digiur

TE12(
TE120P/TE12

User

601-00010

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Note: Canada, Finland, Norway, Sweden and the Unit
America require that equipment using this product mus
Restricted Access Location (RAL).

Telecom:

FCC Part 68, ANSI/ITA-968-A, Including Amendment A
Industry Canada CS-03
AS/ACIF S016: 2001
AS/ACIF S038: 2001
TBR4 November 1995 as amended by TBR4/A1 Decemb
TBR12 December 1993
TBR13 January 1996

EMC:

EN 55022:1998 Class B and 47 CFR Part 15, Subpart B C
and Conducted EN 55024:1998 / IEC 61000

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A plug and jack used to connect this equipment to the pre and telephone network must comply with the applicable I rules and requirements adopted by the ACTA.

If your TE120 Series card causes harm to the telephone n telephone company may notify you in advance that tempo discontinuance of service may be required. But if advance practical, the telephone company will notify you as soon Also, you will be advised of your right to file a complaint you believe it is necessary.

The telephone company may make changes in its facilitie operations or procedures that could affect the operation of If this happens, the telephone company will provide adva order for you to make necessary modifications to maintai service.

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1.544 Mbps – ESF	04DU9
1.544 Mbps – ESF and B8ZS	04DU9

If you experience problems with the TE120 Series, contac
Technical Support +1.256.428.6161 for repair and/or war
information. If the equipment is causing harm to the telep
the telephone company may request that you disconnect t
until the problem is resolved.

FCC Part 15

This device complies with part 15 of FCC rules. Operatio
the following two conditions: (1) This device may not cau
interference, and (2) This device must accept any interfer
including interference that may cause undesired operation

Industry Canada Compliance Information

The Industry Canada label applied to the product (identifi
Industry Canada logo or the "IC:" in front of the certifica
number) indicates that the Industry Canada technical spec
met.

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Chapter/ Appendix	Title	Description
1	Overview	Identifies your card's features. T covers applications and uses for card in the real world.
2	Card Installation	Provides instructions for installi PC, acquiring correct drivers, an compatibility.
3	Configuration	Provides instructions for configu
4	Troubleshooting	Explains resolutions to common frequently asked questions pertai installation and usage.
A	Pin Assignments	Lists the connectors and pin assi
B	Specifications	Details card specifications.
C	Glossary and Acronyms	A list of terms and acronyms use manual.

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precautions for handling the unit. Wear a properly
electrostatic discharge (ESD) wrist strap while han

The Electrical Hazard Symbol indicates a possibili
shock when operating this unit in certain situations
risk of damage or injury, follow all steps or proced
instructed.

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Water and Moisture.
Do not spill liquids on this unit. Do not operate this ___ wet environment.

Heat.
Do not operate or store this product near heat sour___ radiators, air ducts, areas subject to direct, intense s___ products that produce heat.

Static Electricity.
To reduce the risk of damaging the unit or your equi___ attempt to open the enclosure or gain access to area___ not instructed to do so. Refer servicing to qualified s___

Save these instructions for future refe___

Service Personnel Cautions

Warning.
This card must be used with the PC lid screwed dow___ Telecommunications network voltages exist inside th___ The PC must be shut down and telecommunications ___ shall be removed before opening the PC.

Electrical Shock.
To reduce the risk of injury, damage to the unit or yo___ not attempt to touch the modules while they are pow___ should be securely closed before power is applied to___

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Caution.
equipment previously labelled **Permitted** *or* **Certi...**

Caution.
*Only connect regulatory equipment (approved for us...
country) to the telecommunications network voltage...*

Caution.
*This card is not intended for home use. It must be us...
access locations and installed in UL Listed I.T.E. on...*

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Robbed Bit Signaling (also known as CAS or Channel As
Signaling), CCS (Common Channel Signaling), E&M, Pr
ISDN (PRI), and several data modes (PPP, HDLC, Cisco
frame relay). The TE120 Series cards are capable of runni
J1 modes.

Designed to be fully compatible with existing software ap
integrate fully with the Asterisk platform, the TE120 Seri
many advanced call features.

