

# Digium® Communications Hardware

The Gold Standard



## Exceptional Satisfaction Program

**NO RISK  
GUARANTEE**  
**100%**  
**SATISFACTION**

Under the Risk-Free Guarantee, Digium will refund the purchase price of any qualifying

Digium product for any customer who is not 100% satisfied with the performance of the Digium product they purchased. If Digium can not resolve the trouble to the customer's complete satisfaction, the customer may return the product for a full refund of the purchase price up to MSRP. The refund will be paid in US dollars only, to the same entity listed on the invoice. There is no predetermined end date for this offer, but Digium reserves the right to discontinue this offer at any time. Digium is committed to complete customer satisfaction.

## All Digium analog and digital interface cards:

- are RoHS compliant
- are manufactured in an ISO 9001:2001 certified facility in the United States
- maintain an MTBF greater than one million hours.
- are backed by a five-year hardware warranty
- are backed by Digium's Exceptional Satisfaction Program (ESP)



**Digium's Asterisk software has, since its first release in December of 1999, become the global standard for companies and individuals** who need to decrease their cost of ownership of, and improve their control over, telecommunications. With Asterisk, users build anything from simple home-based business solutions to complex multi-location enterprise telephone systems. Since 2001, Digium has designed, manufactured, and sold PC-based interface cards for extending the functionality of Asterisk to the Public Switched Telephone Network (PSTN).

Not only was Digium the first vendor of telephony interface cards built specifically for Asterisk, but it has always been the market leader, with more than 50% of the world's card business.

## What makes Digium the best?

- Digium telephony voice cards are developed by the creators of Asterisk
- The only telephony card products certified to work with Asterisk
- Digium cards have been heavily tested in all the major server hardware platforms, such as Dell, HP, and IBM. Digium cards also work in a variety of hardware platforms with chipsets including AMD, Intel, VIA, Nvidia, etc.
- Digium cards are based on state-of-the-art technology developed by Digium, which ensures that Digium cards will work on the vast majority of hardware platforms. When used with Asterisk, the Digium telephony cards provide superior compatibility, quality and performance.
- Digium cards have been tested with multiple Linux-based operating systems, including OpenSUSE, Ubuntu, Fedora, Redhat Enterprise Linux, and CentOS, Gentoo, Linux from Scratch, and Slackware.
- Digium built the first line of telephony cards for Asterisk and continues to be the market leader, selling more telephony cards than any other vendor
- Digium developed the analog signaling and digital line-signaling library used by the Digium cards (as well as competitive cards). If there is ever a question about connectivity between the cards and the protocol stack or signaling, then Digium is uniquely capable to resolve it.

# Digium Analog Cards and Modules

## Target Applications

Channel Bank Replacement/Alternative  
 Small Office Home Office (SOHO) applications  
 Small and Medium Business (SMB) applications  
 Gateway Termination to analog telephones/lines  
 Analog PCI/PCI-Express  
 4-24 Modular Ports  
 32-bit 33MHz  
 Analog Trunk or Station  
 Loop Start or Kewl Start Signaling  
 Temperature: 0° to 50° C  
 Optional DSP  
 Echo Cancellation

**Digium analog cards were created for connecting analog telephones and analog POTS lines through a PC.** Using one of our analog cards in concert with Digium's Asterisk software, standard PC platforms, and Linux®, one can create telephony environments capable of satisfying the needs of business applications with industry-leading quality.

The analog cards, with their interchangeable single and quad FXS and FXO modules, can eliminate the requirement for separate channel banks or access gateways. The optional hardware echo cancellation modules provide a G.168-compliant solution to eliminate echo, but without the performance impact of a software-based solution. Scaling of an analog card solution is accomplished by adding additional cards.

