



**OpenVox Communication Co.Ltd**



## **A2410P/AE2410P on DAHDI User Manual**

Version: 2.2



**OpenVox Communication Co.Ltd**

***Most Advanced Asterisk Cards***

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## General Safety Instructions



### CAUTION

1. The computers that have A2410P/AE2410P card installed must comply with the country's specific safety regulations.
2. Only service personnel should go to install A2410P/AE2410P card.
3. Before installing A2410P/AE2410P card, please unplug the power cord and remove the cover from your PC.
4. For avoiding personal injuries and damages to your machine and A2410P/AE2410P 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 A2410P/AE2410P



## 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 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).

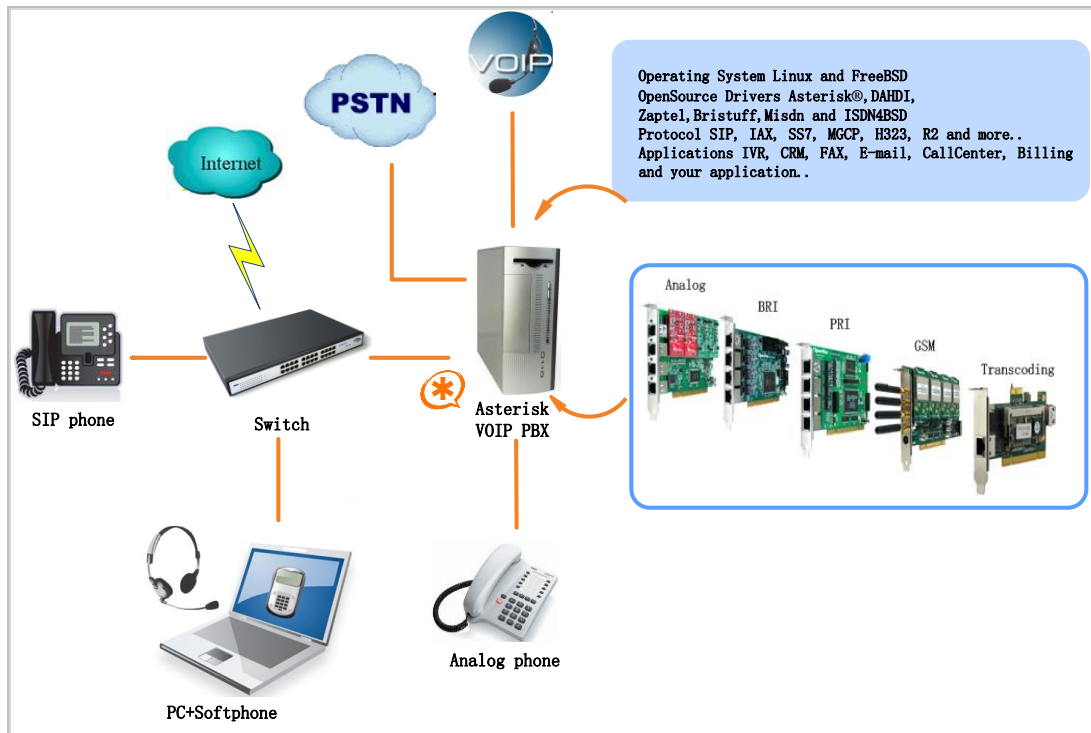


Figure 1 Topology

## 1.2 What is A2410P/AE2410P

A2410P is a new generation analog card and AE2410P is an A2410P with Octasic<sup>®</sup> Hardware Echo Cancellation Module on board. With interchangeable quad-FXS and quad-FXO modules they can eliminate the requirements for separate channel banks or access gateways.

The A2410P/AE2410P contains 6 module banks. Each bank supports one RJ-45 interface. The module banks may be filled with up to 6 quad-FXO or quad-FXS modules enabling the creation of any combination of ports. Scaling of an analog card solution is accomplished by simply adding additional cards.

A2410P/AE2410P works well with Asterisk<sup>®</sup>, Elastix<sup>®</sup>, FreeSWITCH<sup>™</sup>, PBX in a Flash, trixbox<sup>®</sup>, Yate<sup>™</sup> 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





**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 24 ports
- Adjustable interrupt routing design, interrupts frequency adjustment
- Up to 24 simultaneous PSTN calls (per PCI slot)
- 3-Month “No Question Asked” return policy
- Lifetime warranty RoHS compliant
- Certificates: CE, FCC, A-Tick
- trixbox™ officially certified
- Elastix® officially certified



## Chapter 2 Hardware Setup

There are some points that should be paid attention to when set up

A2410P/AE2410P.

