Call Routing Wizard - page 1

Pattern requires the routing pattern. To make the specified call, the appropriate Call Code should be dialed prior to the routing pattern. Only digit values and wildcard symbols are allowed here:

- the "?" character stands for only one unknown digit
- the "*" character stands for any number of any digits.
- the "!" character stands for exclusion.
- '[', ']', '{', '}', ',' and '-' are used to define a range or a quantity of numbers.

Number of Discarded Symbols (NDS) specifies the number of digits that should be discarded from the beginning of the routing pattern. In this example, no digits have to be discarded, so leave that field empty.

Prefix specifies digits that will be inserted at the beginning of the routing pattern. Leave the field empty if no digits need to be added.

Suffix specifies digits that will be inserted at the end of the routing pattern. Leave the field empty if no digits need to be added.

Call Type gives a possibility to select the routing call type (PBX, PBX-Voicemail, SIP, ISDN or IP-PSTN). For this example **SIP** has to be selected.

Metric allows entry of a rating for the selected route in a range from 0 to 20. If no value is inserted into this field, 10 will be used as a default. When two route entries match a user's dial string, the route with the lower metric will be preferred. In this example the **Metric** field's value will be left default (10).

Description allows entry of short text, e.g. to name the path.

Filter on Caller/Call Type Modify Caller ID allows you limit the functionality of the current route to be used by the defined caller(s) only. If this checkbox is enabled, inbound caller information (Inbound Caller Pattern, Inbound Call Type, Inbound Port ID, etc.) will be required later in the Local Call Routing Wizard (see Manual-II, Administrator's Guide). In this example, no caller specific limitation is needed, so leave that checkbox unchecked empty.

Set Date/Time Period(s) allows setting a time period, during which the route shall be valid. For this purpose, and own page is displayed as the third page of the Local Call Routing Wizard.

Next will display the second page of the **Local Routing Wizard**:

Call Routing Wizard

Routing Call Settings - Add Entry

Use Extension Settings: Keep Original Caller ID
 Add Remote Party ID

Destination Host:
 Destination Port:

Username:
 Password:

Enable Activity Timeout
 Activity Timeout:

Use RTP Proxy
 Use Secure RTP (SRTP)
 Proceed Non-secure on Failure

AAA Required:
 Local Authentication
 RADIUS Authentication and Authorization
 RADIUS Accounting
 Client Code Identification

Fail Reason: None

Transport Protocol for SIP messages:
 UDP
 TCP

SIP Privacy:
 Default Privacy
 Disable Privacy
 Enable Privacy
 Session Header
 User ID
 Require Privacy

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Fig. I-34: Local Call Routing Wizard - page 2

Use Extension Settings is applicable to SIP and IP-PSTN call types only and allows to select the extension (also Auto Attendant) on behalf of the call that will be placed. The SIP settings of the selected extension will be used as the caller information. If no entry is selected in this list, the original caller information will be kept. If the **Keep original Caller ID** checkbox is selected, the called destination will receive the original caller's information, rather than the information of extension selected from the **Use Extension Settings** list.

When the **Add Remote Party ID** checkbox is selected, the Remote-Party-ID parameter is delivered to the destination side upon call establishment procedure.

Destination Port requires the port number of the destination or the SIP server. As Quadro devices use port 5060 per default, use this field empty which will be implied as 5060 port.

User Name and **Password** are identification settings for public SIP servers or servers requiring authentication. Leave these fields empty.

Enable Activity Timeout checkbox is used to limit time-to-live period of routing pattern (makes sense if accept or failure feedback arrives too late from the destination). Checkbox selection enables the **Activity Timeout** text field which is used to insert a routing pattern activity timeout (in the range from 1 to 180 seconds). When timeout is configured, the routing pattern will be active within the defined time frame and if no response has been received from the destination during that period, the pattern will be stopped and next routing rule might be optionally considered (depending on the **Fail Reason** configuration on the corresponding pattern).

Use RTP Proxy checkbox is available for **SIP** and **IP-PSTN** call types and is applicable only when the route is used for calls through Quadro between peers both located outside the Quadro. When this checkbox is selected, RTP streams between external users will be

routed through Quadro, otherwise, when checkbox is not selected, RTP packets will be moving directly between peers.

Use Secure RTP (SRTP) checkbox is available for **SIP** and **IP-PSTN** call types and is used to encrypt RTP streams outgoing from the Quadro. This selection enables **Proceed Non-secure on Failure** checkbox. When the **Proceed Non-secure on Failure** checkbox is also selected, the non-secure RTP streams transmission will be allowed even when **Use Secure RTP (SRTP)** checkbox is selected but the peer side does not support the SRTP. Otherwise, when **Proceed Non-secure on Failure** checkbox is not selected and the peer side does not support SRTP, the call will not be established.

