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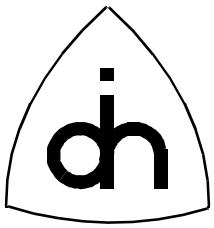

Technical Description for Vidar-5x16-PCI

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1. Abstract

This document provides a technical description of Odin TeleSystems' Vidar-5x16-PCI adapter card. This presentation is targeted to systems integrators and application developers who are developing telecommunications systems and/or software applications using the Vidar-5x16-PCI platform. The purpose of this document is to provide the needed information about the hardware to allow software developers to efficiently integrate Vidar-5x16-PCI into their overall system under design.

For information on how to develop host applications utilizing the OTX Hardware Device Driver Application Programming Interface (API), please refer to the "*Programmer's Guide for OTX Hardware API"* document (Odin TeleSystems Inc. document number 1411-1-SAA-1006-1). For information on how to develop custom DSP applications, please refer to "*Programmer's Guide for OTX C54x DSP Software Development Kit"* (Odin document number 1412-1-SAA-1007-1). And finally, for help on how to install the Vidar-5x16-PCI card and the OTX Device Driver Software, please refer to the *"Installation Guide for OTX PCI Adapters"* (Odin document number 1512-1-HCA-1001-1).

2. Table of Content

3. Introduction to Vidar-5x16-PCI

Vidar-5x16-PCI is a high-density Digital Signal Processing (DSP) resource board for PCI based systems. Vidar-5x16-PCI can be utilized together with OTX Network Interface Cards (such as Arni-16-PCI, Thor-2-PCI, Thor-8-PCI) to provide a large number of Digital Signal Processing Resources often needed for a variety of telecom applications.

Vidar-5x16-PCI is a member of the Odin Telecom frameworX (OTX) product family and is supported by the following OTX Software Products:

- SDA-1012-1 : OTX Adapter Family WDM driver for Windows and Windows 2000
- SDA-1013-1: OTX Adapter Family NT driver for Windows NT 4.0
- SDA-1014-1: OTX Adapter Family Linux driver.
- SAA-1006-1: OTX Hardware Driver Software Development Kit (SDK)
- SAA-1007-1: OTX DSP C54x Software Development Kit (SDK)

The Vidar-5x16-PCI contains 16 Texas Instruments TMS320C548 DSPs. The DSPs on the Vidar board can be used to run Odin provided standard DSP applications or they can be used to run user developed custom applications. Vidar-5x16-PCI is delivered with the Odin Signal Processing Module 1 (OtxSpm1) DSP application package that provides supports for many common telecom applications; such as tone detection and generation, FSK detection, and HDLC sending and receiving.

For custom application development, the Vidar-5x16-PCI adapter supports the standard Texas Instruments development tools. These tools can be purchased from Odin and are listed in the following:

- Odin Product # SAA-1004-1: Texas Instruments C Compiler/Assembler/Linker for TMS320C54x DSPs
- Odin Product # SAA-1005-1: Texas Instruments Code Composer Debugger with DSP Research Emulator Board

For more information on custom DSP application development, please refer to *Programmer's Guide for OTX C54x DSP Software Development Kit* (Odin document number 1412-1-SAA-1007-1)

The Vidar-5x16-PCI provides H.100 Computer Telephony Bus. The H.100 bus comprises of thirty-two (32) 2, 4, or 8 Mbit/s Time-Division Multiplexed (TDM) highways for board-to-board communication. Typical application of the H.100 bus is to utilize it to transfer time slots from a OTX Network Interface Card (e.g. E1 time-slots from a Thor-2-PCI board) to a Vidar DSP resource board for processing. On OTX boards the H.100 highways are connected to a non-blocking time-space switch. The time-space switch allows 256 time-slots to be switched between H.100 highways and the local highways. 1024 time-slots can be switched locally between on-board

devices. The H.100 bus is backwards compatible with the MVIP bus and with the SCBus.

The Vidar-5x16-PCI board also contains an OTX Application Specific Module (ASM) socket. The ASM interface can be used to add daughter boards providing additional resources. For example, Vidar-5x16-PCI can be augmented with Vidar-5x4-ASM providing additional 4 TI TMS320C548 Digital Signal Processors (DSPs).

Finally, Vidar-5x16-PCI contains four (4) codecs. The codecs perform Analog-to-Digital (A/D) and Digital-to-Analog (D/A) conversions. Both the A-law and the u-law are supported. The codecs can be switched to any time-slots on the board. Standard handsets can be connected to the codecs to provide phone functionality and to listen to any time-slots transmitted in and our from the board.

4. Specifications

Vidar-5x16-PCI is a full-length PCI board. The physical dimensions of Vidar-5x16-PCI are shown in Figure 1.

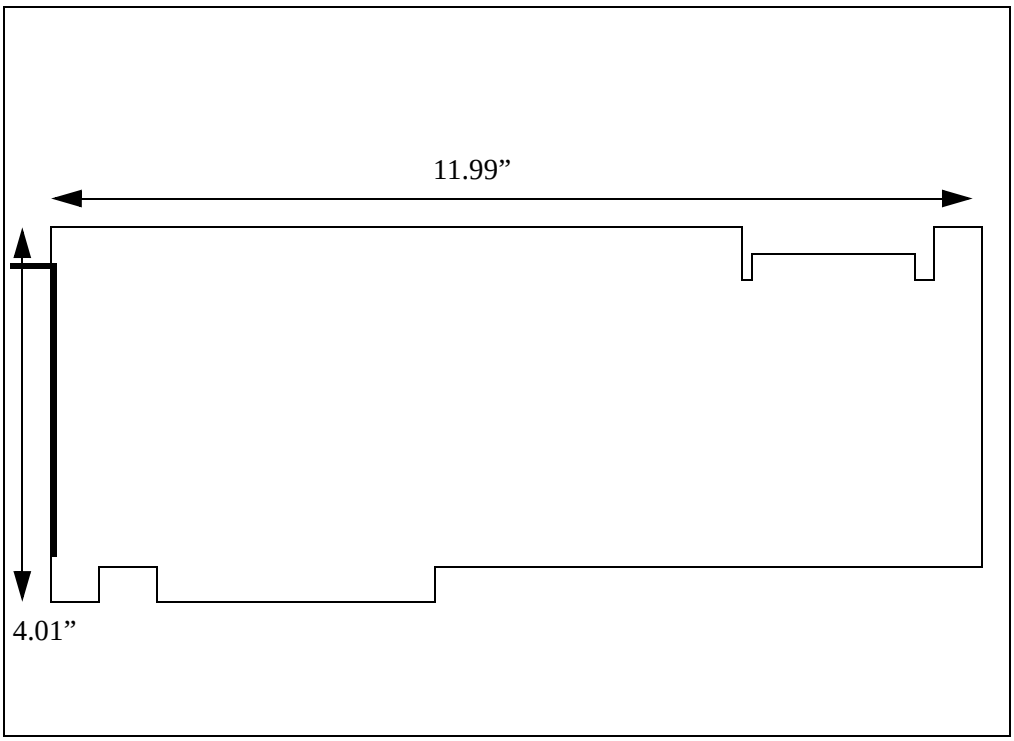

Figure 1. Vidar-5x16-PCI Physical Dimensions (inches).

