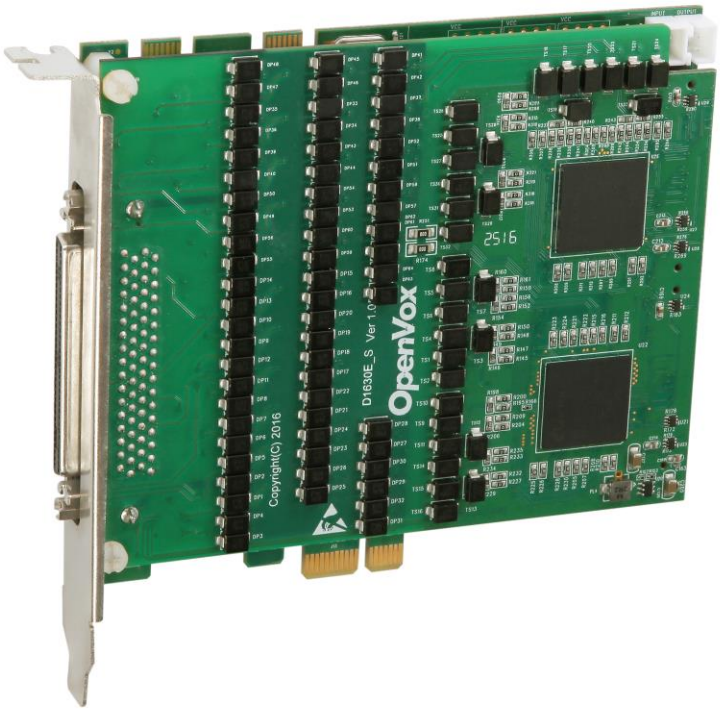
OpenVox Communication Co.Ltd



D(E)1630E on DAHDI User Manual

Version: 1.0

OpenVox Communication Co.Ltd

Most Advanced Asterisk Cards

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Content

General Safety Instructions

CAUTION

1. The computers that have DE1630E card installed must comply with the country's specific safety regulations.
2. Only service personnel should go to install DE1630E card.
3. Before installing DE1630E card, please unplug the power cord and remove the cover from your PC.
4. For avoiding personal injuries and damages to your machine and DE1630E 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: asterisk-20

Libpri: libpri-1.6.1

Hardware: OpenVox D1630E/DE1630E

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).

