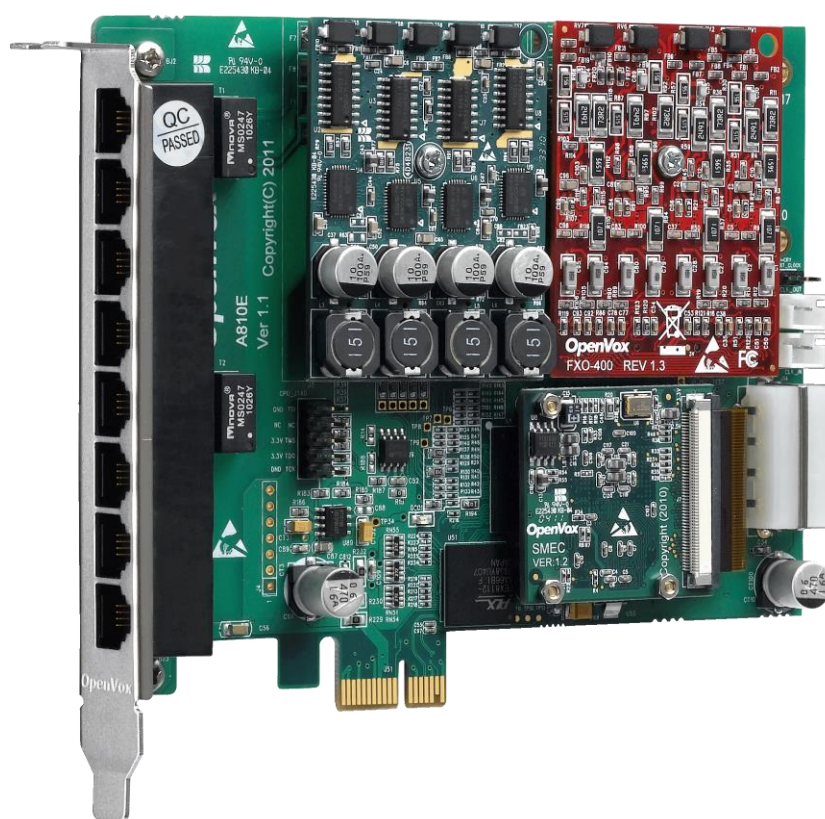




OpenVox Communication Co.Ltd



A810E/AE810E on DAHDI User Manual

Version: 2.2



OpenVox Communication Co.Ltd

OpenVox-Best Cost Effective Asterisk Cards

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General Safety Instructions



CAUTION

1. The computers that have A810E/AE810E card installed must comply with the country's specific safety regulations.
2. Only service personnel should go to install A810E/AE810E card.
3. Before installing A810E/AE810E card, please unplug the power cord and remove the cover from your PC.
4. For avoiding personal injuries and damages to your machine and A810E/AE810E card, make sure bracket of the card is secured to the PC's chassis ground by fastening the card with a screw.
5. Electrical Surges, ESD are very destructive to the equipment. To avoid it, make sure there is a low impedance discharge path from your computer to chassis ground.
6. To reduce the risk of damage or injury, please follow all steps or procedures as instructed.



Test Environments

Rocky-9.1

Kernel version: 5.14.0

DAHDI: dahdi-linux-complete-current

Asterisk: 20

Hardware: OpenVox A810E/AE810E



Chapter 1 Overview

1.1 What is Asterisk

The Definition of Asterisk is described as follows:

Asterisk is a complete PBX in software. It runs on Linux, BSD, Windows (emulated) and provides all of the features you would expect from a PBX and more. Asterisk does voice over IP in four protocols, and can interoperate with almost all standard-based telephony equipment using relatively cost-effective hardware. Asterisk provides Voicemail services with Directory, Call Conferencing, Interactive Voice Response, Call Queuing. It supports for three-way calling, caller ID services, ADSI, IAX, SIP, H323 (as both client and gateway), MGCP (call manager only) and SCCP/Skinny (voip-info.org).