The Vidar-5x16-PCI operates with +5.0 V supply voltage.

5. Supported Driver Devices

5.1 Physical Devices

The Vidar-5x16-PCI supports the following physical API driver devices:

TABLE 1. OTX Physical Driver Devices supported by Vidar-5x16-PCI

Host Device	Device Type	Max #	Description
0	*OTX_DEVICE_VIDAR_5x_PCI*	1	Board Device
OTX_DEVICE_VIDAR_5x_PCI	*OTX_DEVICE_DSP*	4, 8, 12 or 16	Digital Signal Processor
OTX_DEVICE_VIDAR_5x_PCI	*OTX_DEVICE_TSS*	1	Time-Space Switch
OTX_DEVICE_VIDAR_5x_PCI	*OTX_DEVICE_CODEC*	4	Codec performing A/D and D/A conversions for analog front ends.
OTX_DEVICE_VIDAR_5x_PCI	*OTX_DEVICE_VIDAR_5x_ASM*	1	Vidar-5x4-ASM Daughter Board (OPTIONAL)

5.2 Logical Devices

The Vidar-5x16-PCI is delivered with OTX Signal Processing Module 1 (OtxSpm1) DSP application pack. The OtxSpm1 DSP application supports the following logical devices.

TABLE 2. OTX Logical Driver Devices supported by Vidar-5x16-PCI

Host Device	Device Type	Max #	Description
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_EFFECTS_GENERATOR*	8	Logical Device for Generating Tone Effects (such as saw tooth, sweeping sine wave, noise, etc.)
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_SINEWAVE_GENERATOR*	8	Logical Device for Generating Sine waves with variable frequencies.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DTMF_GENERATOR* *OTX_LDEVICE_TONE_MF_GENERATOR*	8	Logical Device for Generating single DTMF or MF tones.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DTMF_DIALER* *OTX_LDEVICE_TONE_MF_DIALER*	8	Logical Device for Dialling DTMF or MF tone sequences
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_SILENCE_DETECTOR*	8	Logical Device for Detecting Silence.

TABLE 2. OTX Logical Driver Devices supported by Vidar-5x16-PCI

Host Device	Device Type	Max #	Description
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DTMF_DETECTOR* *OTX_LDEVICE_TONE_MF_DETECTOR*	8	Logical Device for Detecting DTMF or MF tones.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DIAL_DETECTOR*	8	Logical Device for Detecting Dial Tone
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_FSK_DETECTOR*	8	Logical Device for Detecting FSK.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_CONVERTER*	8	Logical Device for converting from one data format to another.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_RAW_SENDER*	8	Logical Device for sending raw (unstructured) used data.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_RAW_RECEIVER*	8	Logical Device for receiving raw (unstructured) used data.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_HDLC_SENDER*	4	Logical Device for sending HDLC frames.
OTX_DEVICE_DSP	*OTX_LDEVICE_TONE_DATA_HDLC_RECEIVER*	4	Logical Device for receiving HDLC frames.

Additional OTX DSP packages will be offered in the future for:

- *OTX_LDEVICE_MODEM_V34_SENDER*
- *OTX_LDEVICE_MODEM_V34_RECEIVER*
- *OTX_LDEVICE_MODEM_V90_SENDER*
- *OTX_LDEVICE_MODEM_V90_RECEIVER*
- *OTX_LDEVICE_FAX_V17_SENDER*
- *OTX_LDEVICE_FAX_V17_RECEIVER*
- *OTX_LDEVICE_VOICE_ECHO_CANCELLER*
- *OTX_LDEVICE_VOICE_SILENCE_SUPRESSOR*
- *OTX_LDEVICE_VOICE_CODEC_G723_ENCODER*
- *OTX_LDEVICE_VOICE_CODEC_G723_DECODER*
- *OTX_LDEVICE_VOICE_CODEC_G729_ENCODER*
- *OTX_LDEVICE_VOICE_CODEC_G729_DECODER*

For mode information on how to use the physical and logical driver devices, please refer to the *Programmer's Guide for OTX Hardware API* (Odin document # 1412-1-SAA-1006-1).

6. System Architecture

The overall system architecture can be best described and understood through different architectural views or aspects. This document explores the systems architecture from the following angles:

1. **External Interface View:** The external interface view describes the external interfaces of the adapter board, and how they are connected to the various internal devices and modules.

2. **Data Architecture View:** The data architecture view illustrates how the Time - Division Multiplexed (TDM) serial data is connected and transferred through the board.

3. **Control Architecture View:** The control architecture view describes how the internal devices and modules can be controlled by the host processor.

4. **Clock Architecture View:** The clock architecture view specifies what clocking and synchronization options are available, how clocking is derived, and how it distributed to the various devices.

5. **Logical Subsystem View:** The logical subsystem view describes the logical design subsystems in the system. Each subsystem can comprise hardware, firmware and driver or on-board processor software.

It is important to note that one device within the board can be involved in several of these views, each view describing how one aspect of the device interfaces with other devices.

6.1 External Interfaces

The Vidar-5x16-PCI contains the following external interfaces:

- PCI Host Bus
- H.100 Computer Telephony Bus
- 4 Handsets
- OTX ASM Socket
- JTAG Port for DSP Control

The external interfaces of the Vidar-5x16-PCI card are illustrated in Figure 2.