AAA Required checkboxes are used to choose one or more Authentication, Authorization, and Accounting (AAA) settings:

- **Local Authentication** – with this checkbox selected, callers will need to pass authentication through Local AAA table (see below) when dialing the current pattern.
- **RADIUS Authentication and Authorization** – checkbox is present when RADIUS client is enabled. With this checkbox selected, when dialing the current pattern, callers will need to pass the authentication through RADIUS server (see above).
- **RADIUS Accounting** - checkbox is present when RADIUS client is enabled. With this checkbox selected, no authentication will take place, but a caller identifying CDR (call detail report) will be sent to the RADIUS server. Checkbox selection enables accounting on the RADIUS for the certain call. This selection enables the **Client Code Identification** checkbox which is used to activate/deactivate the code identification on the RADIUS server. When the **Client Code Identification** checkbox is selected, caller may optionally dial an identity code at the end of the corresponding route. To make an identified call, caller should dial **Routing Number + * + Identity Code**. Here, **Identity Code** is an arbitrary digit combination used to identify the corresponding routing rule. Identity Code can be used to identify certain called destinations. This will allow to search the calls by the certain identity code criteria on the RADIUS server (for example, for further billing calculation purposes).

Fail Reason offers a list of fail reasons depending on the selected call type. If the selected fail reason occurs, the local routing table will be parsed for the next matching pattern, and if found, the call will be routed to the destination specified there. In the example described here, the default value **None** is used.

The **Transport Protocol for SIP messages** manipulation radio buttons group is available for **SIP** or **IP-PSTN** call types only and allows you to select the transport (UDP or TCP) to transmit the SIP messages through.

The **SIP Privacy** manipulation radio buttons group is only available for the **SIP** call type and allows you to select the security of the SIP route by means of hiding (or replacing, depending on the configuration of the SIP server) the key headers of the SIP messages used to establish the call.

- **Default Privacy** – with this selection, Quadro specific SIP privacy will not be applied and all privacy will rely on the configuration of the SIP Server.
- **Disable Privacy** – with this selection, SIP call security will not be disabled and all headers of the SIP message will be transparently visible to the destination.
- **Enable Privacy** - with this selection, SIP privacy will be specified for the corresponding route. This selection enables a group of checkboxes in order to choose the key headers that are to be fully or partly hidden or replaced. The **Require Privacy** checkbox selection is used to restrict the delivery of the SIP message if any of the selected headers cannot be hidden (or replaced, depending on the configuration of the SIP server) before being sent to the destination.

The last page of the Local Call Routing Wizard summarizes all settings and **Finish** will save the route. The **Call Routing – Local Routing** page is displayed again showing the new call routing path.

Configuring the QuadroISDN as an IP PBX Expansion device

QuadroISDN as a LINE expansion device does not require further configuration but the ISDN line sharing, if the Quadro IP PBX

- **is connected to the network and all network settings are done without any issues**
- **still acts as a DHCP Server as it does by default**

The only required configuration for sharing the ISDN lines of the QuadroISDN to the Quadro IP PBX is the sharing mode configuration on both devices (see details in [Step 3: Sharing Mode Configuration on the Quadro IP PBX](#) and [Step 4: Sharing Mode Configuration on the QuadroISDN](#)).

In this case, the QuadroISDN has to be connected with its WAN interface to the LAN interface of the Quadro IP PBX and with its LINE ports to the ISDN lines. The QuadroISDN will get its IP address from the DHCP server of the Quadro IP PBX and will automatically route all incoming PSTN calls to the Auto Attendant of the Quadro IP PBX and will allow all routed calls from the Quadro IP PBX to access the ISDN lines of the QuadroISDN.

If the Quadro IP PBX does not act as a DHCP server and/or does not use the default LAN IP address any more, follow the step-by-step instructions presented below on both the Quadro IP PBX and QuadroISDN setups for incoming/outgoing calls through QuadroISDN ports.

Please Note: The QuadroISDN is functioning as an ISDN lines expansion device independent on the interface running on the Quadro IP PBX. It will work either with Quadro IP PBXs with ISDN interface available (like Quadro2xi, Quadro4xi and Quadro16xi) or with Quadro IP PBXs with ISDN interface available (like Quadro2x, Quadro4x and Quadro16x).

Step 1: Connecting the QuadroISDN

- Connect the WAN port of the QuadroISDN to the LAN port of the Quadro IP PBX via a straight-through Cat 5 cable with a RJ 45 connector.
- Make sure that the LINE ports of the Quadro IP PBX and the QuadroISDN are connected to ISDN telephone lines.

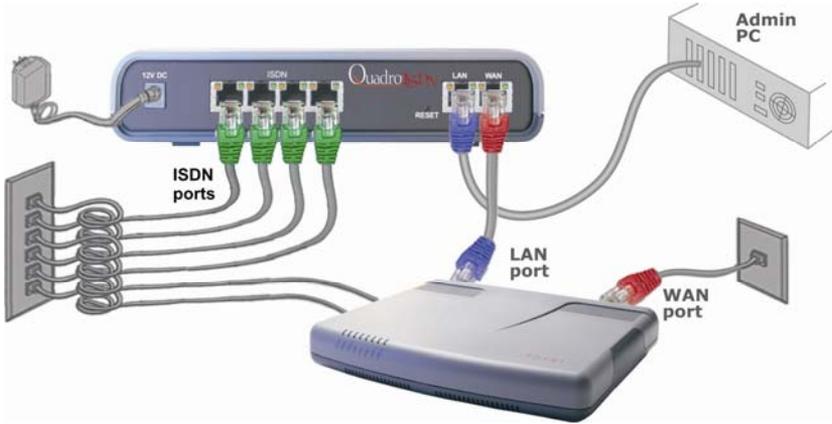


Fig. I-35: Installation of QuadroISDN as a LINE expansion for a Quadro IP PBX

- The software image SOHO-SW 4.1.x or later must be running on the Quadro IP PBX.
- The software image ISDN-SW 4.1.x or later must be running on the QuadroISDN.