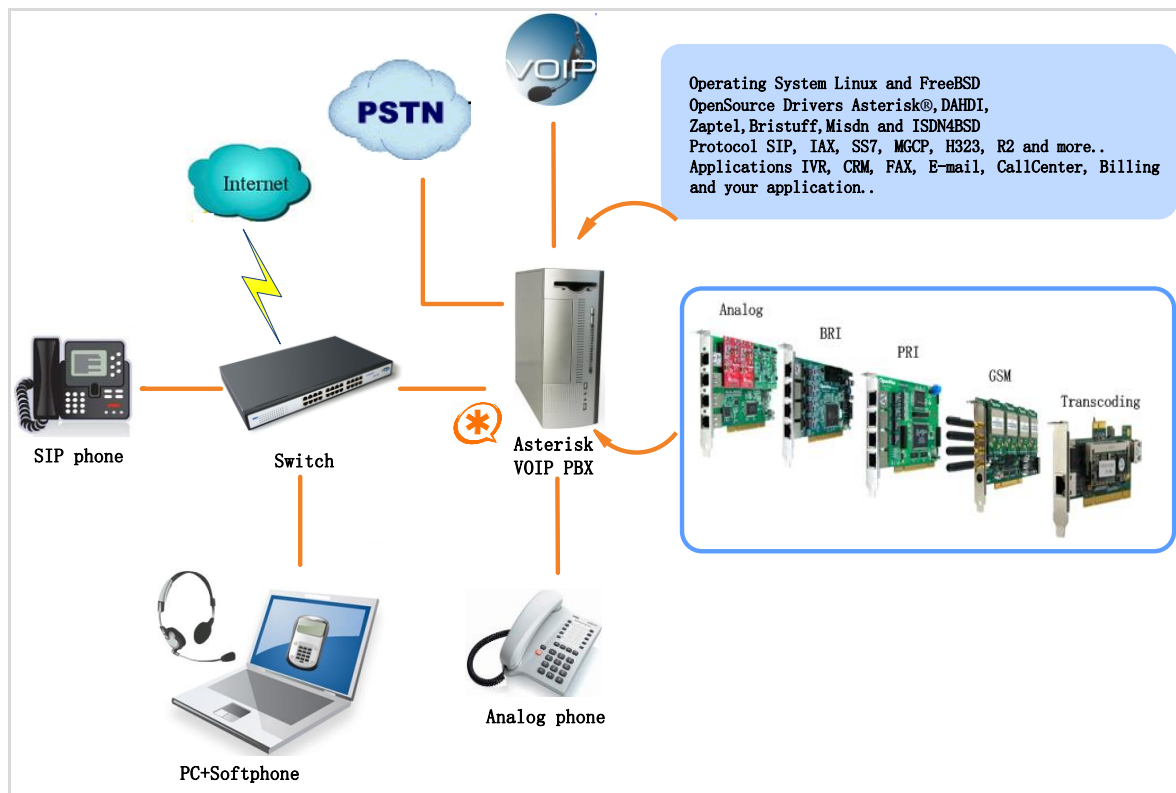


Figure 1 Topology

1.2 What is A810E/AE810E

A810E/AE810E is a new generation analog card, and AE810E is an A810E with an Octasic® Hardware Echo Cancellation Module on board. With the interchangeable quad-FXS and quad-FXO modules, A810E/AE810E can eliminate the requirement for separate channel banks or access gateways.

Once the Octasic® DSP module EC2032 is added to the AE810E, please make sure you are ready to say goodbye to the poor voice quality and echo echo echo in your phone system. No one will even get a chance to hear that anymore! The AE810E with Octasic DSP module will support Telco-grade hardware echo cancellation on all channels, up to the card's

maximum configuration in 8 ports with no additional CPU load.

They all works with Asterisk®, Elastix®, FreeSWITCH™, PBX in a Flash, trixbox®, Yate™ and IPPBX/IVR projects as well as other Open Source and proprietary PBX, Switch, IVR, and VoIP gateway applications.

Target applications

- Channel Bank Replacement / Alternative
- Small Office Home Office (SOHO) applications
- Small and Medium Business (SMB) applications
- Gateway Termination to analog telephones/lines

Sample application

When you need 4 PSTN lines and 4 extension sets, for example, one FXO-400 module and one FXS-400 module should be installed. PSTN lines correspond to FXO modules which are red while extension lines correspond to FXS modules which are green.