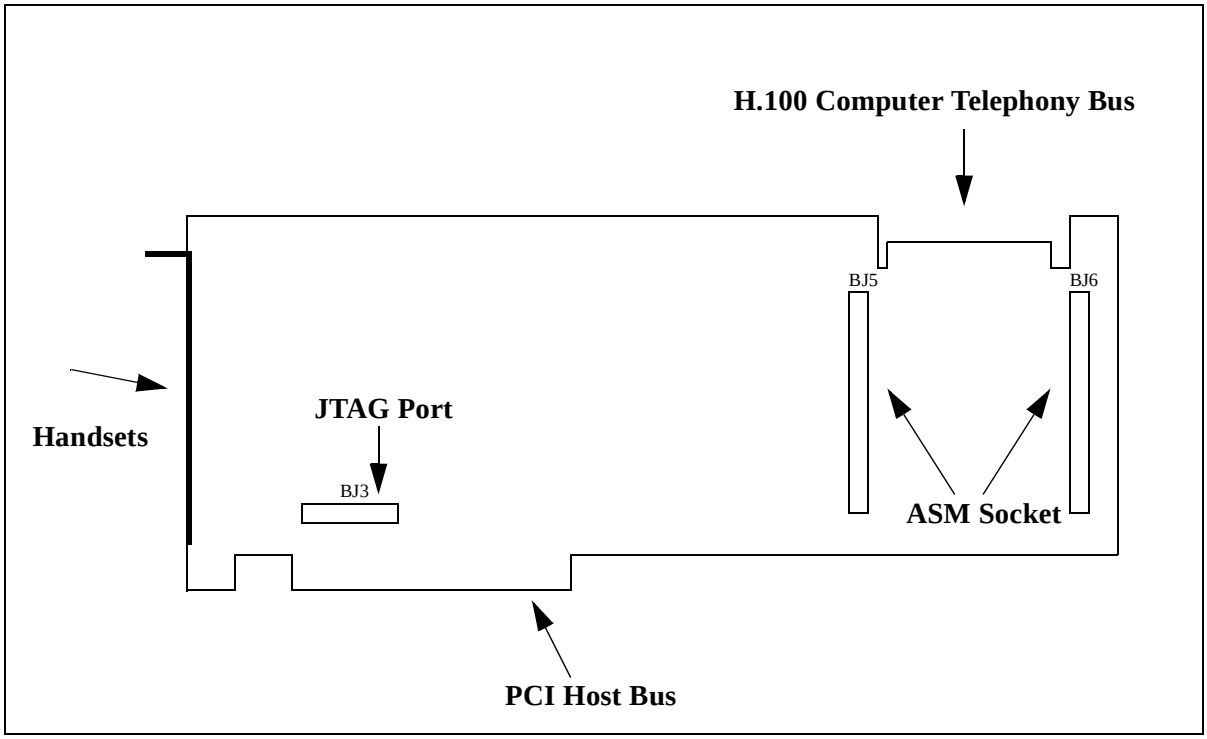

Figure 2. Vidar-5x16-PCI External Interfaces.

6.1.1 PCI Host Bus Interface

The interface between the Vidar-5x16-PCI board and the Host Computer is the PCI (Peripheral Connection Interconnect) bus. The electrical characteristics comply to the PCI Standard, Revision 2.1. For more information on the PCI bus, please contact the PCI special interest group, PCI SIG, ***http://www.pcisig.com*** .

6.1.2 H.100 Computer Telephony Bus Interface

Vidar-5x16-PCI supports the H.100 Computer Telephony Bus standard. The H.100 bus is a collection of time-division multiplexed (TDM) digital telephony highways designed to carry telephony traffic between extensions boards within one PC chassis. The H.100 bus supports 32 TDM highways. The highways can be operated at 2.048, 4.096, or 8.192 MBit/s carrying 32, 64, or 128 64 kbit/s time-slots, respectively. Up to 20 boards can be connected to one H.100 bus. The maximum distance between boards is 7 inches.

Within the PC chassis the data streams are passed from card to card using a 60 pin ribbon cable and AMP 1-557089-2 connectors. The H.100 connector is a 60-finger edge connector on the upper right-hand side (Figure 2) of the board. The pin-out of the H.100 connector is listed in Table 3.

TABLE 3. Vidar-5x16-PCI H.100 Pin Assignments

Pin	Signal	Pin	Signal
1	Reserved	2	Power to active devices (CT_+5Vdc)
3	TDM Highway 31 (CT_D31)	4	TDM Highway 30 (CT_D30)
5	TDM Highway 29 (CT_D29)	6	TDM Highway 28 (CT_D28)
7	GND	8	TDM Highway 27 (CT_D27)
9	TDM Highway 26 (CT_D26)	10	TDM Highway 25 (CT_D25)
11	TDM Highway 24 (CT_D24)	12	GND
13	TDM Highway 23 (CT_D23)	14	TDM Highway 22 (CT_D22)
15	TDM Highway 21 (CT_D21)	16	TDM Highway 20 (CT_D20)
17	GND	18	TDM Highway 19 (CT_D19)
19	TDM Highway 18 (CT_D18)	20	TDM Highway 17 (CT_D17)
21	TDM Highway 16 (CT_D16)	22	GND
23	TDM Highway 15 (CT_D15)	24	TDM Highway 14 (CT_D14)
25	TDM Highway 13 (CT_D13)	26	TDM Highway 12 (CT_D12)
27	GND	28	TDM Highway 11 (CT_D11)
29	TDM Highway 10 (CT_D10)	30	TDM Highway 9 (CT_D9)
31	TDM Highway 8 (CT_D8)	32	GND
33	TDM Highway 7 (CT_D7)	34	TDM Highway 6 (CT_D6)
35	TDM Highway 5 (CT_D5)	36	TDM Highway 4 (CT_D4)
37	GND	38	TDM Highway 3 (CT_D3)
39	TDM Highway 2 (CT_D2)	40	TDM Highway 1 (CT_D1)
41	TDM Highway 0 (CT_D0)	42	GND
43	Frame Sync from “A” Clock Master (/CT_FRAME_A)	44	GND
45	Bit Clock from “A” Clock Master (CT_C8_A)	46	GND
47	Secondary Network Timing Reference (CT_NETREF)	48	GND
49	Redundant Frame Sync from “B” Clock Master (/CT_FRAME_B)	50	GND
51	Redundant Bit Clock from “B” Clock Master (CT_C8_B)	52	GND
53	Message Channel (CT_MC)	54	GND
55	Compatibility Frame Pulse (/FR_COMP)	56	GND
57	SCbus System Clock (SCLK)	58	GND
59	SCbus System Clock time two (SCLKx2)	60	GND
61	MVIP-90 bit clock (C2)	62	GND

TABLE 3. Vidar-5x16-PCI H.100 Pin Assignments

Pin	Signal	Pin	Signal
63	MVIP-90 bit clock time two (/C4)	64	GND
65	H-MVIP 16 Mhz Clock (/C16+)	66	H-MVIP 16 Mhz Clock /C16-
67	GND	68	RESERVED

For more information on the H.100 bus, please contact the Enterprise Computer Telephony Forum, ECTF, ***http://www.ectf.org*** .