Data Modes:

- Cisco HDLC
- HDLC
- PPP
- Multilink PPP
- Frame Relay

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- 5ESS (Lucent)
- DMS100
- Q.SIG

- E&M
  - Wink
  - Feature Group B
  - Feature Group D

- FXO and FXS
  - Ground Start
  - Loop Start
  - Loop Start with Disconnect Detect

The TE120 Series cards can be used to connect your Aste
the PSTN world, your channel bank, or even another PBX
accomplished via a T1/E1 interface. The cards allow Aste
connect to your network, creating a professional telephon
Figure 1 and Figure 2 show examples of the card's applic

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Remote offices

Figure 1: Sample Legacy Phone Applica...
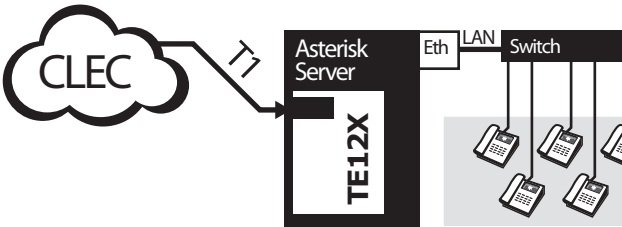
CLEC

T1

Asterisk
Server

TE12X

Eth LAN Switch

Figure 2: Sample IP Phone Applicatio...

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The TE120 Series cards, unless otherwise equipped, utiliz[e] perform software-based echo cancellation. Asterisk main[tains] of open source echo cancelers. These open source echo ca[ncelers provide] a moderate level of echo cancellation, but are not capable [of handling] higher levels of, or more advanced, echoes.

Digium recommends that those users concerned about ec[ho cancellation] purchase the VPMADT032 hardware echo cancellation m[odule. The] VPMADT032 may be combined with both the TE121 and [the TE122, but] may not be combined with the TE120P card. The TE121 [and TE122, when] offered bundled with the VPMADT032 as, respectively: T[E121B and] TE122B.

The VPMADT032 is designed to handle up to 128ms of ec[ho] across all channels and provides a G.168 compliant echo c[ancellation] solution.

If equipped and not explicitly disabled in chan_dahdi.con[f, the] VPMADT032 will automatically operate and cancel all n[oise] within its tail range (1024 taps). Users of TE120P cards, [which do not] maintain the capability to support the VPMADT032, may [consider] Digium's commercial HPEC software:
http://www.digium.com/en/products/software/hpec.php

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for download free of charge. Asterisk is the most popular
software available, with the Asterisk Community being th
in VoIP.

Asterisk as a Switch (PBX)

Asterisk can be configured as the core of an IP or hybrid
calls, managing routes, enabling features, and connecting
outside world over IP, analog (POTS), and digital (T1/E1

Asterisk runs on a wide variety of operating systems inclu
Mac OS X, OpenBSD, FreeBSD, and Sun Solaris. It prov
features you would expect from a PBX including many ad
that are often associated with high end (and high cost) pro
Asterisk's architecture is designed for maximum flexibilit
Voice over IP in many protocols, and can interoperate wit
standards-based telephony equipment using relatively ine
hardware.

Asterisk as a Gateway

It can also be built out as the heart of a media gateway, br
legacy PSTN to the expanding world of IP telephony. Ast
architecture allows it to convert between a wide range of o
protocols and media codecs.

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Asterisk in the Call Center

Asterisk has been adopted by call centers around the worl[d]
flexibility. Call center and contact center developers have
ACD systems based on Asterisk. Asterisk has also added
existing call center solutions by adding remote IP agent c
advanced skills-based routing, predictive and bulk dialing

Asterisk in the Network

Internet Telephony Service Providers (ITSPs), competitiv
exchange carriers (CLECS) and even first-tier incumbent
discovered the power of open source communications wit
Feature servers, hosted services clusters, voicemail syste
calling solutions, all based on Asterisk have helped reduc
enabled flexibility.

Asterisk Everywhere

Asterisk has become the basis for thousands of communi
solutions. If you need to communicate, Asterisk is your an
information on Asterisk visit http://www.asterisk.org or h
www.digium.com.

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Note: The TE120 Series card installation instructions that they will apply to any card in the series. Example specific information are included as needed.

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shipment.

Note: Only qualified service personnel should install t
should not attempt to perform this function themselve
must ensure that the equipment is permanently connec
pluggable type B or connected to a socket-outlet that h
to ensure that it is reliably earthed in accordance with
Electrical Code.

> *This card is intended for installation in a Restricte*
> *Location (RAL) only.*

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Your TE120 Series card has one RJ45 port and two status is used for connecting T1, E1, or J1 cables. The two LED status LED and an amber loop-back LED. The card inclu selecting either T1 or E1 line mode. See Figure 3 on page these features.

