KSZ8382L
VoIP Evaluation Board User's Guide

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Purpose

This document describes the KSZ8382L VoIP Evaluation Board and associated resources in sufficient detail so as to allow the platform to function as a demonstration platform, a platform to investigate product functionality, and as a hardware platform that can be used to develop firmware.

Audience

This document is intended for hardware and firmware developers and technical managers who are involved with product development using the KSZ8382L device.

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Glossary

Host	PC used to install the SDK for further development and testing
SDK	Software Development Kit for VEB
VEB	VoIP Evaluation Boards (part of the VEK) based on Micrel's KSZ838xx family of processors
VEK	Voice over IP (VoIP) Evaluation Kit for Micrel's KSZ838xx family of processors

1 Introduction

This document describes the hardware resources and functionality available on the KSZ8382L Evaluation Board. References are made to various software resources which can be utilized to enhance the total system involvement.

2 Organization

The document is organized as follows:

Section 3: The Features of the KSZ8382L Evaluation Board

Section 4: Contents of the Eval Board Kit

Section 5: Eval Board Quick Start

Section 6: Making and Receiving Phone Calls Using the Eval Board

Section 7: Evaluation Board Description

Section 8: Evaluation Board Firmware and Tools

Section 9: Updating the Firmware

Section 10: Help

Section 11: Reference Documentation

Section 12: Revision History

3 Features

The KSZ8382L Evaluation Board contains the following features:

- IP Phone with Ethernet, headset, handset, and speaker interfaces
- Two 10/100 Ethernet ports
- 2 Gbits of DDR2 memory
- Up to 2 Gbits of NAND Flash memory (not installed)
- 8 MB of SPI NOR Flash memory
- One RJ11 phone jack for handset applications
- Support for speaker-phone applications via speaker and microphone headers
- Two 3.5 mm jacks; one for a headset and one for a microphone
- Four RCA audio test connectors; two for microphone audio input and two for audio output
- Communications port utilizing a UART and one DB-9 connector
- Access to GPIO pins and LED indicators
- Two JTAG Ports; one for the MIPS processor and one for the ZSP processor
- Two 4x4 key pads for emulating a 4x6 matrix keypad
- One 2x20 character LCD module
- 176-pin QFP KSZ8382L device

4 KSZ8382L VoIP Evaluation Board Kit Contents

The KSZ8382L VoIP Evaluation Board Kit contains the following items;

- KSZ8382L Evaluation Board
- KSZ8382L Evaluation Board User Guide (This document)
- KSZ8382L Evaluation Board Schematic
- KSZ8382L Evaluation Board PCB files
- KSZ8382L Evaluation Board BOM
- KSZ8382L IBIS files
- 5V Power Module

To successfully use the KSZ8382L VoIP evaluation board kit, the following items, which are not supplied with the kit, are required;

- Qty 1 – Handset with RJ11 connector
- Qty 1 – 8-port Ethernet switch
- Qty 1 or 2 – VoIP telephone to connect up to the Ethernet switch
- Qty 1 – Laptop or desktop computer (Windows XP or Windows 7) with the Brekeke SIP Server installed to connect to Ethernet switch
- Your favorite communication program such as TeraTerm or Hyperterminal.
- SolarWinds Trivial FTP Program

Figure 1 illustrates the components of the KSZ8382L VoIP Evaluation Board Kit.

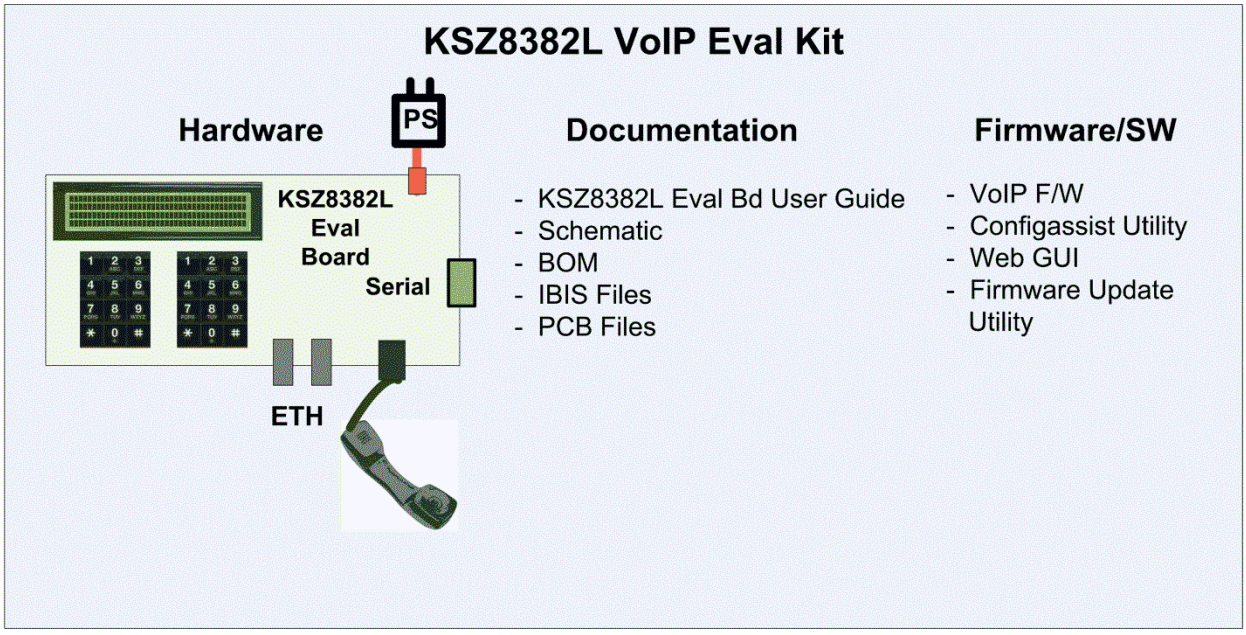


Figure 1 KSZ8382L VoIP Evaluation Board Kit

5 KSZ8382L VoIP Evaluation Board Quick Start

This section provides the information necessary to assist in assembling, configuring, and bringing up the Micrel KSZ8382L VoIP Evaluation Board. Before starting, refer to Section 4 which lists the items that come with the eval Board kit and those items which are not included but will be needed.

The order of bring up should follow the sequence described below.

- Connect all hardware items as shown in Figure 2.
- Turn on computer and evaluation boards in preparation for communicating with the board.
- Using the techniques discussed in sections 5.1.2 check, verify, or configure the key parameters that are required for this specific platform.
- Configure and set up the two VoIP telephones per the manufacturers instructions.
- Power down the evaluation board.
- Bring the Brekeke SIP Server online and configure it as discussed in section 5.1.3.

5.1.1 Eval Board Test Environment

In order to bring up the KSZ8382L Eval Board, you must build an environment. Micrel strongly suggests that you build up the basic environment illustrated in Figure 2. This basic platform is an entirely local environment which makes bringing up the board an easier task. This environment utilizes the Brekeke SIP Server. A free time-limited version can be installed for immediate use or a permanent license/package can be purchased and installed. After this environment is proven to work, other different SIP Servers and configurations and features can be explored.

The environment shown in Figure 2 will allow the designer to demonstrate the VoIP product and try out many product features.

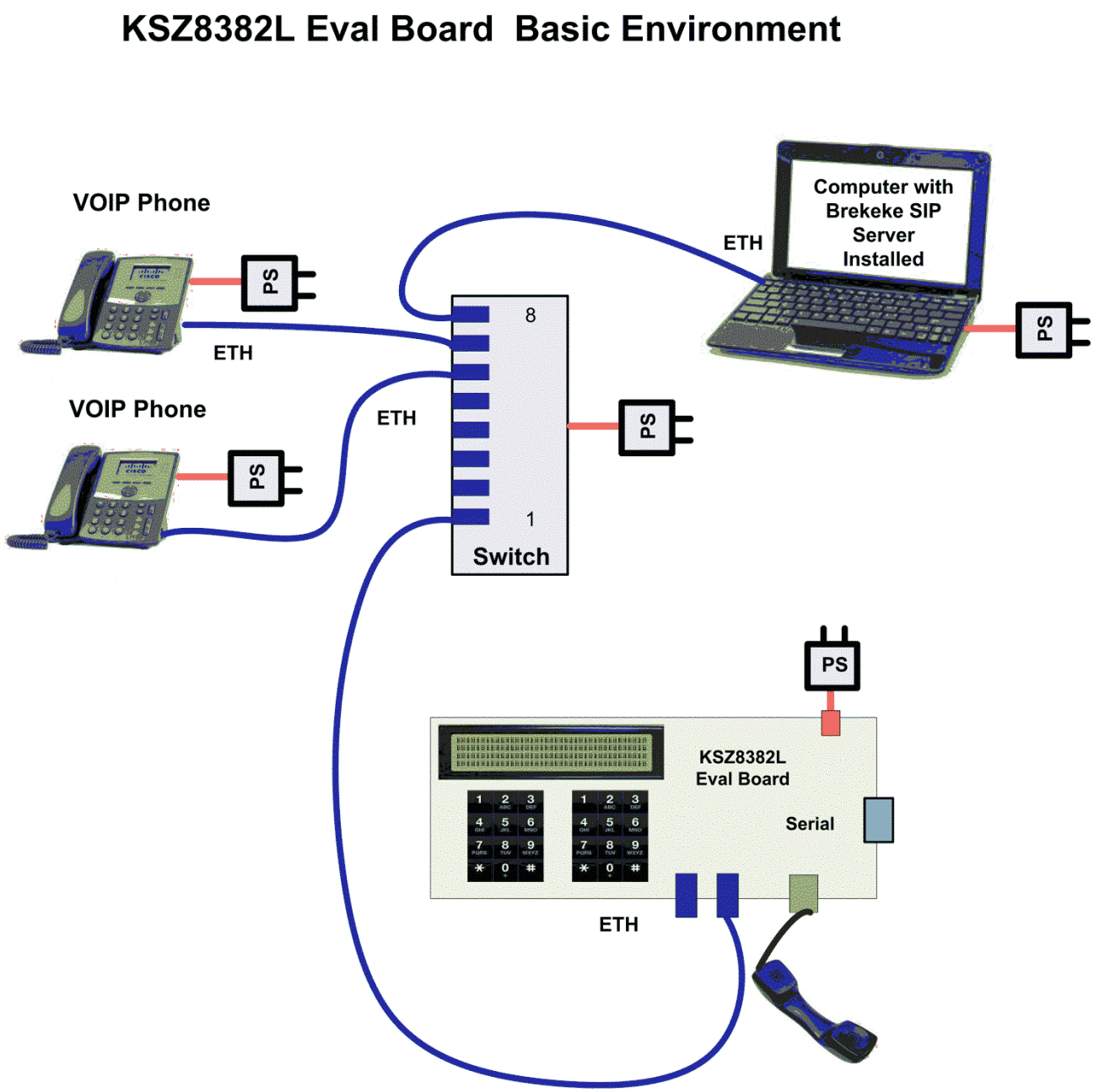


Figure 2 KSZ8382L Eval Board Basic Environment

Note that the KSZ8382L Eval Board may be operated with the POE (Power Over Ethernet) feature turned on. In this case, the POE enabled port on the KSZ8382L Eval Board (J30) must be connected to the POE enabled port on the Ethernet switch and without the 5V power module connected to the board.

5.1.2 Configuring the Evaluation Board

There are two ways the various parameters can be checked, verified , or changed; the Web GUI method and the *configassist* Utility method. This section describes each method. We recommend using the *configassist* Utility method but there may be times when using the Web GUI method may be desired.

5.1.2.1 Using the *configassist* Utility Configure the Evaluation Board

Follow the procedure below to get access to the Command Line Interface and execute the *configassist* Utility.

- Connect a serial cable from the Serial Port DB-9 connector (P2) on the KSZ8382 eval board to a notebook computer with an RS232 serial port cable. (Or connecting to the USB port on the notebook computer using the same serial cable with a USB to Serial converter cable.)

- The notebook computer needs to have a communications utility that can be configured for 115,200 BAUD and 8N1 parameters.

- When correctly set, and after the eval board is powered up, the notebook will display output from the onboard Linux based environment.
  A prompt will be displayed. (/ #) At this prompt, the user should type in the “configassist” command.

The text and screen shots which follow provide a summary of the usage of the *configassist* Utility.

Figure 3 illustrates what is displayed after typing “configassist” on the Linux command line.

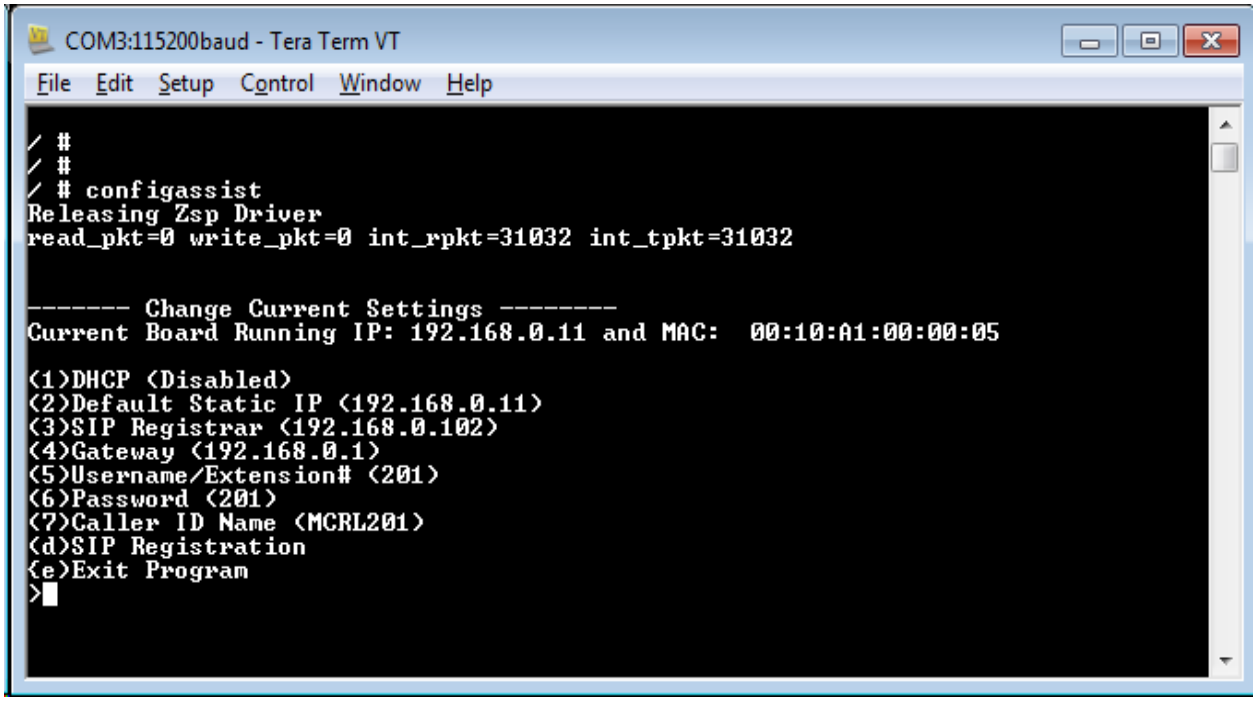


Figure 3 Executing the Command Line Interface (*configassist*)

The display shows the list of commands that are available to execute. Next to each command is the current state or value of the parameter. Note that the current IP Address and current MAC Address are displayed in a summary line. The current IP Address will be the IP Address of the Web GUI. At this point in time, the user can continue with using the *configassist* utility or switch over to using the Web GUI using the IP Address noted.

Figure 4 shows the results of entering the <1> command which allows for disabling or enabling the DHCP mode of operation. For initial setup, it is suggested to choose “Disable DHCP”. Entering <3> for “Cancel” allows you to go back to the main menu without any action occurring.

