Synway CTI Series

SHD-30E/60E-CT/PCIe
SHD-30E/60E-CT/PCIe/EC
SHD-30E/60E-CT/PCIe/FAX
SHD-120E/240E-CT/PCIe
SHD-120E/240E-CT/PCIe/EC
SHD-120E/240E-CT/PCIe/FAX
Digital Trunk Board

Hardware Manual

Version 1.0

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0	2009.10	Initial publication

Note: Please visit our website http://www.synway.net to obtain the latest version of this document.

Chapter 1 Overview

The CTI Series SHD E-type boards are digital trunk voice boards with PCIe bus, and have almost all functions needed for call/voice processing systems which are connected to them through E1/T1/J1 trunks. These boards are designed with the enhanced capability in echo cancellation and the DMA Read and Write function which speeds up the data transfer and minimizes the cost of CPU, further improving the system performance.

1.1 Functions

- A single board accommodates 1, 2, 4 or 8 E1/T1/J1 trunks
- Supports China SS1, SS7 and ISDN connections in E1/T1 mode
- Supports phone calling and voice processing
- Activity/silence detection
- Automatic Gain Control (AGC) support in recording operation
- Enhanced echo cancellation
- Up to 64 fax channels optional on a single board
- Allows DTMF transmission and detection during voice recording or playback
- Includes H.100 bus, compatible with MVIP, SC and ST buses, facilitating smooth connectivity to third-party boards with H.100 bus for the transfer of acquired voice signals to other devices
- The flexible distributed conferencing system sets no limit on the number of simultaneous conferences and participants in each conference, allows monitoring and recording of the whole conference and each individual speaker
- The on-board lightning-proof circuit reaches the telecom standard and surely eliminates the damage caused by lightning
- Equipped with the EMI circuit, effectively preventing the electromagnetic interference
- Each board has a unique hardware serial number written in the firmware to distinguish itself from other boards and prevent piracy. The number is available via an easy function call with applications
- The on-board authorization code identification circuit is designed for software safety. Users can apply to our company for the authorization code
- Compatible with other series of voice boards from Synway

1.2 Features

- **PCIe Bus Support**

  Includes PCIe 1.0a bus and PCIe x1 interface, applicable to various PCIe slots; supports the PNP (plug and play) feature.

- **DMA Read and Write**

  Uses the DMA technology based on PCI bus to read and write data, greatly reducing the CPU cost.

- **E1/T1/J1 Support**

  Provides an easy selection of the E1, T1 or J1 trunk and its matching impedance via software reconfiguration, not requiring any change in the hardware.

- **Signaling Interface**

  SS1 provides two levels of interfaces respectively for MFC transmission/receipt and SS1 connection; SS7 provides two levels of interfaces respectively for MTP and TUP/ISUP, meeting various customer requirements.

- **Signaling Processing**

  Installed with loadable signaling processing modules, each board supports SS1, SS7 and ISDN, eliminating the need for extra signaling boards. The signaling processing program can be upgraded via a simple software configuration, without having to change the hardware.

- **Signaling Links**

  Each board supports up to 8 signaling links and the signaling hot-backup feature, i.e. the signaling can be processed by the standby server whenever something is wrong with the links being used, which increases the flexibility and reliability in a great extent. All the timeslots ranging from 1 to 31, not only TS16, can be used for SS7 and ISDN signalings.

- **Programmable Tone Detector**

  Detects single or dual tones at any frequency, offering facility for use with a variety of PBXes and key telephone systems.

- **Software-based Terminal Matching**

  A single board supports several kinds of trunks which differ in impedance. They are 100Ω T1, 110Ω J1 and 120Ω E1 twisted-pair cables and 75Ω E1 coaxial cable. Both transmit and receive terminals on the board are specified via software configurations, facilitating easy connections to a variety of digital trunks and optical transceivers.

- **Specialized Driver Algorithm**

  The driver uses SPECDial - a specialized driver algorithm - to perform a complete

automatic dial process through digital trunks and to accurately identify the called-party status.

- **Echo Cancellation**

  The self-adaptive echo cancellation feature effectively eliminates echoes under various conditions, which cancels out the effect of voice playback on DTMF and busy tone detection, avoids self-excited oscillation and howling, and minimizes the possibility of registering wrong DTMF and busy tones in a conference call. Among the products introduced in this file, the SHD-30/60E-CT/PCIe/EC, SHD-120/240E-CT/PCIe/EC, SHD-30/60E-CT/PCIe/FAX, SHD-120E-CT/PCIe/FAX boards have an increased capability in echo cancellation and offer a much better effect in this aspect.

- **Barge in**

  Supports the Barge-in feature.

- **Various CODECs Support**

  Offers a large selection of voice CODECs, including hardware-based A-Law (G.711), μ-Law, IMA ADPCM and software-based 16-bit linear PCM, MP3.

- **Supports WAV File**

  The recorded voice files can be edited and played by audio tools such as Cooledit.

- **Synway's Unified SynCTI Driver Development Platform**

  Synway owns the intellectual property rights for the unified high-intelligence SynCTI driver development platform. Each system supports up to 2048 channels. The complex call procedures can be analyzed and controlled through simple function calls on the driver platform, without having to understand details.