### 2.1 Power supply

The board should be powered no matter what modules are installed, please connect the power source with A2410P/AE2410P board by a 4-pin power source connector.

### 2.2 Slot compatibility

A2410P/AE2410P is compatible with any kind of standard PCI 2.2 or above with both 3.3 V and 5 V slot while PCI-E slot is not fit for it; you should confirm your slot type and insert A2410P/AE2410P into any type of PCI slot as previously described.

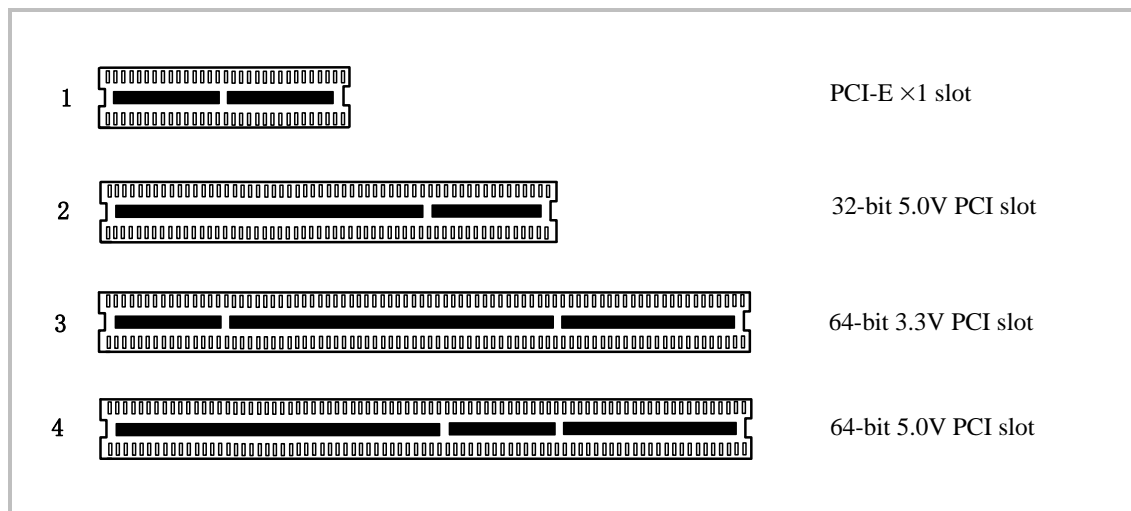


Figure 2 PCI-E and PCI slots

## 2.3 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-400 module corresponds to four FXO interfaces which receive power (battery) and ring signals, and a FXS-400 module corresponds to four FXS ports which provides power (battery) and generates ring signals.

## 2.4 Splitter

A RJ45 interface of A2410P/AE2410P is divided into four RJ11 ports by a specific splitter as the picture of Appendix B stated. So you should prepare for some splitters when install A2410P/AE2410P.

## 2.5 Hardware setup procedure

- Power off your PC, remember unplug the AC power cable
- Insert A2410P/AE2410P into a PCI 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

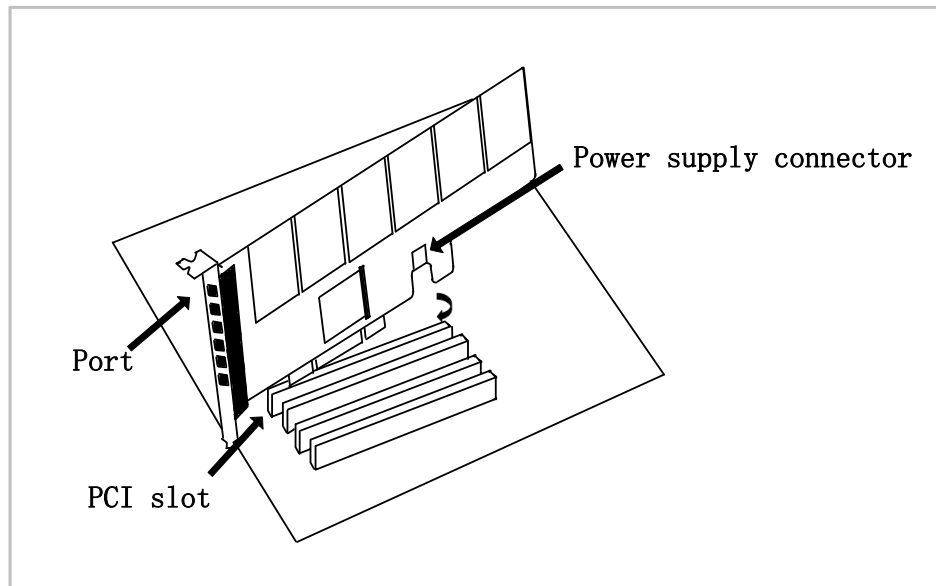


Figure 3 Hardware setup



**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

A2410P/AE2410P supports DAHDI software driver on Linux. To make full use of A2410P/AE2410P, you should download, compile, install and configure DAHDI and Asterisk. Let's make the specific DAHDI and Asterisk version for an example to explain how to install software.