6.1.3 Handsets

The back panel of Vidar-5x16-PCI contains a Centronics type connector with 50 contacts. The connector provides 4 Analog Interfaces for Handsets

Vidar-5x16-PCI is delivered with a telco-type connector cable and a Harmonica modules which converts from Centronics connector to 8 RJ-11 connectors. The Harmonica module allows the connection of handsets to the Vidar-5x16-PCI board using RJ-11 connectors (See Figure 3).

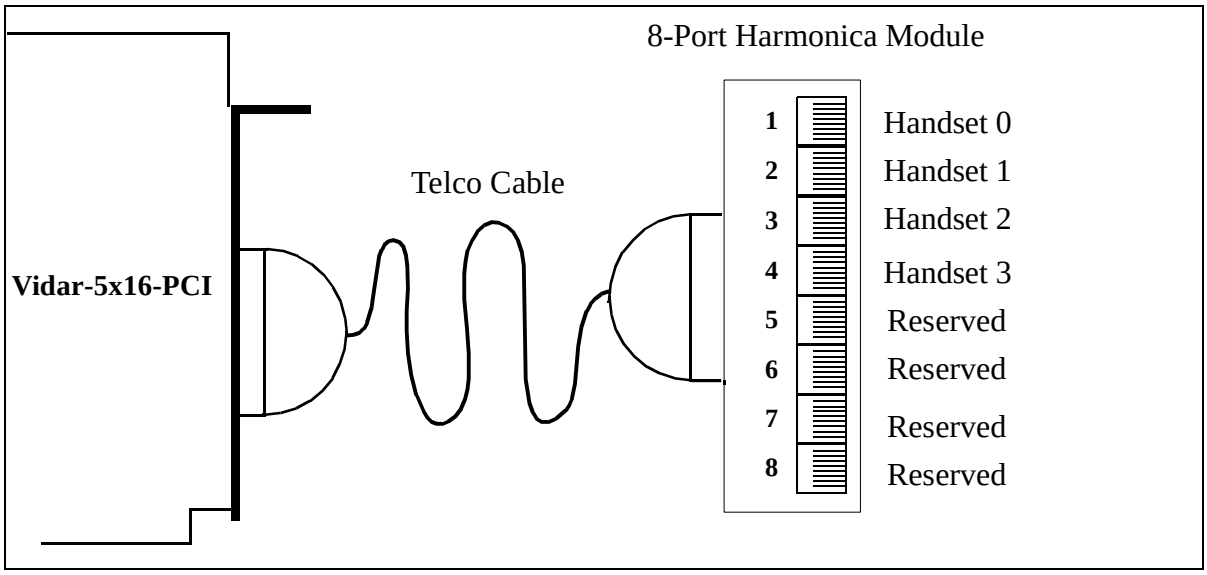

Figure 3. Vidar-5x16-PCI Harmonica Module for Handsets

The pin-outs of the Centronics and the RJ-11 connectors are documented in Figure 5 and in Table 5.

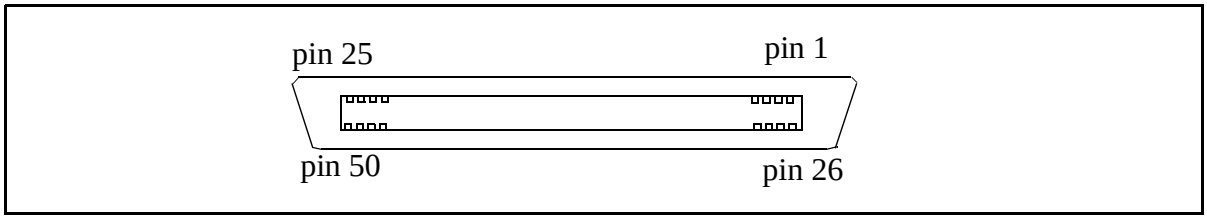

Figure 4. Vidar-5x16-PCI Centronics Connector.

TABLE 4. Vidar-5x16-PCI Centronics Connector Pin Assignments

Pin	Signal	Pin	Signal
1	Codec-0, Speaker (+)	26	Codec-0, Speaker (-)
2	Codec-0, Handset Microphone Ground	27	Codec-0, Handset Microphone (+)
3	Reserved	28	Reserved
4	Codec-1, Speaker (+)	29	Codec-1, Speaker (-)
5	Codec-1, Handset Microphone Ground	30	Codec-1, Handset Microphone (+)
6	Reserved	31	Reserved
7	Codec-2, Speaker (+)	32	Codec-2, Speaker (-)
8	Codec-2, Handset Microphone Ground	33	Codec-2, Handset Microphone (+)
9	Reserved	34	Reserved
10	Codec-3, Speaker (+)	35	Codec-3, Speaker (-)
11	Codec-3, Handset Microphone Ground	36	Codec-3, Handset Microphone (+)
12	Reserved	37	Reserved
13	Reserved	38	Reserved
14	Reserved	39	Reserved
15	Reserved	40	Reserved
16	Reserved	41	Reserved
17	Reserved	42	Reserved
18	Reserved	43	Reserved
19	Reserved	44	Reserved
20	Reserved	45	Reserved
21	Reserved	46	Reserved
22	Reserved	47	Reserved
23	Reserved	48	Reserved
24	Reserved	49	Reserved
25	Reserved	50	Reserved

Although Vidar-5x16-PCI is delivered with the RJ-11 Harmonica module, the modular structure of Vidar-5x16-PCI allows it to be adapted for other types of connectors as well. For example, if the application requires BNC or Bantam type connectors, the Harmonica module can be replaced with another type of adapter which converts from Centronics to BNC or Bantam type connectors. The pin-outs of the Centronics and the RJ-11 connectors are documented in Figure 5 and in Table 5.

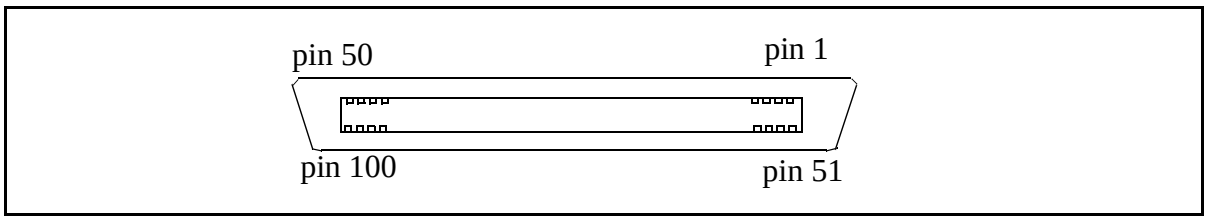

Figure 5. Vidar-5x16-PCI Centronics Connector.