The TE121 and TE122 cards may also be combined with hardware-based echo canceler, model VPMADT032. See page 24 for an example of the TE121 card shown with th cancellation module.

T1/E1 Selection

The T1/E1 mode, in most cases, is set at the distributor be You may want to check the setting to be certain it is set fo use. With the jumper **off,** the span is ready for T1 mode, a jumper **on**, the span is ready for E1 mode.

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Status LED

Loopback Mode LED

Port 1

PCI Connector
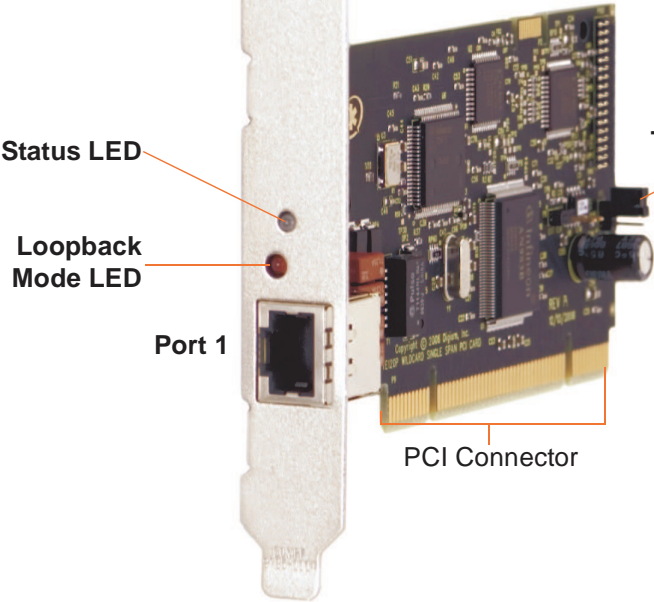
Figure 3: TE120P Card

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Status LED

Loopback Mode LED

Port 1

PCI Expre...
Connect...
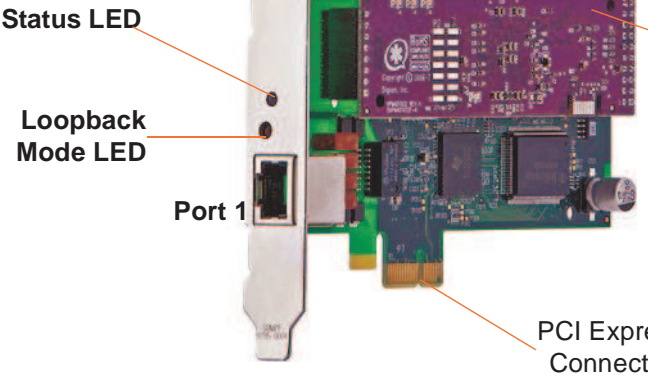
Figure 4: TE121 Card with Echo Cancellatio...

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Loopback Mode LED

Port 1

PCI Connect
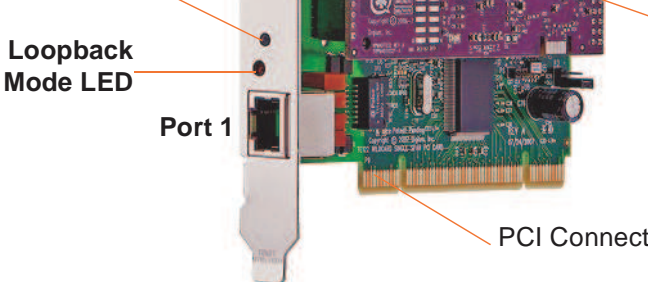
Figure 5: TE122 Card with Echo Cancellatio

⚠ **Caution.**
*Only qualified service personnel should continu
hardware installation and configuration of the T
card. Non-qualified personnel should not attemp
these functions themselves.*

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1: 64-bit 5.0 volt PCI Slot
2: 64-bit 3.3 volt PCI Slot
3: 32-bit 5.0 volt PCI Slot
4: PCI Express X1 Slot
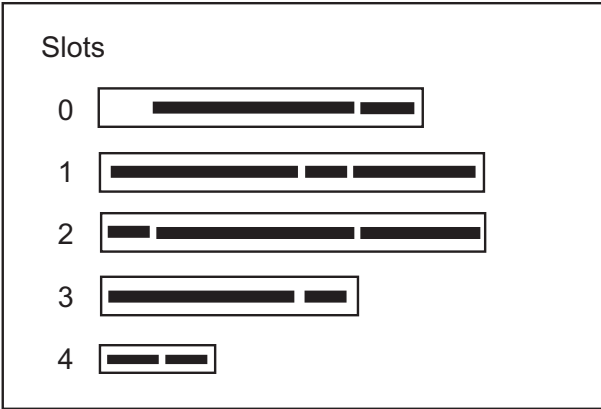
Figure 6: Motherboard Slots