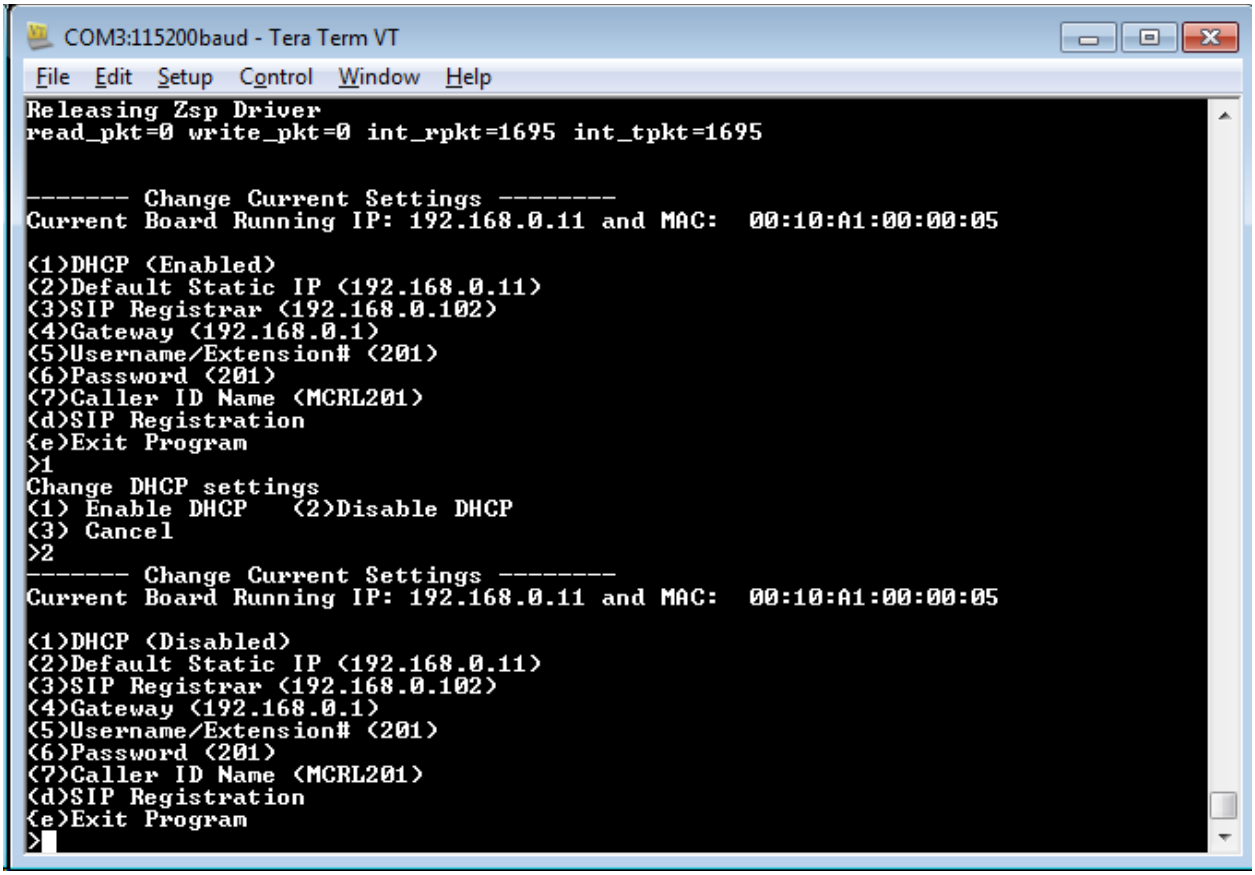


Figure 4 Command <1> DHCP Enable/Disable

The IP Address of the evaluation board is displayed next to the “Default Static IP <xxx.xxx.x.xx>” Command. To change the IP Address, enter “2” and then at the response, input the new Static IP Address. This is shown in Figure 5.

The IP address of the SIP Server can be viewed or changed using the <3> Command. In the example shown in Figure 5, the SIP Server IP Address is examined and changed. The SIP Server IP Address will be the IP Address associated with the computer in which the SIP Server is installed. Obtain this IP Address value from the computer in which the SIP Server is installed and enter it into *configassist*.

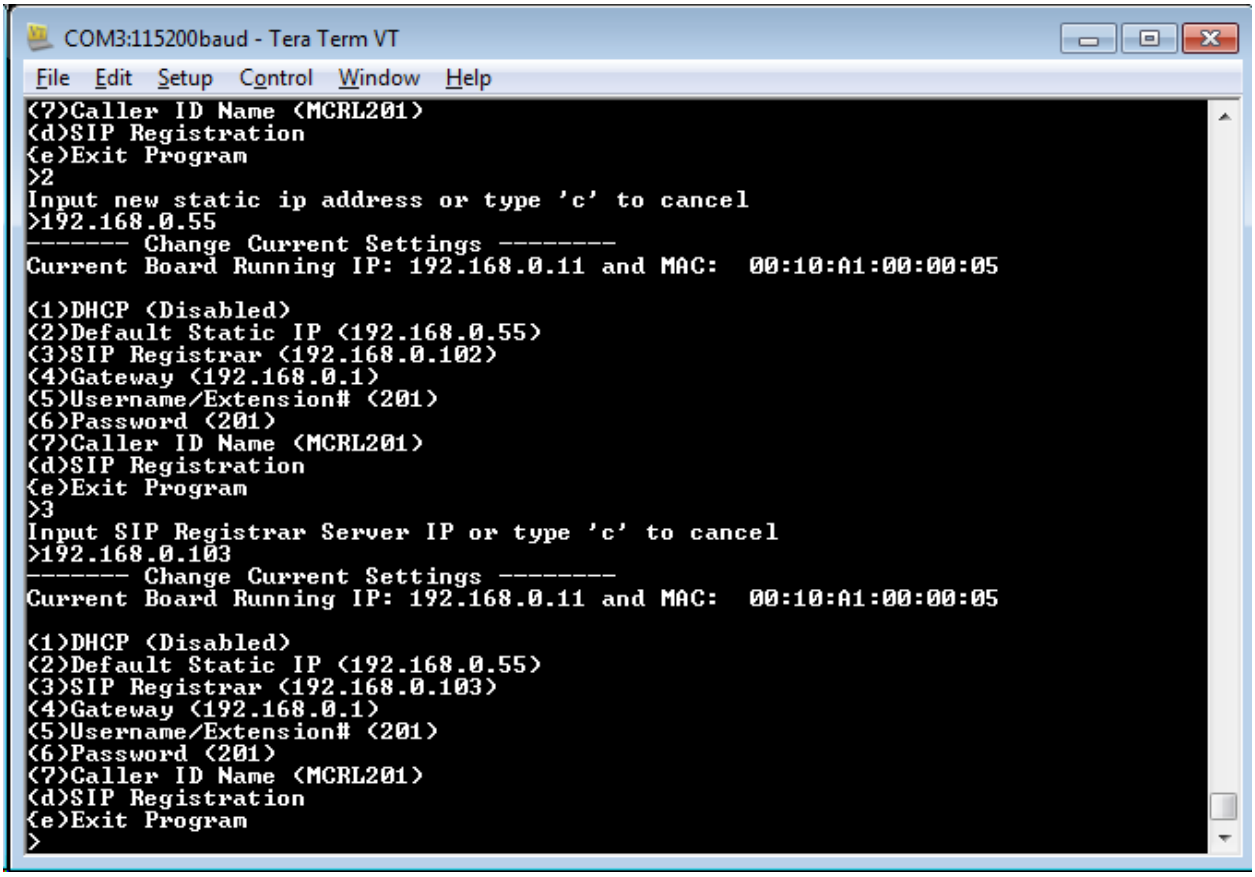


Figure 5 Viewing and Changing the SIP Server IP Address and Board IP Address

The IP Address of the evaluation board is the same as the Web GUI IP Address.

An example of viewing and changing the Gateway IP Address is shown in Figure 6. The Gateway IP Address is associated with the same IP address as the computer in which the SIP Server is located.

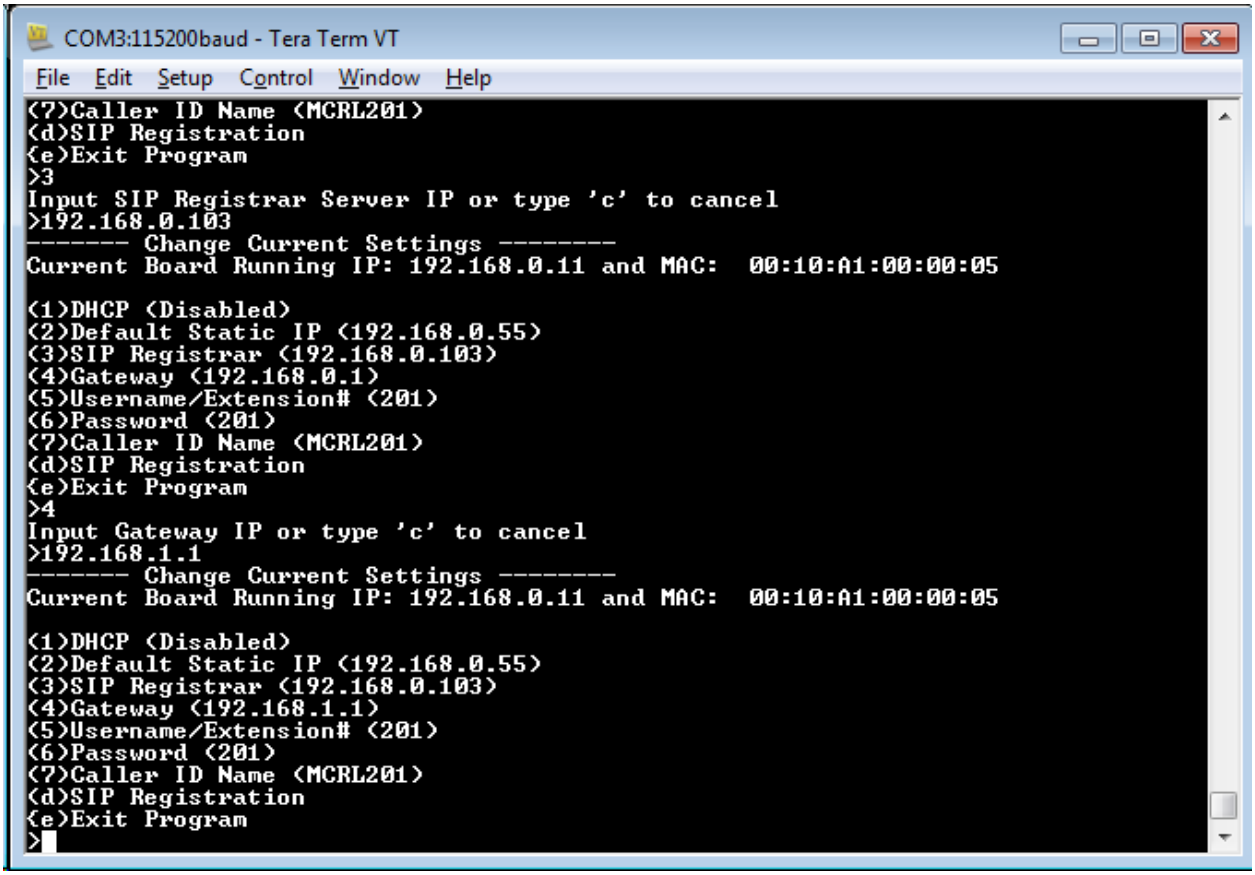


Figure 6 Viewing and Changing the Gateway IP Address

The Username and Extension # are the same. This is the multi-digit phone extension number of the eval board phone. An example of viewing and changing the User Name / Extension # is shown in Figure 7. The eval boards typically come preprogrammed with the value 100 for this parameter. There is no need to change this number as long as it is not the same number as any other phone attached to your environment but you do need to write it down for use in making telephone calls. This number can be as large as 32 digits if needed.

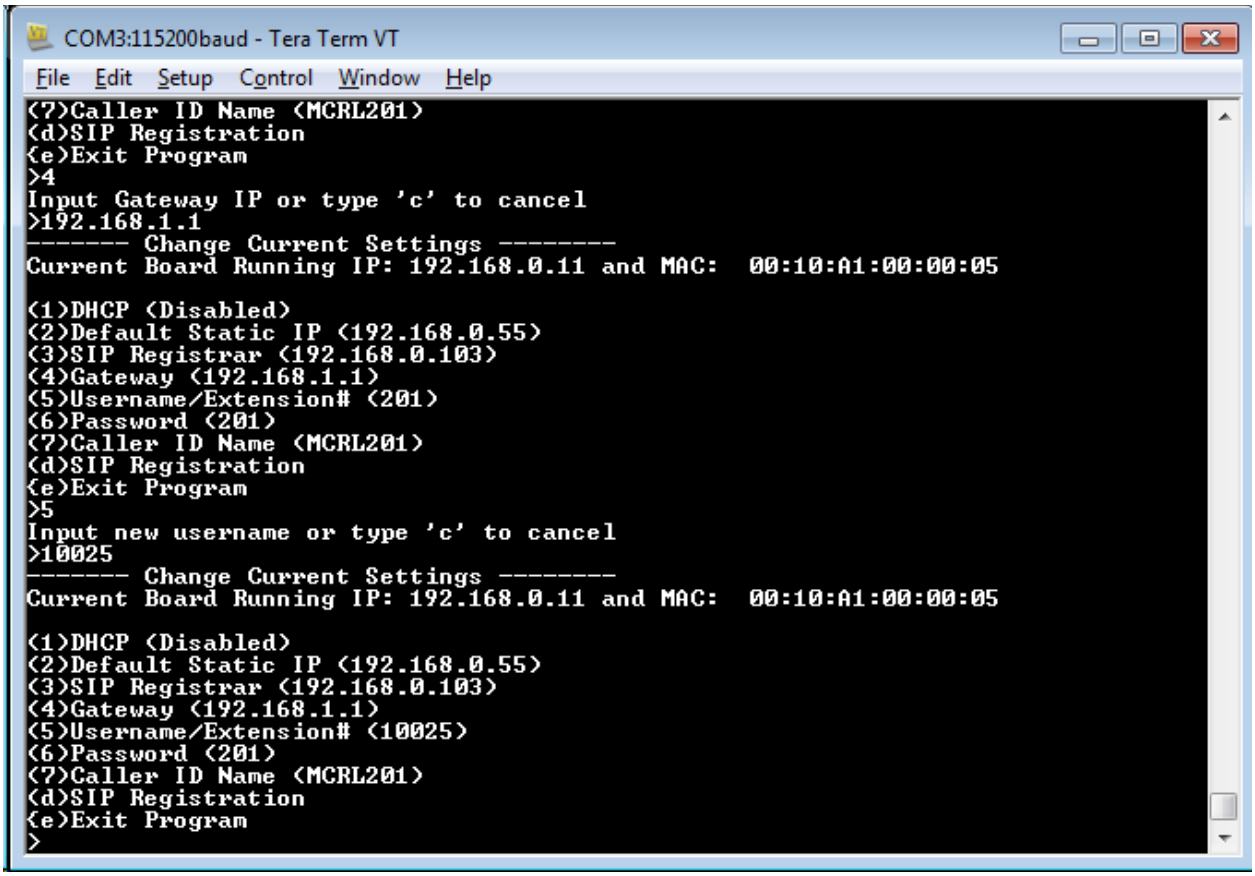


Figure 7 Viewing and Changing the User / Extension #

In some installations, it might be desirable to have a level of security in the SIP Server. Most SIP Servers offer a password level that can be used to enable authentication operation of the SIP Server – User Phone connection. Figure 8 illustrates the viewing and changing of the SIP Server Authentication User Password. For initial setup and simplicity, you should not set this up at this time.