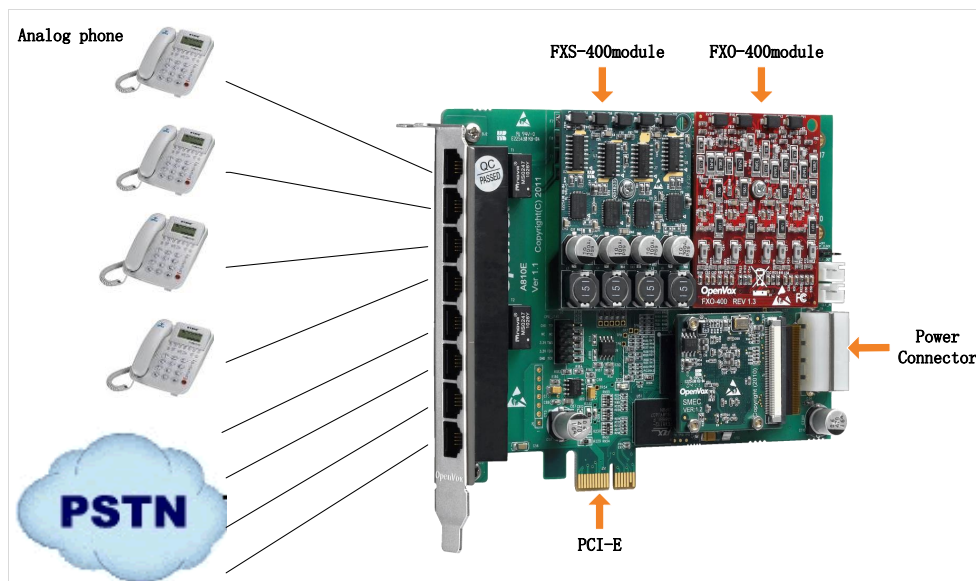


Figure 2 Sample application

Key benefits

- Takes full advantage of Octasic hardware echo cancellation module to deliver the superior voice quality on both FXO and FXS interfaces in all 8 ports
- Adjustable interrupt routing design
- Interrupts frequency adjustment
- Up to 8 simultaneous PSTN calls (per PCIe slot)
- Compatible with all commercially available motherboards
- 3-Month “No Question Asked” return policy
- Lifetime warranty RoHS compliant
- Certificates: CE, FCC, A-Tick
- trixbox™ officially certified
- Elastix® officially certified

Features

- Supports PCI-E ×1, ×2, ×4, ×8, ×16
- Open source driver working with Zaptel, DADHI and so on.
- Caller ID and Call Waiting Caller ID
- ADSI Telephones
- Loopstart Signaling Support



Chapter 2 Hardware Setup

There are some points that should be paid attention to when setting up A810E/AE810E.

2.1 Power supply

The board should be powered no matter what modules are installed, please connect the power source with A810E/AE810E board by a 4-pin power source connector.

2.2 Slot compatibility

A810E/AE810E is compatible with any kind of standard PCI-E $\times 1$, $\times 2$, $\times 4$, $\times 8$, $\times 16$ slot while PCI slot is not fit for it; you should confirm your slot type and insert A810E/AE810E into any type of PCI-E slot as previously described.