Step 2: Enable the DHCP Server on the Quadro IP PBX

The QuadroISDN has to have an IP address to identify itself in the Quadro IP PBX LAN. This IP address can be assigned to it manually or dynamically via the DHCP server of the Quadro IP PBX. The simple way from the configuration perspective is to dynamically get an IP address from the Quadro IP PBX (default IP is 172.28.0.1). This will be done automatically, if the connected Quadro IP PBX acts as a DHCP server and if the QuadroISDN acts as a DHCP client. Both devices will do so in their default settings.

To make sure, that the Quadro IP PBX will serve as a DHCP server, login to the Quadro IP PBX as an administrator and select **DHCP Settings for the LAN Interface** from the **LAN services** menu.

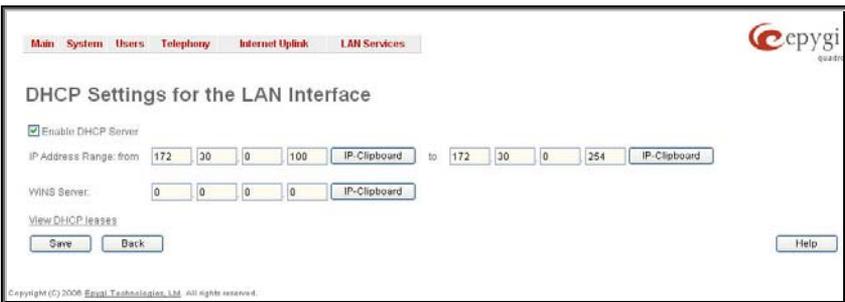


Fig. I-36: LAN-DHCP Settings page on the Quadro IP PBX

Make sure the **Enable DHCP Server** checkbox is selected and the **IP Address Range** is configured.

To make sure, that the DHCP Server of the Quadro IP PBX assigned a valid IP address to the QuadroISDN, go to the **LAN Services** Menu of the Quadro IP PBX, click on **DHCP Settings for the LAN Interface** and select **View DHCP Leases**. The table on the opened page should list the IP address and other details of QuadroISDN.

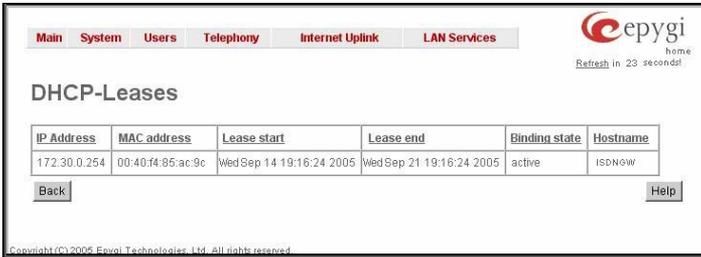


Fig. I-37: DHCP Leases page of the Quadro IP PBX

Step 3: Sharing Mode Configuration on the Quadro IP PBX

This configuration is required on the Quadro IP PBX in order to make it use the shared ISDN lines on the QuadroISDN, as well as to configuration the appropriate settings for the successful authorization between Quadro IP PBX and the QuadroISDN.

Connect to the Web GUI of the Quadro IP PBX and login as an administrator. From **Telephony** menu, enter **External PSTN Gateways** page.



Fig. I-38 – External PSTN Gateways page on Quadro IP PBX

Select the **Use PSTN lines of the other device** checkbox and press **Save** to apply changes.

Press the **Authorization Parameters** link. **External PSTN Gateways – Authorization Parameters** page is displayed. Here, a list of authorized devices should be configured.



Fig. I-39 – External PSTN Gateways – Authorization Parameters page on Quadro IP PBX

Press **Add** functional link to add new authorization parameters for the QuadroISDN.



Fig. I-40 – Sharing Mode – Authorization Parameters – Add Entry page on Quadro IP PBX

On the opened page, insert the **Username** and the **Password** in the corresponding text fields. These authentication parameters should match on both Quadros. Save the parameters.

Step 4: Sharing Mode Configuration on the QuadroISDN

This configuration is required on the QuadroISDN to share its ISDN lines to the QuadroISDN. Open the Web Management of the QuadroISDN in your browser (by default the IP address of QuadroISDN is 172.28.0.1).

Go to **Telephony** menu, enter **PSTN Lines Sharing** page.

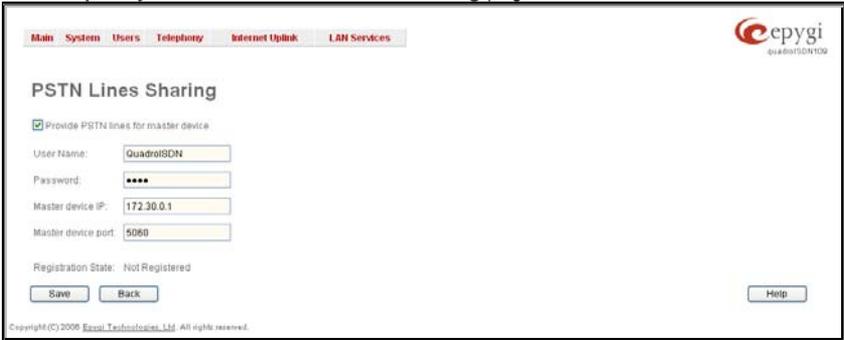


Fig. I-41 – PSTN Lines Sharing page on QuadroISDN

Select the **Provide PSTN lines for master device** checkbox. Insert the **Username** and the **Password** in the corresponding text fields. These authentication parameters should match on both Quadros. Enter the IP address of the Quadro IP PBX into the **Master device IP** text field. Enter the SIP Port of the Quadro IP PBX into the **Master device port** text field. Save the inputs.