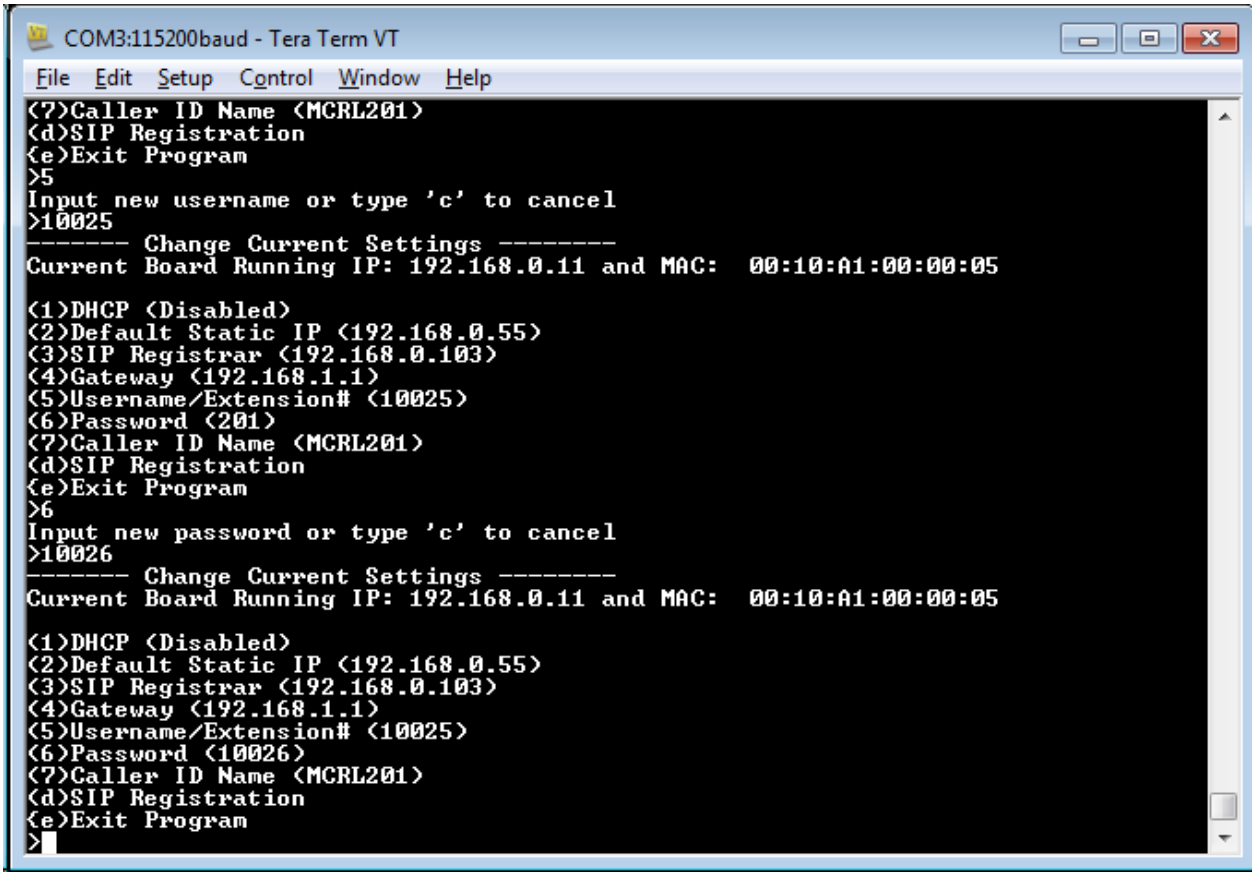


Figure 8 Viewing and Changing the SIP Server Authentication User Password

The Caller ID (Display Name) is programmable via Command <7>. Figure 9 illustrates the viewing and changing of the Caller ID / Display Name. Select a name that is appropriate for your use.

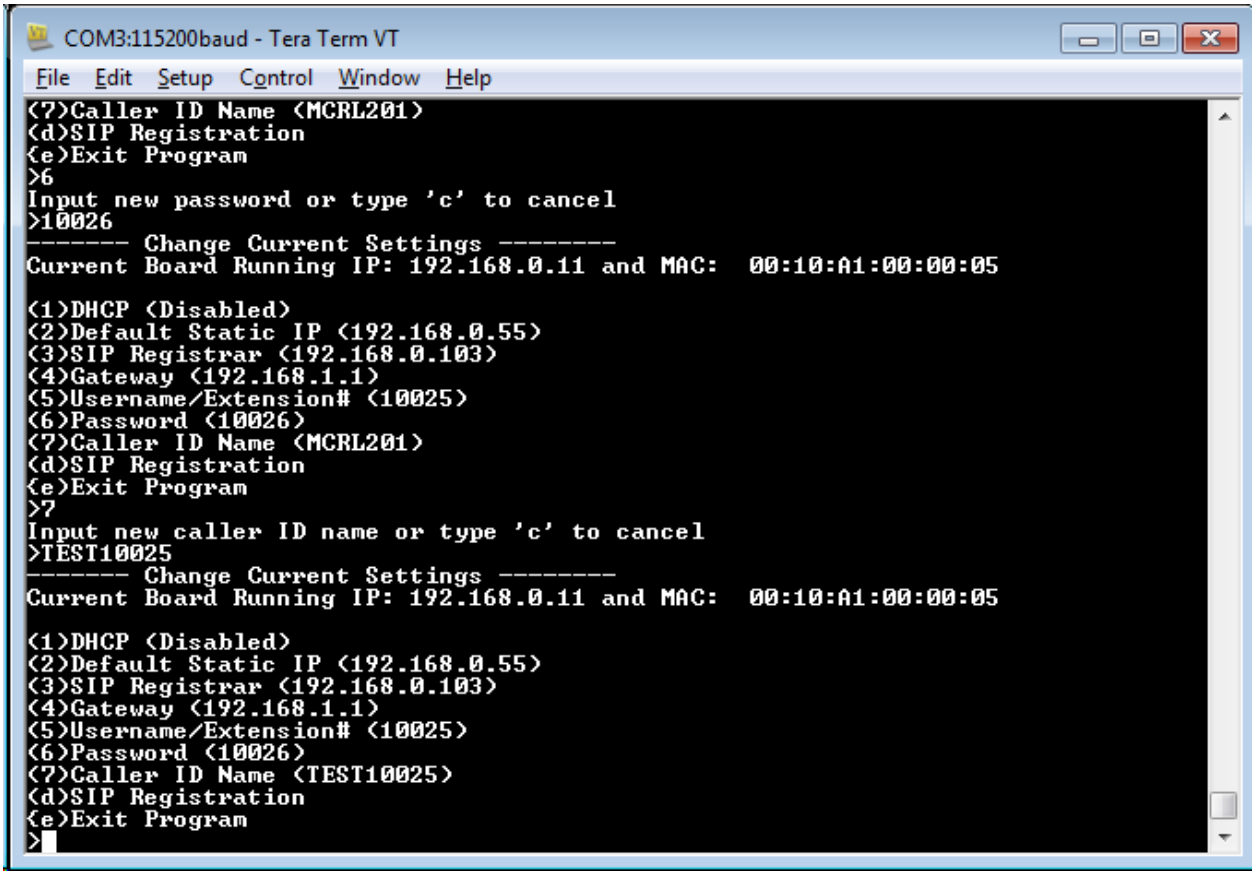


Figure 9 Viewing and Changing of the Caller ID Display Name

The process of registering with the SIP Server is accomplished with Command <d>. An example of a successful SIP Server registration is shown in Figure 10. Figure 12 is an example of an unsuccessful SIP Server registration caused by a mismatch between the IP Address and the Gateway IP Address. Figure 13 is an example of an unsuccessful SIP Server registration caused by using the wrong SIP Server IP Address. Figure 14 is an example of an unsuccessful SIP Server registration caused by an unconnected network cable.

The software comes with a default value of the SIP Server IP Address. When the board is powered up, it will try and register to a SIP Server at that IP Address. Most likely the actual SIP Server Address will not be the same as the default value. In this case, registration will not occur and the LCD will display a “Reg Fail” message. In that case, the SIP Server Address needs to be changed on the board via the *configassist* Utility. Then, the SIP Registrar Command can be executed to register the phone.

For the case where the Evaluation board powers up and the SIP Server IP Address programmed on the board matches the actual SIP Server IP Address, registration will occur and a “Ready” message will be displayed on the LCD of the board.

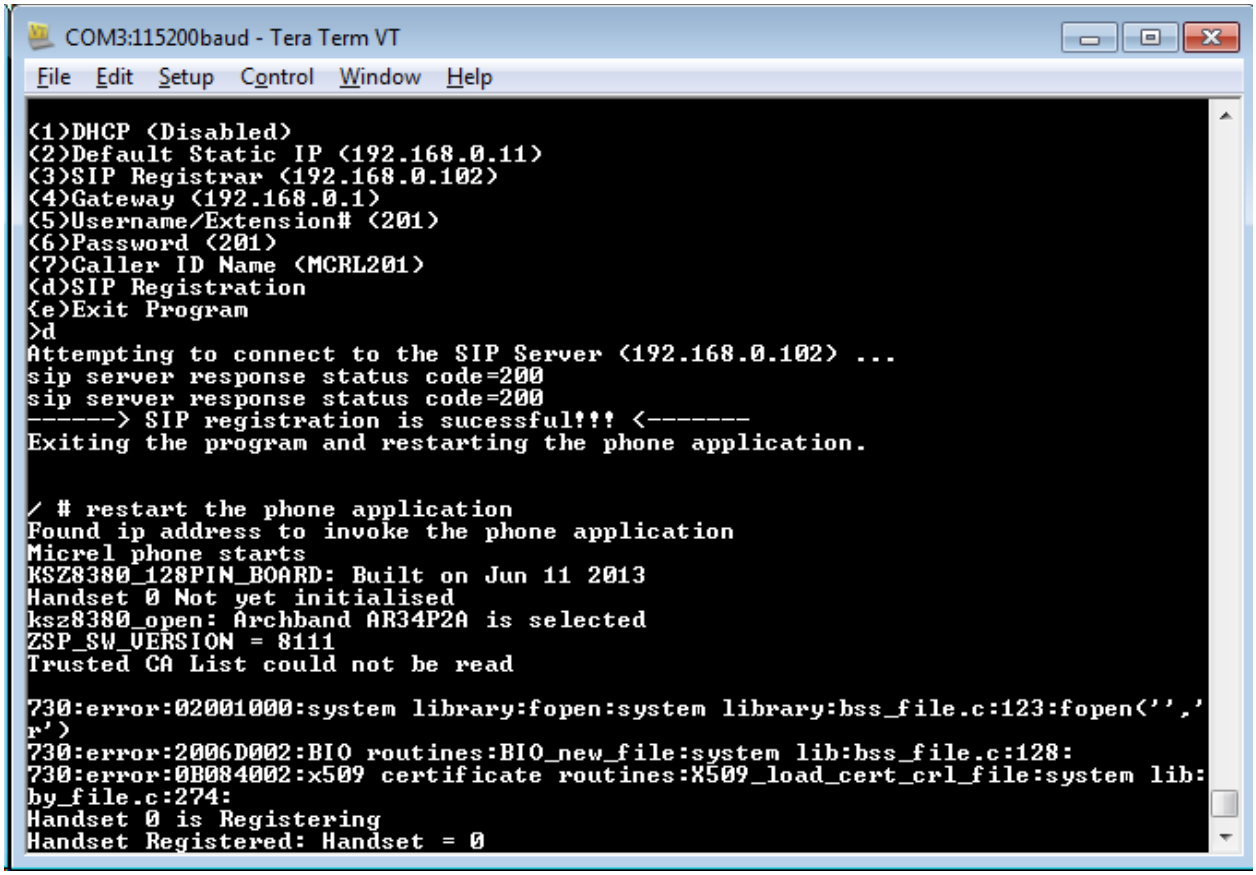


Figure 10 Successful SIP Server Registration

You can verify the registration of the phones with the Brekeke SIP Server by viewing the “Registered Clients” page on the SIP Server. The telephones will be communicating with the SIP Server and will become registered. As each one is registered, it will appear in the table on the “Registered Clients” page. The telephone number associated with each telephone will also be displayed in the table. After all devices (discrete telephones or the Micrel VoIP Eval Board) have been registered, telephone calls can then take place between any combination of registered clients. Note that the “Registered Clients” page will need

refreshing to display devices as they become registered. You can do this by using the refresh function on your browser or by going to another page in left pane and then returning to the “Registered Clients” page. Figure 11 shows the Registered Clients SIP Server Page. (Refer to Section 5.1.3 of resetting up the SIP Server.)