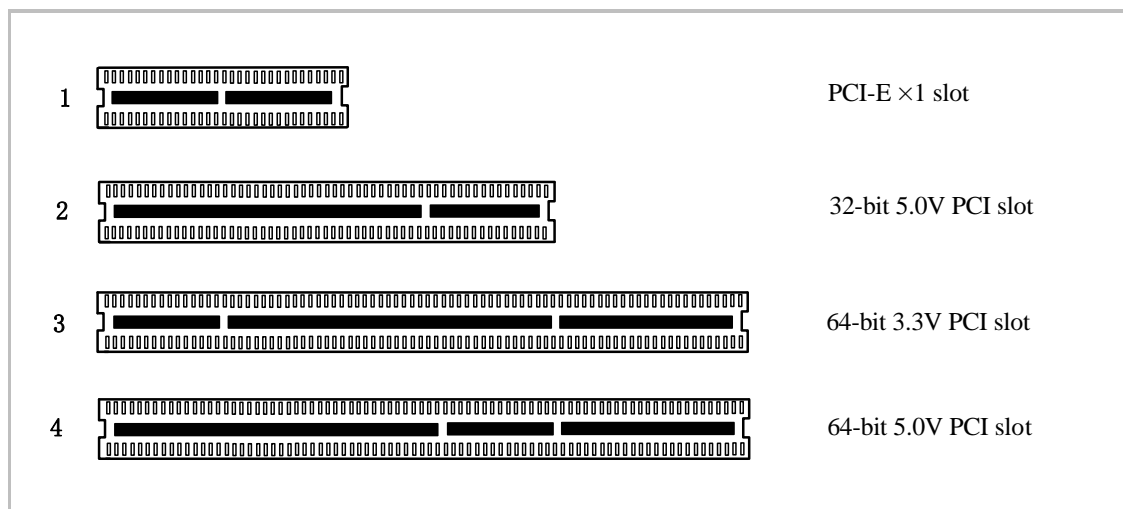


Figure 3 PCI-E and PCI slots

2.3 Timing cable

If you have just one card in the system, all channels on that card have already run under the same clock source, so timing cable is unnecessary.

But if there are more than one card, using timing cable has some advantages. Before using the clock line, each card works on its own clock, therefore precision of the clock is limited; each card will send /receive voice data at different speeds. In voice usage, this small issue can be omitted, but in data communication such as Fax/Modem, it will cause big problem. Data loss will cause communication broken or fax broken. Timing cable will force all cards to work at the same clock source, send data at the same speed, as a result no data will lost.

If you found J914 (input) and J915 (output) interfaces on the card, it means the card supports clock line.

2.4 FXO and FXS modules

FXO (Foreign eXchange Office) is the office end of the line, and FXS (Foreign eXchange Station) is the station end, there is so much difference between them, they can be identified by color, the former ones are red and the latter ones are green. FXO modules use FXS signaling while FXS modules use FXO signaling. A FXO module corresponds to four FXO interfaces which receive power (battery) and ring signals, and a



FXS module corresponds to four FXS ports which provides power (battery) and generates ring signals.

2.5 Hardware setup procedure

- Power off your PC, remember unplug the AC power cable
- Insert A810E/AE810E into a PCI-E slot
- Put timing cable correctly if necessary.
- Fix the board by a screw
- Please plug PSTN lines into FXO ports and extension telephone lines into FXS interfaces before you have detected your PSTN line works well.
- Power on PC

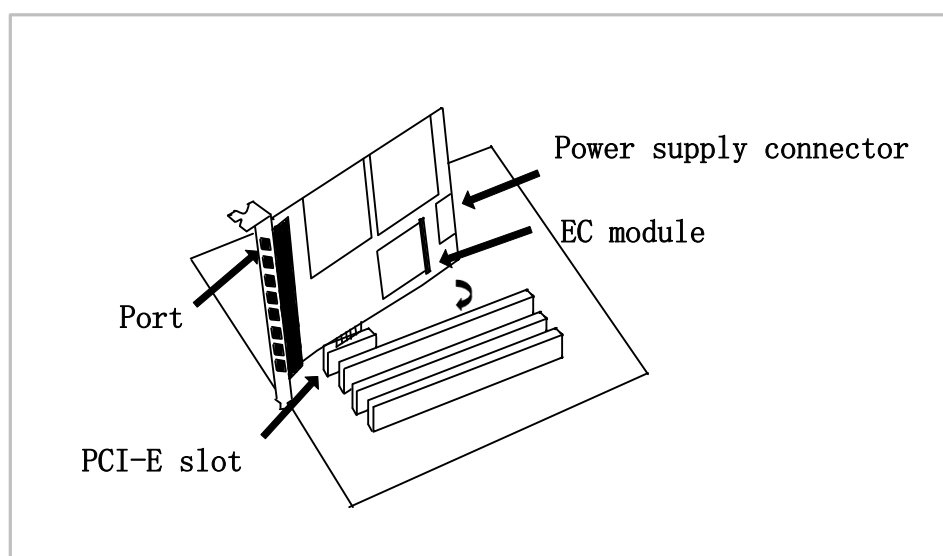


Figure 4 Hardware setup



Caution: During the above processes, an ESD wrist strap is needed. Once power is on, you must not attempt to install or take down the board. Do not forget to connect PSTN lines into analog phones directly to make sure the lines are available before inserting the PSTN lines into FXO ports. After hard ware setup, it is time to install software.



Chapter 3 Software Installation and Configuration

A810E/AE810E supports DAHDI software driver on Linux. To make full use of A810E/AE810E, you should download, compile, install and configure DAHDI and Asterisk.

3.1 Download

DAHDI software packages are available on openvox official website or Digium. Some patches should be added while the driver source is from Digium, therefore, it is recommended that downloading the DAHDI driver package from openvox official website.