1.3 Operation Principle

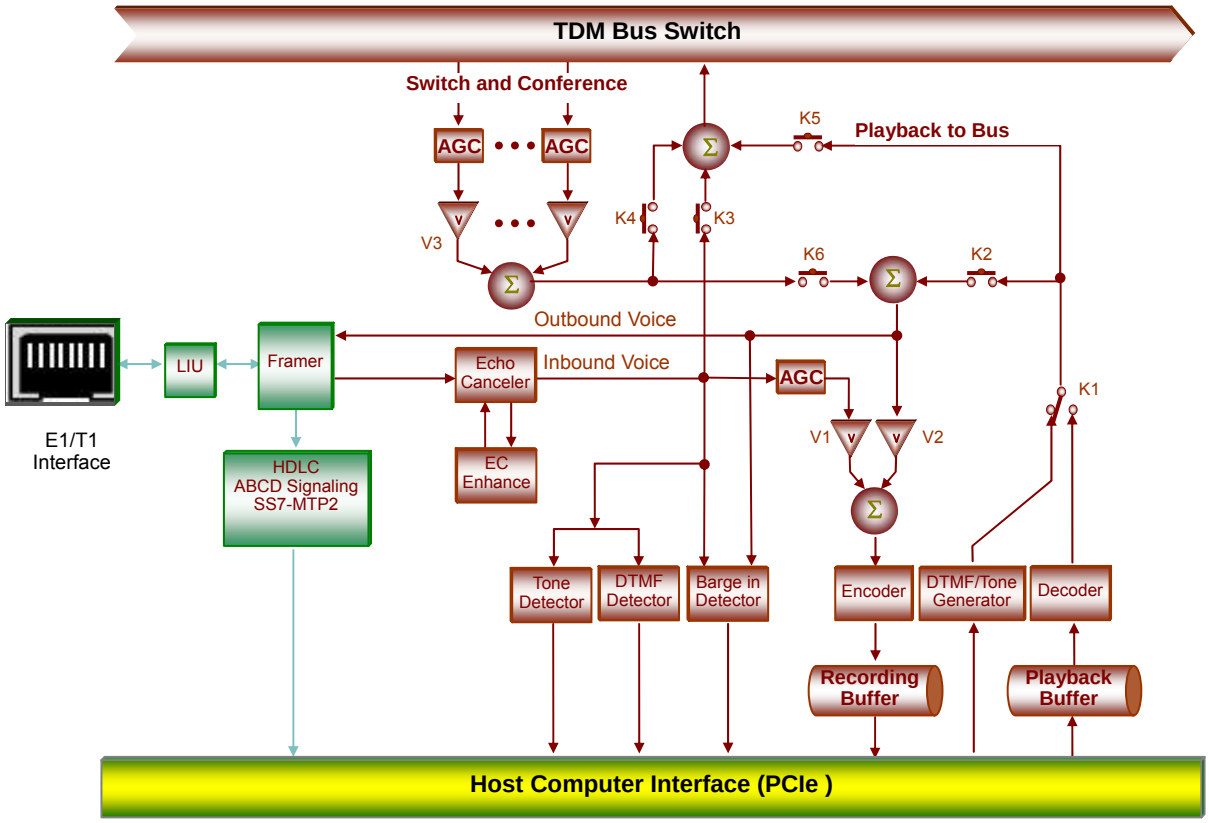

Figure 1-1 Operation Principle of SHD E-type Boards

Chapter 2 Installation

2.1 Hardware Structure

- **SHD-30E-CT/PCIe Board**

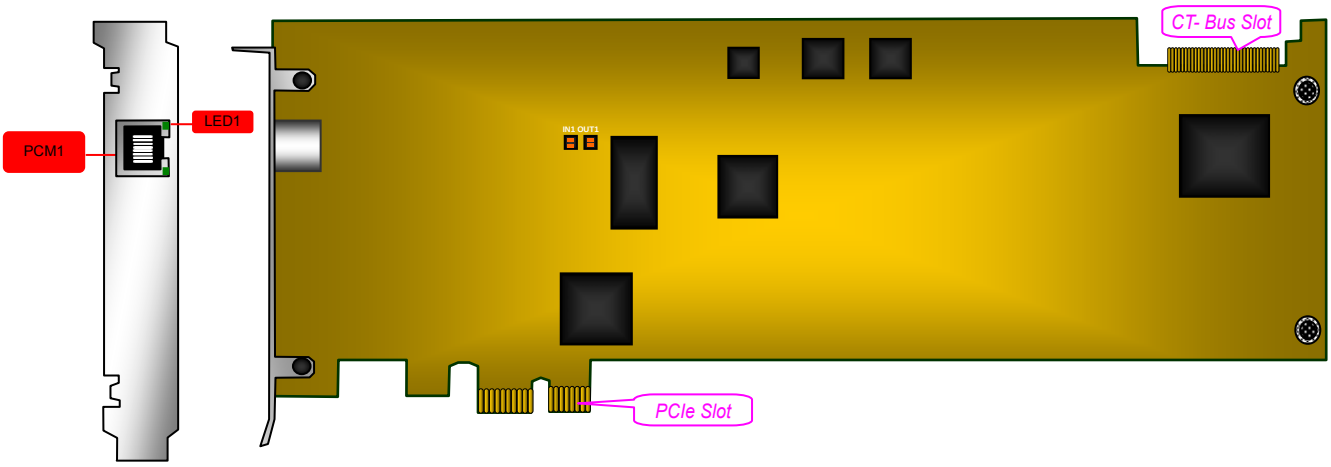

Figure 2-1 Left and Front Views

- **SHD-30E-CT/PCIe/EC Board**

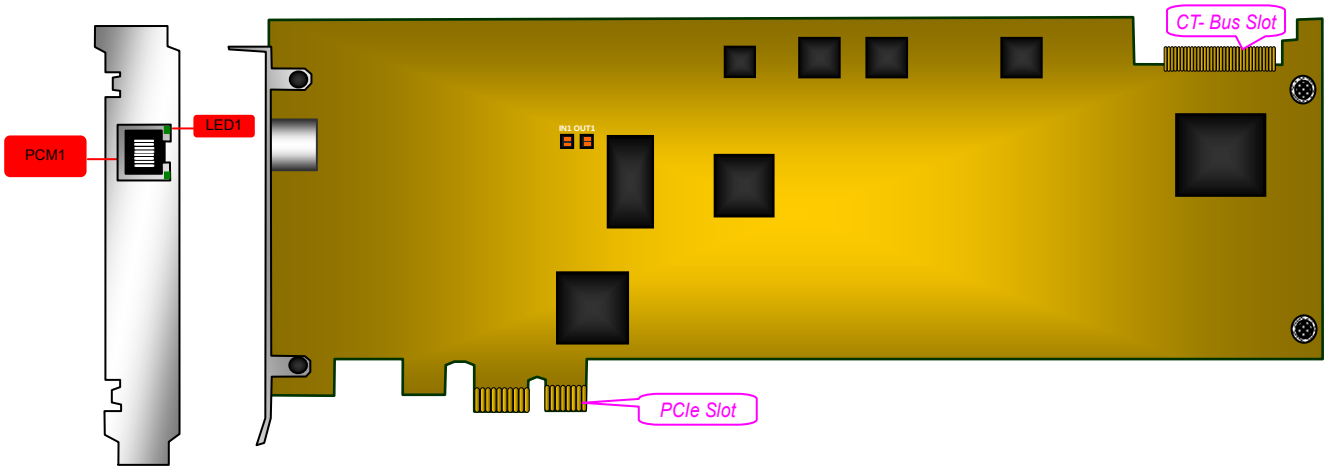