Figure 11 Registered Clients SIP Server Page

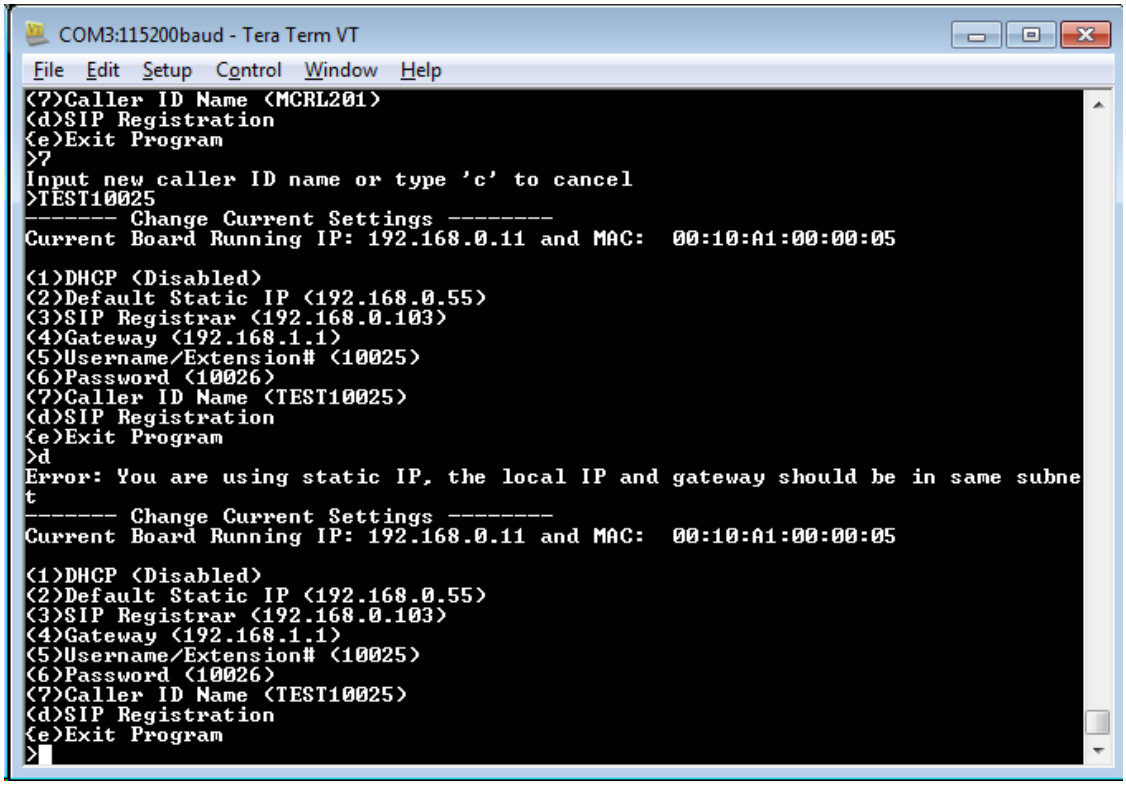


Figure 12 Unsuccessful SIP Server Registration - IP & Gateway IP Addr Mismatch

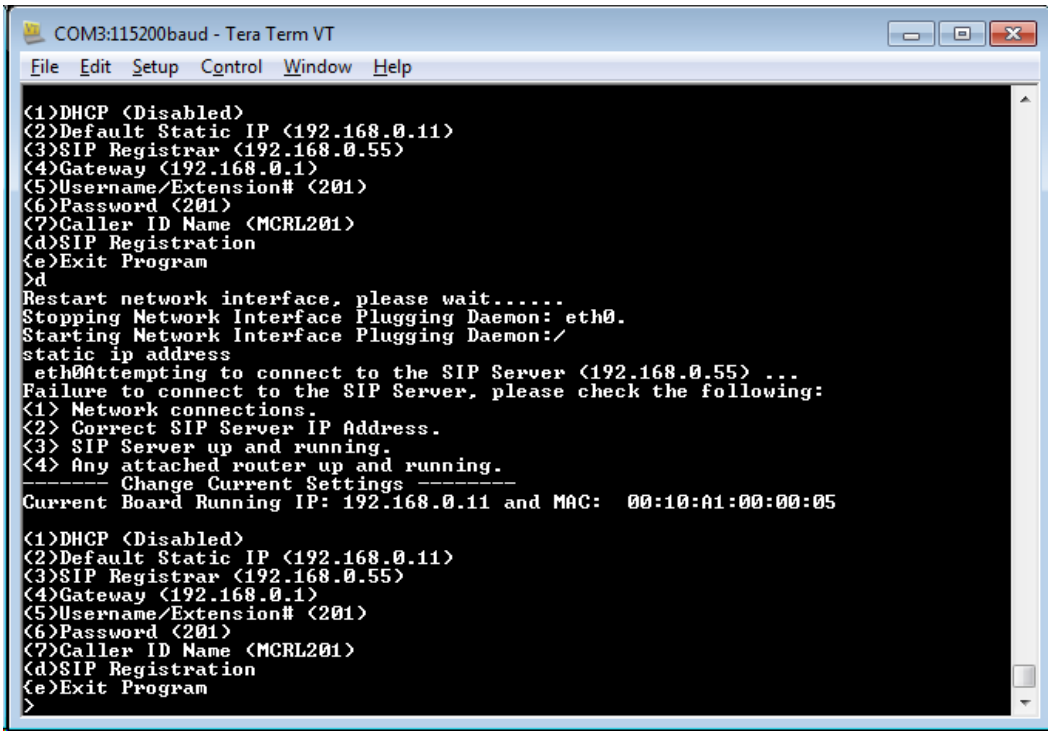


Figure 13 Unsuccessful SIP Server Registration - Wrong SIP Server Address

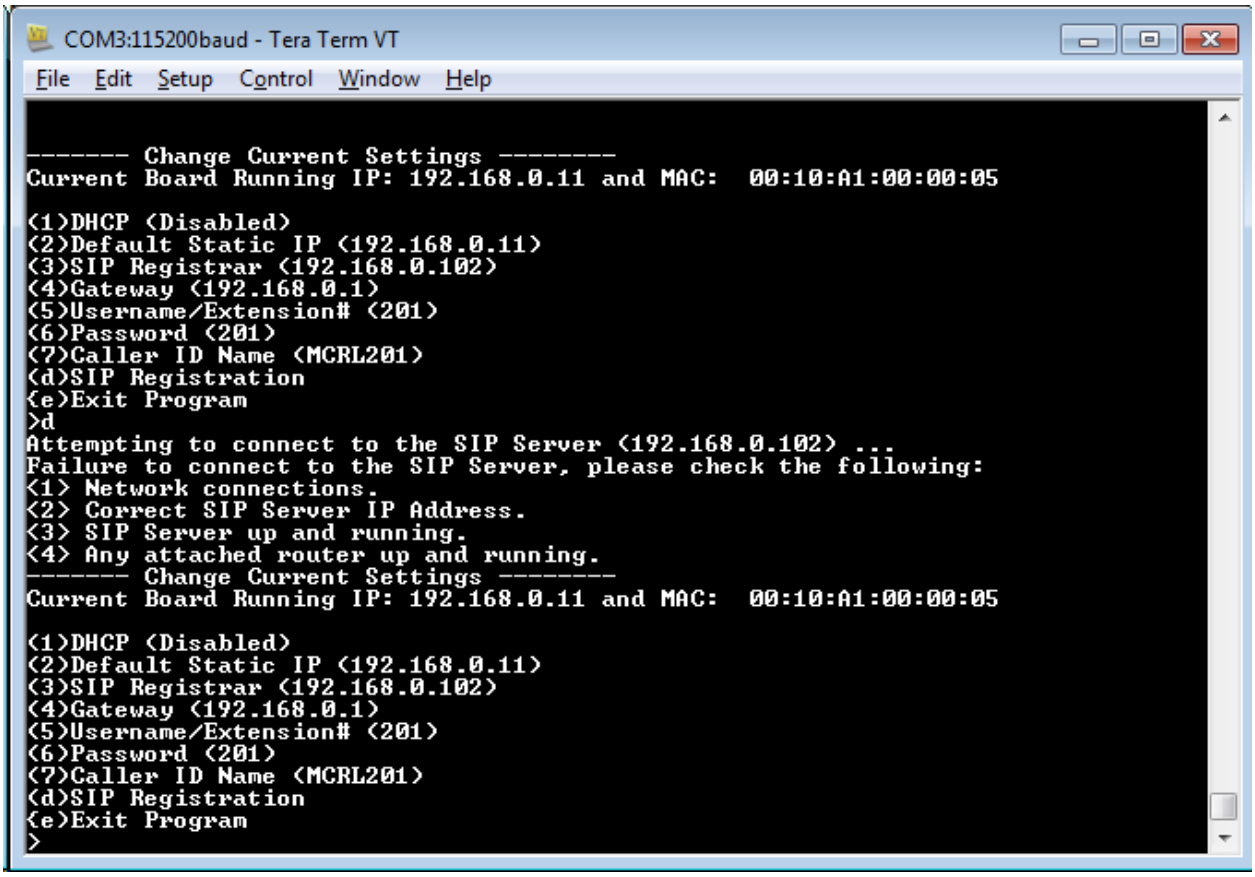


Figure 14 Unsuccessful SIP Server Registration - Cable Disconnected

5.1.2.2 Using the Web GUI to Configure the Evaluation Board

The Web GUI Interface can be used as an alternate method for interrogating or changing key parameters associated with the KSZ8382 eval board. The GUI Interface does not provide the detailed error messages as provided in the via *configassist*. Because of this, the *configassist* is the desired method since it enables detailed error information to be communicated to Micrel if the need arises. The information which follows provides a summary of its functionality.

The Web GUI Interface is accessed by entering the IP address of the evaluation board (IP Phone) into a Web Browser and going to that location. If you do not know the IP address of the evaluation board (IP Phone), refer to Section 5.1.2.1 and Figure 3 of this document which will show how to obtain this parameter using the *configassist* Utility.

The text and screen shots which follow provide a summary of the usage of the Web GUI Interface.

Figure 15 illustrates what is displayed in the Web Browser after going to the evaluation board (IP Phone).

Figure 15 Micrel IP Phone Configuration Web GUI Home Page

Figure 16 and 17 shows the information displayed on the “Network Config” and “SIP Basic Config” page. These contain the same configurable parameters that are available through the *configassist* Utility.

The parameters on this page are the ones that you have to make sure are correct per your environment.

Figure 16 Web GUI Interface – Network Config Page

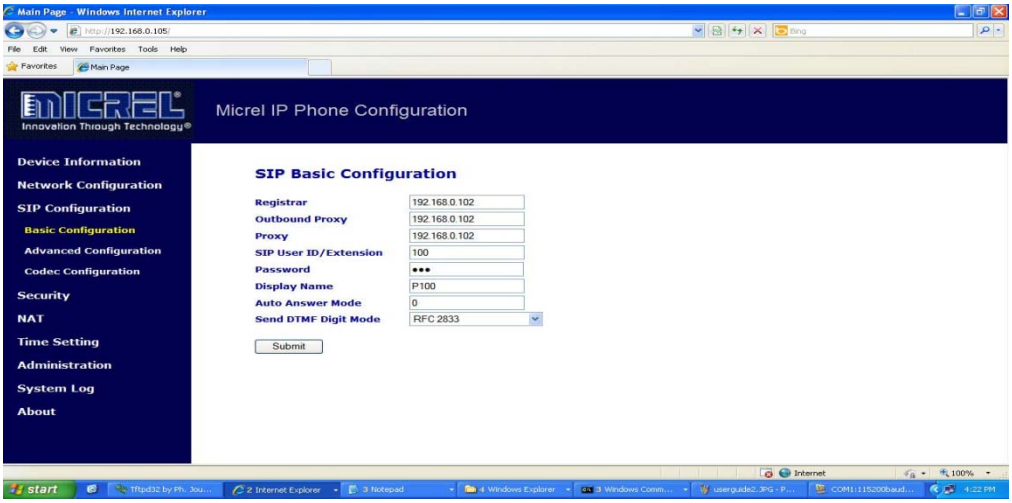


Figure 17 Web GUI Interface – Basic SIP Config Page

For the initial setup, the following values should be in place.

DHCP = checked

Gateway IP = Default (192.168.0.1)

Subnet Mask = 255 255 255 0

DNS = Default (192.168.0.253)

Registrar = SIP Server Address

Outbound Proxy = (Not needed initially)

Proxy = (Not needed initially)

Username / Telephone # = (Up to 32 digits)

Password = (Not needed initially)

Display Name = Change if desired

Figure 18 displays the contents of the Codec Config Page. This page is used to configure the selection of which Codecs are to be enabled as well as the order of priority of the Codecs. When a call is made between phones, this list will determine which Codec will be used first to establish the call connection. The boxes are shown in order of priority. Within each box, a dropdown box will appear which will provide a selection to choose from to select for that specific priority position.

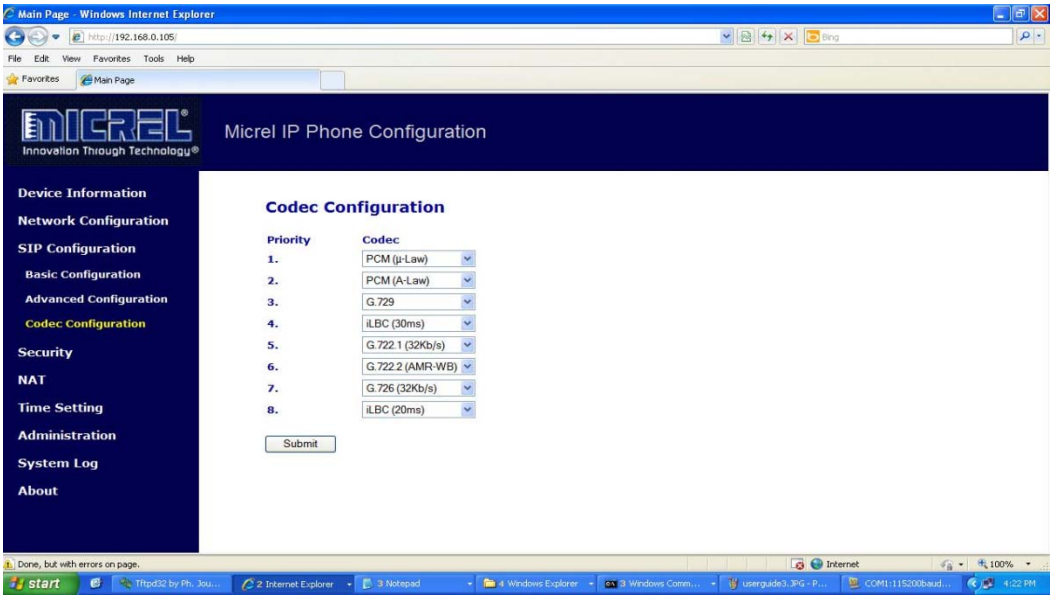


Figure 18 Web GUI Interface - CODEC Config Page

Initially, all CODECs are selected to enable the eval board to engage a call with other telephones using any of the indicated CODECs. There is no need to change the setting on this page initially.

The Advanced Config Page is shown in Figure 19. This page is used to configure various advanced parameters.

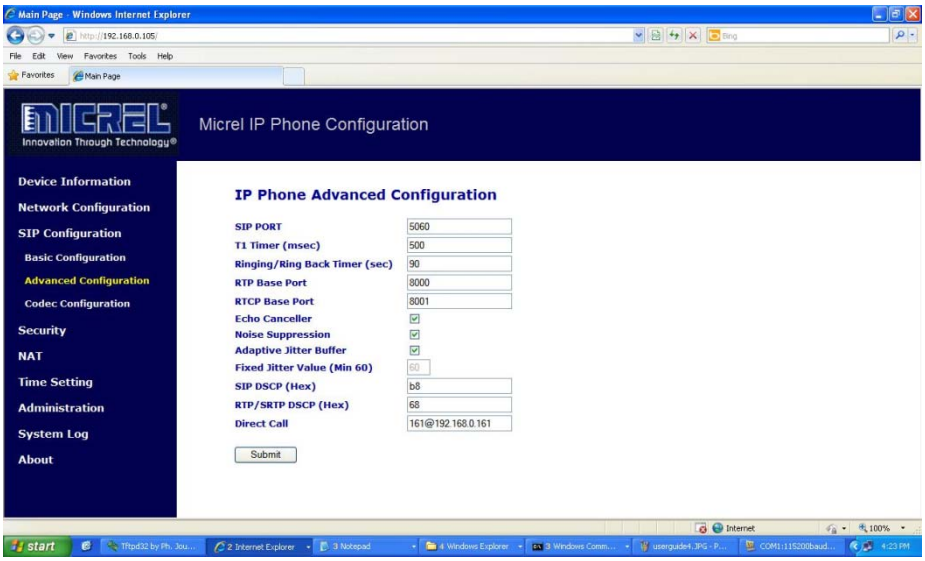


Figure 19 Web GUI Interface - Advanced Config Page

For initial setup, the default values need not be changed.

Figure 20 shows the Restore Factory Default Page. This page is used to restore all of the parameters to a default state. All user changes will be changed back to the default settings that the evaluation board was shipped with.

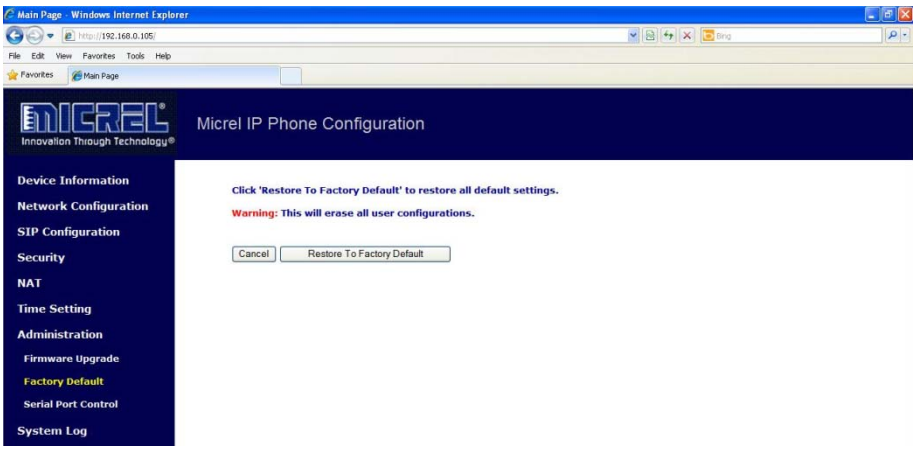


Figure 20 Web GUI Interface - Restore Default page

Figure 21 shows the Firmware Upgarde Page. This page is used to upgrade the firmware.

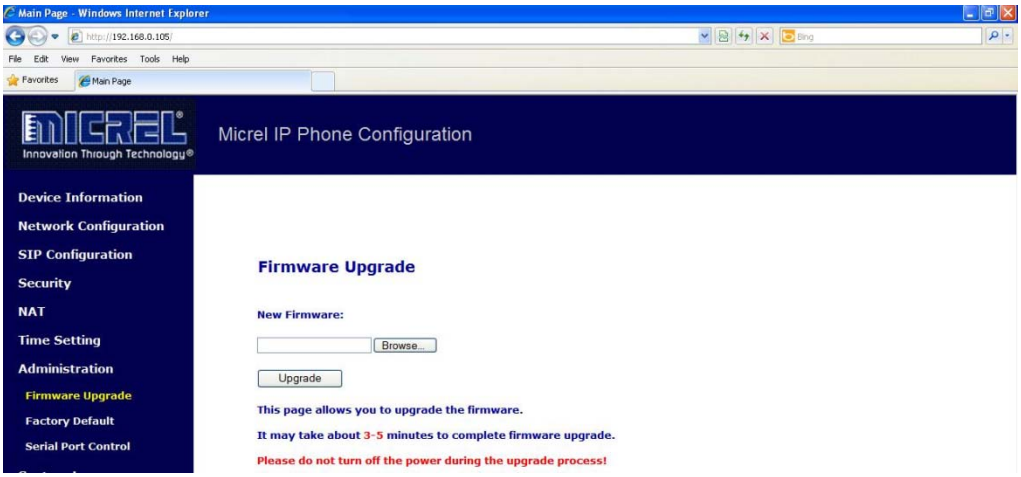


Figure 21 Web GUI Interface – Firmware Upgrade page

5.1.3 Setting Up the Laptop or Desktop Computer Server / SIP Server

We recommend that the properly configured VoIP Eval Board Basic Environment be connected and powered up after the Brekeke SIP Server is set up. Refer to Figure 2 for the setup. Refer to Sections 5.1.1 and 5.1.2 for instructions on properly configuring the VoIP Evaluation board.

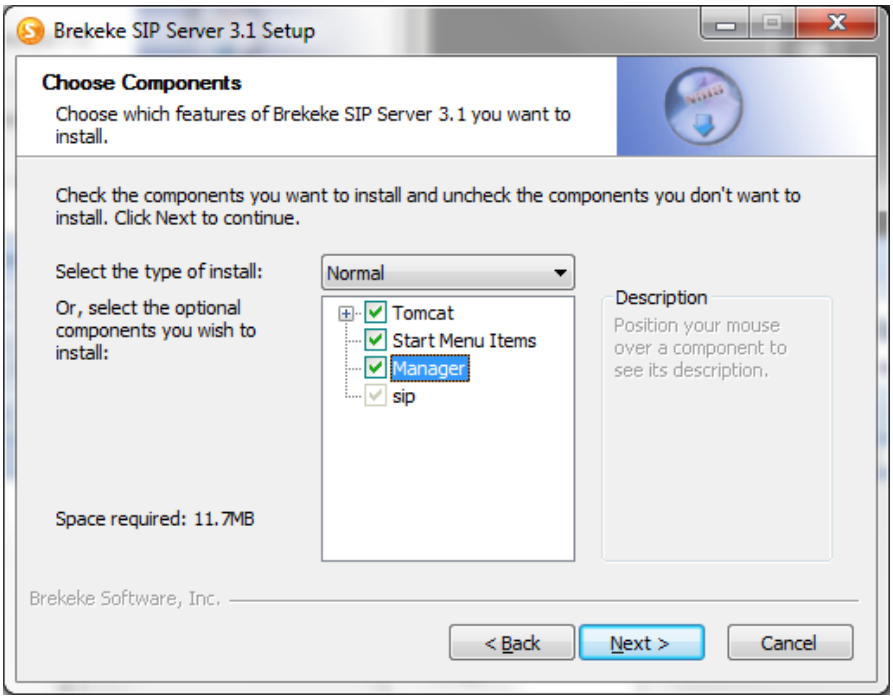
Downloading & Installing the Brekeke SIP Server

(1) A Brekeke Quick start Guide is located at http://wiki.brekeke.com/wiki/Brekeke-SIP-Server-v3-Quickstart . It explains the details of downloading, installing, and setting up of User Authentication Accounts. At the time of creation of this document, the revision level of the Brekeke SIP Server was 3.15.8. A late revision may be available. Note that the steps that follow are a clarification of the steps in that document. Make sure to turn off the software firewall on your computer before installing.