Get DAHDI source package from openvox:

http://www.openvoxtech.com/pub/drivers/dahdi-linux-complete/openvox_dahdi-linux-complete-current.tar.gz

Get Asterisk software package from Digium official website:

<http://downloads.asterisk.org/pub/telephony/asterisk/asterisk-20-current.tar.gz>

Execute the following commands under the directory of /usr/src/ in general, the former two below are used for downloading these two packages and the later two are for unzipping them.




```
# wget http://www.openvoxtech.com/pub/drivers/da  
hdi-linux-complete/openvox_dahdi-linux-complete-c  
urrent.tar.gz  
  
# wget http://downloads.asterisk.org/pub/telephon  
y/asterisk/asterisk-20-current.tar.gz  
  
# tar -xvzf openvox_dahdi-linux-complete-current.  
tar.gz  
  
# tar -xvzf asterisk-20-current.tar.gz
```

3.2 Installation

1. Hardware detection

```
# lspci -vvvv
```

Check the outcome and confirm your system has recognized

A810E/AE810E. If it has been recognized, "communication controller" will be displayed in the output information like that:

```
01:02.0 Communication controller: Device 1b74:0810 (rev 01)
    Subsystem: Device 1b74:0001
    Control: I/O+ Mem+ BusMaster+ SpecCycle- MemWINV+ VGASnoop-
ParErr- Stepping- SERR- FastB2B- DisINTx -
    Status: Cap- 66MHz- UDF- FastB2B- ParErr- DEVSEL=slow >TAbort-
<TAbort- <MAbort- >SERR- <PERR- INTx -
    Latency: 64, Cache Line Size: 16 bytes
    Interrupt: pin A routed to IRQ 22 5
    Region 0 : Memory at ded8000 0 (32-bit , non-prefetchable )
[size=512K ]
    Kernel driver in use: opvxa24xx
    Kernel modules: opvxa24xx
```

Figure 5 Hardware detection

If A810E/AE810E is not recognized by the system, you have to power off and take out the card, then try to insert it into other PCI-E slot.

2. Software installation

Some dependencies are crucial. If any of them is absent, the software installation process would not go through successfully. Let's run "yum install XX" (XX stands for the dependency's name) to check the availability of dependencies.

```
# yum install bison
# yum install autoconfig
# yum install automake
# yum install ncurses
# yum install ncurses-devel
# yum install zlib
# yum install zlib-devel
```



```
# yum install openssl
# yum install openssl-devel
# yum install gnutls-devel
# yum install gcc
# yum install gcc-c++
# yum install libxml2
# yum install libxml2-devel
# yum install chkconfig
```



If there is no kernel-devel source in the system, users should run the following command to install the kernel-devel to peer current kernel:

```
# yum install kernel-devel-`uname -r`
```

While if there is no matched kernel-devel found, you should download matched RPM package to install it, or execute the following command to update to the latest and stable kernel version:

```
# yum install kernel kernel-devel
```

After installed, please reboot your machine to apply the new kernel and install the dependencies. If the dependency has been installed, system indicates that nothing to do which means you could go to next one directly. Otherwise, the system will keep on installing it.

After install the dependencies, please change to the directory

dahdi-linux-complete-XX (XX represents DAHDI version), then perform the following commands one by one to install DAHDI.

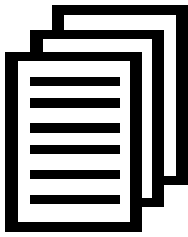
```
# cd /usr/src/dahdi-linux-complete-XX
# make
# make install
# make install-config
# systemctl enable dahdi
```

if successfully, you are going to install Asterisk.

Please operate those commands to install Asterisk.

```
# cd asterisk-XX
# contrib/scripts/install_prereq install
# ./configure --libdir=/usr/lib64 --with-jansson-bundled=yes
# make
# make install
# make samples
# systemctl enable asterisk
```





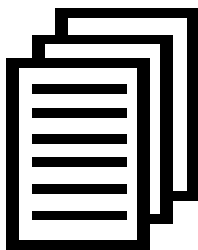
"make samples" will install the standard sample configuration file in the directory /etc/asterisk. As a freshman, you should perform make samples, that is to say, it is unnecessary to perform make samples every time. Because once performed, it will cover the old sample configuration files you have installed.