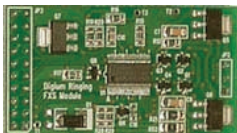


|                          | A4A            | A4B            | A8A                        | A8B         | TDM2400       | AEX2400       |
|--------------------------|----------------|----------------|----------------------------|-------------|---------------|---------------|
| Ports                    | 4              | 4              | 8                          | 8           | 24            | 24            |
|                          | RJ11           | RJ11           | RJ11                       | RJ11        | 50-pin RJ21   | 50-pin RJ21   |
| Bus Type                 | PCI 2.2+       | PCI-E 1.0+     | PCI 2.2+                   | PCI-E 1.0+  | PCI 2.2+      | PCI-E 1.0+    |
| Connector                | 3.3/5.0V       | X1             | 3.3/5.0V                   | X1          | 3.3/5.0V      | X1            |
| Dimensions (cm)          | 16 x 6.3       | 16 x 6.3       | 15.7 x 10.6                | 15.7 x 10.6 | 31.19 x 10.67 | 31.19 x 10.67 |
| Low-Profile              | Yes            | Yes            | No                         | No          | No            | No            |
| Half-Length              | Yes            | Yes            | Yes                        | Yes         | No            | No            |
| FXO Module               | Single Trunk   | Single Trunk   | Single and/or Quad Trunk   |             | Quad Trunk    | Quad Trunk    |
| FXS Module               | Single Station | Single Station | Single and/or Quad Station |             | Quad Station  | Quad Station  |
| Echo Cancellation Module | VPM032         | VPM032         | VPM032                     | VPM032      | VPMOCT032     | VPMOCT032     |

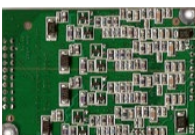
## Station: FXS

(Foreign Exchange Station)

FXS is an interface that connects to a station, such as an analog telephone or the FXO interface of another PBX. It provides ringing voltage and battery to the FXO devices. FXS interfaces are used on the inside of your PBX, they do not connect directly to the PSTN. One FXS channel is required for each telephone that you wish to connect to your Asterisk system.



S100M

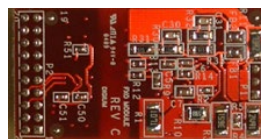


S400M

## Station: FXO

(Foreign Exchange Office)

FXO is an interface that connects to a trunk line, like the one from your service provider. It receives ringing voltage and battery from FXS devices. FXO interfaces are used to connect your PBX to the PSTN. One FXO channel is required for each line you receive from your telco.



X100M



X400M

# Digium Digital Cards

Digium's digital cards are high-performance, cost-effective, digital telephony interfaces that support T1 and E1 environments. The environments are selectable on a per-card or per-port basis.

This feature enables signaling translation between T1 and E1 equipment, and allows inexpensive T1 channel banks to connect with E1 circuits. The bus-mastering cards improve I/O speed over slave-only architectures, resulting in reduced CPU usage and increased card density per server. The cards provide the power to interconnect traditional telephony systems with Voice-over IP (VoIP) technologies.

Digium's digital cards support industry standard telephony protocols, including Primary Rate ISDN

(both North American and Euro Standard) protocol families. Both line-side and trunk-side interfaces are supported, as well as advanced call features.

Digium's digital cards have been designed to be fully compatible with existing software applications. They are fully integrated with Digium's Asterisk software. With the combination of Digium hardware and Asterisk software, numerous telephony configurations are possible. From the traditional PBX to VoIP Gateways, Digium solutions are paving the way for a new generation of worldwide communications.

## Target Applications

- Legacy PBX/IVR Services
- Voice-over Internet Protocol (VoIP) Services
- Complex IVR Trees
- "Meet-Me" Bridge Conferencing
- VoIP Gateways
- Calling Card Platforms
- PRI Switch Compatibility – Network or CPE



|                          | TE131/TE133                                     | TE132/TE134 | TE235      | TE236      | TE435      | TE436      | TE820      |
|--------------------------|---|-------------|------------|------------|------------|------------|------------|
|                          | E1/T1/J1  |             | E1/T1/J1   |            | E1/T1/J1   |            | E1/T1/J1   |
| Ports                    | 1   |             | 2          |            | 4          |            | 8          |
| Bus Type                 | PCI-E 1.0+                                      | PCI 2.2+    | PCI-E 1.0+ | PCI 2.2+   | PCI-E 1.0+ | PCI 2.2+   | PCI-E 1.0+ |
| Connector                | X1  | 3.3V/5.0V   | X1         | 3.3V/5.0V  | X1         | 3.3V/5.0V  | X1         |
| Dimensions (cm)          | 12.7 x 5.4                                      |             | 12.7 x 6.7 | 12.7 x 6.7 | 12.7 x 6.7 | 12.7 x 6.7 | 16.8 x 9.5 |
| Low-Profile              | Yes   |             |            |            |            |            | No         |
| Half-Length              | Yes   |             |            |            |            |            |            |
| Echo Cancellation Module | TE131 & TE132 - N/A<br>TE133 & TE134 - Built-In |             | VPM064     | VPM064     | VPM128     | VPM128     | VPMOCT256  |