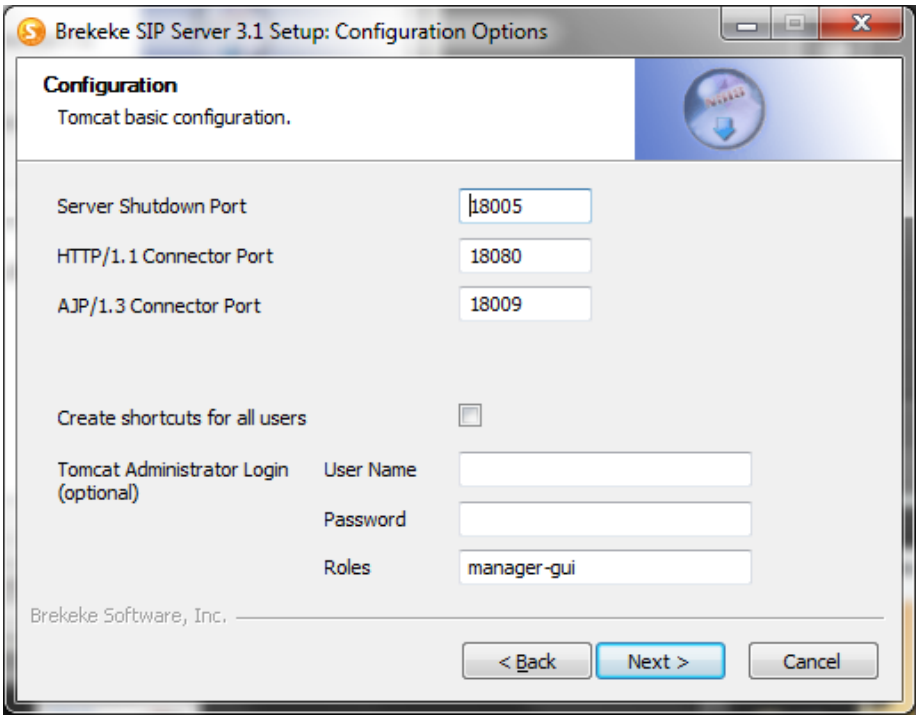
(2) Proceed to http://www.brekeke.com/downloads/sip-server.php which is the Brekeke download area.

Change the Operating System box if needed. Leave the other boxes as is. Click on “Download” to start the download process. Once you have downloaded the Installer executable, you have the option of either “running” it or saving it and running it later.

(3) Upon execution of the Installer, the following screen will appear.

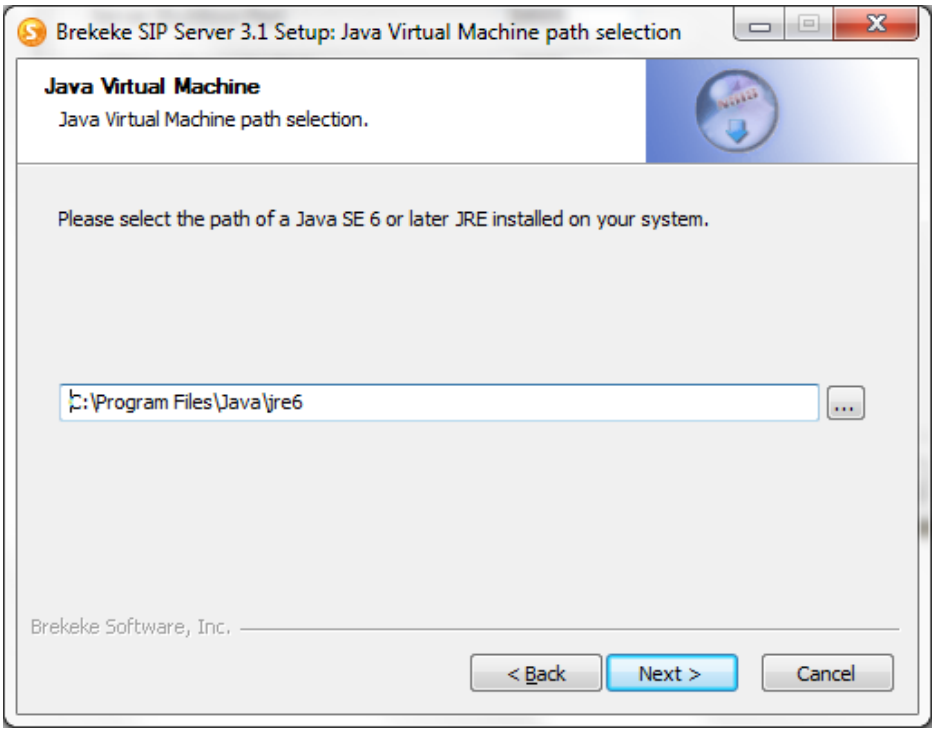


Do not uncheck any boxes and select “Next”. The following screen will appear:

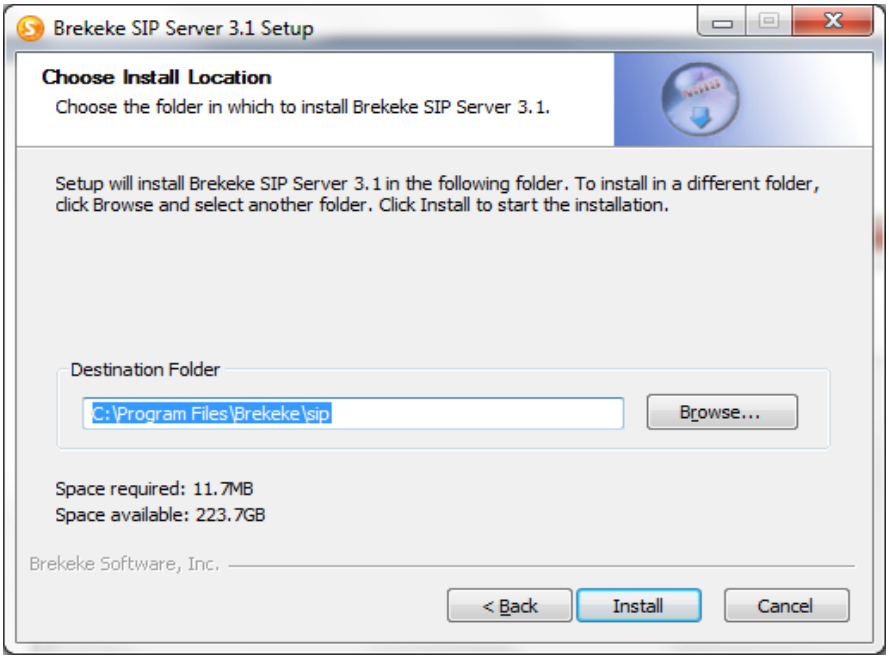


Select “Next”.

(4) The next two screens will allow you to select where you want the Brekeke SIP Server software and Java components to be installed.

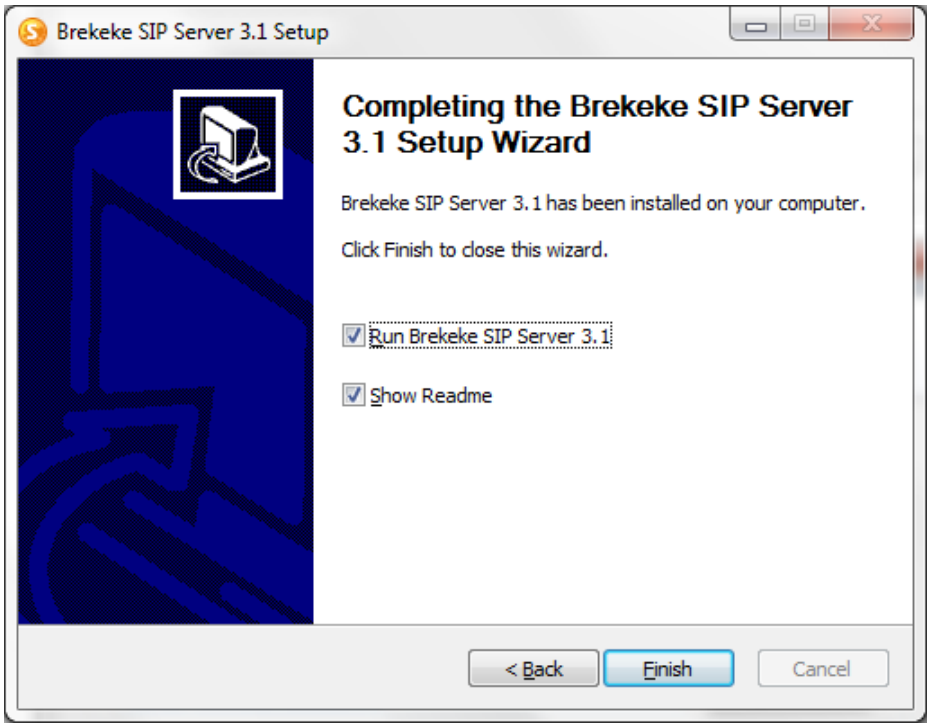


Enter your desired location if you want to change the default location of the java components and then select “Next”.

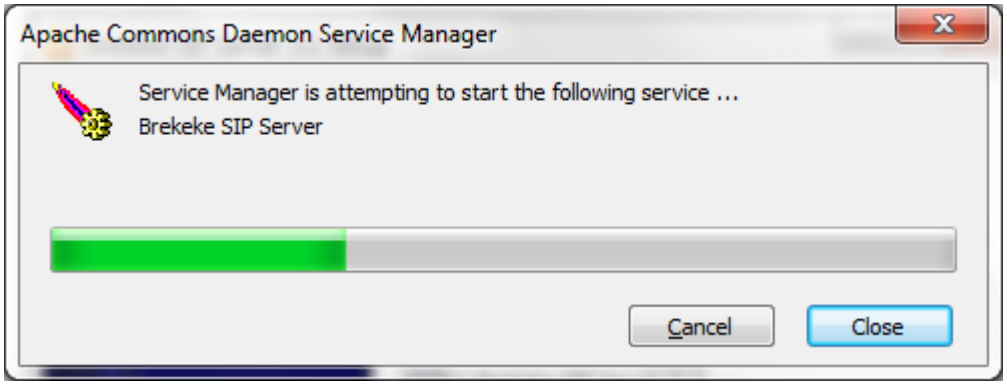


Enter your desired location if you want to change the default location of the Brekeke SIP Server installation then select “Next”.

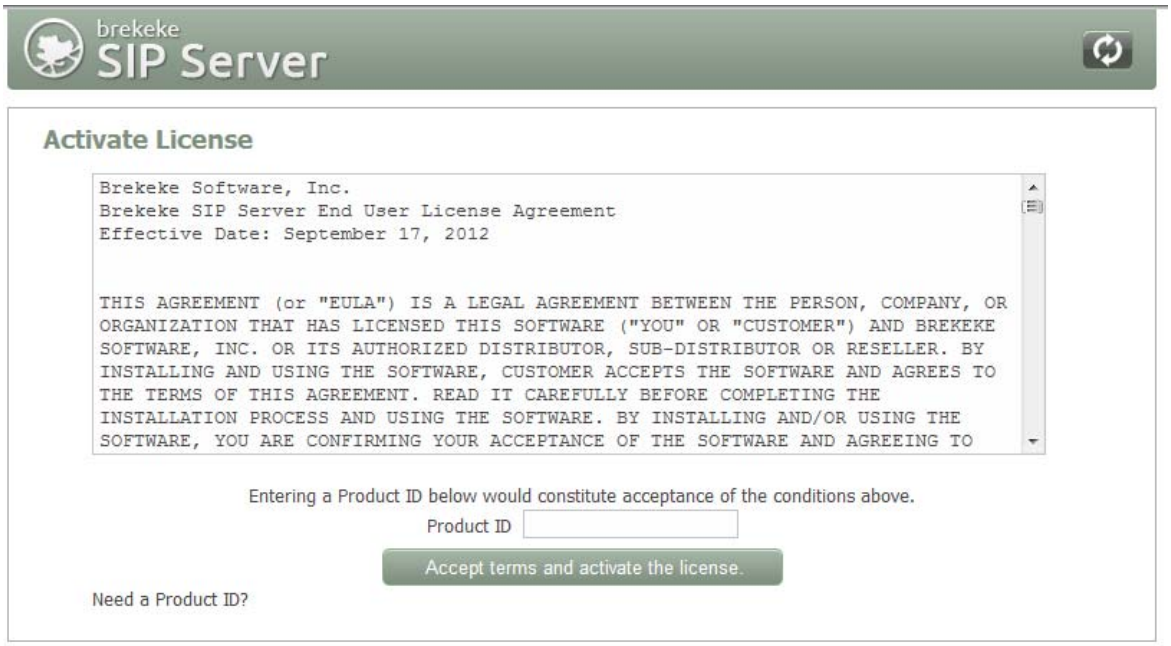
(5) The installation will begin and the last step will show a screen as follows:



We recommend you de-select “Show Readme” and select “Run Brekeke SIP Server 3.1”. Select “Finish”. The Brekeke SIP Server will begin execution and you will see the following:

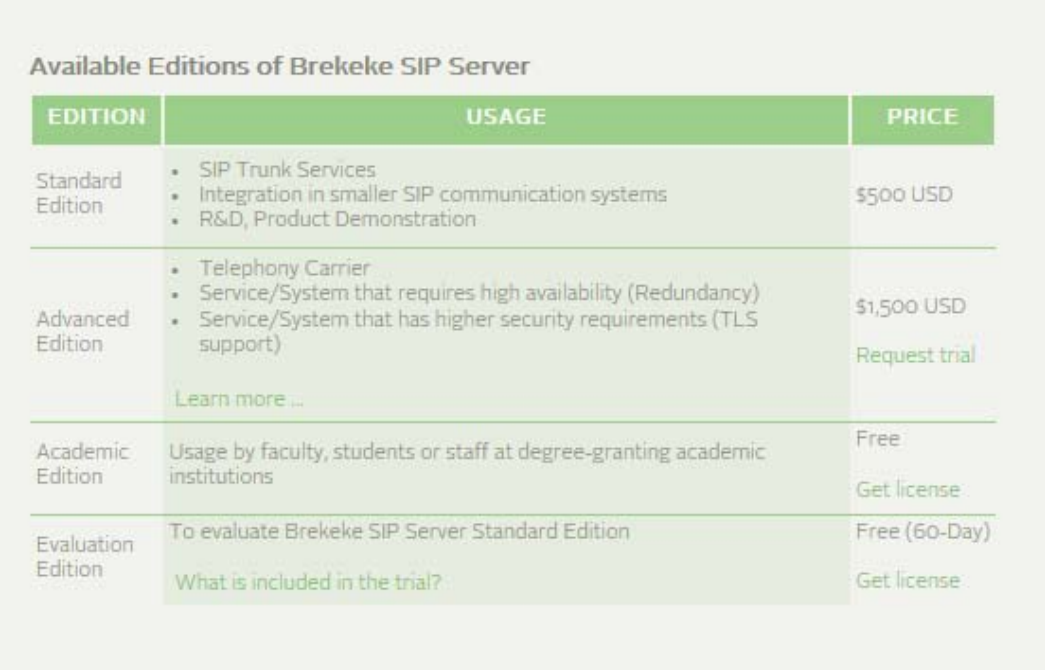


(6) The next screen will require your interaction to activate the license.



If this is the first time to use, you will need to secure a “Product ID”. Click on “Need a Product ID?”

You will be brought to a page to allow selection of your license type.