3.3 Configuration

1. Driver loading

After compiling and installing DAHDI and Asterisk, please load the driver by running:

```
# modprobe dahdi
# modprobe opvxa24xx opermode=CHINA
# dahdi_genconf
```



After running "modprobe dahdi" or "modprobe opvxa24xx opermode=CHINA", there is not any indication information displayed if loaded normally and successfully. opvxa24xx is the driver module name of A810E/AE810E. "opermode" applies to FXO port and is invalid for FXS port, and you are allowed to take place of "CHINA" to other mode name

which is available in the file:

```
../dahdi-linux-XX/linux/drivers/dahdi/fxo_modules.h
```

If there is any error, please trace the cause. Until all errors are clear up, you could execute "dahdi_genconf" again, and then go to the next step. By running "dahdi_genconf", it will generate /etc/dahdi/system.conf and etc/asterisk/dahdi-channels.conf automatically. Checking whether the generated files information agrees with your hardware setup, if not, you should modify to your specific requirements. Do not forget to confirm dahdi-channels.conf is included in chan_dahdi.conf, if not, run command:

```
# echo "#include dahdi-channels.conf" >>  
/etc/asterisk/chan_dahdi.conf
```

FXO ports use FXS signaling, while FXS ports adopt FXO signaling. A part of system.conf which is one of the basic channel configuration files is displayed.

```
# Span 1: OPVXA24XX/24 "OpenVox A810E Board 25" (MASTER)
    fxoks=1
    fxoks=2
    fxoks=3
    fxoks=4
    fxsk=5
    fxsk=6
    fxsk=7
    fxsk=8

# Global data

loadzone= us
defaultzone= us
```

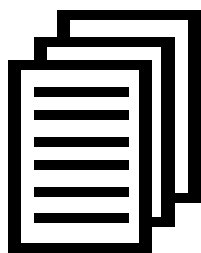
Figure 6 A part of system.conf

2. Country mode modification

In order to match your country pattern, you need to change parameters loadzone and defaultzone to your country. For example, your system is in CHINA, you would like them change to:

```
loadzone = cn
```

```
defaultzone = cn
```



Some zonedata is available in the file

.. /dahdi-XX/tools/zonedata.c, you can refer to it to match your country mode. Meanwhile, you also need to modify another parameter which is in file

/etc/asterisk/indications.conf.

```
country=cn
```

A part of file /etc/asterisk/dahdi-channels.conf is showed as below.

(Modification, if it is not agree with the hardware setup)

```
; Span 1: OPVXA24XX/24"OpenVox A810 Board 25" (MASTER)
;;; line="1 OPVXA24XX/24/0 FXOKS (In use)"
Signalling=fxo_ks //FXS ports use FXO signalin g
callerid="Channel 1" <4001>
mailbox=4001
group=5
context=from-internal
channel => 1
callerid=
group=
context=defaul t

;;; line="2 OPVXA24XX/24/1 FXOKS (In use)"
signalling=fxo_ks
callerid="Channel 2" <4002>
mailbox=4002
group=5
context=from-internal
channel => 2
callerid=
group=
Context=default
.....
.....
.....

;;; line="5 OPVXA24XX/24/4 FXSKS "
signalling=fxs_ks //FXO ports use FXS signalin g
callerid=asreceived
group=0
context=from-pstn
channel => 5
callerid=
group=
context=defaul t

;;; line="6 OPVXA24XX/24/5 FXSKS "
signalling=fxs_ks
callerid=asreceived
group=0
context=from-pstn
channel => 6
callerid=
group=
Context=default
.....
.....
.....
```

Figure 7 A part of dahdi-channels.conf



After modifying the country mode, please execute the following command:

```
# dahdi_cfg -vvvvvv
```

The command is used for reading and loading parameters in the configuration file system.conf and writing to the hardware. A part of outputs are showed in the following figure.

```
Channel map:

Channel 01: FXO Kewlstart (Default) (Echo Canceler: none) (Slaves: 01)
Channel 02: FXO Kewlstart (Default) (Echo Canceler: none) (Slaves: 02)
Channel 03: FXO Kewlstart (Default) (Echo Canceler: none) (Slaves: 03)
Channel 04: FXO Kewlstart (Default) (Echo Canceler: none) (Slaves: 04)
Channel 05: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 05)
Channel 06: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 06)
Channel 07: FXS Kewlstart ( Default) (Echo Canceler: none) (Slaves: 07)
Channel 08: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 08)

8 channels to configure.

Setting echocan for channel 1 to none
Setting echocan for channel 2 to none
Setting echocan for channel 3 to none
Setting echocan for channel 4 to none
Setting echocan for channel 5 to none
Setting echocan for channel 6 to none
Setting echocan for channel 7 to none
Setting echocan for channel 8 to none
```