TABLE 5. Vidar-5x16-PCI Centronics Connector Pin Assignments

Pin	Signal	Pin	Signal
1	Codec-0, Speaker (+)	100	Codec-0, Speaker (-)
2	Codec-0, Handset Microphone (+)	99	Codec-0, Handset Microphone Ground
3	Codec-1, Speaker (+)	98	Codec-1, Speaker (-)
4	Codec-1, Handset Microphone (+)	97	Codec-1, Handset Microphone Ground
5	Codec-2, Speaker (+)	96	Codec-2, Speaker (-)
6	Codec-2, Handset Microphone (+)	95	Codec-2, Handset Microphone Ground
7	Codec-3, Speaker (+)	94	Codec-3, Speaker (+)
8	Codec-3, Handset Microphone (+)	93	Codec-3, Handset Microphone Ground
9	Reserved	92	Reserved
10	Reserved	91	Reserved
11	Reserved	90	Reserved
12	Reserved	89	Reserved
13	Reserved	88	Reserved
14	Reserved	87	Reserved
15	Reserved	86	Reserved
16	Reserved	85	Reserved
17	Reserved	84	Reserved
18	Reserved	83	Reserved
19	Line Interface 0 (Tip)	82	Line Interface 0 (Ring)
20	Line Interface 1 (Tip)	81	Line Interface 1 (Ring)
21	Line Interface 2 (Tip)	80	Line Interface 2 (Ring)

TABLE 5. Vidar-5x16-PCI Centronics Connector Pin Assignments

Pin	Signal	Pin	Signal
22	Line Interface 3 (Tip)	79	Line Interface 3 (Ring)
23	Line Interface 4 (Tip)	78	Line Interface 4 (Ring)
24	Line Interface 5 (Tip)	77	Line Interface 5 (Ring)
25	Line Interface 6 (Tip)	76	Line Interface 6 (Ring)
26	Line Interface 7 (Tip)	75	Line Interface 7 (Ring)
27	Line Interface 8 (Tip)	74	Line Interface 8 (Ring)
28	Line Interface 9 (Tip)	73	Line Interface 9 (Ring)
29	Line Interface 10 (Tip)	72	Line Interface 10 (Ring)
30	Line Interface 11 (Tip)	71	Line Interface 11 (Ring)
31	Line Interface 12 (Tip)	70	Line Interface 12 (Ring)
32	Line Interface 13 (Tip)	69	Line Interface 13 (Ring)
33	Line Interface 14 (Tip)	68	Line Interface 14 (Ring)
34	Line Interface 15 (Tip)	67	Line Interface 15 (Ring)
35	Line Interface 16 (Tip)	66	Line Interface 16 (Ring)
36	Line Interface 17 (Tip)	65	Line Interface 17 (Ring)
37	Line Interface 18 (Tip)	64	Line Interface 18 (Ring)
38	Line Interface 19 (Tip)	63	Line Interface 19 (Ring)
39	Line Interface 20 (Tip)	62	Line Interface 20 (Ring)
40	Line Interface 21 (Tip)	61	Line Interface 21 (Ring)
41	Line Interface 22 (Tip)	60	Line Interface 22 (Ring)
42	Line Interface 23 (Tip)	59	Line Interface 23 (Ring)
43	Line Interface 24 (Tip)	58	Line Interface 24 (Ring)
44	Line Interface 25 (Tip)	57	Line Interface 25 (Ring)
45	Line Interface 26 (Tip)	56	Line Interface 26 (Ring)
46	Line Interface 27 (Tip)	55	Line Interface 27 (Ring)
47	Line Interface 28 (Tip)	54	Line Interface 28 (Ring)
48	Line Interface 29 (Tip)	53	Line Interface 29 (Ring)
49	Line Interface 30 (Tip)	52	Line Interface 30 (Ring)
50	Line Interface 31 (Tip)	51	Line Interface 31 (Ring)

The RJ-11 pin-outs for the Handsets are shown in Figure 6.

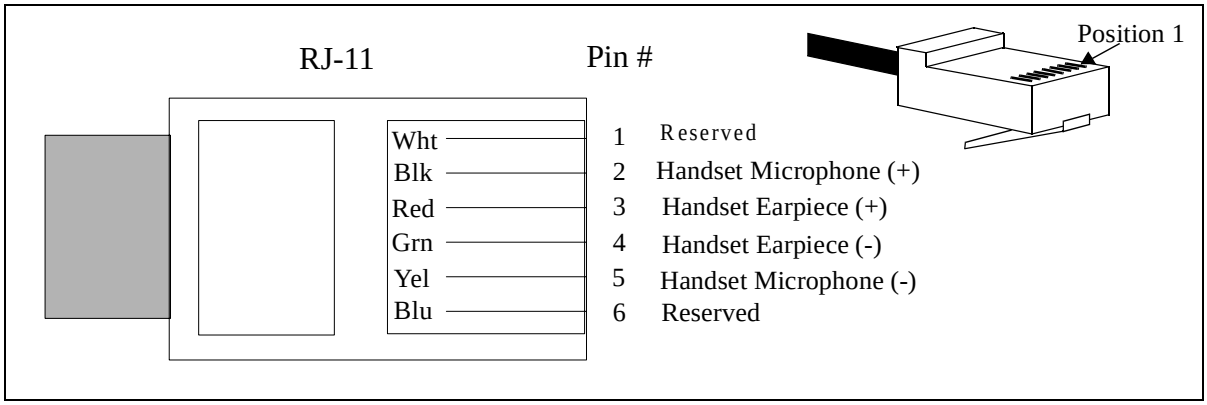

Figure 6. Vidar-5x16-PCI RJ-11 Connector for the Handsets.

6.1.4 OTX ASM Interface

The Vidar-5x16-PCI board contains an OTX ASM (Application Specific Module) Interface (Reference Designators BJ5 and BJ6). The ASM Interface can be used to attach a daughter board modules to the Vidar-5x16-PCI board. The ASM daughter boards can be used to add additional DSP or other resources to the Vidar-5x16-PCI adapter.

6.1.5 JTAG Interface

The JTAG port (reference designator BJ3) are used for:

- Board Testing
- Programming of Complex Programmable Logical Devices (CPLDs)
- Connecting the DSP emulator board for DSP Software Development.