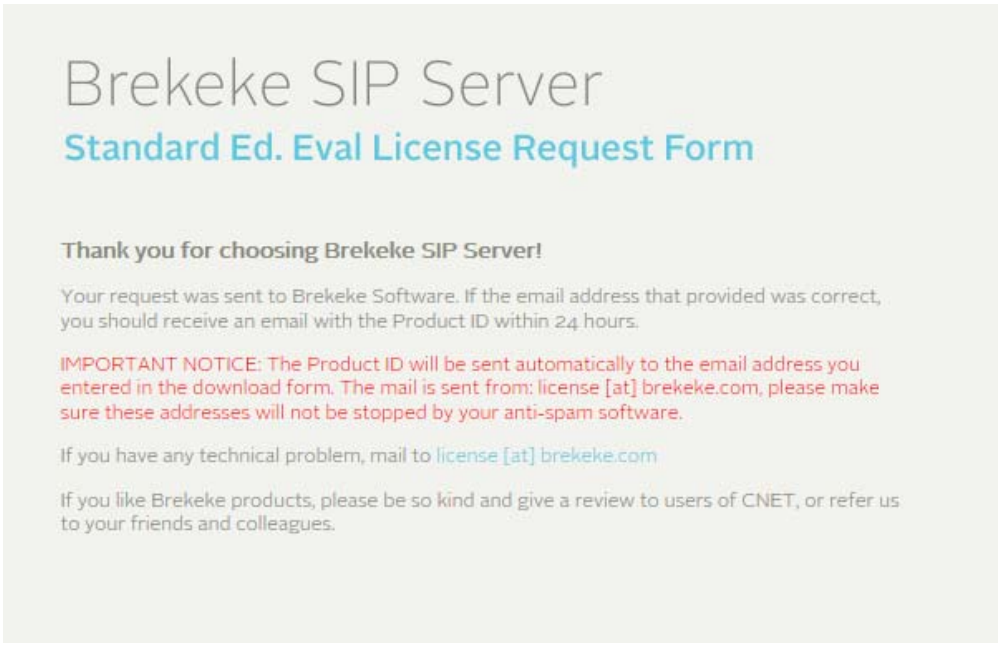


Available Editions of Brekeke SIP Server

EDITION	USAGE	PRICE
Standard Edition	• SIP Trunk Services • Integration in smaller SIP communication systems • R&D, Product Demonstration	$500 USD
Advanced Edition	• Telephony Carrier • Service/System that requires high availability (Redundancy) • Service/System that has higher security requirements (TLS support) Learn more ...	$1,500 USD Request trial
Academic Edition	Usage by faculty, students or staff at degree-granting academic institutions	Free Get license
Evaluation Edition	To evaluate Brekeke SIP Server Standard Edition What is included in the trial?	Free (60-Day) Get license

Select the license type (typically first time of “Free (60-Day)) and then click on “Get License”. You will be brought to another page where you will be required to provide information. Fill out the required boxes.

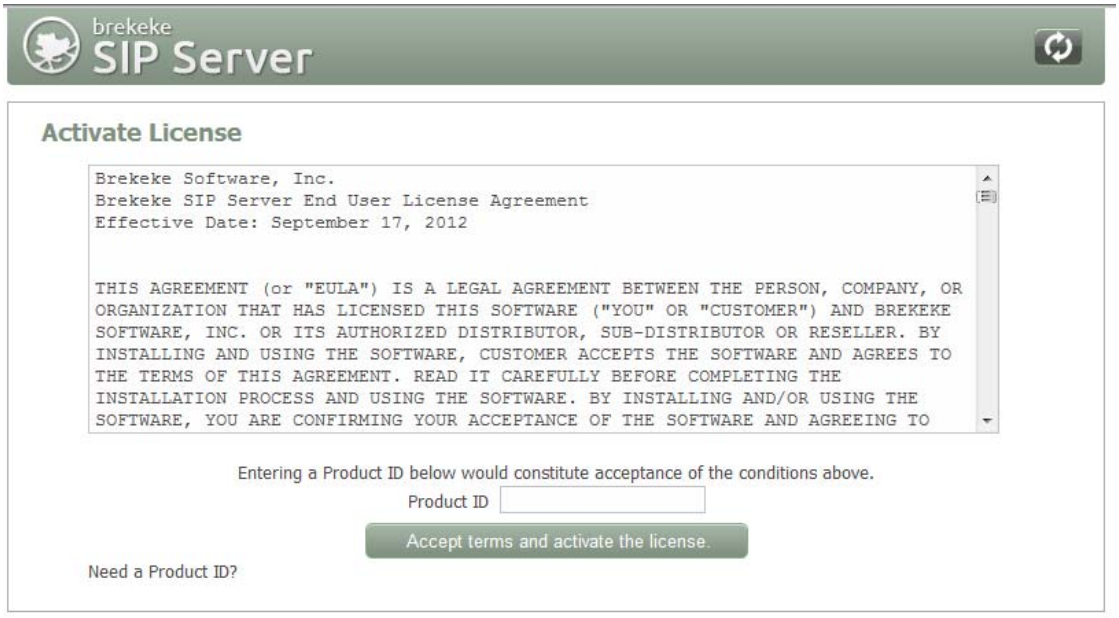
Another screen appears informing you that an email will be sent to at the email address you entered. It will contain the Product ID that you will be required to enter later.



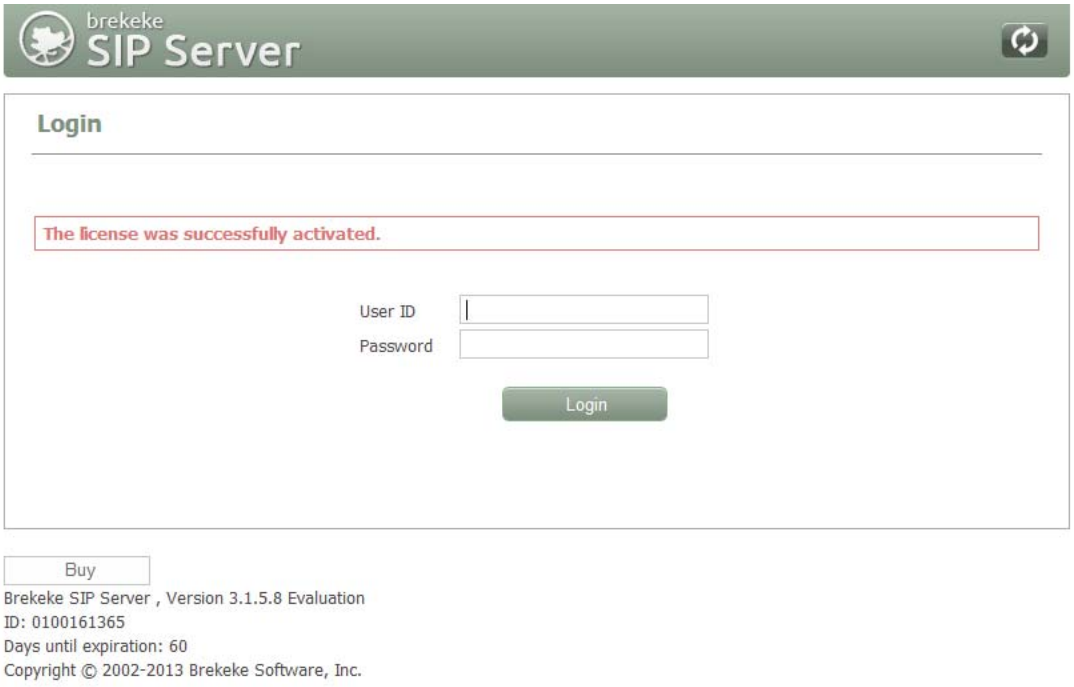
You will receive an email with the Product ID provided to you.

```
Thank you for your interest in Brekeke SIP Server v3.
Please print this page for your records and follow the instructions closely.

Enter the License (Product ID) below to begin your 60-day evaluation period.

**************************************************************************
Brekeke SIP Server v3 Evaluation Edition License (PRODUCT ID):

BR606E0100161365


Note: The product ID contains letters and numbers - copy and paste to avoid confusion.
**************************************************************************

Once you have entered the Product ID, you will be able to login to the server.
The Username and Password you will need to login are:

[DEFAULT SYSTEM ADMIN LOGIN]
Username: sa
Password: sa
```

(7) Go back to the Activate License screen and enter the Product ID into the “Product ID” box and then click on “Accept terms and activate the license”.



If successful, the following screen will appear with a “successful message”.

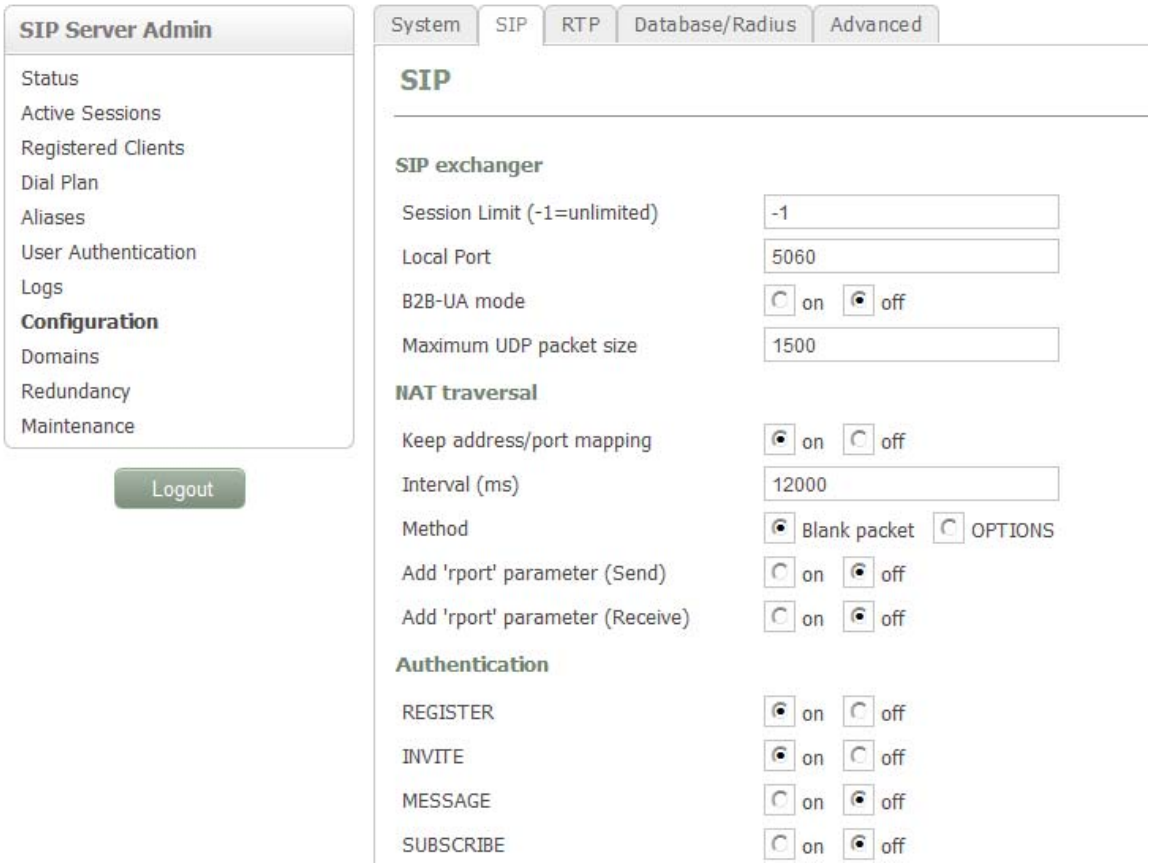


Type in “sa” for User ID and “sa” for Password and click on “Login”. You will be logged in to the SIP Server.

(8) Proceed now to start the SIP Server. Go to the Status Page. To Start the SIP Server, click on “Start”.

(9) It is highly recommended to turn off Authentication when first trying to bring up the Micrel Eval Board. By default, Authentication is enabled. To turn off Authentication, choose the "Configuration" area on the left control pane. When there, select the "SIP" tab. Locate the "Authentication" sub-section, where you will find that the "Register" and "Invite" parameters are in the "On" state. Change them to "Off". At the bottom of the page you will see a "save" button, click on that to save the changes. You will be asked if you want to restart the SIP Servers; choose yes.

With Authentication off, passwords and user IDs will not be required to register the phones when communication first occurs between the Brekeke SIP Server and the telephones.



6 Making and Receiving Calls on the Evaluation Board

The information which follows provides information to familiarize the user with the steps necessary to make and receive call using the KSZ8382L Evaluation Board. The user interface to the features of the IP Phone are through the keypad on the evaluation board. The features associated with the individual keys on the keypad are shown in Section 7.3.

You can call any phone from any other phone.

- Call originates from the Micrel KSZ8382L VOIP eval board phone:
  On the keypad, press the “Off Hook” key (Keypad A-A) and then enter the telephone number you want to call.

- Call originates from the 3rd Party VOIP phone:
  Pick up the receiver, wait for the dial tone, and enter the telephone number followed by the # key.

Conference Call:

On the keypad, press the “Off Hook” key (Keypad A-A). Dial the target extension by pressing the numerical keys. When the target phone rings, answer it. On the keypad, press the “Conf Call” key (Keypad B-2). Dial the other target extension. When the second target phone rings, answer it. Finally, press the “Conf Call” key (Keypad B-2) on the eval board again. This connects all three phones in a conference.

7 Evaluation Board Description

The information in this section provides a detailed overview of functional areas of the board. Use this section as a reference for getting familiar with features and functionality.

7.1 Top Level Evaluation Board Organization

The block diagram in Figure 20 shows the functionality and sub areas on the evaluation board. Every single is not shown on this block diagram. It is advised that the developer look at the schematic of the board to get familiarized with the items shown on the block diagram and the detailed items on the board. The remainder of the sections which follow in Section 6 will provide the necessary details of each feature.

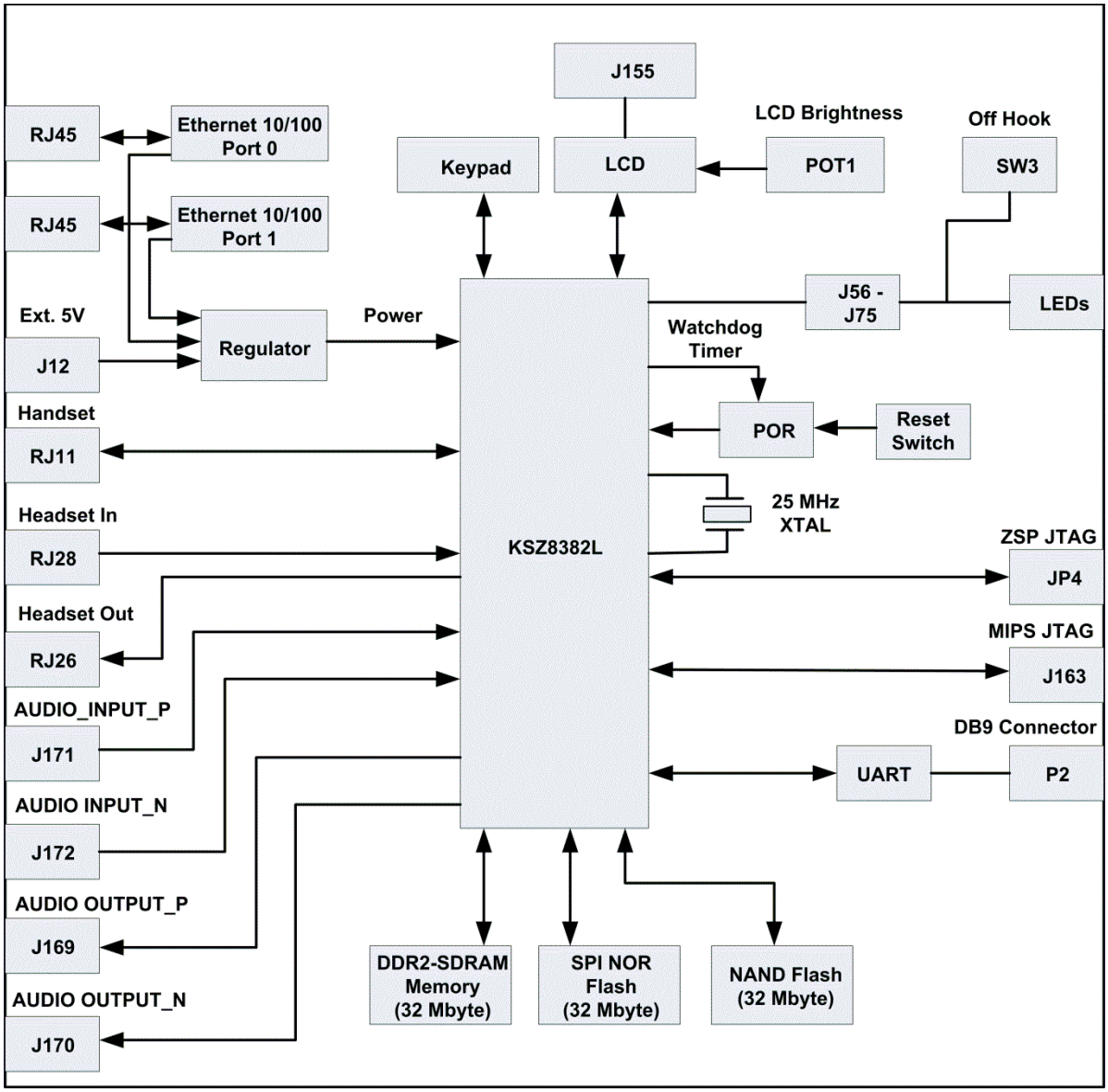


Figure 22 Block Diagram of the KSZ8382L VOIP Evaluation Board

Figure 21 illustrates the actual board with the various interface cables and handset connected.