Figure 8 Channel map

3. Asterisk initiation

```
# asterisk -vvvvvvvgc
```



If Asterisk is already activate, run "asterisk -r" instead. In the CLI, please run the following command:

```
localhost*CLI> dahdi show channels
```

Chan	Extension	Context	Language	MOH	Interpret
Pseudo		default			default
1		from-internal			default
2		from-internal			default
3		from-internal			default
4		from-internal			default
5		from-pstn			default
6		from-pstn			default
7		from-pstn			default
8		from-pstn			default

Figure 9 channels show

If DAHDI channels are found, it means they have been loaded into Asterisk. You are going to edit dialplan by your requirements.

4. Dialplan edit

Users must make sure that the context "from-pstn" and "from-internal" are in extensions.conf, here a simple example is given:

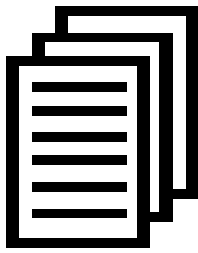
```
# vim /etc/asterisk/extensions.conf

[from-pstn]
exten => s,1,Answer()
exten => s,n,Dial(dahdi/1,,r)
exten => s,n,Hangup()

[from-internal]
exten => 200,1,Dial(dahdi/7/outgoing_number)
exten => 200,2,Hangup()
```

Figure 10 dialplan show





You should write the destination number instead of the `outgoing_number` in the above dial plan. The dial plan achieves that when an extension telephone dials 200, Asterisk will transfer through channel 7 to the destination.

While a call comes from PSTN line, Asterisk answers firstly, and then gets through to the extension set which connects to channel 1.

After saving your dialplan, please run "`asterisk -r`", then execute "`reload`" in the CLI. Next you are able to make calls.

Additional function

Users should run command "`cat /proc/interrupts`" to check A810E/AE810E has independent interrupt. If A810E/AE810E shares interrupt with other devices, it may cause some problems even cannot work normally. While A810E/AE810E allows users to modify interrupt pin during firmware upgrade for avoiding interrupt conflict.

Chapter 4 Reference

www.openvoxtech.com

www.digium.com

www.asterisk.org

www.voip-info.org

www.asteriskguru.com



Appendix A Specifications

• Weight and size

Weight: 85g (A810E) (3.00oz)

10g (ECmodule) (0.35oz)

Size: 136.3×111.2×18mm³

• Interfaces

PCI-E Bus: Be compatible with PCI-E ×1, ×2, ×4, ×8, ×16

Power Supply Connect: 12V 4-pin connector

Local Loop Access: Eight industry standard RJ-11 ports

• Environment

Temperature: 0 ~ 50°C (Operation)

- 40 ~ 125°C (Storage)

Humidity: 10 ~ 90% NON-CONDENSING

• Power consumption

Voltage: 12V

Power consuming: 30.43 W (with full 2 FXS-400 modules), 7.83W(with full 2 FXO-400 modules).



- **Hardware and software requirements**

RAM 128 + MB

Linux kernel 2.4.X or 2.6.X

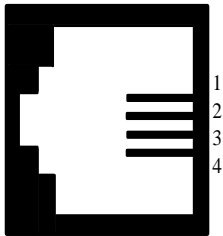
CPU 800+ MHZ



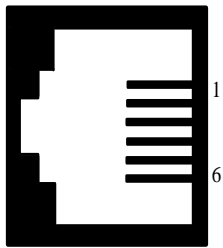
Appendix B PIN Assignments

Either 4-pin or 6-pin RJ11 port is compatible with A810E/AE810E, let's illustrate pin assignments of RJ11 port by the following tables.

4-pin RJ11 port

4-pin RJ11 port	PIN	Description
	1	Not used
	2	Tip
	3	Ring
	4	Not used

6-pin RJ11 port

6-pin RJ11 port	PIN	Description
	1	Not used
	2	Not used
	3	Tip
	4	Ring
	5	Not used
	6	Not used