Figure 2-2 Left and Front Views

- **SHD-30E-CT/PCIe/FAX Board**

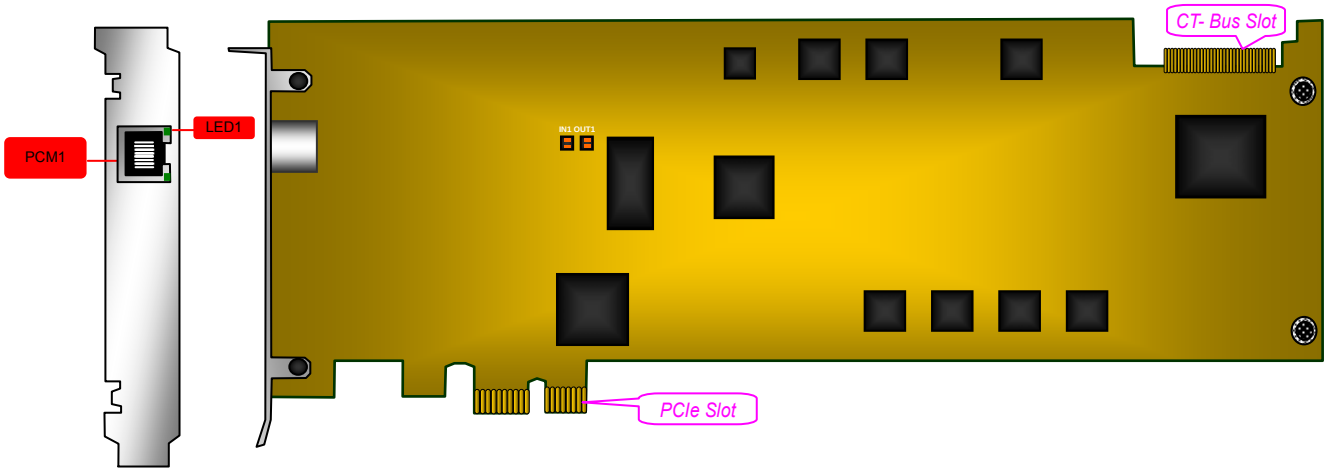

Figure 2-3 Left and Front Views

Notes:

1. In Figure 2-1 and Figure 2-3, PCM1 indicates a trunk interface while LED1 represents its synchronization indicator;
2. IN1 and OUT1 refer to the grounding jumpers respectively at the receiving and transmitting ends for PCM1.