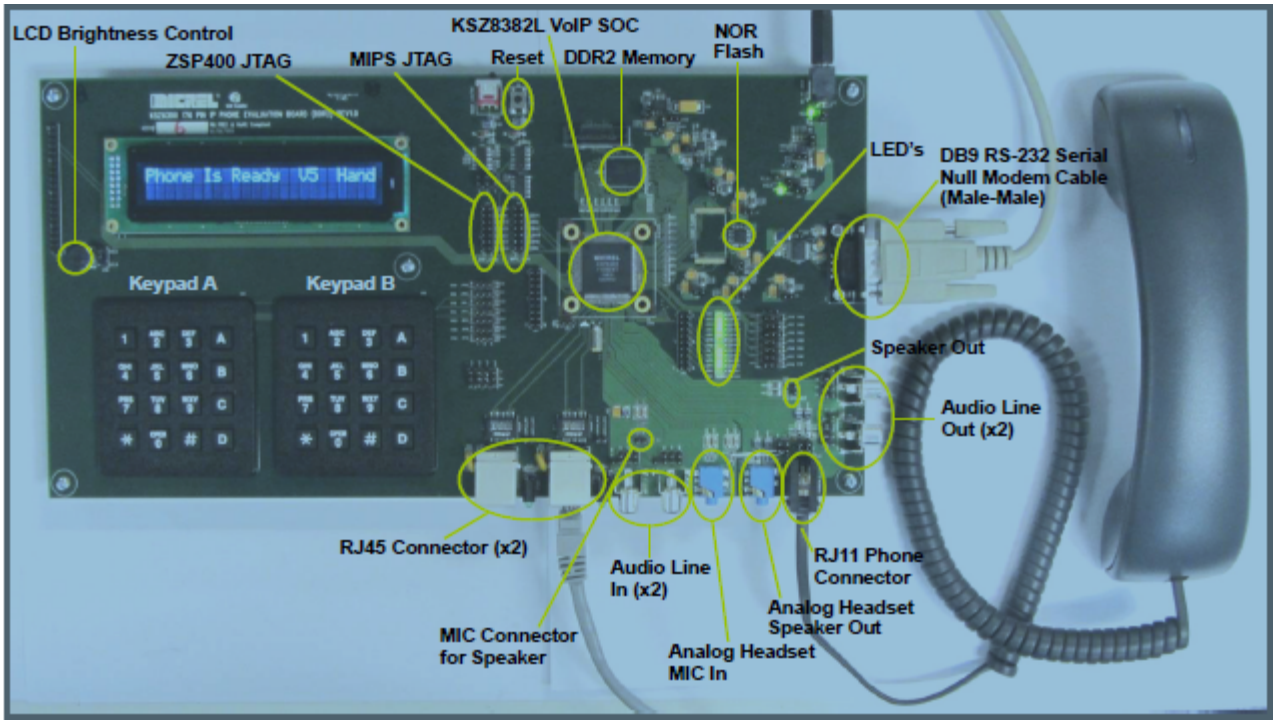


Figure 23 Layout View of the KSZ8382L VoIP Evaluation Board

7.2 Memory

The KSZ8382L device supports two types of memory; DDR2 SDRAM and serial NOR Flash memory. The sections which follow provides detailed information on its usage. Note that the specific configuration of memory used on the board must be properly set up using the four jumpers JP115, JP116, JP117, and JP118. See Table 1.

Table 1 Memory Configuration Jumper

Strapping Pins [1]				Memory Mode
LED11 (JP116)	**LED20 (JP117)**	**LED21 (JP118)**	**LED10 (JP115)**	
X	0 (NOR)	0	0	Reserved
X		0	1	Reserved
X		1	0	SPI NOR
X		1	1	Reserved
X	1 (NAND)	0	0	Reserved
X		0	1	Large Block Normal Address
X		1	0	Reserved
X		1	1	Large Block Extended Address
0	0	X	X	Reserved
1	1	X	X	DDR2 SDRAM

Note 1: A “1” means in jumper position 2-3 connected so as to pull the strapping pin on the device to a high logic voltage.

7.2.1 DDR2 SDRAM Memory

The DDR2 SDRAM memory is used by the MIPs processor to execute the code. At power up time, the code image that is in the Serial NOR Flash device is loaded into the SDRAM for execution by the MIPs processor. When power is turned off, the contents of the SDRAM are lost.

- The memory data width required is 16 bits. At this time, only 16-bit devices are supported.
- The minimum - maximum SDRAM size that can be used is 8 Mbytes - 64 Mbytes.
- The DDR2 SDRAM is located at U109.

Refer to the latest firmware readme files and SDK package for more details on the memory organization and utilization. See Table 1 for jumper settings related to using the DDR2 SDRAM memory.

7.2.2 Serial NOR Flash Memory

The Serial NOR Flash memory is used to store the code image. It is programmed at the factory with the latest revision of code. At power up time, the code image is loaded into the DDR2 SDRAM for execution.

- The maximum Serial NOR Flash memory size that can be used is 16 Mbytes.
- The SPI interface is used to interface to the Serial NOR Flash memory.
- The Serial NOR Flash memory is located at U57.

Refer to the latest firmware readme files and SDK package for more details on the memory organization and utilization. See Table 1 for jumper settings related to using the Serial NOR Flash memory.

7.2.3 NAND Flash Memory

The NAND Flash memory can optionally be used to store the code image. This component is not installed at the factory, but can be installed by the user if desired. If installed in place of the Serial NOR Flash memory and programmed with the latest firmware, at power up time, the code image is loaded into the SDRAM for execution.

- The maximum NAND Flash memory size that can be used is 8 Gbits for a small block device (512 bytes/page) or 512 Gbits for a large block device (2k bytes/block).
- The location for installing the NAND Flash memory is at U11.

See Table 1 for jumper settings related to using the NAND Flash memory.

7.3 Keypad

The KSZ8382L VoIP evaluation board supports keypad sizes up to 6 x 6. There are two 4 x 4 keypads mounted on the board to simulate a 4 x 6 matrix. The keypads are enabled using the jumpers indicated in Table 2.

Table 2 Keypad Jumper Settings

Jumper Number	Description	Jumper Setting
JP98	Keypad enable for Row 1	Pins 1-2 connected
JP99	Keypad enable for Row 2	Pins 1-2 connected
JP100	Keypad enable for Row 3	Pins 1-2 connected
JP101	Keypad enable for Row 4	Pins 1-2 connected

The keypad matrix is functionally organized as shown in Table 3.

Table 3 Keypad Organization and Function Assignments

Keypad A			
1	2 ABC	3 DEF	CALL (Off Hook)
4 GHI	5 JKL	6 MNO	CALL END (On Hook)
7 PQRS	8 TUV	9 WXYZ	CONF CALL (Start/Join)
*	0	#	HOLD

Keypad B			
TRANSFER (Hook Flash)	CONF DROP	DND	Version
VOL UP	WIDE/NAR BAND	(Res)	Current Time
VOL DN	NET INFO	Direct Call	(Res)
MUTE	SPEAKER HANDSET HEADSET (Select)	Redial	Music

7.4 LCD Display

The LCD display module is located at position U63 which is located in the upper left corner of the board. It is a 2x20 character LCD display.

Various display can be powered by either 3.3V or 5V. Table 4 illustrates the jumper used to select the desired voltage.

Table 4 LCD Display Voltage Selection Jumper Settings

Jumper	Description	Jumper Setting
JP90	3.3V LCD Display	Pins 1-2 connected
	5V LCD Display	Pins 2-3 connected

7.4.1 External LCD Connector

A 20-pin single row connector at location J155 is provided to allow connection to external displays for purpose of evaluating those displays. This connector is located just to the left of the onboard LCD module.

7.4.2 LCD Backlighting

A potentiometer is provided to allow for adjustment of the LDC display backlighting. POT1 is located just to the left of the onboard LCD display.

7.5 Ethernet Interface

The KSZ8382L VoIP evaluation board supports two 10/100 Ethernet ports. These ports are available on two RJ45 connectors located at J27 and J30 along the bottom edge of the board. The internal Ethernet switch design is based on Ethernet switch technology available on stand alone Micrel switch products such as the KSZ8773. Refer to the KSZ8382L datasheet for more details on the available Ethernet functionality. It is recommended to use at least a Cat5e cable or better for all Ethernet connections.

7.6 Audio / Voice Interfaces

The KSZ8382L VoIP evaluation board supports the following voice interfaces for VoIP applications:

- Speaker
- Microphone
- Handset
- Headset
- Audio at RCA Jacks

By making these various interfaces available, the board can be configured to operate in a range of different environments and the various signals can be monitored and measured.

7.6.1 The Speaker Interface

A two wire speaker interface is available at the “MIC9” header located at the center-right side of the board. The available power that can be supplied by the device is under 400 mW. Speaker selection should take this into account. A practical application will utilize an external audio amplifier to provide the necessary drive for an assortment of applications. The speaker should have an impedance of 4 – 8 Ω and have a power rating of 500 mW.

7.6.2 The Microphone Interface

A microphone can be connected to the “MIC5” header located in the bottom-right corner of the board. This input is labeled as MIC_IN. The microphone interface is differential. A nominal microphone with about 2kΩ ohm of impedance will be required.

7.6.3 The Handset Interface

A handset can be connected to the board. An RJ9 connector, located at J162 near the bottom-right corner of the board, has been provided for that use. The handset allows for both sending and receiving of voice information.

7.6.4 The Headset Connection

A headset can be connected to the board. Two 3.5 mm audio jacks are provided for interfacing to the headset. J26 handles the HEADSET_OUT signal and J28 handles the HEADSET_IN signal. These audio jacks are located in the bottom-right corner of the board.

7.6.5 The Audio RCA Jacks Interface

The various voice signals discussed above can be made available on a set of RCA audio jacks. There are two audio input jacks and two audio output jacks. The input jacks are INPUT_N at location J171 and

INPUT_P at location J172. Both of these RCA jacks are at the bottom of the evaluation board, next to the Ethernet connectors. The output jacks are OUTPUT_N at location J170 and OUTPUT_P at location J169. Both of these RCA jacks are located near the bottom-right corner of the board.

There are a number of jumpers used to determine which of the audio interfaces are connected to the RCA audio input and output jacks. The jumper settings are shown in Table 5.

Table 5 Configuring the RCA Audio Input and Outputs Ports

Interface	Jumper	Setting	Type	Connection
Speaker	J60	Connected	Output	Speaker output on OUTPUT_P RCA jack J169
	J63	Connected	Output	Speaker output on OUTPUT_N RCA jack J170
Microphone	J66	Connected	Input	Mic input on INPUT_P RCA jack J171
	J69	Connected	Input	Mic input on INPUT_N RCA jack J172
Handset / Headset	J62	Connected	Output	Handset output on OUTPUT_P RCA jack J169
	J65	Connected	Output	Handset output on OUTPUT_N RCA jack J170
	J68	Connected	Input	Handset input on INPUT_P RCA jack J171
	J71	Connected	Input	Handset input on INPUT_N RCA jack J172

Note that if a particular RCA output jack is used, the sound is also output onto the original interface. For example, if the J62 and J65 jumpers are connected as listed in Table 4, the handset output is driven onto the OUTPUT_P and OUTPUT_N RCA jacks at locations J169 and J170 respectively. In this case, the sound would still be driven onto RJ9 handset output jack located at J162 at the bottom right hand corner of the evaluation board.

In addition, the same jumpers (J62 and J65) are used to control both the handset and headset on the KSZ8382L evaluation board. Therefore, if the handset jumpers are set as described in the example above, the sound will be output not only onto the handset jack at location J162, and the RCA output jacks at locations J169 and J170, but also onto the headset output jack J26 located at the lower right hand corner of the evaluation board.

7.7 Phone On Hook / Off Hook Switch

The KSZ8382L VoIP evaluation board has onboard Phone On / Off Hook switch capability. The boards come from the factory with this switch not installed and not wired in. However, if the user would like to implement this function, a switch can be installed and wired up to a GPIO pin of choice so as to simulate the on hook / off hook function. Refer to the schematic if it is desired to implement this function.The location for this switch is at S3 which is located at the top-center of the board.

7.8 Communications Interface

Communication with the onboard processor and firmware takes places across a serial interface communication port. An onboard UART (Maxim MAX3218) handles the communication across the RS232 serial bus. A male DB9, null modem connector is located at location P2 at the middle-right side of the board. The nominal settings for communication are 8 bits, no parity, 1 stop bit (8N1) at 115200 baud.

This is the interface that the user will use to communicate to the processor and onboard firmware from an external computer. Firmware updates will utilize this interface. When the board is first manufactured, the first code image will be transferred to the onboard Flash device via the JTAG interface.

7.9 MIPS JTAG and ZSP JTAG

The KSZ8382L VoIP evaluation board supports JTAG operations for both the MIPS CPU and the ZSP400 DSP. The MIPS JTAG interface is a 14-pin header located at header J163. The ZSP400 JTAG connector a 14-pin header located at header JP4. These JTAG interfaces can be used to download code to the NOR Flash memory or the NAND Flash memory as well as for software development and debugging purposes. Both headers are located to the right of the LCD display.

7.10 GPIO Pins

The KSZ8382L VoIP evaluation board supports 13 dedicated GPIO pins which are connected to LED indicators LED0 through LED12. A logic low on an individual GPIO pin turns the associated LED ON and a logic high turns it OFF. These LED's can be use to assist with software debug and development. Refer to Figure 2 for the relative location of this bank of LEDs. The LEDs can be removed if desired and the GPIO pin used for any general I/O purpose as necessary.

There are 39 other shared GPIO pins in the device which are shared with other functionality. Some of those GPIO pins are available to use if the shared function is not used. Refer to the KSZ8382 data sheet for information on those pins if it is desired to use them.

Table 6 shows the relationship between the GPIO pins and the LEDs on the board.

Table 6 GPIO Pin to LED Mapping

GPIO	LED	Relative Location on Board
0	0	LED[12:0] and jumpers located towards the bottom right corner of the board.
1	1	
2	2	
3	3	
4	4	
5	5	
6	6	
7	7	
8	8	
9	9	
10	10	
11	11	
12	12	

7.11 Reset

There are three types of resets implemented on this evaluation board.

- Power on reset
- Push button reset
- Watchdog Timer reset

7.11.1 Power On Reset

A power on reset circuit is implemented which maintains a zero voltage level on the Reset pin (Pin 44) of the KSZ8382L device for approximately 100 ms while the various voltage regulators and other devices are powering up.

7.11.2 Push Button Reset

A momentary push button switch (S4) is provided to enable the user to power cycle the KSZ8382L device at any time. S4 is located at the top-center of the board.

7.11.3 Watchdog Timer Reset

The board has been designed to make available the optional use of an internal Watchdog timer to assert reset after an elapsed programmed period of time. When a specific internal programmable timer expires, the WRSTO signal output on Pin 139 is used to create a reset signal to the KSZ8382L device. Table 6 presents the options the user has when using this Watchdog timer reset function. It is recommended that the jumpers remain in the default state until thoroughly understood.

Table 7 Watchdog Timer Jumper Settings

Jumper	Jumper Setting (Default)	Description
J81	Open	This jumper is used to match the polarity of the watchdog timer reset output. If the KSZ8382L device is programmed with an active high watchdog timer reset output, this jumper should be installed. The default setting is an active low WRSTO reset. In this case a high voltage on WRSTO is used to reset the board.
J83	Closed	This jumper is used to match the polarity of the watchdog timer reset output. If the KSZ8382L device is programmed with an active low watchdog timer reset output, this jumper is installed. The default setting is an active low WRSTO reset. In this case a low voltage on WRSTO is used to reset the board.
J82	Open	Installed = The watchdog timer reset is not used to reset the board. Not installed = The watchdog timer reset is used to reset the board.

7.12 Power

This section provides the information necessary to understand the voltages necessary to power the evaluation board, voltage configuration choices available, and voltage / power monitoring capabilities.

7.12.1 Primary Power Source

The KSZ8382L VoIP evaluation board is powered by an external 5V power module.

The user must make sure the jumpers listed in Table 8 are configured properly in order for the external 5V power to be connected to the onboard regulators. select a configuration from one of the columns and make sure the jumpers are all correctly configured.