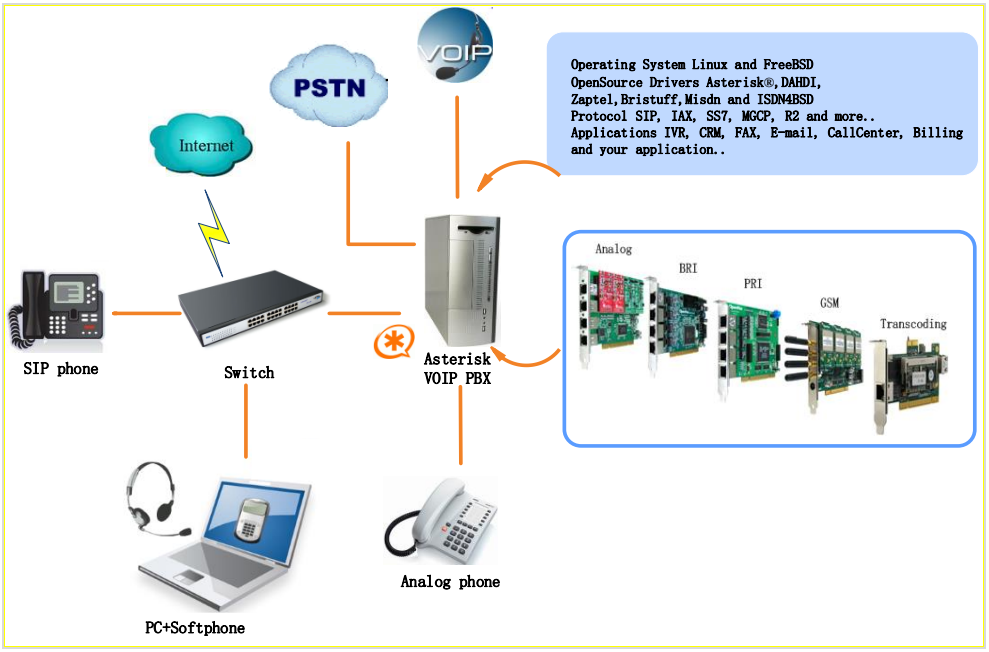


Figure 1 Topology

1.2 What is D1630E/DE1630E?

DE1630E with an EC module, they are new products of the Digital cards. It's supposed to be the most advanced 16 ports T1/E1/J1 Asterisk® card with superior quality in the open source community. The leading innovation ensures users to adjust the interrupt frequency to reduce the CPU load up to 70%.

DE1630E offers an on-board Octasic® DSP-based echo cancellation module. It supports T1, E1, and J1 environments and is selectable on a per-card or per-port basis. The Octasic® DSP-based EC module enables users to eliminate echo tails up to 128ms or 1024 taps across all 512 channels in E1 mode or 384 channels in T1/J1 modes. Furthermore, this module takes advantage of the Octasic® Voice Quality Enhancement to provide superior sound quality on all calls.

D1630E/DE1630E supports industry standard telephony and data protocols, including Primary Rate ISDN (both North America and Standard Euro) protocol families for voice, PPP, Cisco, HDLC, and Frame Relay data modes. Both line-side and trunk-side interfaces are supported.

D1630E/DE1630E works with Asterisk®, Elastix®, FreeSWITCH™, PBX in a Flash, Yate™ and IPPBX/IVR projects as well as other Open

Source and proprietary PBX, Switch, IVR, and VoIP gateway applications. RoHS compliant Certificates: CE and FCC

Target Applications

- Voice-over Internet Protocol (VoIP) Services
- Complex IVR Trees
- "Meet-Me" Bridge Conferencing
- Calling Card Platforms
- VoIP Gateways (support SIP and IAX2)
- Legacy PBX/IVR Services
- Voice/Data Router (replace expensive routers)
- PRI/SS7/R2/Switch Compatibility-Network or CPE

Chapter 2 Hardware Setup

2.1 Span type setup

Each DIP switch controls one span configuration for E1 or T1 mode. Setting DIP1 to ON means SPAN1 will be E1.Setting DIP1 to OFF means SPAN1 will be T1.

When loading the card driver, it needs the “default_linemode” parameter to config the spans mode as below:

E1 mode: modprobe wct4xxp default_linemode=e1

T1 mode: modprobe wct4xxp default_linemode=t1

J1 mode: modprobe wct4xxp default_linemode=j1

2.2 Slot compatibility

D1630E/DE1630E is compatible with PCI-E ×1 (slot 1) and ×2, ×4, ×8, ×16 slot, except PCI slot; you should confirm your slot type and insert D1630E/DE1630E into any type of PCI-E slot as previously described.

