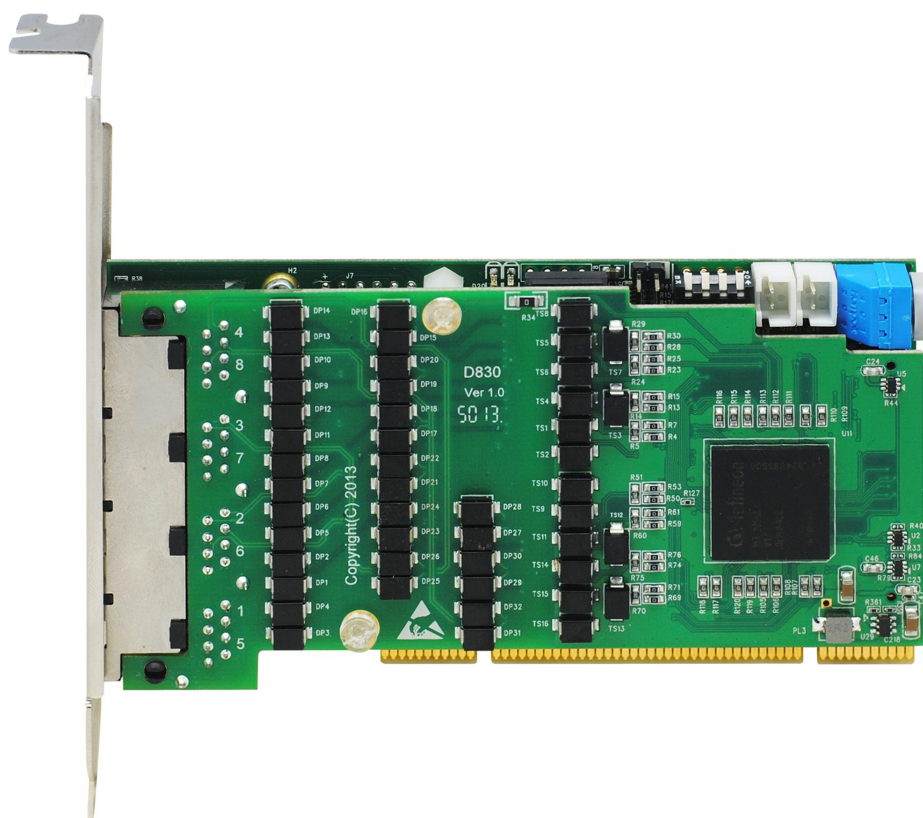




OpenVox Communication Co.Ltd



D830 Series on DAHDI User Manual

Version: 2.3





OpenVox Communication Co.Ltd

Most Advanced Asterisk Cards

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General Safety Instructions



CAUTION

1. The computers that have D830 Series card installed must comply with the country's specific safety regulations.
2. Only service personnel should go to install D830 Series card.
3. Before installing D830 Series card, please unplug the power cord and remove the cover from your PC.
4. For avoiding personal injuries and damages to your machine and D830 Series 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 D830 Series

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).