- **SHD-60E-CT/PCIe Board**

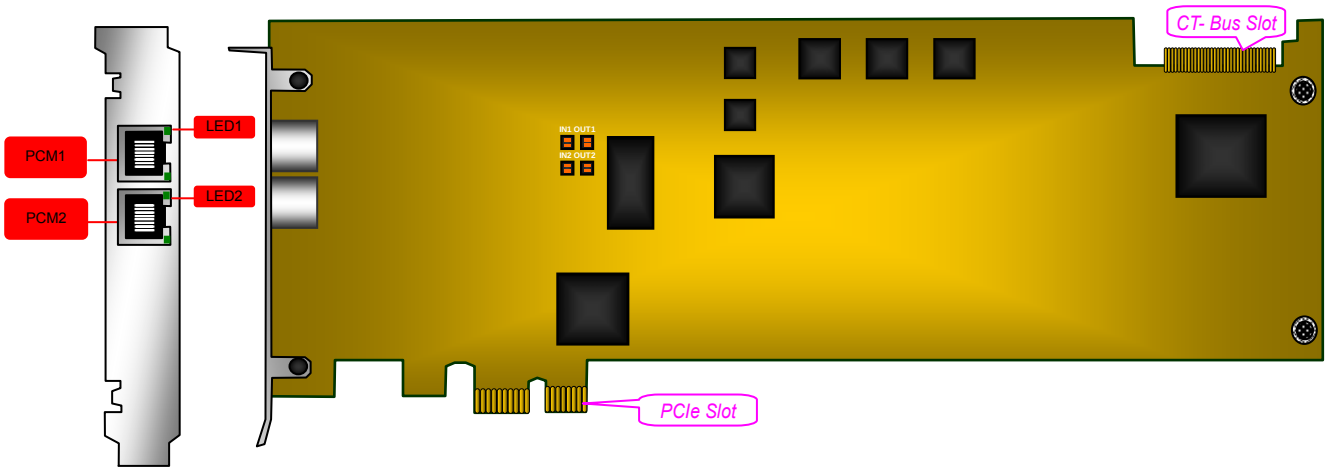

Figure 2-4 Left and Front Views

- **SHD-60E-CT/PCIe/EC Board**

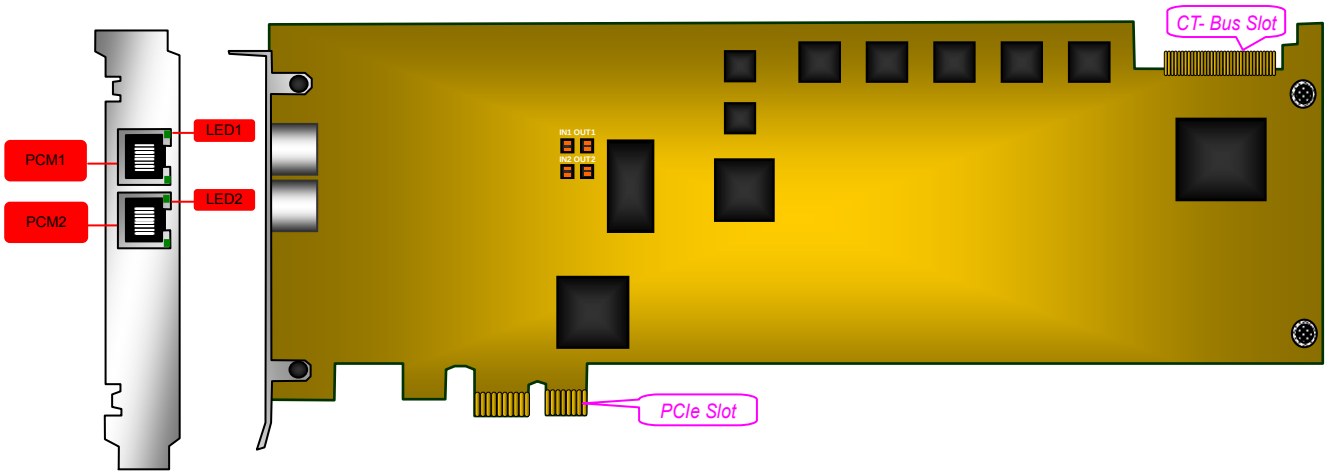

Figure 2-5 Left and Front Views

- **SHD-60E-CT/PCIe/FAX Board**

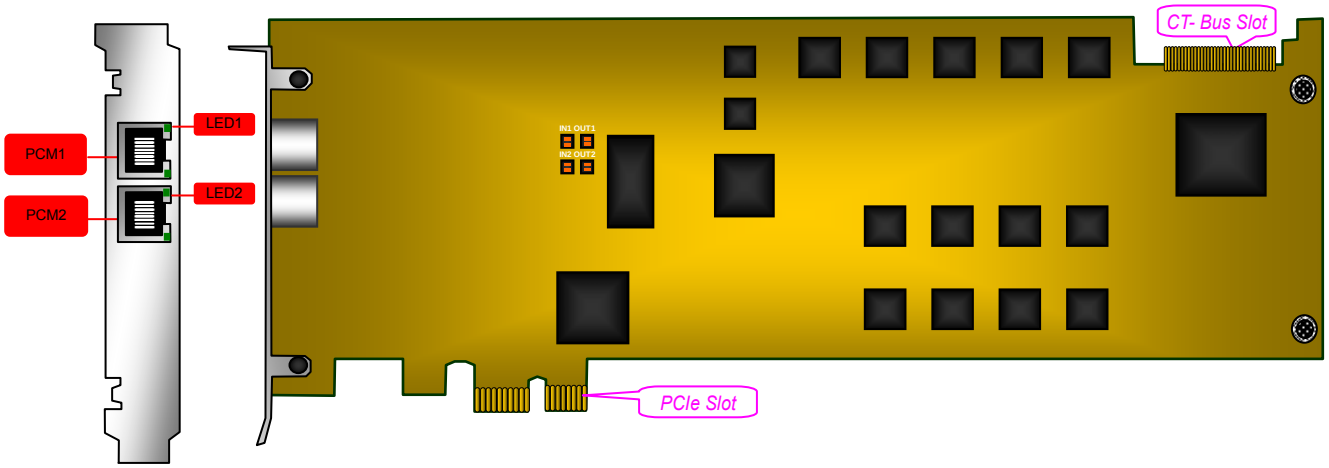

Figure 2-6 Left and Front Views

Notes:

1. In Figure 2-4 and Figure 2-6, PCM1～PCM2 indicate 2 trunk interfaces while LED1～LED2 represent their synchronization indicators;
2. INm and OUTm refer to the grounding jumpers respectively at the receiving and transmitting ends for PCM(m), m＝1～2.