## Digium Digital PCI/PCI-Express

- 1-8 Ports E1/T1/PRI
- 32-bit 33MHz
- RJ48C Ports
- Built-in CSU/DSU
- RoHS Compliant
- 5 Year Warranty
- Temperature: 0 to 50° C
- Built in Octasic DSP Echo Cancellation for the TE133 and TE134
- Optional Octasic DSP Echo Cancellation (2, 4, and 8 port models)

## Framing Types

- Superframe (D4)
- Extended Superframe (ESF)
- Channel Associated Signaling (CAS)
- Common Channel Signaling (CCS)

## Coding Types

- Alternative Mark Inversion (AMI)
- Bipolar with Eight (8) Zeros Substitution (B8ZS)
- High Density Bipolar of Order Three (3) Code (HDB3)\*
- \*Optional Cyclic Redundancy Check 4 (CRC4)

## Signaling Types

- E&M, E&M E1, E&M Wink
- Feature Group D (DTMF)
- Feature Group D (MF)
- Feature Group D (Tandem Access)
- Feature Group B
- Feature Group C-CAMA

- Feature Group C-CAMA (MF)
- Foreign Exchange Station (FXS) Loop Start, Ground Start, Kewl Start
- Foreign Exchange Office (FXO) Loop Start, Ground Start, Kewl Start

## PRI Network and CPE

- Primary Rate Interface (PRI) Switch Types
- National ISDN 1 (NI1)
- National ISDN 2 (NI2)
- Nortel DMS100
- AT&T 4ESS
- Lucent 5ESS
- EuroISDN Q.931
- Q.SIG (Limited Support)
- \*Both PRI NET and PRI CPE are supported

# Hardware Echo Cancellation

In the early days of telephone systems, echo during a call was not much of a problem. It was more likely that callers experienced side-tone, or heard what their ears perceived as reverb. As telephone systems have become more modern, they have also become prone to more frequent and bothersome echo.

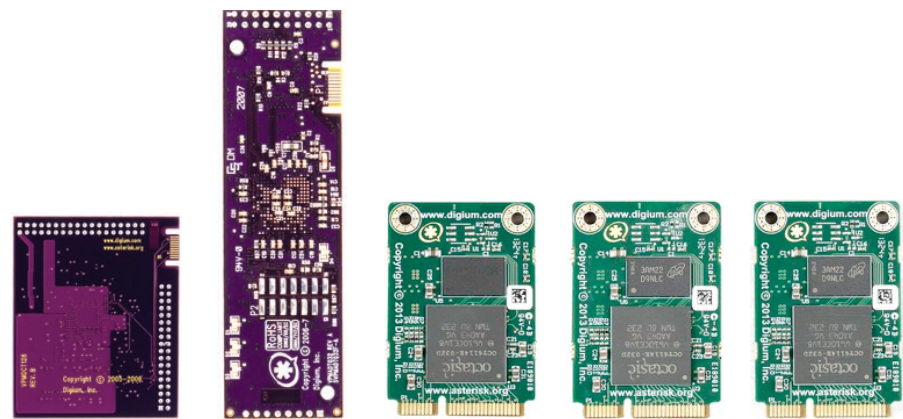
Echo is most common when you are utilizing a VoIP system. Why? Because a VoIP system introduces latency, which analog systems do not have, and frequently attempts conversion between a 2-wire and 4-wire system. The result of this is echo heard by callers on a VoIP system whenever they call someone on the PSTN.

Even though echo may be present, you should never have to experience it when making a call. There are two primary ways with which you can combat this problem: software and hardware. Asterisk does the best job possible utilizing several free echo cancellation tools. While they can do a decent job eliminating minor echoes, they can also do a bad job when the echoes are anything but minor.

Fortunately, Digium's telephony card offerings have the ability to use hardware echo cancellation modules. Hardware echo cancellation can be more successful, because it removes the burden of echo cancellation from the PC. Hardware echo cancellation is also advantageous when handling large call volumes or a high number of channels that would otherwise stress the CPU and result in the potential for poor audio quality. What makes the hardware echo cancellation so great?