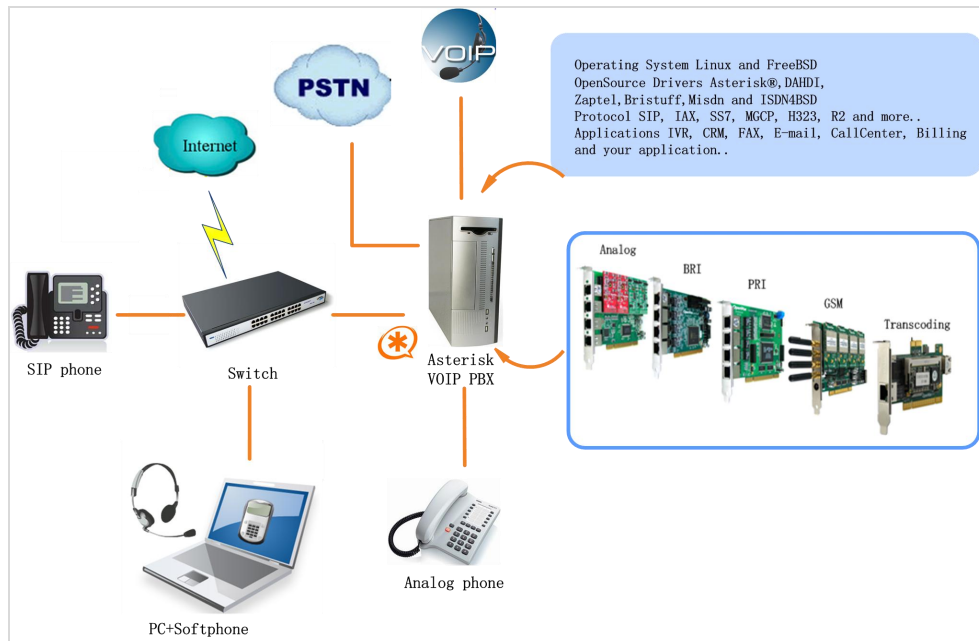


Figure 1 Topology

1.2 What is D830 Series

DE830P/E is a D830P/E with an EC module, they are new products of the Digital cards. It's supposed to be the most advanced 8 port 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% and adjust the interrupt pin to avoid interrupt number sharing or conflict. DE830P/E 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 256 channels in E1 mode or 192 channels in T1/J1 modes. Furthermore, this module takes advantage of the Octasic® Voice Quality Enhancement to provide superior sound quality on all calls. D830 Series supports industry standard telephony and data protocols, including Primary Rate ISDN (both N. American and Standard Euro) protocol families for voice, PPP, Cisco, HDLC, and Frame Relay data modes. Both line-side and trunk-side interfaces are supported.

D830 Series 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.

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, H.323, and IAX)
- Legacy PBX/IVR Services
- Voice/Data Router (replace expensive routers)
- PRI/Switch Compatibility-Network or CPE

Chapter 2 Hardware Setup

There are some points that should be paid attention to when set up D830 Series.

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.

2.2 Card ID switch setup

If want to install more than one card of D830 Series in a PC, you should take care of the card ID switch. There are two pieces of rules you must obey:

- The first Card must be set to 0, which is a card that will be initialized (i.e. installing driver) firstly when the system boot up. And the second should be set to 1, and so forth.
- At most cases, Linux will initialize PCI devices according to their slot order. The slot nearest to the CPU will be initialized firstly and the far end slot will be initialized at last. That is to say, the card which is nearest to the CPU ID should be set to 0 if there is more than one D830 Series on your machine.

2.3 Slot compatibility

D830 Series is compatible with 32-bit 5.0V PCI slot, 64-bit 3.3V PCI slot or 64-bit 5.0V PCI slot except PCI-E slot; you should confirm your slot type and insert D830 Series into any type of PCI slot as previously described.

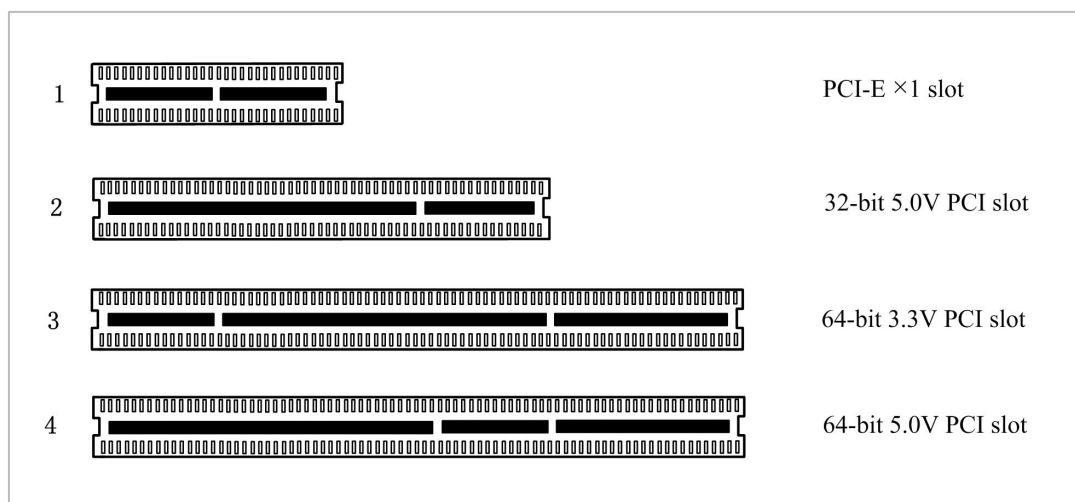


Figure 2 PCI-E and PCI slot

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.