- **SHD-120E-CT/PCIe Board**

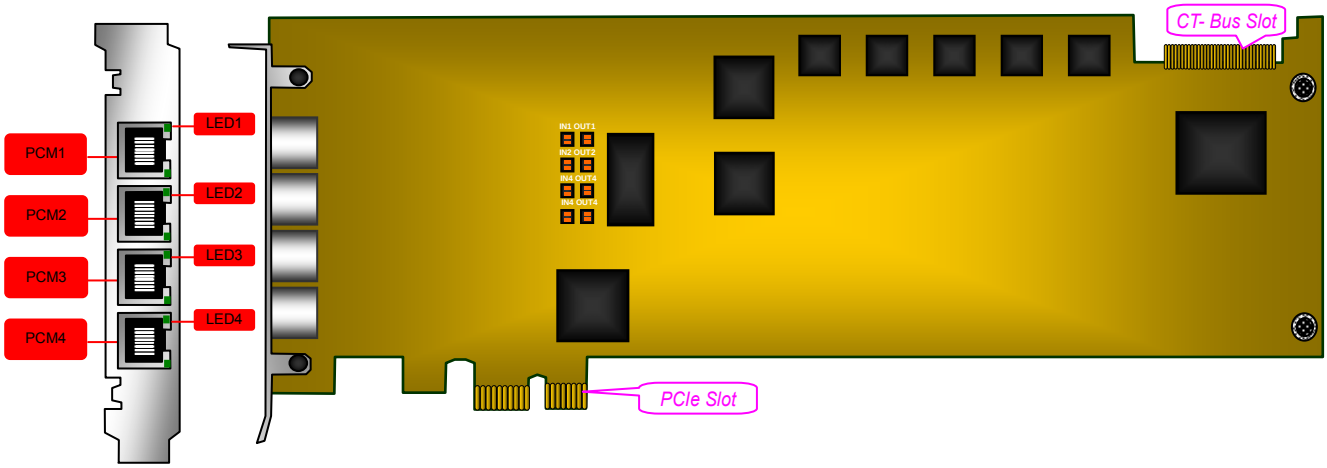

Figure 2-7 Left and Front Views

- **SHD-120E-CT/PCIe/EC Board**

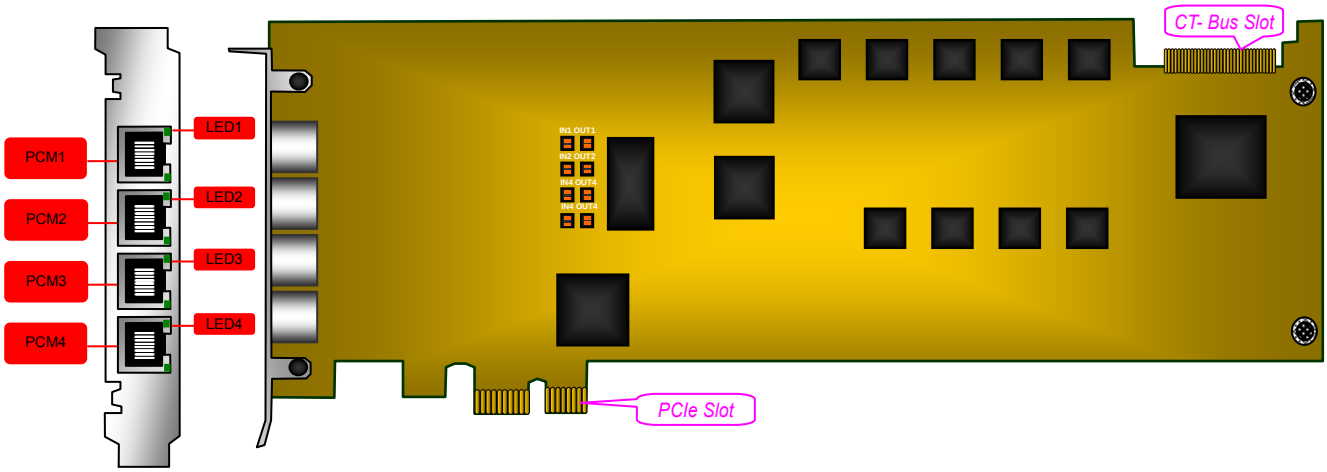

Figure 2-8 Left and Front Views

- **SHD-120E-CT/PCIe/FAX Board**

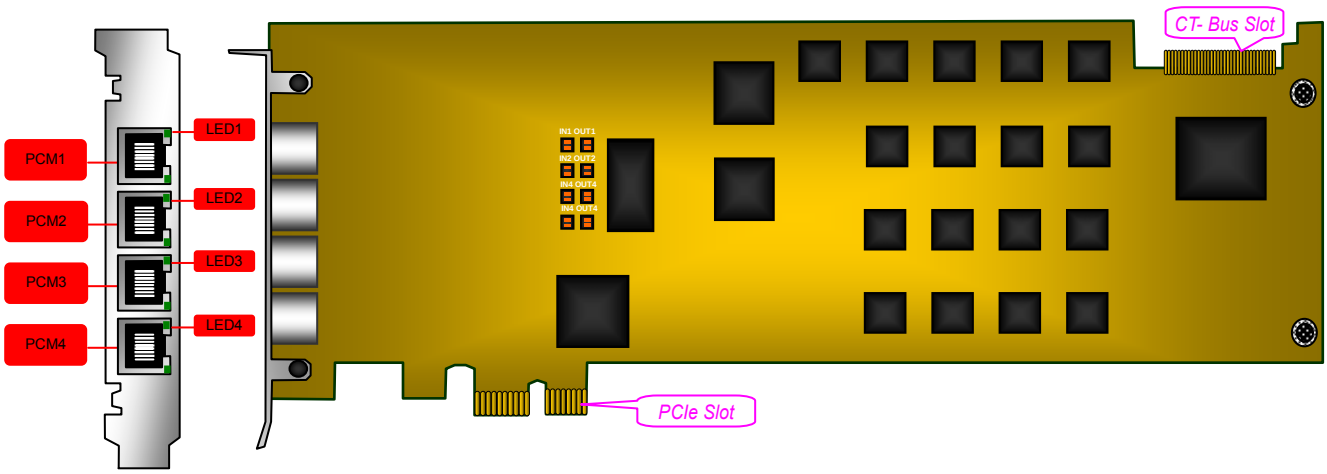

Figure 2-9 Left and Front Views

Notes:

1. In Figure 2-7 and Figure 2-9, PCM1～PCM4 indicate 4 trunk interfaces while LED1～LED4 represent their synchronization indicators;
2. INm and OUTm refer to the grounding jumpers respectively at the receiving and transmitting ends for PCM(m), m＝1～4.