- Octasic DSP-based (all modules)
- 128ms (1024 taps) of echo cancellation across all channels
- G.168-2004-compliant algorithm
- Dynamic Nonlinear Processor
- Automatic Tail Search
- Cancel Multiple Reflections
- Double-talk Detection

What all this means is that your call has less chance of sounding like you've stepped into a canyon, canyon, canyon or empty concert hall, hall, hall because the hardware echo cancellation module is standards-compliant and certified to perform.



|                    | VPMOCT256            | VPMOCT032           | VPM032                   | VPM064         | VPM128         |
|--------------------|----------------------|---------------------|--------------------------|----------------|----------------|
| Max. Channels      | 256                  | 32                  | 32                       | 64             | 128            |
| Card Compatibility | TE820F<br>(TE820BF)* | TDM2400P<br>AEX2400 | A4A<br>A4B<br>A8A<br>A8B | TE235<br>TE236 | TE435<br>TE436 |

\* TE820BF is bundled with the echo cancellation module



# TC400 Series: Voice Processing

**Asterisk, in software and with Digium G.729a licensing, is capable of transforming the G.729a codec into other codecs for the purposes of call origination or termination, bridging disparate calls, or VoIP to TDM connectivity.** These transformations in software are

very expensive, in terms of MIPS, and require a substantial amount of CPU time to accomplish. The TCE400B and TC400B not only relieve the CPU of this duty, freeing it up to handle other tasks or to complete additional call processing, but also provide Asterisk with the capability of bridging G.723.1 compressed audio into other formats, a capability not otherwise possible.

The TCE400B and TC400B decompress G.729a (8.0kbit) or G.723.1 (5.3kbit/6.0kbit) into G.711 u-law or a-law and compress G.711 u-law or a-law into G.729a (8.0kbit) or G.723.1 (5.3kbit).

The TCE400B and TC400B are rated to handle up to 120 bi-directional G.729a-only transformations or 92 bi-directional mixed-mode G.729a/G.723.1 transformations. The TCE400B and TC400B do not require additional licensing fees for the use of these codecs nor do they require the registration process association with Digium's software-based G.729a codec licensing.

The TCE400B is a bundle of the half-length, low-profile PCI-Express x1 TCE400P base card and the TC400M voice processing module. The TC400B is a bundle of the half-length, low-profile PCI 3.3/5.0V TC400P base card and the TC400M voice processing module. The TCE400B and TC400B are designed to handle, in dedicated DSP resources, the complex codec translations for highly compressed audio as would otherwise be processed by Asterisk in software.

## Target Applications

Media Gateway  
Conferencing Server  
IVR Server  
Distributed Office PBX  
Call Centers

## Features

TC400M Voice Processing Module  
TC400P - Half-Length Low-Profile  
PCI 2.2+ 3.3/5.0V Card  
TCE400P - Half-Length Low-Profile  
PCI-Express x1 Card  
Includes Codec Licensing  
and Indemnification  
120 G.729a Transformations  
92 G.723.1 Transformations

## Requirements

DAHDI 2.2.0 or greater and  
Asterisk 1.6.0.10 or greater  
Linux Kernel 2.6  
Available PCI-Express or PCI Slot

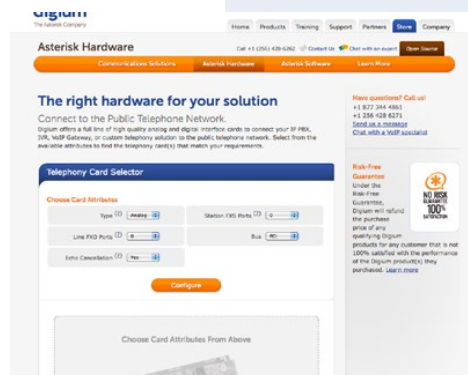
## Codec Support

G.729a - 8.0kbit/s  
G.723.1 - 6.3kbit/s (decode-only)  
5.3kbit/s (decode/encode)  
G.711  $\mu$ -law  
G.711 a-law



## TCE400B and TC400B

The TCE400B (left) and TC400B (right) transform the G.729a codec into other codecs, freeing the CPU to handle other tasks. They also provide Asterisk with the capability of bridging G.723.1 compressed audio into other formats.



## Telephony Card Selector

Digium now offers a Telephony Card Selector to help you easily determine your hardware needs. Simply select from the available filters (Digital or Analog, number of FXS ports, number of FXO ports, echo cancellation requirements) to find the telephony card(s) that match your requirements.

Visit the online Telephony Card Selector: [store.digium.com/boards](http://store.digium.com/boards)



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