The results:

The configuration above will cause the corresponding 4 ISDN lines (trunks) of the QuadroISDN device to be shared to the Quadro IP PBX.

Additional ISDN trunks appear in **ISDN Settings** page on the Quadro IP PBX:

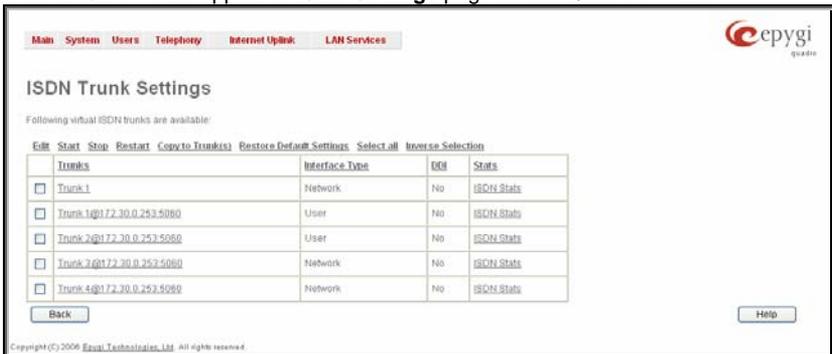


Fig. I-42 – ISDN Settings page with shared ISDN lines on Quadro IP PBX

New routing rule (#9) is automatically added to the **Call Routing** table on the Quadro IP PBX:

Call Routing Table

Show Detailed View >>>

Enable	Disable	Add	Edit	Duplicate	Delete	Select all	Inverse Selection	Move Up	Move Down	Move To										
ID	State	Pattern	Pattern Modification	Call Settings	Fall Reason	Local Authentication	Inbound Pattern/Modification	Inbound Settings	DT	UES /URP	Metric									
1	Enabled	911		ISDN trunk: Any Port(User)@Any	None	No	*	PBX			10									
2	Invalid	9?*	NDS: 1	ISDN trunk: Any Port(User)	Any	No	*	PBX			10									
<input type="checkbox"/>	Enabled	0*	NDS: 1	SIP sip.epygi.com	None	No				URP: No	10									
<input type="checkbox"/>	Enabled	??		PBX	None	No					10									
<input type="checkbox"/>	Enabled	450000		FXO port: Any@Any	None	No					10									
<input type="checkbox"/>	Enabled	660066		ISDN trunk: Any Port(User)@Any	None	No					10									
<input type="checkbox"/>	Enabled	4409		ISDN trunk: Any Port(Network)@Any	None	No					10									
<input type="checkbox"/>	Enabled	99*	NDS: 2	SIP 192.168.75.215:5116	None	No				URP: No	10									
<input type="checkbox"/>	Enabled	9?*	NDS: 1	ISDN trunk: Any Port(User)@172.30.0.253:5060	Any	No	*	PBX			10									
<input type="checkbox"/>	Enabled	550099		FXO port: Any@Any	None	No					10									
<input type="checkbox"/>	Enabled	9?*	NDS: 1	FXO port: Any Port@192.168.23.101:5060	Any	No	*	PBX			10									

NDS - Number of Discarded Symbols
 UES - Use Extension Settings
 ML - Multiple Logons
 URP - Use RTP Proxy
 AAA - Authentication, Authorization, Accounting
 DT - Date/Time

Back Help

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Fig. I-43 – Call Routing table on Quadro IP PBX

The **ISDN Wizard** and **Edit Trunk** pages on the QuadroISDN gateway become read-only. Although these pages remain accessible, they act for informative purposes only and no changes in the ISDN related settings are possible.

New routing rules (# 1-7) are automatically added to the **Call Routing** table on QuadroISDN:

Call Routing Table

Show Detailed View >>>

ID	State	Pattern	Pattern Modification	Call Settings	Fail Reason	Local Authentication	Inbound Pattern Modification	Inbound Settings	DT	UES / URP	Metric	Description
1	Enabled	*		SIP 172.30.0.1:5060	None	No	* Inb Prefix: 0	ISDN trunk: ISDN Trunk0		URP: No	10	For Routing PSTN
2	Enabled	*		SIP 172.30.0.1:5060	None	No	* Inb Prefix: 1	ISDN trunk: ISDN Trunk1		URP: No	10	For Routing PS
3	Enabled	*		SIP 172.30.0.1:5060	None	No	* Inb Prefix: 2	ISDN trunk: ISDN Trunk2		URP: No	10	For Routing PS
4	Enabled	*		SIP 172.30.0.1:5060	None	No	* Inb Prefix: 3	ISDN trunk: ISDN Trunk3		URP: No	10	For Routing PSTN
5	Enabled	9(7,8)*	NDS: 1	ISDN trunk: Any Port	None	No	*	SIP 172.30.0.1			10	For Routing calls Fr
6	Enabled	*	NDS: 1	ISDN trunk: Any Port	None	No	*	SIP			10	
7	Enabled	911		ISDN trunk: Any Port	None	No	*	SIP 172.30.0.1			10	Emergency Call

NDS - Number of Discarded Symbols
 UES - Use Extension Settings
 ML - Multiple Logons
 URP - Use RTP Proxy
 AAA - Authentication, Authorization, Accounting
 DT - Date/Time

Back Help

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Fig. I-44 – Call Routing table on QuadroISDN

All these routing rules cannot be edited or deleted.