- **SHD-240E-CT/PCIe Board**

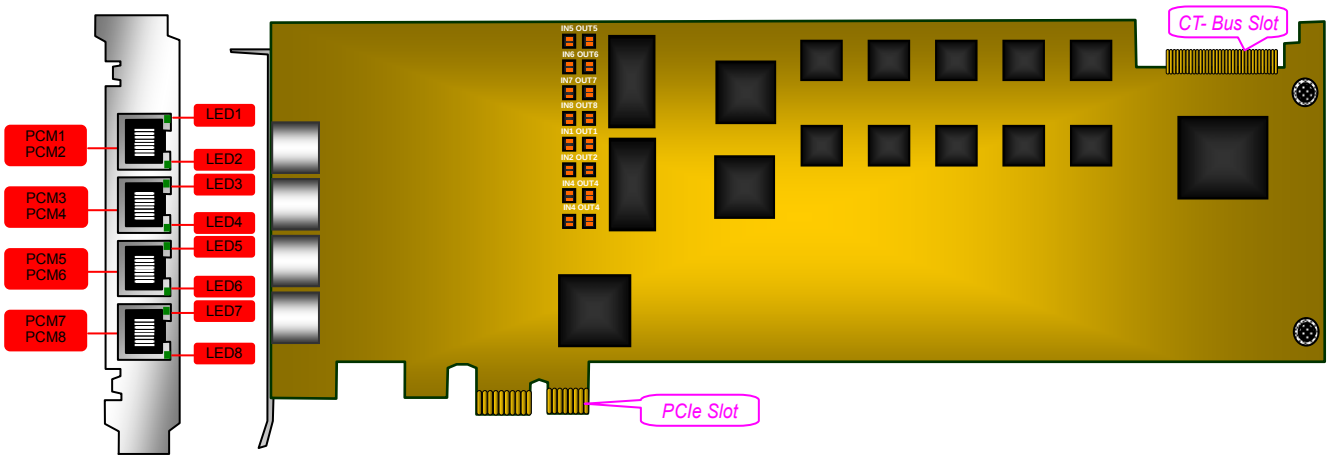

Figure 2-10 Left and Front Views

- **SHD-240E-CT/PCIe/EC Board**

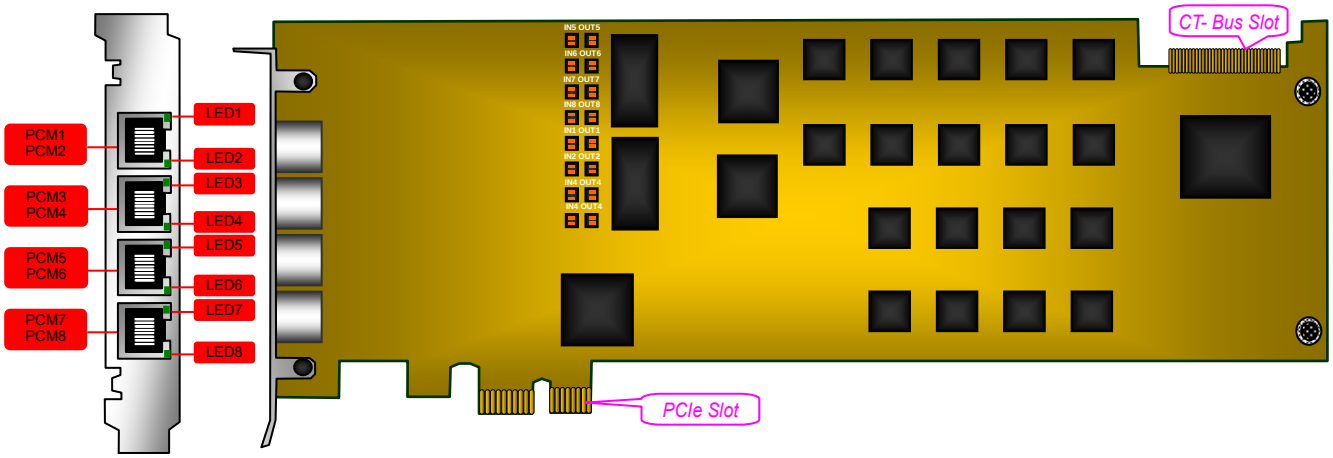

Figure 2-11 Left and Front Views

- **SHD-240E-CT/PCIe/FAX Board**

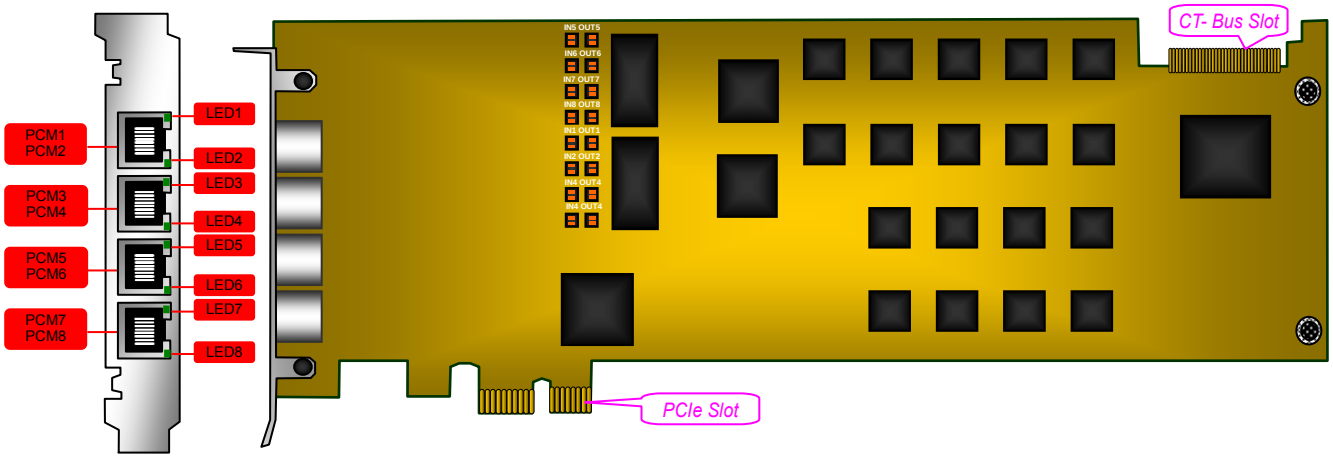

Figure 2-12 Left and Front Views

Notes:

1. In Figure 2-10 and Figure 2-12, PCM1～PCM8 indicate 8 trunk interfaces while LED1～LED8 represent their synchronization indicators;
2. INm and OUTm refer to the grounding jumpers respectively at the receiving and transmitting ends for PCM(m), m＝1～8.