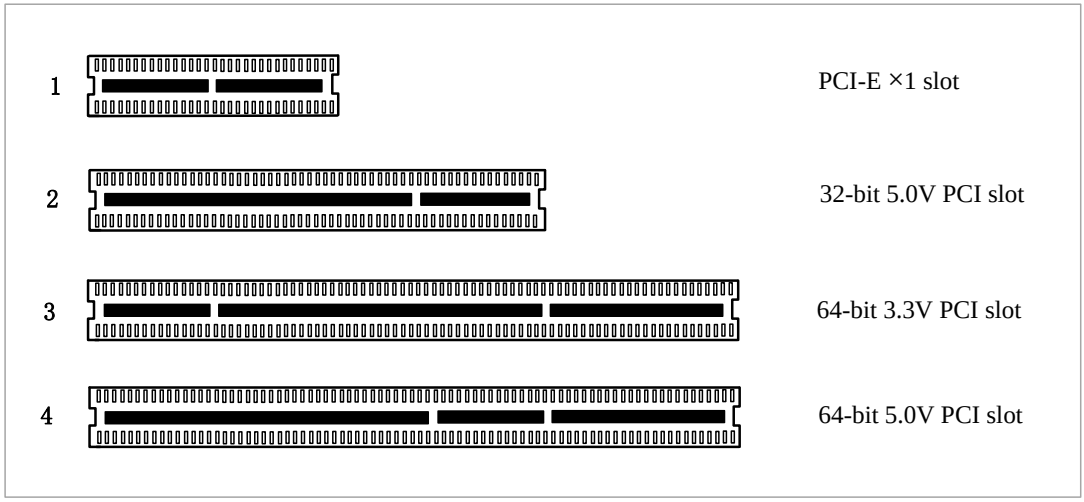


Figure 2 PCI-E and PCI slot

2.4 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 problems. Data loss will cause communication broken or fax broken. D430E/DE430E on DAHDI User Manual OpenVox Communication Co. LTD. URL: www.openvoxtech.com 13 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.

Chapter 3 Software Installation and Configuration

D1630E/DE1630E supports DAHDI software driver on Linux. To make full use of D1630E/DE1630E, you should download, compile, install and configure libpri, 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

Get libpri software package from digium official website:

http://downloads.asterisk.org/pub/telephony/libpri/libpri-1-current.tar.gz

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

```
# wget http://www.openvoxtech.com/pub/drivers/dahdi-linux-complete/openvox_dahdi-linux-complete-current.tar.gz
# wget http://downloads.asterisk.org/pub/telephony/asterisk/asterisk-20-current.tar.gz
# wget http://downloads.asterisk.org/pub/telephony/libpri/libpri-1-current.tar.gz

# tar -xvzf openvox_dahdi-linux-complete-current.tar.gz
# tar -xvzf asterisk-20-current.tar.gz
# tar -zxvf libpri-1-current.tar.gz
```

3.2 Installation

1. Hardware detection

```
# lspci -vvvv
```

Check the outcome and confirm your system has recognized D1630P/DE1630P. If it has been recognized, the output information will

be displayed like that:

```
05:00.0 Network controller: Digium, Inc. Device 1820 (rev 15)
        Subsystem: Device 0005:0000
        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: 32 (8000ns min, 32000ns max), Cache Line Size: 64 bytes
        Interrupt: pin A routed to IRQ 18
        Region 0: Memory at f7c10000 (32-bit, non-prefetchable) [size=64K]
        Kernel driver in use: wct4xxp
        Kernel modules: wct4xxp

05:01.0 Network controller: Digium, Inc. Device 1820 (rev 15)
        Subsystem: Device 0005:0000
        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: 32 (8000ns min, 32000ns max), Cache Line Size: 64 bytes
        Interrupt: pin A routed to IRQ 19
        Region 0: Memory at f7c00000 (32-bit, non-prefetchable) [size=64K]
        Kernel driver in use: wct4xxp
        Kernel modules: wct4xxp
```

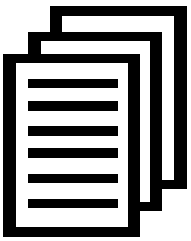
Figure 4 Hardware detection

If D1630P/DE1630P 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 chkconfig
```



If there is no kernel source in the system, users should also install it by running like:

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

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.

Among libpri, DAHDI and Asterisk, let's install DAHDI firstly, please execute those commands under the directory of /usr/src/ in generally:

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

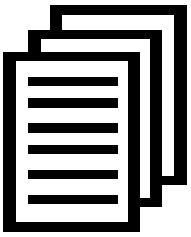
Then change to the directory of libpri-XX (XX represents libpri version), then perform commands one by one to install libpri.

```
# cd libpri-XX
# make
# make install
```

if successfully done, it is time for you 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 wct4xxp
# dahdi_genconf
```

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
```

A part of system.conf which is one of the basic channel configuration files is displayed. If you have just one card in the system, the first 8 channels of this card run in the time frequency is different between the last 8 channels, which run in another time frequency, you must modify the time order in /etc/dahdi/system.conf.