Please Note: Any changes made in the **ISDN Settings** on the Quadro IP PBX will automatically be reflected in this table.

Please Note: Following dependencies are used when sharing the ISDN lines:

- All preconfigured information of all shared ISDN trunks on the QuadroISDN is transparent to Quadro IP PBX and will be accordingly displayed in the **ISDN Settings** page.
- Independent of the configuration on the QuadroISDN, the incoming calls on all shared ISDN lines will be automatically routed to the default Auto Attendant (00) once ISDN lines sharing is activated. Occasionally, routed destinations can be changed on Quadro IP PBX by clicking on the corresponding ISDN trunk.
- Any changes applied to the configuration of shared ISDN trunks on Quadro IP PBX will be automatically reflected in the **ISDN Settings** page and **Call Routing** table on the QuadroISDN device. There might be a delay of up to 60 seconds.

How this configuration works:

When the Quadro IP PBX user dials 9 followed by a PSTN number (or 9 + # + PSTN number) and no ISDN trunk is available on the Quadro IP PBX (they are either unavailable, in use or disabled), the call will be routed to QuadroISDN and will go through the first available ISDN trunk on the QuadroISDN.

When incoming call arrives to either of the ISDN trunks on the QuadroISDN, it will be automatically routed to the Auto Attendant on the Quadro IP PBX (unless stated otherwise from the **ISDN Settings** page on the Quadro IP PBX).

Registering on Epygi's Technical Support

It is recommended that you register your QuadroISDN on the Epygi Technical Support web page. Registration will give you access to the Technical Support Database. There, you can send requests concerning technical problems as well as refer to the frequently asked questions. In addition, the technical support page allows users to download new firmware, manuals and other information. You can access the support section only if you are registered. Additionally, registration at Epygi's Technical Support web page gives you the username and password to login to the Epygi SIP Server.

To register, you need to know the serial number of your QuadroISDN, which you will find on QuadroISDN's bottom label and its purchase date. Next, open the Epygi home page (www.epygi.com), select **Support** and click on **Registration Form**. The online registration page will appear:

Complete all fields and record the **Login Name** and **Password** in a safe place. You will need it for the SIP server.

Please Note: In some cases the QuadroISDN units will be shipped pre-configured from the factory with the Support login and password already set-up. In this case, an information sheet is included in the packaged contents indicating the user-name/password to access Epygi's online Support and the Epygi SIP Server.

The registration form is titled "Registration Form" and includes a "Required Information" indicator. It is divided into four main sections:

- Product Information:** Includes fields for Serial Number (112233001729), Purchase Location (United States), Purchased From (EPYGI), and Purchase Date (05/21/2004).
- Login Information:** Includes fields for Login Name (Samantha), Password, and Confirm Password.
- Customer Information:** Includes fields for First Name (Samantha), Last Name (Donaldson), Company (OmniTec, Ltd), Email (samantha.donaldson@omnitec.com), Street, City (Seattle), Country / State (Washington), Zip / Postal Code, Phone 1, Phone 2, and Fax.
- Information Requested:** Includes checkboxes for New Software Version, New Product, New Security Issue, and Maintenance Announcement.

At the bottom right, there are "SUBMIT" and "CANCEL" buttons.

Fig. I-45: Registration form

Appendix: PC DHCP Settings

The QuadroISDN LAN port has a DHCP server that provides DHCP IP addresses to devices connected to the LAN either directly or through an Ethernet hub or switch. Appendix A describes how to configure Windows PCs for DHCP. The PC used to access the QuadroISDN must meet the following conditions:

- TCP/IP network protocol has to be installed.
- DHCP has to be activated to request the IP address automatically.

Please Note: If your PC is already configured for DHCP, then simply power it on. Verify the LAN LED is lit. If not, check the cable connections.

Follow the instructions below to install TCP/IP and enable DHCP functionality:

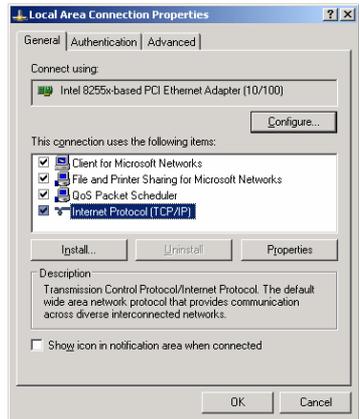
TCP/IP and DHCP under Windows 2000/Windows XP

Windows 2000 and Windows XP PCs with Ethernet cards or adapters normally are configured with a TCP/IP network connection by default. Nothing additional needs to be installed. To enable the DHCP functionality, you may have to modify the properties of TCP/IP:

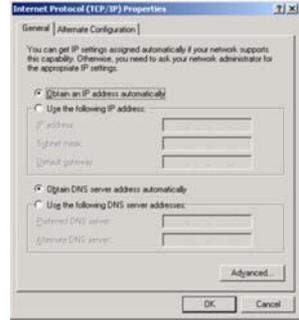
1. Click the **Start** button. Choose **Settings**, then **Control Panel**.
2. Double-click on the **Network Connection** icon to open the corresponding window. Select **Local Area Connection** with the right mouse button and select **Properties**.