### 3.1 Download

DAHDI software packages are available on OpenVox official website or Digium. Some patches should be added while the driver sources are from Digium, therefore, it is recommended that downloading the DAHDI driver package from OpenVox official website. Let's make the specific DAHDI and Asterisk versions for an expatiation.

Get DAHDI source package from OpenVox:

[http://www.openvoxtech.com/pub/drivers/dahdi-linux-complete/  
openvox\\_dahdi-linux-complete-current.tar.gz](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](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/asteris/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

A2410P/AE2410P. If it has been recognized, "communication controller" will be displayed in the output information like that:

```
01:02.0 Communication controller: Device 1b74:1610 (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 225
  Region 0: Memory at ded80000 (32-bit, non-prefetchable)
[size=512K]
  Kernel driver in use: opvxa24xx
  Kernel modules: opvxa24xx
```

Figure 4 Hardware detection

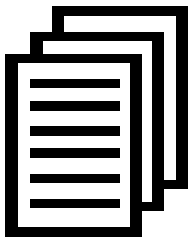
If A2410P/AE2410P is not recognized by the system, you have to power off and take out the card, then try to insert it into other PCI slot.

## 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.

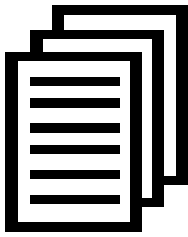
```
# cd /usr/src/dahdi-linux-complete-XX
# make
# make install
# make install-config
# systemctl enable dahdi
```

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
```





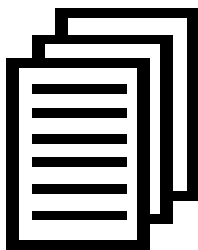
"make samples" will install the standard sample configuration file in the directory /etc/asterisk. As a freshman, you should perform make samples, that is to say, it is unnecessary to perform make samples every time. Because once performed, it will cover the old sample configuration files you have installed.

### 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 A2410P/AE2410P. "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 A2410 Board 25" (MASTER)
fxoks=1
fxoks=2
fxoks=3
fxoks=4
fxoks=5
fxoks=6
fxoks=7
fxoks=8
fxoks=9
fxoks=10
fxoks=11
fxoks=12
fxsks=13
fxsks=14
fxsks=15
fxsks=16
fxsks=17
fxsks=18
fxsks=19
fxsks=20
fxsks=21
fxsks=22
fxsks=23
fxsks=24

# Global data

loadzone      = us
defaultzone   = us
```

Figure 5 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 A1610 Board 25" (MASTER)
;;; line="1 OPVXA24XX/24/0 FXOKS"
Signalling=fxo_ks           // FXS modules use FXO signaling
callerid="Channel 1" <4001>
mailbox=4001
group=5
context=from-internal
channel => 1
callerid=
mailbox=
group=
context=default

;;; line="2 OPVXA24XX/24/1 FXOKS"
signalling=fxo_ks
callerid="Channel 2" <4002>
mailbox=4002
group=5
context=from-internal
channel => 2
callerid=
mailbox=
group=
context=default
.....
.....
.....
;;; line="13 OPVXA24XX/24/12 FXSKS"
Signalling=fxs_ks           // FXO modules use FXS signaling
callerid=asreceived
group=0
context=from-pstn
channel => 13
callerid=
group=
context=default

;;; line="14 OPVXA24XX/24/13 FXSKS"
signalling=fxs_ks
callerid=asreceived
group=0
context=from-pstn
channel => 14
callerid=
group=
context=default
.....
.....
.....

```

Figure 6 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: FXO Kewlstart (Default) (Echo Canceler: none) (Slaves: 05)
Channel 06: FXO Kewlstart (Default) (Echo Canceler: none) (Slaves: 06)
.....
.....
Channel 13: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 13)
Channel 14: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 14)
Channel 15: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 15)
Channel 16: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 16)
Channel 17: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 17)
Channel 18: FXS Kewlstart (Default) (Echo Canceler: none) (Slaves: 18)
.....
.....
```