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.

Chapter 3 Software Installation and Configuration

D830 Series supports DAHDI software driver on Linux. To make full use of D830 Series, 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.

Gain 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/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
```

```
# wget http://downloads.asterisk.org/pub/telephon  
y/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-curernt.tar.gz
```

3.2 Installation

1. Hardware detection

```
# lspci -vvvv
```

Check the outcome and confirm your system has recognized D830 Series.

If it has been recognized, the output information will be displayed like that:

```
05:04.0 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: 4
bytes
      Interrupt: pin A routed to IRQ 20
      Region 0: Memory at fdbf0000 (32-bit, non-prefetchable)
[size=64K]
```

Figure 3 Hardware detection

If D830 Series 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.

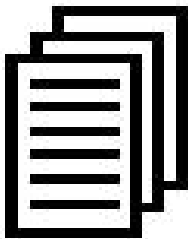
```
# yum install bison
```

```
# 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 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

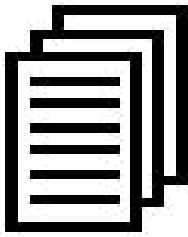
# ./configure --libdir=/usr/lib64 --with-jansson-bundled=yes

# 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.

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

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

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

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

# Global data
loadzone          = us
defaultzone       = us
```

Figure 4 A part of system.conf

span=,<timing source>,<line build out (LBO)>,<framing>,<coding>[,yellow]

: begin with 1, for example , a 4 E1 device is 1 2 3 4 for four spans.

<timing source>: Set 1,2,3,4 to make the equipment at the far end of the E1/T1/BRI link the preferred source of the master clock. If you choose 0, the port will never be used as a source of timing.

<line build out(LBO)> normal set to 0.

<framing>: one of 'd4' or 'esf' for T1 or 'cas' or 'ccs' for E1. Use 'ccs' for BRI. 'd4'

<coding>: one of 'ami' or 'b8zs' for T1 or 'ami' or 'hdb3' for E1. Use 'ami' for BRI.

[crc4]: For E1 there is the optional keyword 'crc4' to enable CRC4 checking.

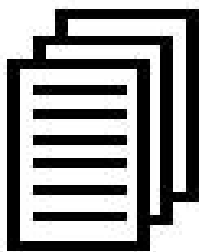
[yellow]:If the keyword 'yellow' follows, yellow alarm is transmitted when no channels are open.

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_net
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_net
channel => 32-46,48-62
context = default
group = 63
.
.
; Span 7: TE8/0/7 "T8XXP (PCI) Card 0 Span 7"
group=0,17
context=from-pstn
switchtype = euroisdn
signalling = pri_net
channel => 187-201,203-217
context = default
group = 63

; Span 8: TE8/0/8 "T8XXP (PCI) Card 0 Span 8"
group=0,18
context=from-pstn
switchtype = euroisdn
signalling = pri_net
channel => 218-232,234-248
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 - 2.7.0

DAHDI Version: 2.7.0
Echo Cancellor(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)

248 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 243 to none
Setting echocan for channel 244 to none
Setting echocan for channel 245 to none
Setting echocan for channel 246 to none
Setting echocan for channel 247 to none
Setting echocan for channel 248 to none
```