For more information on how to use the JTAG port and the DSP emulator, please refer to *Programmer's Guide for OTX C54x DSP Software Development Kit* (Odin document number 1412-1-SAA-1007-1).

6.2 Data Architecture

Internally, Vidar-5x16-PCI utilizes serial TDM (Time-Division Multiplexed) data streams for transfer of data or voice. The internal serial TDM data streams are called "Highways." External interfaces are called spans.

The serial highways provide data paths between physical devices as shown in Figure 7. If the physical device connects to more than one highway, the device specific highway port number is also shown in Figure 7.

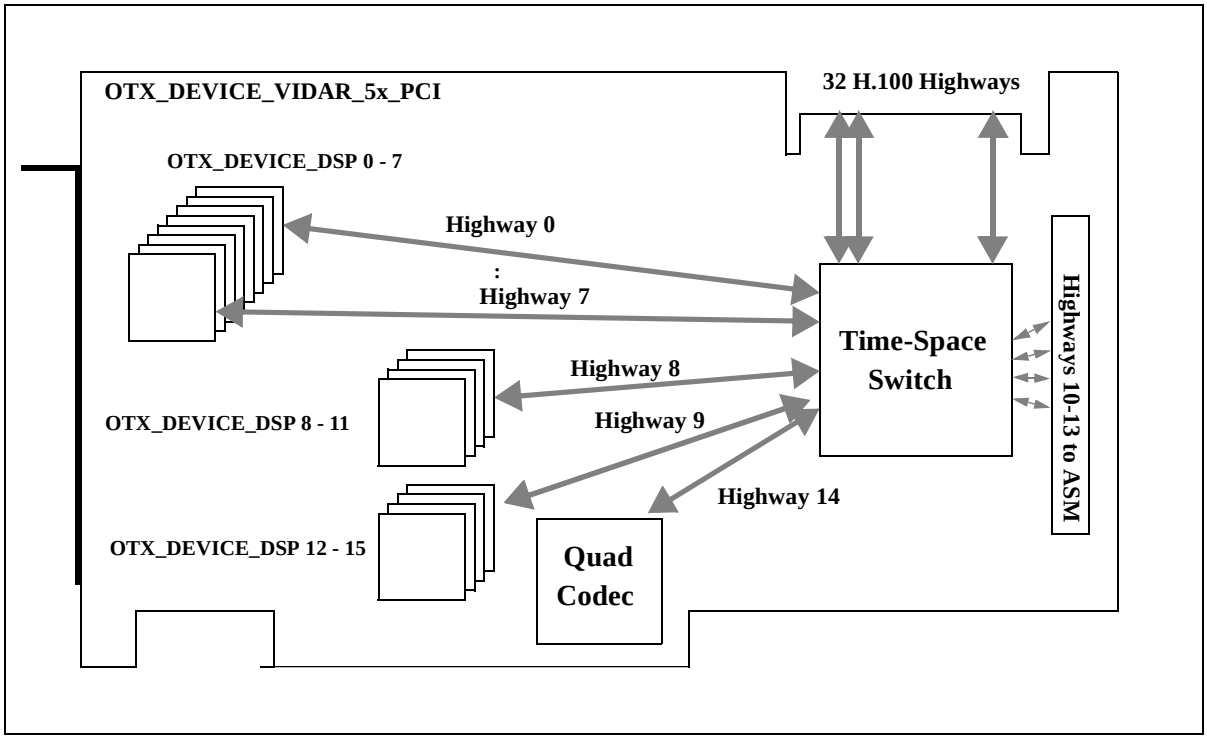

Figure 7. Vidar-5x16-PCI Highway Connections.

The Vidar-5x16-PCI internal highways are configured to operate at 2.048 Mbit/s, each containing 32 8-bit time-slots. The data rate of one time-slot is 64 kbit/s. Table 7 lists the internal highways used on Vidar-5x16-PCI boards.

TABLE 6. Vidar-5x16-PCI Highway Connections

Highway #	Connecting Time-Space Switch to
0 - 7	DSP #0 - DSP #7, one highway each
8	DSP#8 - DSP#11 share highway #8. Each uses 8 of 32 time-slots.
9	DSP#12 - DSP#15 share highway #9. Each uses 8 of 32 time-slots.
10-13	ASM Daughter Board
14	Quad Codec
15	Reserved

The time-space switch in non-blocking and allows any internal time-slot on any internal highway to be switched to any other highway/time-slot. The cross-connections are software programmable and automatically taken care of by the OTX driver.

In addition to the internal highways, Vidar-5x16-PCI supports 32 external H.100 highways.

The Vidar-5x16-PCI time-space also provides support for multicasting and messaging. In multicasting any input channel can be cross-connected to multiple output channels. For example, an incoming Li time slot can be both switched to an outgoing H.100 Highway and it can also be switched to the Codec or ASM board.

In the messaging mode, the time-space switch can be instructed to send a constant byte on any time slot. Once activated, every byte on the specified time slot will contain the same value. The generation of constant byte does not consume any processing capacity.

The DSPs on Vidar-5x16-PCI are connected to the local highway through their buffered serial ports. However, in addition to the buffered serial port, each TMS320C548 DSP also provides a Time Division Multiplexed (TDM) serial port which is ideal for DSP to DSP communication. Up to 8 DSPs can be connected together using the TDM serial ports. On Vidar-5x16-PCI, two groups of 8 DSPs are connected together as shown in Figure 8. The DSP to DSP communication channels can be used to transmit serial data between DSPs or to establish allow DSPs to control each other through a user defined control protocol.