```
# Span 1: TE8/0/1 "T8XXP (PCI) Card 0 Span 1" (MASTER)
span=1,1,0,ccs,hdb3
# termtype: te
bchan=1-15,17-31
dchan=16

# Span 2: TE8/0/2 "T8XXP (PCI) Card 0 Span 2"
span=2,2,0,ccs,hdb3
# termtype: te
bchan=32-46,48-62
dchan=47

# Span 3: TE8/0/3 "T8XXP (PCI) Card 0 Span 3"
span=3,3,0,ccs,hdb3
# termtype: te
bchan=63-77,79-93
dchan=78

# Span 4: TE8/0/4 "T8XXP (PCI) Card 0 Span 4"
span=4,4,0,ccs,hdb3
# termtype: te
bchan=94-108,110-124
```

```
dchan=109

# Span 5: TE8/0/5 "T8XXP (PCI) Card 0 Span 5"
span=5,5,0,ccs,hdb3
# termtype: te
bchan=125-139,141-155
dchan=140

# Span 6: TE8/0/6 "T8XXP (PCI) Card 0 Span 6"
span=6,6,0,ccs,hdb3
# termtype: te
bchan=156-170,172-186
dchan=171

# Span 7: TE8/0/7 "T8XXP (PCI) Card 0 Span 7"
span=7,7,0,ccs,hdb3
# termtype: te
bchan=187-201,203-217
dchan=202

# Span 8: TE8/0/8 "T8XXP (PCI) Card 0 Span 8"
span=8,8,0,ccs,hdb3
# termtype: te
bchan=218-232,234-248
dchan=233

# Span 9: TE8/1/1 "T8XXP (PCI) Card 1 Span 1"
span=9,1,0,ccs,hdb3
# termtype: te
bchan=249-263,265-279
dchan=264

# Span 10: TE8/1/2 "T8XXP (PCI) Card 1 Span 2"
span=10,2,0,ccs,hdb3
# termtype: te
bchan=280-294,296-310
dchan=295

# Span 11: TE8/1/3 "T8XXP (PCI) Card 1 Span 3"
span=11,3,0,ccs,hdb3
# termtype: te
bchan=311-325,327-341
dchan=326
```

```
# Span 12: TE8/1/4 "T8XXP (PCI) Card 1 Span 4"
span=12,4,0,ccs,hdb3
# termtype: te
bchan=342-356,358-372
dchan=357

# Span 13: TE8/1/5 "T8XXP (PCI) Card 1 Span 5"
span=13,5,0,ccs,hdb3
# termtype: te
bchan=373-387,389-403
dchan=388

# Span 14: TE8/1/6 "T8XXP (PCI) Card 1 Span 6"
span=14,6,0,ccs,hdb3
# termtype: te
bchan=404-418,420-434
dchan=419

# Span 15: TE8/1/7 "T8XXP (PCI) Card 1 Span 7"
span=15,7,0,ccs,hdb3
# termtype: te
bchan=435-449,451-465
dchan=450

# Span 16: TE8/1/8 "T8XXP (PCI) Card 1 Span 8"
span=16,8,0,ccs,hdb3
# termtype: te
bchan=466-480,482-496
dchan=481



# Global data

loadzone          = us
defaultzone       = us
```

Figure 3 A part of system.conf

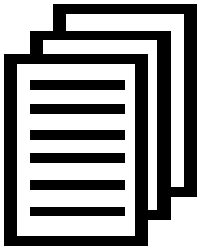
2. Country mode modification

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: TE8/0/1 "T8XXP (PCI) Card 0 Span 1" (MASTER)
group=0,11
context=from-pstn
switchtype = euroisdn
signalling = pri_cpe
channel => 1-15,17-31
context = default
group = 63

; Span 2: TE8/0/2 "T8XXP (PCI) Card 0 Span 2"
group=0,12
context=from-pstn
switchtype = euroisdn
signalling = pri_cpe
channel => 32-46,48-62
context = default
group = 63
```

.