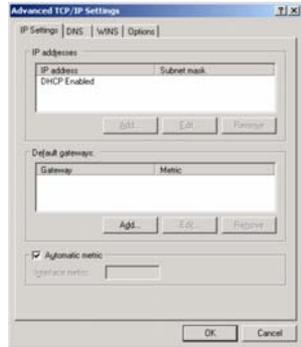
3. Highlight **Internet Protocol (TCP/IP)** and click **Properties**. The corresponding window will be displayed.



- 4. Select **Obtain an IP address automatically**, then click on **Advanced**.



- 5. You will see the entry **DHCP Enabled**.
- 6. Click **OK** three times to close all windows.



TCP/IP and DHCP under Windows 95/98/ME

- 1. Click the **Start** button. Choose **Settings**, then **Control Panel**.
- 2. Double-click on the **Network** icon to open your Network window. Select the **Configuration** tab.
- 3. Click **Add**.
- 4. Double-click on **Protocol**.
- 5. Highlight "Microsoft" under the list of manufacturers.
- 6. Find and double-click on **TCP/IP** in the list to the right.
- 7. The Network window will appear with the TCP/IP protocol now listed.
- 8. Highlight "TCP/IP" and click on **Properties**.
- 9. Select **Getting IP address automatically** to enable the DHCP functionality.
- 10. Click **OK**.
- 11. Windows will ask you to restart the PC. Click **Yes**.

The TCP/IP installation is now complete and the DHCP functionality is enabled.

Appendix: Changing the Admin's Password

For security reasons, it is recommended that you change the default admin password. The username of the administrator (**admin**) cannot be changed.

To change the administrator password, go to the **System** menu, **User Rights Management**.

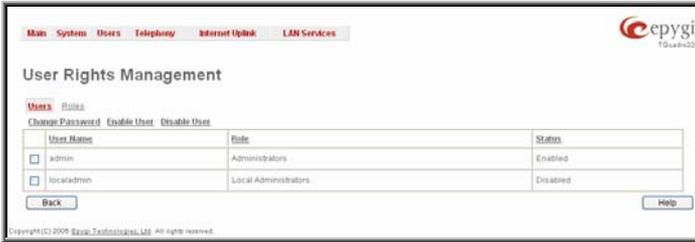


Fig. I-46: User Right Management page

Choose **admin** from the list and press the **Change Password** functional button from the **User Right Management** page toolbar.

The **Change Password** page will be displayed.



Fig. I-47: Change Password page

Enter the **Old Password** (19) and the **New Password** in both the **New Password** and **Confirm New Password** fields. Please note that only numeric digits may be entered here. Leave **Store password in persistent area (Factory reset save)** disabled.

Write down the password somewhere and keep it in a secure place. If the password is lost, a factory reset will be required on the unit (see Administrator's Guide, Hardware Overview). All settings are lost after a factory reset. After a factory reset the default password (19) will be restored.

Appendix: Configuring SIP NAT Traversal

The QuadroISDN initiates and receives SIP calls from the network connected to the WAN port) To receive SIP calls, the QuadroISDN must be able to receive packets from the SIP server or any other device that is trying to make an incoming call. If the QuadroISDN is placed behind a router with NAT, like most basic routers on the market today, the QuadroISDN will not be able to receive calls. To resolve this issue, either STUN must be enabled on the QuadroISDN or SIP NAT traversal must be set up in the router and in the QuadroISDN to properly route the incoming calls.

NAT or Network Address Translation is a common feature used to expand the use of connected PCs and other networked devices without having to use multiple global Internet public IP address. Most ISP will assign one public IP address to each customer that is connected to the Internet. The customer can use a router to provide NAT capability and create a private network of PCs and other devices not visible to the Internet. This method offers security and also eliminates the need to assign global Internet public IP addresses to each device.

Please Note: SIP NAT traversal only works with Internet connections that have static IP addresses. Verify from your provider this is the case for your Internet connection. Some ISPs provide dynamic IP addresses that may change from time to time, and are not appropriate for SIP NAT traversal.

Please Note: If you have more than one router in series between the QuadroISDN and the Internet, the same port forwarding setup must be configured on each router.

SIP NAT Traversal Setup

- Install the QuadroISDN behind the router. If the QuadroISDN is configured with its factory default settings, it is already configured for DHCP and will obtain an IP address automatically from the router. If the DHCP was changed, please [Run the System Configuration Wizard](#) to place the QuadroISDN in DHCP mode. Power up the QuadroISDN.
- Connect a PC or laptop to the QuadroISDN LAN port and power it up.
- Verify the QuadroISDN can connect to the Internet by opening a browser window and browsing to a familiar WEB site. If the QuadroISDN can not reach the Internet, verify the LAN/WAN cabling. Verify the QuadroISDN is set up for DHCP on the WAN and that the router has the DHCP server enabled for the devices behind it.
- Find the address of the router and log into the router. Refer to the router user manual on how to open the router configuration.
- Set up port forwarding on the router to forward the UDP ports according to the ports specified for SIP (Mapped Port for SIP, default: 5060) and RTP/RTCP (Min mapped RTP/RTCP port (default 6000 and Max mapped RTP/RTCP port (default 6099)) on the QuadroISDN. The router should forward that UDP (USP/TCP for SIP) ports to the IP address assigned to the QuadroISDN. You can see the IP address of the QuadroISDN in the System menu under Status. The IP address will be listed as the WAN IP address. Your router may also indicate the IP address assigned to the QuadroISDN.
- Find out the public Internet address of the router. To do so, open a browser and go to www.whatismyip.com. The site will return your public Internet IP address. Record this IP address.
- From the **QuadroISDN Management** menu, go to the **Telephony** menu, select **NAT Traversal Settings/SIP Settings** and check **Use Manual NAT Traversal**.