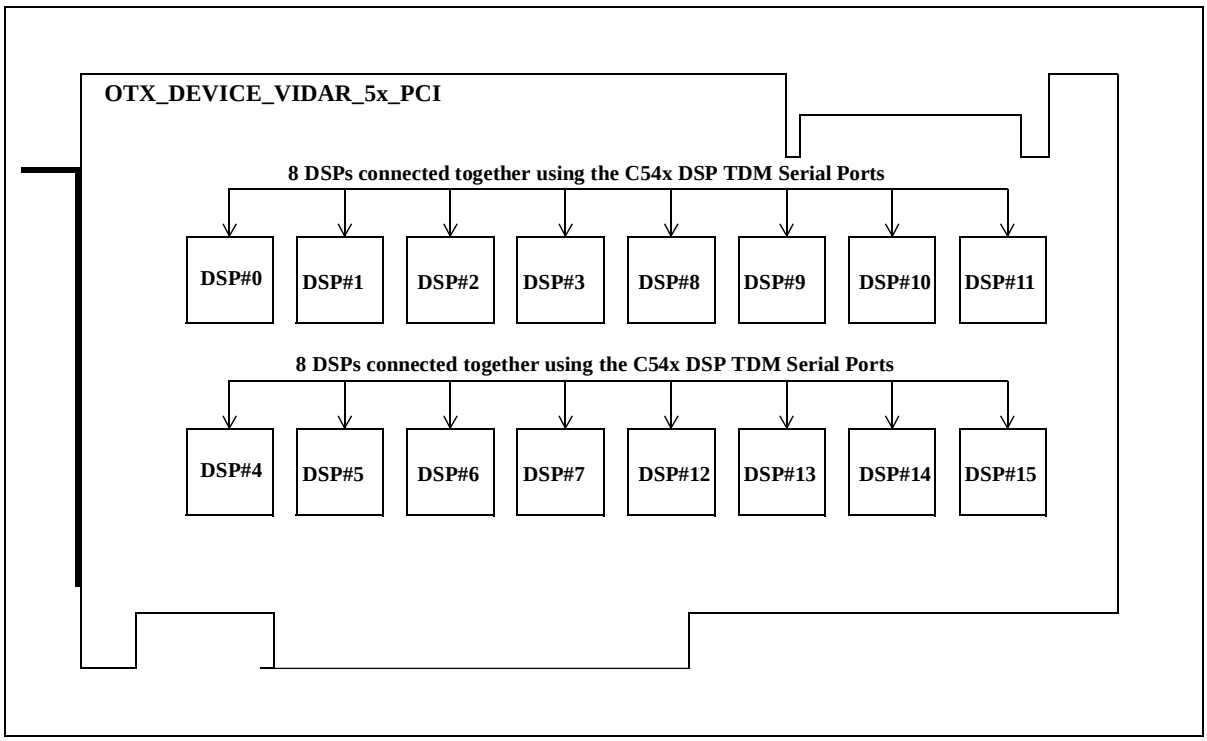

Figure 8. Vidar-5x16-PCI DSP-to-DSP TDM Serial Port Connections.

6.3 Control Architecture

The host PC can control the physical and logical devices on the Vidar-5x16-PCI board through the PCI bus. The Vidar-5x16-PCI control architecture is illustrated in Figure 9.

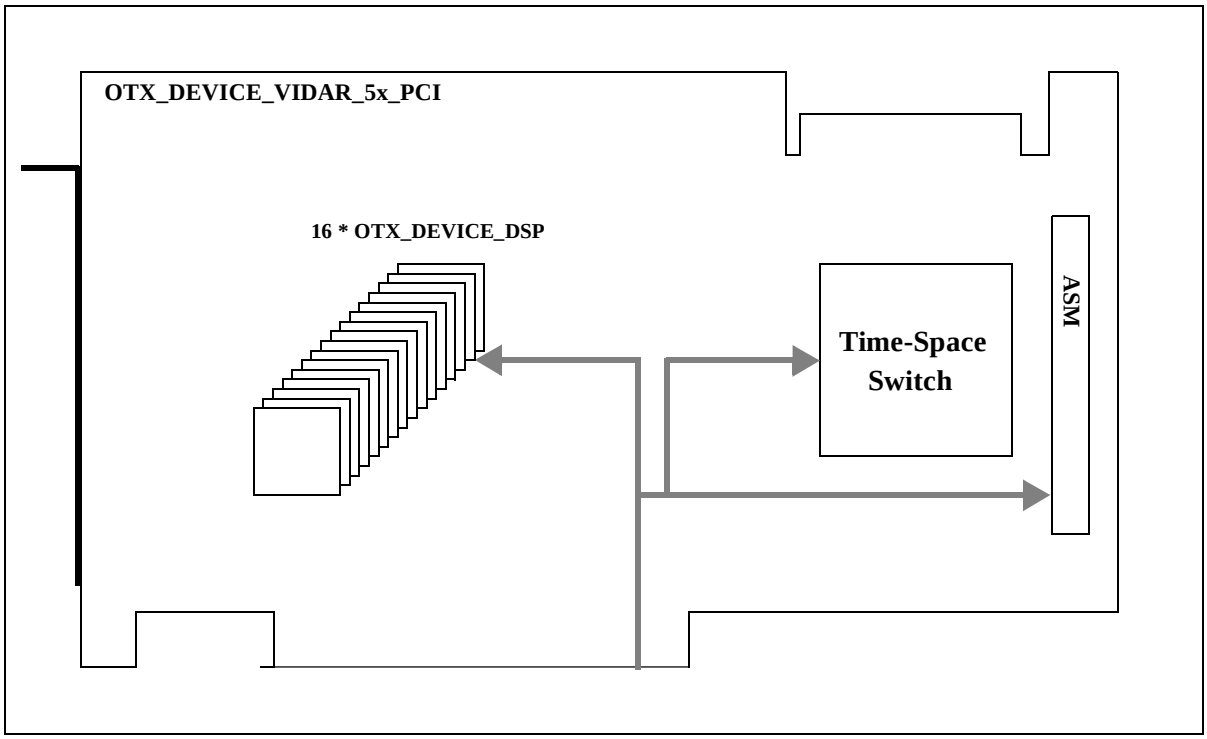

Figure 9. Vidar-5x16-PCI Control Architecture.

6.4 Clock Architecture

On the Vidar-5x16-PCI board all the internal TDM data highways and the all the devices processing TDM data are synchronized to one clock reference. The clock reference can be derived from multiple sources and then switched to all the devices. The clocking sources supported by Vidar-5x16-PCI are illustrated in Figure 10 and listed in Table 7.