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(X1) PCI Express compliant slot. The TE121 will work in
Express compliant slot, including lane lengths X1, X4, X8
means that in the motherboard shown in Figure 6, the TE
into Slot 4. The TE121 **can not** be used in Slots 0 through

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ports for E1. Setting the jumper with the jumper strap
ports for T1.

4. Remove the bracket place holder and insert the card ir
   Express slot. See Figure 7 for an example of card insta
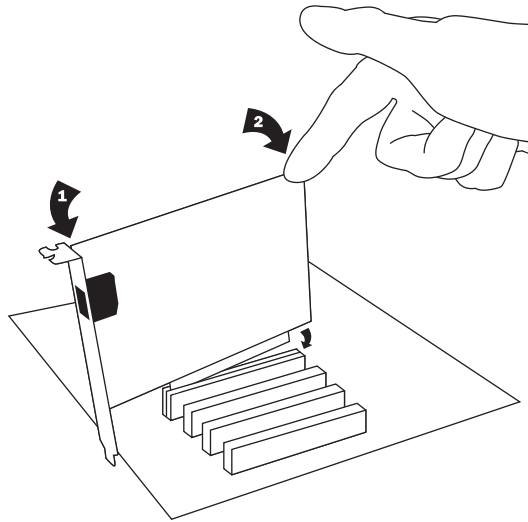
Figure 7: Insert the Card

5. Replace the cover to your computer.

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Caution.
This unit must be connected only to the appropr
Telecommunications Network port (as approved
specific country).

Software Installation

Digium hardware requires drivers and libraries that are no
with the Linux kernel. Digium hardware is only supporte
Digium recommends CentOS, Debian, Red Hat, and Ubu
of Linux. However, many other distributions are supporte
Technical Support.

Digium's software, including drivers and application soft
obtained from Digium's download server at:
http://downloads.digium.com

For an introduction to Asterisk, Digium's telephony softw
additional information on its configuration, setup, and fea
refer to:
http://www.asterisk.org

For the latest information on setting up and configuring D
for your Digium hardware product, please refer to the late
manual which is available from the product-specific docu

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- Development libraries and headers for newt
- GCC and standard software build tools

It is recommended that you use the most recent version of DAHDI, and libpri software for the best results. If you ha installed any of these, Digium recommends that you upgr "-current" version of each.

If you are using the 1.4.x series of Asterisk, you will need or newer.

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Vendor ID which is "d161". The screen output should
following:

```
0000:01:00.0 0200: ISDN controller: Unkr
d161:<card identifier>
```

> **Note:** The output from **lspci** may or may not state
> device". If it does, this does not indicate a problem

In the PCI device listing shown above, <card identifie
populated with one of the identifiers listed in the table

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| TE122 | 8001 |

A Digium TE120 Series (TE120P/TE121/TE122) card
should be listed. If a matching card identifier is not lis
machine is not PCI 2.2 (or higher) or PCI Express com
card will not work with your motherboard.

3. Download the latest version of libpri. Substitute the ve
for the X.X in the command line below. libpri is availa
download from:
http://downloads.digium.com/pub/telephony/libpri

```
# wget http://downloads.digium.com/pub/t
libpri/libpri-X.X.current.tar.gz
```

4. Expand the downloaded file, compile its contents, and
libraries. Substitute the version of libpri for the X.X ar

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Note: There is no coorelation between the versioning
Asterisk. The libpri 1.4 branch will function with the A
branch.

5. Download the latest DAHDI drivers with tools. DAHI
for download from:
http://downloads.digium.com/pub/telephony/dahdi-lin

```
# wget http://downloads.digium.com/pub/t
dahdi-linux-complete/dahdi-linux-complet
current.tar.gz
```

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```
# make install
# make config
```

Note: Executing 'make config' will install an init scri[pt]
which will allow you to start and stop DAHDI as a ser[vice]

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the command below. Asterisk is available for downloa
http://downloads.digium.com/pub/telephony/asterisk

```
# wget http://downloads.digium.com/pub/t
asterisk/asterisk-X.X-current.tar.gz
```

2. Expand the downloaded file, compile its contents, and
application. Substitute the version of Asterisk for the t
X.X.X in the command lines below.