Table 8 Selecting the Power Source

Jumper	Power Via: Power Jack
J34	Closed
J80	Closed
J79	Closed

The 5V input power jack (J12) is located at the top-right corner of the board. It is recommended to use a 5V power module capable of supplying 1.5 A to ensure the power source is not operating near its top end.

7.12.2 Voltages and Test Points

Four additional voltages (3.3V, 1.2V, 1.8V/2.5V, 0.9V) are generated from the 5V for use on the board. Table 9 outlines the onboard derived voltages and the associated test points.

Table 9 KSZ8382L VoIP Evaluation Board Derived Voltages and Test Points

Voltages	Test Points
V1.2 (Digital and analog core)	TP_V12
V3.3 (Digital and analog core/I/O, and CODEC)	TP_V33
V1.8 or V2.5	TP_V18
0.9V for DDR2 SDRAM	TP_09VTT

The three indicated test points are located in the upper right corner of the board.

7.12.3 Power Related Jumper and Test Points

The board has an assortment of jumpers which can serve as breakpoints and measurement points for the various related power sources and connections. These can be useful when measuring currents associated with specific parts of the device or board. These jumpers are listed in Table 10.

Table 10 Power Related Jumper Settings

Jumper Numbers	Description	Jumper Setting
J34	5V input connection onto board	Connected
J79	5V input connection for power regulator U107.	Connected
J80	5V input connection for power regulator U105.	Connected
J409	Connect 3.3V source to V33	Connected
J410	Connect 1.2V source to V12	Connected
J74	3.3V input connection for V18 generator	Connected
J407	Create 2.5V on V18	Connected
J406	Create 1.8V on V18	Open
JP408	Connect V09_VTT (.9V reference voltage for DDR2)	in
J73	3.3V VDDA33 connection.	Connected
J72	3.3V VDDACODEC33 connection.	Connected
J75	3.3V VDDABTL33 connection.	Connected
J78	3.3V VDDIO33 connection.	Connected
J76	1.2V VDDA12 connection.	Connected
J77	1.2V VDDCORE connection.	Connected

7.13 Numerical List of Jumpers

The information in Table 11 is provided as a convenient way of finding out what a specific jumper is used for and its default setting.

Table 11 Numerical List of Jumpers and Default Settings

Jumper	Description	Default Jumper Setting
JP4	14-Pin JTAG Connector for ZSP	n/a
J12	5V Power Jack	n/a
J26	Headset Out	n/a
J27	Ethernet Port	n/a
J28	Headset In	n/a
J30	Ethernet Port	n/a
J34	5V input connection onto board	Connected
J55	Reserved	out
J60	Speaker Output on OUTPUT_P RCA Jack @ J169	out
J61	Headset Output P1 on OUTPUT_P RCA Jack @ J169	out
J62	Handset Output on OUTPUT_P RCA Jack @ J169	out
J63	Speaker Output on OUTPUT_N RCA Jack @ J170	out
J64	Headset Output N1 on OUTPUT_N RCA Jack @ J170	out
J65	Handset Output on OUTPUT_N RCA Jack @ J170	out
J66	Speaker Input MCP1 on INPUT_P RCA Jack @ J171	out
J67	Headset Input MCP2 on INPUT_N RCA Jack @ J171	out
J68	Handset Input MCP3 on INPUT_P RCA Jack @ J171	out
J69	Speaker Input MCN1 on INPUT_N RCA Jack @ J172	out
J70	Headset Input MCN2 on INPUT_N RCA Jack @ J172	out
J71	Handset Input MCN3 on INPUT_N RCA Jack @ J172	out

J72	Connect V33 source to VDDACODEC33	in
J73	Connect V33 source to VDDA33	in
J74	Connect V33 source to VDDR18 generator	in
J75	Connect V33 source to VDDABTL33	in
J76	Connect V12 source to VDDA12	in
J77	Connect V12 source to VDDCORE12	in
J78	Connect V33 source to VDDIO33	in
J79	Connect V50 as input to U107 (V33)	in
J80	Connect V50 as input to U105 (V12)	in
J81	Active High WRSTO for Watchdog Timer	out
J82	Jumper for disabling (not using) the watchdog timer reset function	out
J83	Active Low WRSTO for Watchdog Timer	in
JP90	Select 3.3V or 5V LCD Module	2-3
JP98	Keypad Enable for Row 0/4	1-2
JP99	Keypad Enable for Row 2/6	1-2
JP100	Keypad Enable for Row 1/5	1-2
JP101	Keypad Enable for Row 3/7	1-2
JP106	BISTEN (Micrel Use Only)	1-2
JP107	SCANEN (Micrel Use Only)	1-2
JP108	TESTEN (Micrel Use Only)	1-2
JP109	KCOL0 / SGPIO[5]	1-2
JP110	KCOL1 / SGPIO[4]	1-2
JP111	KCOL2 / SGPIO[3]	1-2
JP112	KCOL3 / SGPIO[52	1-2
JP113	KCOL4 / SGPIO[1]	1-2

JP114	KCOL5 / SGPIO[0]	1-2
JP115	LEDP10	1-2
JP116	LEDP11	2-3
JP117	LEDP20	1-2
JP118	LEDP21	2-3
JP119	KCOL6 / SGPIO[35]	1-2
J155	LCD External Interface	n/a
J162	Handset	n/a
J163	14-Pin JTAG Connector for MIPS Processor	n/a
J166	18-Pin Header for GPIO[12:0], GND, V33	n/a
J167	18-Pin Header for GPIO[16:13], GND, V33	n/a
J169	RCA Jack Output_P	n/a
J170	RCA Jack Output_N	n/a
J171	RCA Jack Input_P	n/a
J172	RCA Jack Input_N	n/a
JP406	Select 1.8V or 2.5V as source for VDDR18	out
JP407	Connect 1.8V or 2.5V source to VDDR18	in
JP408	Connect V09_VTT (.9V reference voltage for DDR2)	in
JP409	Connect 3.3V source to V33	in
JP410	Connect 1.2V source to V12	in

7.14 Numerical List of Test Points

The information in Table 12 is provided as a convenient way of finding out what a specific test point is used for.

Table 12 Numerical List of Test Points

TP	Description
TP_V33	3.3V Test Point
TP_V12	1.2V Test Point
TP_V18	1.8V Test Point
POE_5V	5V POE
TP_INN	RCA Jack INPUT_N
TP_INP	RCA Jack INPUT_P
TP_OUTN	RCA Jack OUTPUT_N
TP_OUTP	RCA Jack OUTPUT_P
TP_09VTT	0.9V for DDR2 SDRAM

7.15 Reserved Jumpers

The following list of jumpers indicate which jumpers are for Micrel use and not for general user usage.

Table 13 Reserved Jumpers

Jumper	Description
J55	Reserved For Micrel Use
JP106	Reserved For Micrel Use
JP107	Reserved For Micrel Use
JP108	Reserved For Micrel Use
JP109	Reserved For Micrel Use
JP110	Reserved For Micrel Use

JP111	Reserved For Micrel Use

8 KSZ8382L VoIP Evaluation Board Firmware and Tools

To complement the evaluation board hardware components, a set of firmware and software components are available (SDK) as the firmware part of the VEK – VoIP Evaluation Kit. In addition, there are a set of tools available to allow the user to perform such tasks as configuring the system, updating the firmware, or changing various parameters. These pieces are described below and should be referred to as appropriate.

SDK	**---**	The Software Developers Kit is a package which provides the information needed by developers to develop applications which can run on the evaluation board or in a similar environment based on the KSZ8382L device. This package contains the specifications, the tools, and the code used to develop those packages.
Web GUI	**---**	The Web GUI is a Web based access tool that is built into the firmware. It allows the user to configure the device and environment to meet the requirements of the design. This tool will be needed to properly configure the evaluation board for use.
***configassist* Utility**	**---**	The *configassist* utility runs in the command window and interfaces to the board via the RS232 interface. It can be used to set or change various parameters.
F/W Update Utility	**---**	The Firmware Update Utility is a tool that can be used to update the firmware on an evaluation board in which firmware has already been installed.

9 Updating the Firmware

Micrel will periodically make available updated code. The material in this section will provide the information necessary for updating the firmware on the KSZ8382L VoIP Evaluation Board.

Note that there are two methods available for updating an existing functional instance of firmware; the automated method using the Web GUI Utility and the manual method which is accomplished by entering commands into the command line.

If the firmware is non-functional or the board does not have firmware installed, the procedure will be slightly different. Both scenarios will be described in this section.

9.1 General Setup and Items Required

Environment Requirements

- Same general environment as described in Figure 4. Any telephones or extra evaluation boards do not have to be installed. The important part is to make sure the computer, the Ethernet connection, and the RS232 connection between the computer and the board are connected and functioning.

Required Files and Programs

- New Firmware Image file, located in a directory of your choice.
- SolarWindsTrivial FTP Program.(for manual method only)

- Communication Utility (Hyperlinks, TeraTerm, or equivalent).(for manual method only)

Information on the SolarWinds Trivial FTP Program

- The SolarWinds TFTP server can be downloaded from the following web address.
- http://www.solarwinds.com/register/registrationb.aspx?program=52&c=70150000000C cH2&INTCMP=DLIndexA_FreeTools_freeTFTPserver
-

9.2 Firmware Update Procedure - Automated Method

- Open the Web GUI and go to the Firmware Upgrade page as in Fig. 21
- Check the “Browse” and select the firmware that will be installed. The check the “Upgrade” as described in Fig.24.
  It will take about 3 to 5 minute to finish the upgrade and then the system will automatically reboot.

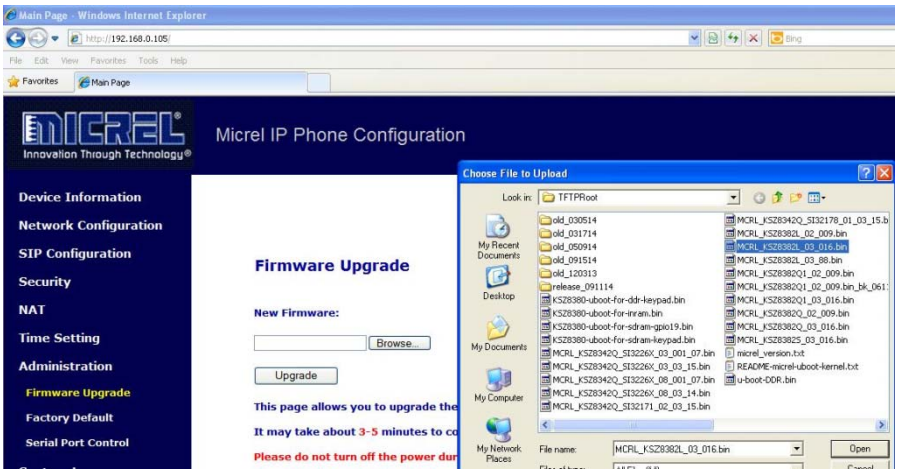


Figure 24 Firmware Upgrade via Web GUI

9.3 Firmware Update Procedure – Manual or Script Method

The procedure outlined in Figure 24, is the core procedure that is used in the automated method. If it is desired to execute this procedure either manually on the command line or incorporate it into a custom script, the procedure shown should be followed.

KSZ8382L Eval Board Manual F/W Upgrade Steps

Preparation

Step 1 – Install Trivial FTP software. Connect between computer and board using an RS232 cable.
Step 2 – Open the communication program and make sure it is set at 115200 baud rate, 8 bits, no parity, and 1 stop bit (8N1).
Step 3 – Power down and then power up the board.
Step 4 – Within 5 seconds, hit the <Space> key.
Step 5 – You should see the # prompt. At the prompt enter the following commands.

Step 6 – setenv ipaddr 192.168.0.1 // (or some other specific IP Address as desired)
Step 7 – setenv serverip 192.168.0.102 // Set the desired IP address of the PC where the tftp // server is located.
Step 8 – setenv bootcmd bootm bf040000 // Set where to boot from in Serial Flash
Step 9 – save // Save changes to the env variables.
Step 10 – reset // Reset the system; within 5 seconds hit the spacebar.

Updating the Serial FLASH F/W

Step 1 - tftp 80200000 uImage-mips // Load the file into the RAM at address 80200000 // Name of actual file may be different than indicated
Step 2 - sf protect off // Flash Protection off
Step 3 - sf erase 40000 7C0000 // Erase area of Flash based on uImage size (~ 2 min)
Step 4 - sf write 80200000 40000 ${filesize} // Write RAM contents starting at addr 80200000 in Serial Flash starting at location 40000 (~ 10 min)

Optional In-Line Verification Steps

The below optional procedure is needed if verification of file load is desired. If any differences are detected, repeat the above procedure.

Step 5 - sf protect on
Step 6 - cmp.b 80200000 bf040000 ${filesize} // Compare data in RAM to Serial FLASH.
Step 7 – reset // After this final reset you should see the "/ #" prompt.

Figure 25 Manual Steps to Update the KSZ8382L Eval Board Firmware

9.4 UBOOT Update Procedure

If the firmware is corrupt and must be re-installed or if the board has not yet been programmed, the procedure outlined in Figure 25, is the initial procedure that must be followed prior to installing any firmware. This procedure installs the UBOOT section of code. Follow these instructions below and in Figure 27 first and then

install the firmware using the methods described in Section 8.3 or 8.4.

- Install the Trivial FTP program. Set the terminal utility to use 115200 baud rate and 8 bits, no parity, and 1 stop bit (8N1).
- Power up the board. Press the space bar within the first 5 seconds after power up.
- Make sure the board is connected to the computer using the interfaces shown in Figure 1.
- A “#” prompt will appear in the cmd line window. You are now in the Linux U-Boot environment.
- Follow the steps shown in Figure 2. This will update your U-Boot firmware area.

KSZ8382L Eval Board U-Boot F/W Upgrade Steps

Updating the Serial FLASH Environment Variables

- This is needed only to change/update the environment variables. It is suggested to update these u-boot environment variables whenever changing the u-boot f/w code.
- When U-Boot code is first programmed on a board, this step is required.
- Customer must use their own MAC address rather in place of the default MAC address from Micrel.
- Step 1, 2 below are needed only for non-overwritable environment variables (ethaddr, serial#)

Step 1 - #sf erase 30000 10000 // Erase the environment variables
Step 2 - #reset // Resets the system
Step 3 - #setenv ethaddr 00:10:a1:ab:cd:ef // Set the desired MAC address
Step 4 - #setenv serial# 123456 // Set the desired serial number
Step 5 - #setenv ipaddr 192.168.0.1 // Set the desired IP address of the board
Step 6 - #setenv serverip 192.168.0.102 // Set the desired IP address of the PC where tftp is located
Step 7 - #setenv bootcmd bootm bf040000 // Set where to boot from
Step 8 - #reset // Reset the system, again within 5 seconds hit the spacebar

Updating the Serial FLASH U-Boot F/W

- This procedure is needed only to update the U-Boot code.

Step 1 - #tftp 80200000 u-boot.bin // Load the file into the RAM area at address 80200000
// Name of actual file may be different than indicated
Step 2 - #sf protect off //
Step 3 - #sf erase 0 30000 // Erase 30000 locations in FLASH starting at address 0
Step 4 - #sf write 80200000 0 ${filesize} // Write RAM contents starting at addr 80200000 into Serial FLASH

- The below procedure is needed if verification of file load is desired. If any differences are detected, repeat the above procedure.

Step 1 - #sf protect on
Step 2 - #cmp.b 80200000 bf000000 ${filesize} // Compare data in RAM to Serial FLASH

Figure 26 UBOOT Programming Procedure

10 Help

Setup of the Micrel VoIP environment should go smoothly if all the directions are followed. However, if issues arise, please refer to the hints lists below.

➔ If the clients appear to be registered, but you cannot make a call, try the following methods to fix the problem:

- Press the momentary reset switch on the eval board. Wait for re-registration to occur before trying to make a call again.
- Turn off all the clients (boards, telephones, power supplies, but not the SIP Server) and then repower the eval board. Wait for registration to occur before trying to make a call again.
- Turn off everything, and power up using the suggested sequence described earlier.
- Restart the SIP Server by clicking on the “Restart” button on the SIP Server screen.

➔ Regarding the key functions on the keypad:

Note that the functionality of the Eval Board keys are subject to change therefore contact your Micrel representative for information on possible changes.

11 Reference Documentation

KSZ8382L Datasheet (Contact Micrel for latest Datasheet)

KSZ8382L Eval Board Schematics

KSZ8382L Eval Board BOM

KSZ8382L IBIS Files

12 Revision History

Revision	Date	Summary of Changes
0.1	08/28/13	- Document created from KSZ8382Q Rev. 0.3 equivalent document.
0.2	09/13/13	- Minor edits, updated jumper reference designators.
1.0	10/02/14	- Update the Web GUI pages and the Web GUI firmware upgrade for Revision 03_016 software

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