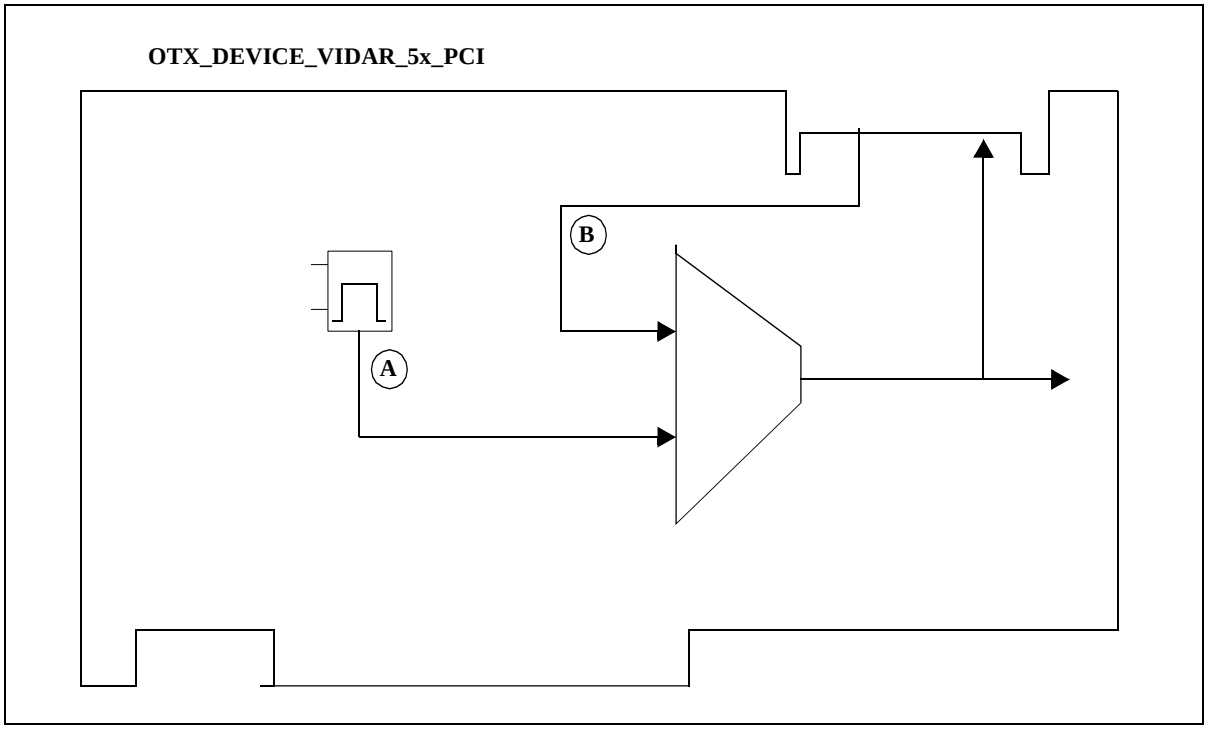

Figure 10. Vidar-5x16-PCI Clock Architecture Overview.

TABLE 7. Vidar-5x16-PCI Clocking Sources.

Clock Source	Description
A	On-board free running oscillator.
B	H.100 Reference Clock

6.5 Logical Subsystems

The logical subsystem view describes the logical design subsystems within the Vidar-5x16-PCI adapter. Each subsystem can comprise hardware, firmware, and driver or on-board processor software. The Vidar-5x16-PCI consists of three subsystems:

1. Processor Subsystem
2. Switching Subsystem
3. Codec Subsystem

6.5.1 Processor Subsystem

The processor subsystem contains 16 Texas Instruments TMS320C548 Digital Signal Processors. Each DSP also contains 64 kWords (128 kBytes) of external Static Random Access Memory (SRAM). In addition, the processor subsystem provides 16 LEDs (one per DSP) which can be turned on and off under DSP software control. The LEDs are typically used as heart-beat indicators (blinked on and off by the DSP application) displaying to the user whether each DSP is up and running (LED blinking) or not (LED steady).

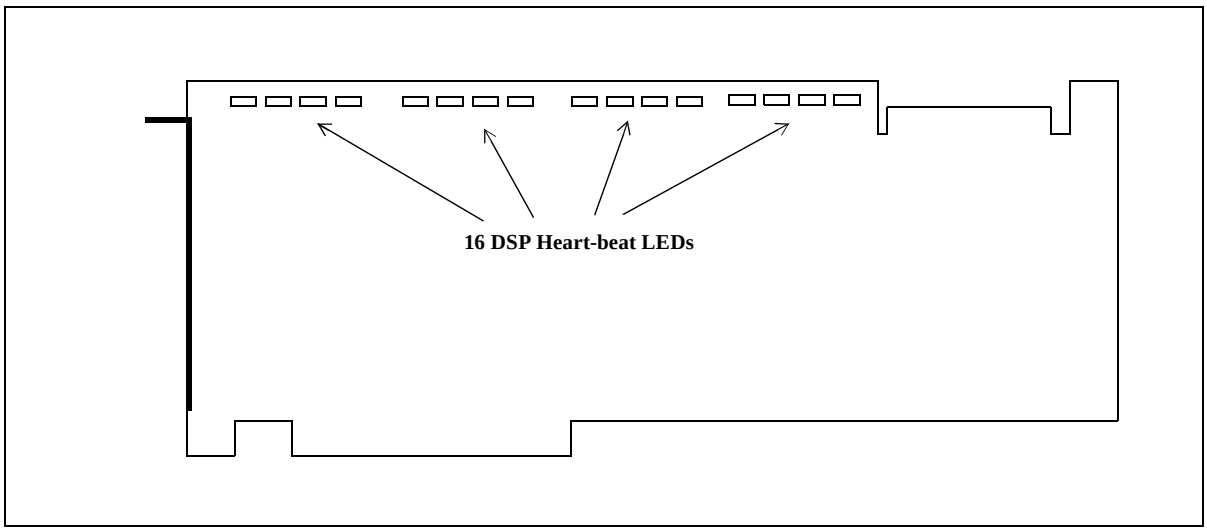

Figure 11. Vidar-5x16-PCI DSP Heart-beat LEDs.

6.5.2 Switching Subsystem

The switching subsystem provides a time-space switch for the switching of any incoming time/slot to any outgoing time slot. This subsystem is also responsible for delivering and switching of the on-board clock signals. The switching subsystem has already been covered in Chapter 6.2: "Data Architecture" and Chapter 6.4: "Clock Architecture".

6.5.3 Codec Subsystem

The Vidar-5x16-PCI board contains four codecs allowing the user to listen in on any 4 internal time-slots. The codecs convert four digital Pulse Code Modulated (PCM) time-slots into analog electrical signals. The analog signals from the codecs can then be connected to standard telephone handsets through connectors 1 - 4 in the Harmonica.

The Vidar-5x16-PCI codecs support both A-law and u-law for the Analog-to-Digital and Digital-to-Analog conversions. The conversion law to be used can be selected by software.

Codec #0 is permanently connected to time-slot 1 (0 count) on the Internal Highway #14. Codecs 1 - 3 are connected to time-slots 2 - 4, respectively. The time-space switch can be used to cross-connect the codecs into any incoming or outgoing time-slot in the Line Interface, ASM, or H.100 Highways.

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