```
# tar -zxvf asterisk-X.X-current.tar.gz
# cd asterisk-X.X.X/
# ./configure
# make menuselect
# make
# make install
```

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copy, any older Asterisk configuration files that you n
asterisk directory.

If your installation has failed, it may be because you a
or more of the build dependencies, the kernel headers,
development tools. Please contact your reseller where
purchased, or call Digium Technical Support at 1.256.
assistance.

4. Complete instructions for installing Asterisk are availa
www.asterisk.org.

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finally, data mode. These sample configurations are provi
in familiarizing yourself with the flexibility of editing the
files to meet your specific needs. The list of possible conf
expansive to cover in this user manual.

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```
dms100:     Nortel DMS100
4ess:       AT&T 4ESS
5ess:       Lucent 5ESS
euroisdn:   EuroISDN
ni1:        Old National ISDN 1
qsig:       Q.SIG
```

Echocancel:

Echo Cancellation is enabled in chan_dahdi.conf by prece channel variable with a variable called echocancel and its of milliseconds multiplied by 8); for example:

```
echocancel = yes

channel => 1-23
```

By default, and when setting to "yes," echo cancellation is to 16 ms (128 taps). Echo cancellation is explicitly disabl

```
echocancel = no
```

Digium does not recommend that users set echo cancellat

Users of open source Asterisk-based echo cancelers also following options:

```
echocancel = 128 (this sets 128 taps or
```

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`echocancel = 1024 (this sets 1024 taps o`

Please note that HPEC consumes extremely high amounts that increase as the number of taps are increased. Audio q may result from choosing a taps length greater than the se process the echo in real-time. If audio quality is affected, length or purchase a TE121 or TE122 with Digium's VPM

Users of Digium's VPMADT032 hardware echo cancellat have 128ms of echo cancellation performed at all times u disabled by setting the echocancel variable equal to "no."

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```
switchtype = national
group = 1
context = incoming
channel => 1-23
```

E1 PRI

```
signalling = pri_cpe
switchtype = euroisdn
context = incoming
channel => 1-15,17-31
```

You can also configure a T1 channel bank of phones

```
signalling = fxo_ks
group = 1
context = phones
channel => 1-24
```

E1 channel bank

```
signalling = fxo_ks
group = 1
context = phones
channel => 1-15,17-31
```

Note: More detailed troubleshooting information is pr
www.asterisk.org.

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your interfaces.

The following is a typical setup for a telco in the US:
```
loadzone = us
defaultzone = us
```

3. Configure the SPAN Map.

You will need to define a span. The SPAN map includ
SPAN number, timing, line build out, framing, and co
Configuration details for each of these items is explain
section.

```
span => <Number>,<Timing>,<Line Build
Out>,<Framing>,<Coding>[,Yellow]
```

Number:

This is the port the T1/E1 is plugged into. The TE120
only have one port. If you have a single TE120 Series
the system, you should specify 1 as the span number.

_____

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3 - Receives tertiary backup timing from remote end

4 - Receives quaternary backup timing from remote e?

Only one span can be defined to take timing, and it de?
the rest of the card's spans.

Line Build Out:

For most setups the line build out is 0.

0: 0 db (CSU) / 0-133 feet (DSX-1)
1: 133-266 feet (DSX-1)
2: 266-399 feet (DSX-1)
3: 399-533 feet (DSX-1)
4: 533-655 feet (DSX-1)
5: -7.5db (CSU)
6: -15db (CSU)
7: -22.5db (CSU)

Framing:

T1 utilizes framing set for D4 (SF) or ESF. E1 utilizes

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yellow alarm when no channels are open.

The following is a typical setup for a telco in the US:
span => 1,1,0,esf,b8zs

In Europe:
span => 1,1,0,ccs,hdb3

4. Specify the channel definitions. The format is:
<device> = <channel list>

A list of valid devices are specified in the sample syst

The following is a typical setup for a T1 PRI in the US
bchan = 1-23
dchan = 24

5. DAHDI uses modular echo cancellers that are configu
The echo cancellers are compiled and installed as part
linux package. You can specify the echo canceller to b
channel. The default behavior is for there to be no ech

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The following is a typical setup for a T1 PRI in the US based echo cancellation:

```
echocanceller = mg2,1-23
```

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```
/etc/dahdi/system.conf:
loadzone = us
defaultzone = us
span = 1,0,0,esf,b8zs
fxoks = 1-24
echocanceller = mg2,1-24


/etc/asterisk/chan_dahdi.conf:
group = 1
echocancel = yes
context = channelbank
signalling = fxo_ks
channel = 1-24
```

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```
/etc/dahdi/system.conf:
loadzone = us
defaultzone = us
span = 1,1,0,esf,b8zs
e&m = 1-24
echocanceller = mg2,1-24

/etc/asterisk/chan_dahdi.conf:
group = 1
echocancel = yes
context = incoming
signalling = feat_d
channel = 1-24
```

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will then have 23 voice channels for Asterisk.

PRI T1:

```
/etc/dahdi/system.conf:
loadzone = us
defaultzone = us
span = 1,1,0,esf,b8zs
bchan = 1-23
dchan = 24
echocanceller = mg2,1-23

/etc/asterisk/chan_dahdi.conf:
group = 1
echocancel = yes
signalling = pri_cpe
switchtype = national
context = incoming
channel = 1-23
```

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```
echocanceller = mg2,1-15,17-31

/etc/asterisk/chan_dahdi.conf:
group = 1
echocancel = yes
signalling = pri_cpe
switchtype = euroisdn
context = incoming
channel = 1-15,17-31
```

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```
span = 1,0,0,esf,b8zs
nethdlc = 1-24
```

Instructions for Cisco HDLC:

1. Compile the Linux kernel with Cisco HDLC support.
kernel menuconfig menu may look similar to the follo

Device Drivers --->
   [*] Network device support --->
      [*] Wan interfaces support --->
         <M> Generic HDLC support
            <M> Cisco HDLC support

Note: Digium recommends using Linux kernel versio
The HDLC implementation in Linux kernel versions p
may not be reliable or function at all.

2. Install the newly compiled Linux kernel.

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5. Rebuild DAHDI in order to compile the **sethdlc** utilit
the following commands from the DAHDI complete s

```
# make sethdlc
# make install
```

6. Load and configure the driver:

```
# modprobe wcte12xp
# dahdi_cfg
```

7. Use **sethdlc** to bring up the interface:

```
# sethdlc hdlc0 cisco
```

8. Assign the interface an address:

```
# ifconfig hdlc0 192.168.0.1 netmask 255
```

The interface may be addressed as any other networking
(*i.e.*, eth0) in Linux.

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```
# dahdi_cfg -vv
# dmesg
```

```
ACPI: PCI interrupt 0000:01:00.0[A] -> GSI 21 (level
209
PCI Config reg is 02900117
wcte120p: New Reg: fe590000!
Detected REG0: 00000100
Detected REG1: 00007849
Detected REG2: 0000001d
(pre) Reg fc is 50000027
Detected REG0: 0000ffff
(post) Reg fc is 50000024
Detected REG2: 0000ffff
wcte120p: reg is a04c0004
TE120P: FALC version: 00000000
TE120P: Setting up global serial parameters for T1 I
TE120P: Successfully initialized serial bus for card
Found a Wildcard TE: Wildcard TE120P
```

Figure 8: Example dmesg Output

Note: Output as shown above may vary depending on
Series card you use.

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```
# asterisk
# asterisk -vvvr
```

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are available to obtain more information about Asterisk a products. These resources are listed on page 58.

What do the Status LED colors indicate?

- Green - Card is in-sync with the far end.
- Yellow - Card is synchronizing or is receiving a red ala end. Use a software tool such as dahdi_tool to get a tex of the state of the card.
- Red - Card is not seeing far end, circuit is not up, or ca

I can't receive DID calls even though I have it enabled extensions.conf.

Your telco might be sending calls with a method you are

1. Check the method being used by attempting the follow context:

```
_X.,1,NoOp(My DID matches as ${EXTEN})
```

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check the common causes of problems for a T1. See the
for all cards, page 57.

**I have trouble dialing out. It seems that one type of di
(local, long distance, international), but another does**

Check your **pridialplan** variable and verify that you are d
method your telco is expecting.

I am having trouble receiving DID information over E

Try the other types of E&M (featd, featb, etc.) to match t
telco is using to stream information.

**I am having issues with my PRI. How can I see the me
across my D channel?**

Enter the following command:

```
*CLI> PRI debug span X
```

where X is the port from which you are connected. This
show you the PRI messages coming across your D chann

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2. Stop Asterisk and edit **system.conf** by removing the l
your card and replacing them with the following:
```
span => 1,0,0,esf,b8zs
clear = 1-24
```

Or if you have an E1 span:
```
span => 1,0,0,ccs,hdb3
clear = 1-31
```

3. Navigate to the tools/ directory in your DAHDI compl
directory and type:
```
# make tests
```

Followed by:

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This runs a pattern looptest for 60 seconds. If you rece
it is possible you have a bad card and will need to call
Technical Support at 1.256.428.6161

How can I enable more features?

To view all of the options available to add to your dial pl
following commands from within Asterisk:

```
*CLI> core show applications
*CLI> core show functions
```

Digium also offers services to help configure and add fea
need. Contact Digium Technical Support at 1.256.428.61
information.

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If the X Window System is running, stop the applicati[on]
cause a conflict with Asterisk.

2. Check to see if your PATA IDE hard drives are runnin[g]
levels set. Advance user can perform an **hdparm** on y[our]
interface.

> ⚠ *Use hdparm with caution as the man page states t[hat]
> corruption can occur when using incorrect settin[gs]
> review the man page for hdparm and make sure y[ou]
> the risks before using this tool.*

Check the current mode using this command:
hdparm -vi /dev/[IDE Device**]**

Use this command to set the drives into UDMA2 mod[e]
hdparm -d 1 -X udma2 -c 3 /dev/[IDE Devi[ce]

If you are still having problems, contact your reseller [from]
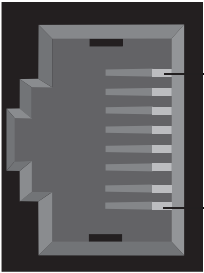card was purchased, or Digium Technical Support at 1

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2. Asterisk users mailing list (asterisk.org/lists.digium.c...

3. IRC channel **#asterisk** on (irc.freenode.net).

Subscription Services Program

Digium is dedicated to supporting your Asterisk system b...
technical support through our Subscription Services Prog...
this program, you can be at ease knowing that your busine...
have access to the Asterisk experts. Pricing on Subscriptio...
be obtained from your nearest reseller or you may call Di...
referral to your nearest reseller at +1.256.428.6000 or e-m...
sales@digium.com.

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Table A-1: RJ45 Telco Port Connector

	Pin	Desc
	1	
	2	
Pin 1 / Pin 8	3	Not
	4	
	5	
	6	Not
	7	Not
	8	Not

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cards.

Physical (All Cards).

Size: 4.82" × 2.175" × 0.63" (12.2 x 5.5 x 1.6
           PCB size, does not include the PCI brac
Weight: 2 oz (57g)

Interfaces.

Local Loop Access: E1, T1, J1, PRI; RJ45
(TE120P and TE122) - PCI Bus: 3.3V or 5V bus slot
slot minimum size, 33MHz minimum bus speed, con
PCI 2.2 or greater.
(TE121) - PCI-E X1, compliant with PCI-E X1 1.0 c

Environment.

Temperature: 0 to 50° C (32 to 122° F) operation
             -20 to 70° C (4 to 158° F) storage
Humidity: 10 to 90% non-condensing

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Table B-2: Maximum Power Consumption

Model	Power
TE120P 3.3V 5V	1.5 Watts 0.1Watt
TE121 3.3V	2.0 Watts
TE121B 3.3V	3.0 Watts
TE122 3.3V 5V	1.5 Watts 0.1Watt
TE122B 3.3V 5V	2.5 Watts 0.1Watt

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international communications.

asynchronous

Not synchronized; not timed to an outside clock source. T
controlled by start bits at the beginning and stop bits at th
character. Asynchronous communications are often found
access and remote office applications.

attenuation

The dissipation of a transmitted signal's power as it trave

bandwidth

The capacity to carry traffic. Higher bandwidth indicates
transfer more data in a given time period.

bit

The smallest element of information in a digital system. A
either a zero or a one.

bps   *bits per second*

A measurement of transmission speed across a data conne

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A generic term for an individual data stream. Service pro...
multiplexing techniques to transmit multiple channels ove...
medium.

Cat5

Category of Performance for wiring and cabling. Cat 5 ca...
applications up to 100 MHz.

Cat5E

Category of Performance for wiring and cabling. Categor...
wiring supports signal rates up to 100 MHz but adheres to...
specifications.

CLEC   *competitive local exchange carrier*

A term for telephone companies established after the
Telecommunications Act of 1996 deregulated the LECs. C...
with ILECs to offer local service. See also *LEC* and *ILEC*...

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Terminal equipment which is connected to the telecommu
network and which resides within the home or office of the
includes telephones, modems, terminals, routers, and tele