- For **Mapped Host**, enter the router IP address found on the step above and the port number **5060** for **Mapped Port**. **Save** the settings
- Select the **RTP Parameters** link, check **Use Manual Nat Traversal**, enter again the router's IP address into the **Mapped Host** field. In the area **Mapped RTP/RTCP Port Range for FXS Lines** enter for **Min: 6000** and for **Max 6099**.
- Click the **Save** button to save the contents.

The QuadroISDN will activate the settings and register the extension on the Epygi SIP Server after a few minutes. You can verify the settings from the main **QuadroISDN Management** menu under **Status** in the **SIP Registration Status** section.

Appendix: Checking the Connections

If the system seems to work incorrectly even when all cables are connected properly, it may be helpful to **Start Network Diagnostics**: The WAN link, IP configuration, gateway, DNS server, and STUN-NAT (if used) will all be checked.

To start diagnostics, open the **System's** menu item **Diagnostics** and click **Start Network Diagnostics**.

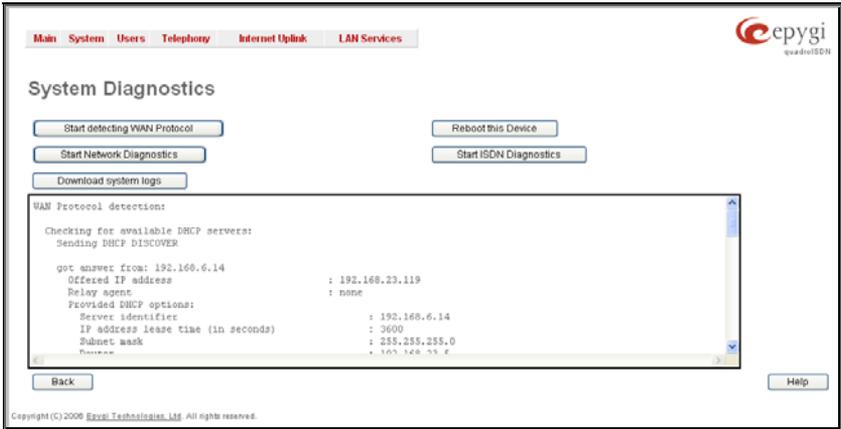


Fig. I-48: System Diagnostics page

In the case of a successful test, the output of the system looks as follows:

Basic Tests:

```

Checking for physical link      : WAN link ok
Checking IP configuration      : dynamically via DHCP Client
    DHCP Client is running
Checking internet connectivity (ICMP ping):
    Gateway (192.168.23.5):      reached
    Primary nameserver (192.168.0.2): reached
    Secondary nameserver (192.168.0.156): reached
Checking name service connectivity (DNS):
    Primary nameserver (192.168.0.2): answered
    Secondary nameserver (192.168.0.156): Error: did not answer
    www.epygi.com:              resolved and answered
    epygi-config.com:           resolved
    ISDNGW.epygi-config.com:    resolved
    www.epygi-config.com:       resolved
STUN Network Address Translation (NAT) Check:
Checking server/port: 195.69.162.138/5065
    External visible address     : 192.168.23.119
    Detected NAT type           : Full Cone NAT
STUN Network Address Translation (NAT) Check:
Checking server/port: 83.217.225.108/5065
    
```

```

External visible address      : 192.168.23.119
Detected NAT type            : Full Cone NAT
STUN Network Address Translation (NAT) Check:
Checking server/port: 69.93.123.244/5065
External visible address      : 0.0.0.0
Detected NAT type            : Blocked UDP

```

Performing MTU Discovery:

```

preparing system
Sending UDP Datagram of size 1500    no answer
Sending UDP Datagram of size 750     no answer
Sending UDP Datagram of size 375     no answer
Sending UDP Datagram of size 188     no answer
Sending UDP Datagram of size 95      no answer
Sending UDP Datagram of size 49      no answer

```

clean up

No data received!

Test successful.

Depending on where the test is failing, the diagnostic can give some advice to solve the problem. See the example below of a failed test:

Basic Tests:

Checking for physical link: no WAN link

Please check the physical connection of the WAN interface. Cable is not plugged or broken?

Test failed.

If you pass the diagnostics successfully, but are still not able to place a call to 899# then check the SIP registration status.

Open the SIP Registration Status page using the QuadroISDN management **System** menu item **Status**. If QuadroISDN is placed behind a NAT router, the detected NAT type and the IP address of this router's WAN port are displayed.