.

```
; Span 15: TE8/1/7 "T8XXP (PCI) Card 1 Span 7"
group=0,25
context=from-pstn
switchtype = euroisdn
signalling = pri_cpe
channel => 435-449,451-465
context = default
group = 63

; Span 16: TE8/1/8 "T8XXP (PCI) Card 1 Span 8"
group=0,26
context=from-pstn
switchtype = euroisdn
signalling = pri_cpe
channel => 466-480,482-496
context = default
group = 63
```

Figure 5 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.

```
[root@localhost ~]# dahdi_cfg -v
DAHDI Tools Version - 2.11.1

DAHDI Version: 2.11.1
Echo Canceller(s): HWEC
Configuration
======================

SPAN 1: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 2: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 3: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
```

SPAN 4: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 5: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 6: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 7: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 8: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 9: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 10: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 11: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 12: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 13: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 14: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 15: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)
SPAN 16: CCS/HDB3 Build-out: 0 db (CSU)/0-133 feet (DSX-1)

496 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 491 to none
Setting echocan for channel 492 to none
Setting echocan for channel 493 to none
Setting echocan for channel 494 to none
Setting echocan for channel 495 to none
Setting echocan for channel 496 to none

Figure 5 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
```

1	from-pstn	default	In Service
2	from-pstn	default	In Service
3	from-pstn	default	In Service
4	from-pstn	default	In Service
5	from-pstn	default	In Service
6	from-pstn	default	In Service
7	from-pstn	default	In Service
8	from-pstn	default	In Service
9	from-pstn	default	In Service
10	from-pstn	default	In Service
11	from-pstn	default	In Service
12	from-pstn	default	In Service
13	from-pstn	default	In Service
14	from-pstn	default	In Service
15	from-pstn	default	In Service
17	from-pstn	default	In Service
18	from-pstn	default	In Service
19	from-pstn	default	In Service
20	from-pstn	default	In Service
21	from-pstn	default	In Service
.....	.....	.....	.....
492	from-pstn	default	In Service
493	from-pstn	default	In Service
494	from-pstn	default	In Service
495	from-pstn	default	In Service
496	from-pstn	default	In Service

Figure 6 channels show

If DAHDI channels are found, it means they have been loaded into Asterisk successfully. 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() // answer the inbound call
exten => s,n,Playback(cc_welcome)
exten => s,n,Hangup()

[from-internal]
exten => _X.,1,Dial(dahdi/g0/${EXTEN})
exten => _X.,n,Hangup()
```

Figure 7 dial plan

Additional function ：

Users should run command "cat /proc/interrupts" to check D1630E/DE1630E has independent interrupt. If it shares interrupt with other device, it may cause some problems even cannot work normally. While D1630E/DE1630E allows users to modify interrupt pin during firmware upgrade for avoiding conflict. Or you can see if the EC module is working as follows:

```
[root@localhost ~]# dmesg |grep VPM
VPM450: echo cancellation for 256 channels
wct4xxp 0000:05:00.0: VPM450: hardware DTMF disabled.
wct4xxp 0000:05:00.0: VPM450: Present and operational servicing 8 span(s)
VPM450: echo cancellation for 256 channels
wct4xxp 0000:05:01.0: VPM450: Present and operational servicing 8 span(s)
VPM450: echo cancellation for 256 channels
```

Figure 8 echo detect

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: D1630E 170g

EC2256 10g

Size: 121mm*18mm*103mm

• Interfaces

RJ48 connector

PCI Bus: 3.3V or 12V bus slot, PCI 2.2 or above

Four T1/E1/J1 ports with PCI interface for high performance voice and data applications

• Environments

Storage temperature: D1630E -65 ~ 125°C

EC2256 -40 ~ 75°C

Operation temperature: 0 ~ 50°C

Humidity: 10 ~ 90% NON-CONDENSING

• Power consumption

Voltage: 3.3V, 12V

Power: 5.2W Minimum, 7.8W Maximum at 3.3 V or 12V

• Hardware and software requirements

RAM 2GB

Linux kernel 2.4.X or 2.6.X

CPU 3.3G Hz

Appendix B Jumper and line Connecting