boxes.

DAHDI   *Digium Asterisk Hardware Device Interface*

A telephony project dedicated to implementing a reasona
affordable computer telephony platform into the world ma
the collective name for the Digium-provided drivers for D
telephony interface products.

DS0   *Digital Signal, Level 0*

A voice grade channel of 64 Kbps. The worldwide standa
digitizing voice conversation using PCM (Pulse Code Mo

DS1   *Digital Signal, Level 1*

1.544 Mbps in North America (T1) and Japan (J1) -up to
channels (DS0s), 2.048 Mbps in Europe (E1) - up to 32 v
(DS0s). DS1/T1/E1 lines are part of the PSTN.

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E1

The European equivalent of North American T1, transmit[...] Mbps, up to 32 voice channels (DS0s).

E3

The European equivalent of North American T3, transmit[...] Mbps, up to 512 voice channels (DS0s). Equivalent to 16[...]

EMI   *Electromagnetic Interference*

Unwanted electrical noise present on a power line

full duplex

Data transmission in two directions simultaneously.

FXO   *Foreign Exchange Office*

Receives the ringing voltage from an FXS device.

FXS   *Foreign Exchange Station*

Initiates and sends ringing voltage.

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A recommendation by the Telecommunication Standardiz (ITU-T) for an algorithm designed to transmit and receive telephone lines at 6.3 Kbps or 5.3 Kbps.

G.729a

A recommendation by the Telecommunication Standardiz (ITU-T) for an algorithm designed to transmit and receive telephone lines at 8 Kbps.

H.323

A recommendation by the Telecommunication Standardiz (ITU-T) for multimedia communications over packet-bas

IAX   *Inter-Asterisk eXchange*

The native VoIP protocol used by Asterisk. It is an IETF s enable VoIP connections between Asterisk servers, and be and clients that also use the IAX protocol.

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The LECs that were the original carriers in the market pri... competition and therefore have the dominant position in t...

interface

A point of contact between two systems, networks, or dev...

ISO   *International Standards Organization*

LED   *light-emitting diode*

Linux

A robust, feature-packed open source operating system ba... that remains freely available on the internet. It boasts dep... offers a wide range of compatibility with hardware and so... is supported exclusively on Linux.

loopback

A state in which the transmit signal is reversed back as th... typically by a far end network element.

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interleaving bits one after the other.

MUX   *multiplexer*

A device which transmits multiple signals over a single c
line or channel. See multiplexing.

PBX   *private branch exchange*

A smaller version of a phone company's large central swi
Example: Asterisk.

PCI   *peripheral component interconnect*

A standard bus used in most computers to connect periph

POP   *point of presence*

The physical connection point between a network and a t
network. A POP is usually a network node serving as the
CO to a network service provider or an interexchange car

POTS   *plain old telephone service*

Standard phone service over the public switched telephon
(PSTN). This service provides analog bandwidth of less t

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world's public circuit-switched telephone networks. Orig[inally] of fixed-line analog telephone systems, the PSTN is now digital, and now includes mobile as well as fixed telephon[es].

QoS *quality of service*

A measure of telephone service, as specified by the Publi[c] Commission.

RJ11

A six-pin jack typically used for connecting telephones, m[odems, fax] machines in residential and business settings to PBX or t[he] telephone CO.

SIP *Session Initiation Protocol*

An IETF standard for setting up sessions between one or [more clients. It] is currently the leading signaling protocol for Voice over [IP, gradually] replacing H.323.

T1

A dedicated digital carrier facility which transmits up to 2[4] channels (DS0s) and transmits data at 1.544 Mbps. Comm[only used to] carry traffic to and from private business networks and IS[Ps].

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into a single high-speed data stream. TDM separates sign interleaving bits one after the other.

telco

A generic name which refers to the telephone companies world, including RBOCs, LECs, and PTTs.

tip and ring

The standard termination on the two conductors of a telep named after the physical appearance of the contact areas

twisted pair

Two copper wires commonly used for telephony and data communications. The wires are wrapped loosely around e minimize radio frequency interference or interference fro the same bundle.

V   *volts*

VoIP   *Voice over IP*

Technology used for transmitting voice traffic over a data the Internet Protocol.

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