Figure 6 Channel map

3. Asterisk initiation

```
# asterisk -vvvvvvvgc
```

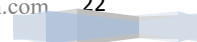
If Asterisk is already activate, run "asterisk -r" instead. In the CLI, please run the following command:

```
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
.....
244	from-pstn	default	In Service
245	from-pstn	default	In Service
246	from-pstn	default	In Service
247	from-pstn	default	In Service
248	from-pstn	default	In Service

Figure 7 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 => _X.,1,Answer() // answer the inbound call
exten => _X.,n,Playback(cc_welcome)
exten => _X.,n,Hangup()

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

Figure 8 dial plan

Additional function

Users should run command "cat /proc/interrupts" to check D830 Series has independent interrupt. If it shares interrupt with other device, it may cause some problems even cannot work normally. While D830 Series 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 0000:05:04.0: VPM450: hardware DTMF disabled.
wct4xxp 0000:05:04.0: VPM450: Present and operational
servicing 8 span(s)
```

Figure 9 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: D830P 98g (3.46oz)

EC2256 10g (0.35oz)

Size: 2U Form Factor: 12×6.4×1.8cm (4.72×2.52×0.71inch)

• Interfaces

RJ48 connector

PCI Bus: 3.3V or 5V 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: D830P -65 ~ 125°C