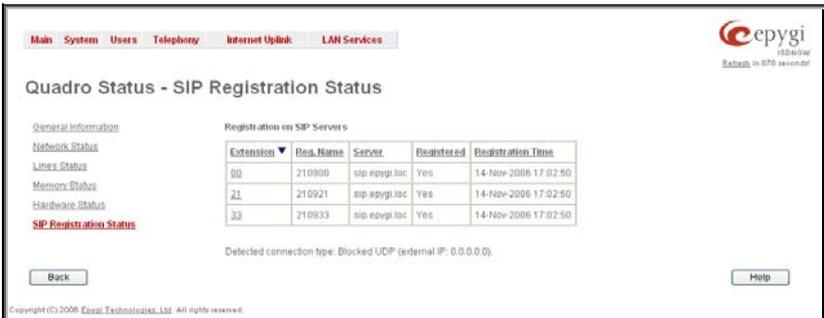


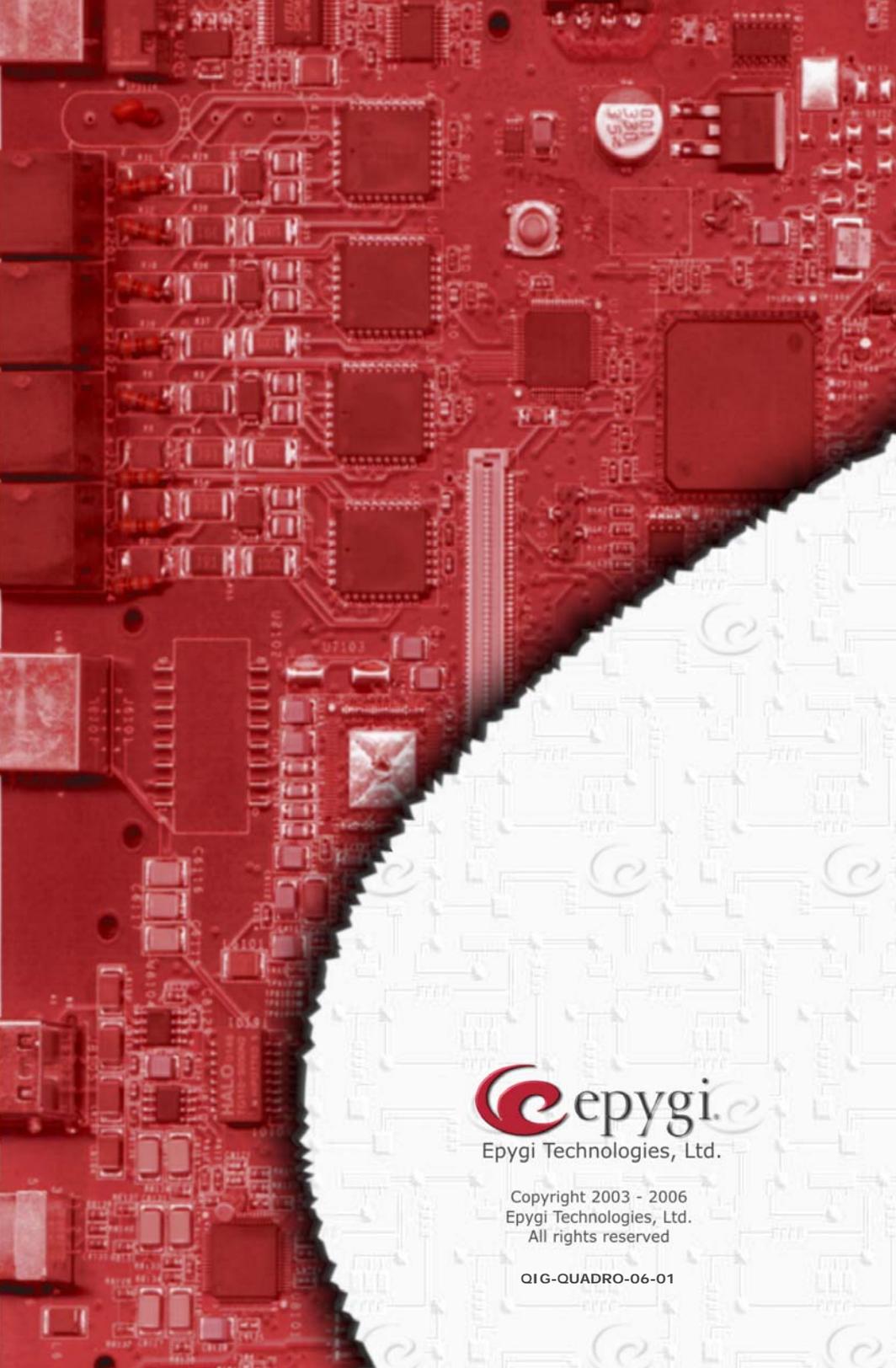
Fig. I-49: SIP Registration Status page

If you are using the STUN functionality the page shown above will additionally display the Detected Connection Type. Unsupported Connection types will cause one of the following messages:

- Unknown connection - unexpected error,
- Symmetric NAT,
- Symmetric Firewall,
- Blocked UDP

If the **Detected Connection Type** is any of the types listed above, QuadroISDN cannot work behind your router. You must either connect the QuadroISDN in front of the router, or configure NAT traversal manually as explained in [Appendix: Configuring SIP NAT Traversal](#)

If you are unable to resolve your problems, please send us a technical support request on the **Support** section of <http://www.epygi.com/>. Please prepare a system log file and attach it to your request. To create a system log file, open the **System Diagnostics** page **System** menu item **Diagnostics**) and click **Download System Logs**.



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