In order to access your radio network from your SIP (Session Initiated Protocol) enabled phone, mobile or computer, you must connect your IPR110Plus to a SIP server. In this document, we provide a quick demonstration of how this is done.

For the purpose of this demonstration we will use the free Iptel *SIP server. Iptel is a free SIP server that can be found at www.iptel.org.

Requirements

For the following setup to work you will need to have:
- Access to the Internet;
- And either:
  - an ADSL router that has a SIP Application Level Gateway; or
  - the IPR110Plus with a public IP address, rather than a local IP address behind a router that supports Network Address Translation (See page 5 for more information about what NAT is and why it is a problem for SIP devices).
  -
- SIP enabled phone.

Process

1. To begin to set up a system, go to iptel.org and register your user name and password. Write down both your Iptel user name and password. You will need to enter these values into the IPR110Plus.

   NOTE: When you change information on an IPR web page you must save it before leaving the page or the information will not be saved. When you have changed all of the information on all pages the unit should be reset and the changes will take effect after the unit restarts.

2. Plug an Omnitronics handset or console into the handset port of the IPR110+ and from the web interface under the Radio/Handset settings change the default settings so that the handset is enabled and under the advanced settings enable the 'Transmit without local BUSY/PTT signal' setting. VAD is enabled as a default setting. This is the easiest way to be able to hear audio.

*Note: Iptel is provided by a third party who have no relationship with Omnitronics. It is a useful free service we are using to demonstrate the IPR110Plus

3. Enable names to be used for access to the SIP server, as opposed to addresses. The IPR110+ must have the address of a Domain Name System server within your network. This is entered on the 'Network' page under advanced settings.

   If you don't know the address of the DNS server provided by your organization, you can use one of several free DNS servers on the Internet. For example you can use opendsn.org.

4. Configure the SIP through the SIP configuration page:

   - Check the enable SIP check box.
   - The page will have the default port for sip, 5060, which should not be changed.
   - In the 'User Name' box enter your Iptel user name.
   - The box for 'SIP Server Enable should be checked.
   - In the box for 'SIP Registrar server type **iptel.org.**
   - In the 'SIP server password' box type the Iptel password.
   - The box to 'Enable status sounds can also be checked.

Session Initiation Protocol (SIP) Configuration

SIP Settings

SIP Enable:	☑
Disable incoming connection:	☐
SIP UDP Port:	5060
User Name:	omnitronics
SIP Server Enable:	☑
SIP Registrar server:	iptel.org
SIP outgoing proxy:	
SIP server password:	ipr100
SIP realm:	
Registration Expires:	60

Leave all the other settings as their default values.

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omnitronics

5. Add two SIP URL's to the 'Remote Device list' at the bottom of the SIP page under **Remote Device Addresses**. These URL's are **sip:echo@iptel.org** and **sip:music@iptel.org**.

	Remote device list		
	SIP Address(URL)	Connect	Disconnect
1	sip:echo@iptel.org	*1	#1
2	sip:music@iptel.org	*2	#2

6. Save the page and restart the IPR110Plus.

7. The IPR110Plus should now register with the SIP server at Iptel.org and you will be able to make and receive SIP calls via the IPR110Plus. Depending on the version of IPR110Plus, the registration status should be displayed at the bottom of the page on the IPR110Plus.

SIP Status	
Current active connections	0
Status	Register status:200, OK
SIP Registration Status	
Registration Status	200 OK

   If it is not working, review the previous steps to check everything has been done correctly.

8. Select Advanced mode and then go to the 'Connections' page under the Diagnostics heading.

Advanced Mode
Go to BASIC mode
System Status
Configuration
Network
Radio / Handset
VoIP / RTP
SIP
Tone Signalling
CTCSS
Serial modes
Change password
Save / Restore
Diagnostics
Diagnostics
Statistics
Connections
Firmware Upgrade
Exit

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9. On the connections page there will be buttons under the 'SIP Connections' heading which will allow the connections to SIP addresses that provide a music and an echo service from the Iptel server.

   If the connect button is pressed for the sip url sip:music@iptel.org, the IPR110Plus will make a VoIP connection to Iptel music service and then the music audio can be tested into the handset.

   If the connect button is pressed for the sip url sip:echo@iptel.org, the IPR100 plus will make a VoIP connection to the Iptel echo service. This allows the audio paths to and from the server to be tested. Note that you need to press the PTT button on the handset or console to switch the audio path on out of the console.

10. Finally, once the IPR110Plus has been proved to be correctly configured you should be able to make a connection from your SIP phone to the IPR110Plus and through to an attached radio. A simple way to do this is to register your phone with the same server (iptel.org) – this is not strictly necessary but it can make things easier. As an example, using the SIP application "3CX" on an Android phone, you can connect to the IPR110Plus by just dialing its *registered name* "omnitronics"once the phone and the IPR110Plus have both registered with the server.

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Network Address Translation and SIP

For a variety of reasons, including the fact the Internet is running out of IPv4 addresses, most computers are connected to the Internet via routers that provide Network Address Translation (NAT).

Network Address Translation allows multiple devices, using addresses in so called "private" address ranges to connect to the Internet and share a "public address".

Generally this is done by the router or ADSL modem that is the connection point to the Internet. Silently as data packets pass through the network router, it changes the addresses of packets to and from the local and public addresses.

NAT causes SIP based devices problems, because the SIP protocol includes IP address information in the SIP messages. This information is the local address information, not the public address. There are a various different strategies to try and compensate for this problem. The simplest solution from an end user point of view is to have a network router that understands the SIP message structure and "fixes" the SIP messages as it passes them. This functionality is generally described as a SIP Application Level Gateway (ALG) and is a standard feature on many Internet Gateway devices.

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