24 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
Setting echocan for channel 9 to none
Setting echocan for channel 10 to none
Setting echocan for channel 11 to none
Setting echocan for channel 12 to none
Setting echocan for channel 13 to none
.....
.....
Setting echocan for channel 24 to none
```

Figure 7 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	Blocked	State
pseudo		default		default		In Service
1		from-internal		default		In Service
2		from-internal		default		In Service
3		from-internal		default		In Service
4		from-internal		default		In Service
5		from-internal		default		In Service
6		from-internal		default		In Service
...		...		...		...
12		from-internal		default		In Service
13		from-pstn		default		In Service
14		from-pstn		default		In Service
15		from-pstn		default		In Service
16		from-pstn		default		In Service
17		from-pstn		default		In Service
18		from-pstn		default		In Service
...		...		...		...
24		from-pstn		default		In Service

Figure 8 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/13/outgoing_number)
exten => 200,2,Hangup()
```

Figure 9 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 13 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 A2410P/AE2410P has independent interrupt. If A2410P/AE2410P shares interrupt with other devices, it may cause some problems even cannot work normally. While A2410P/AE2410P allows users to modify interrupt pin during firmware upgrade for avoiding interrupt conflict.

## Chapter 4 Reference

[www.openvoxtech.com](http://www.openvoxtech.com)

[www.digium.com](http://www.digium.com)

[www.asterisk.org](http://www.asterisk.org)

[www.voip-info.org](http://www.voip-info.org)

[www.asteriskguru.com](http://www.asteriskguru.com)



## **Appendix A Specifications**

### **•Weight and size**

Weight: 165g (A2410P)      (5.82oz)

10 g (EC module)      (0.35oz)

Size:    312×106.7×18mm<sup>3</sup>

### **• Interfaces**

PCI Bus: Be compatible with standard PCI 2.2 or above with both 3.3 V and 5 V slot

Power Supply Connect: 12V 4-pin connector

Local Loop Access: Six RJ-45 interfaces, a RJ-45 port is divided into four RJ-11 ports by the specific splitter

### **• Environment**

Temperature:    0 ~50°C (Operation)

- 40 ~125°C (Storage)

Humidity:        10 ~90% NON-CONDENSING

### **• Power consumption**

Voltage: 12V

Power: 8.21W Minimum, 88.24W Maximum at 3.3 V or 5 V



- **Hardware and software requirements**

RAM 128 + MB

Linux kernel 2.4.X or 2.6.X

CPU 800+ MHZ



## Appendix B Interfaces

There are up to 6 FXS-400/FXO-400 modules on every

A2410P/AE2410P, a module corresponds to a RJ45 port which

A2410P/AE2410P takes 2 of 8 pins for a pair connector to your 4-pin or

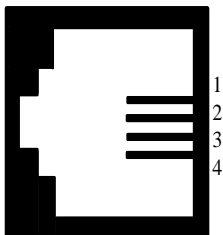
6-pin telephone line, so each RJ45 socket is divided into 4 telephone lines

by a splitter. Either 4-pin or 6-pin RJ11 port is compatible with the

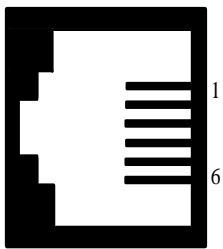
splitter, let's illustrate pin assignments of RJ11 and RJ45 port by the

following tables and figures.

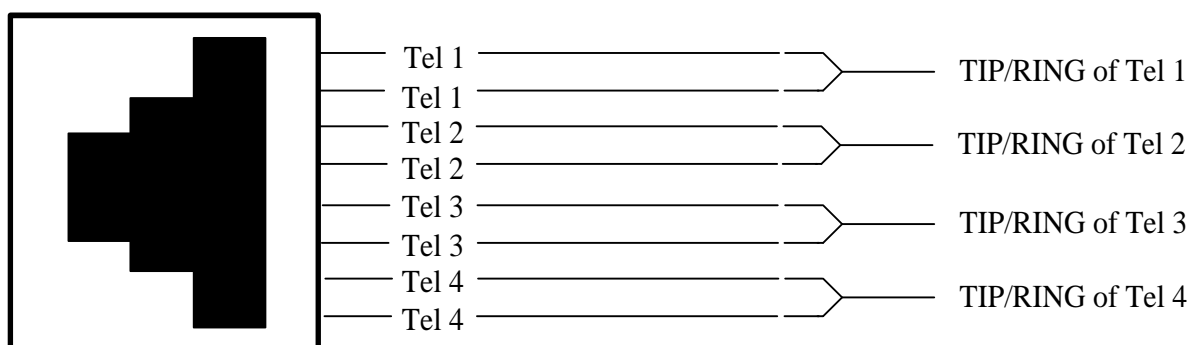
### 4-pin RJ11 port

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

## RJ-45 interface



## Splitter