EC2256 -40 ~ 75°C

Operation temperature: 0 ~ 50°C

Humidity: 10 ~ 90% NON-CONDENSING

• Power consumption

Voltage: 3.3V, 5V

Power: 2.6W Minimum, 3.9W Maximum at 3.3 V or 5 V

- **Hardware and software requirements**

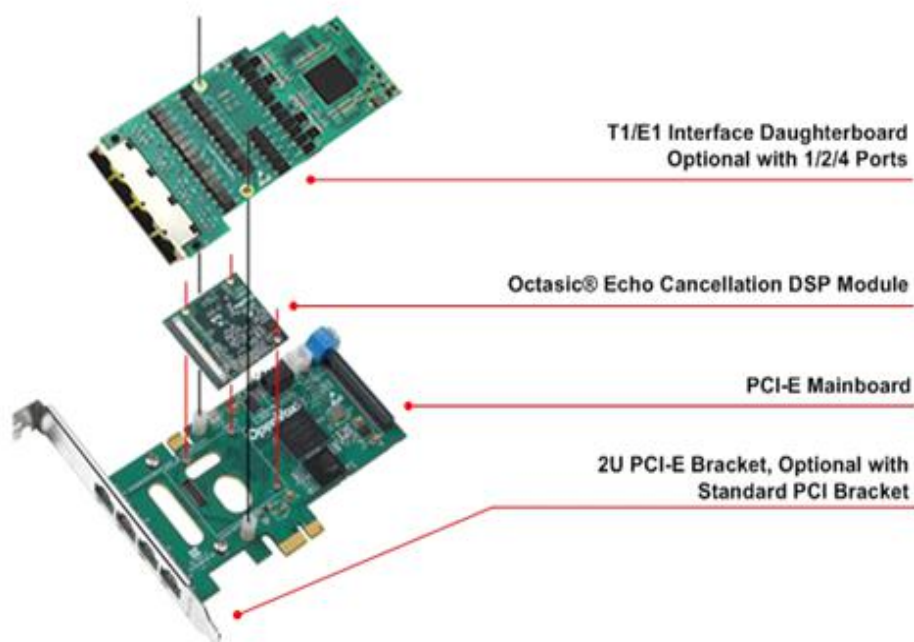
RAM 128 + MB

Linux kernel 2.4.X or 2.6.X

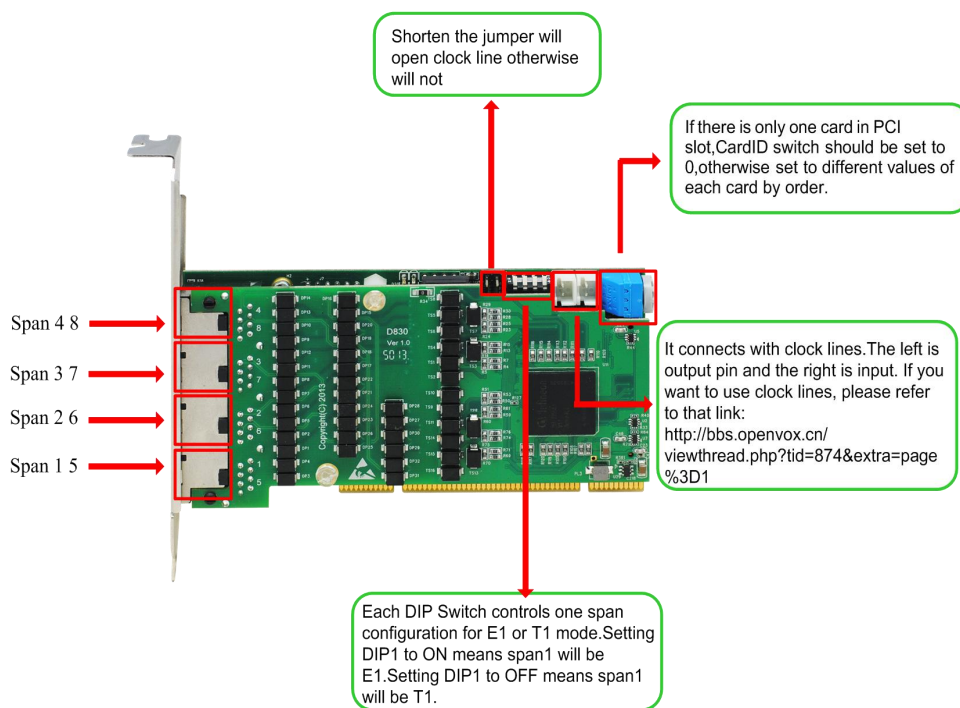
CPU 800+ MHZ

Appendix B Hardware Disassembling Figure

The disassembling figure of D830 Series is alike DE830E/DE830E, the following figure is DE830E's disassembling figure.



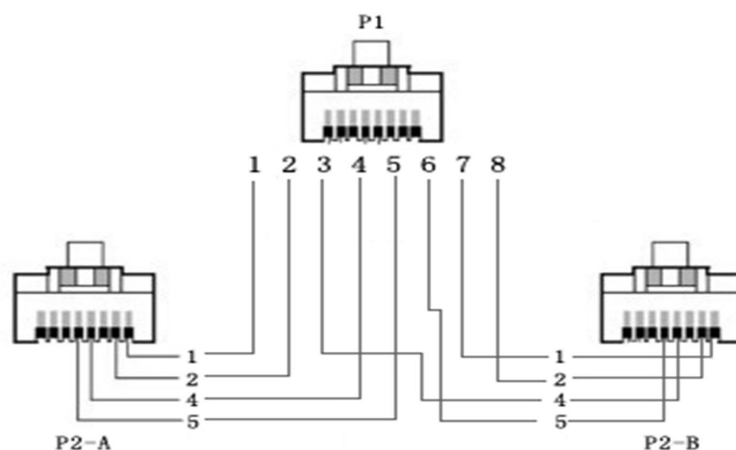
Appendix C Jumper and Switch Settings



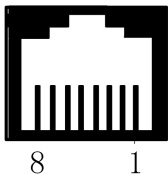
Appendix D Pin Assignments

All four ports on the DE830 Series card bracket are 8-pin RJ45 ports

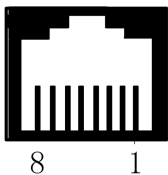
The pin assignments are identified as the following shows.



D830 Series Splitter P1 RJ45 Telco Port Connector

8-pin RJ45 port	PIN	Description
	1	Rx (Pin 1 on Splitter A)
	2	Rx (Pin 2 on Splitter A)
	3	Tx (Pin 4 on Splitter B)
	4	Tx (Pin 4 on Splitter A)
	5	Tx (Pin 5 on Splitter A)
	6	Tx (Pin 5 on Splitter B)
	7	Rx (Pin 1 on Splitter B)
	8	Rx (Pin 2 on Splitter B)

DE830 Series Splitter P2-A and P2-B RJ45 Telco Port Connector

8-pin RJ45 port	PIN	Description
	1	Rx
	2	Rx
	3	Not used
	4	Tx
	5	Tx
	6	Not used
	7	Not used
	8	Not used