- **SHD E-type Boards**

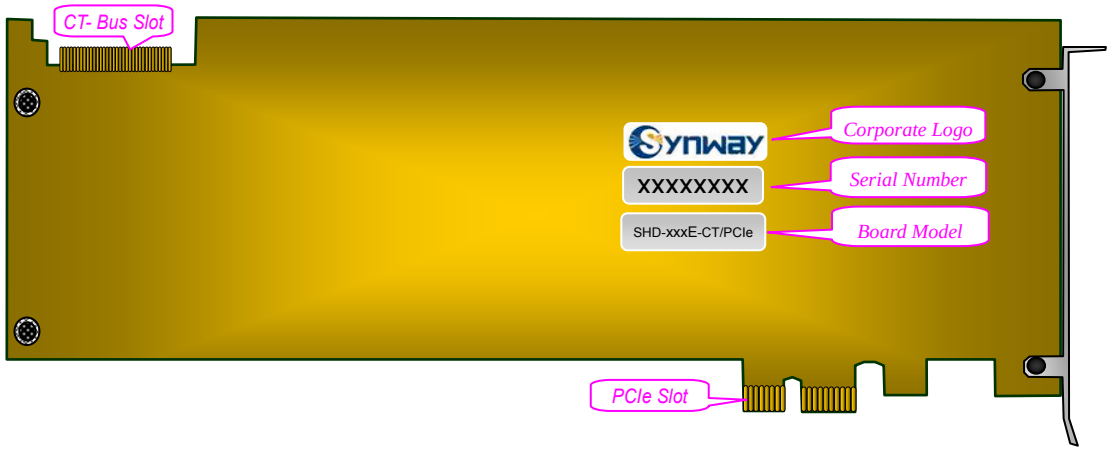

Figure 2-13 Rear View

Note:

1. Here above illustrates the hardware structure of Synway SHD series E-type boards. Always check the label on the back of a board to get the exact board model.
2. See Table 2-1 below for detailed information about the synchronization indicators of on-board trunk interfaces mentioned above.

LED	Lamp Status	Implication
Green Lamps	ON	synchronous
	OFF	asynchronous

	Flash	synchronous but unsteady

Table 2-1 On-board Synchronization Indicators

3. Interfaces on these boards are all RJ48C connectors. Users may convert them into BNC connectors by using the RJ48C-to-BNC adapter supplied with the board. Board models introduced in this file are all listed below.

No.	Model	Trunk	Physical Interface
1	SHD-30E-CT/PCIe	1E1/T1/J1	1 Common RJ48C
2	SHD-30E-CT/PCIe/EC	1E1/T1/J1	1 Common RJ48C
3	SHD-30E-CT/PCIe/FAX	1E1/T1/J1	1 Common RJ48C
4	SHD-60E-CT/PCIe	2E1/T1/J1	2 Common RJ48C
5	SHD-60E-CT/PCIe/EC	2E1/T1/J1	2 Common RJ48C
6	SHD-60E-CT/PCIe/FAX	2E1/T1/J1	2 Common RJ48C
7	SHD-120E-CT/PCIe	4E1/T1/J1	4 Common RJ48C
8	SHD-120E-CT/PCIe/EC	4E1/T1/J1	4 Common RJ48C
9	SHD-120E-CT/PCIe/FAX	4E1/T1/J1	4 Common RJ48C
10	SHD-240E-CT/PCIe	8E1/T1/J1	4 Special RJ48C
11	SHD-240E-CT/PCIe/EC	8E1/T1/J1	4 Special RJ48C
12	SHD-240E-CT/PCIe/FAX	8E1/T1/J1	4 Special RJ48C

Table 2-2 Board Model List

2.2 System Requirements

Host System Requirements

CPU: 300MHz Intel® Pentium®Ⅱ or above

Memory: 256M or more

HD: Depends on individual requirements

Supported Operating Systems

Refer to *SynCTI Programmer's Manual.pdf.*

2.3 Installation Procedure

Step 1: Configure the grounding jumpers.

Disconnect all grounding jumpers for use of the 100ΩT1, 110ΩJ1 or 120Ω E1 balanced twisted-pair cable.

In consideration of various line conditions, this series boards are equipped with two groups of grounding jumpers on each channel which respectively control the groundings of the transmitting and receiving ends. In case the 75Ω E1 unbalanced coaxial cable is used, the grounding jumpers

at the receiving end should be disconnected while those at the transmitting end should be short-circuited, provided that the PC is properly grounded. This configuration is the factory default setting and applicable to most situations so that there is usually no need to change it. If it is difficult to ground the local PC, you may short-circuit the on-board grounding jumper at the receiving end and use the transmitting end at the opposite terminal for grounding. If the receiving end at the opposite terminal is grounded (improper operation), the on-board grounding jumper at the transmitting end must be disconnected. Refer to Table 2-3 for details.

Generally speaking, even in the case of proper grounding at both terminals, only the external layer of the E1 coaxial cable at the transmitting end is allowed to be grounded. The grounding of both transmitting and receiving ends may result in a current loop with ground wires, bringing instability to signals. Therefore, such grounding must be strictly avoided.

Opposite Terminal / Local Terminal					
	Transmit End	**grounded**	**grounded**	**non-grounded**	**non-grounded**
	Receive End	**non-grounded**	**grounded**	**non-grounded**	**grounded**
PC grounded	**Transmit End**	short-circuited	disconnected	short-circuited	disconnected
	Receive End	disconnected	disconnected	short-circuited	short-circuited
PC not grounded	**Transmit End**	short-circuited	short-circuited	manage to make the PC grounded	short-circuited
	Receive End	short-circuited	disconnected		short-circuited

Table 2-3 Configuration of Grounding Jumpers for Use of 75ΩE1 Unbalanced Coaxial Cable

Step 2: Properly fit the required digital trunk board into the PCIe slot on the PC chassis.

Step 3: Connect to digital trunks.

In this series, those boards with 1~4E1/T1/J1 provide common RJ48C connectors to support direct connections to other boards, the pin layout being shown below in Figure 2-14; those with 8E1/T1/J1 provide special RJ48C connectors, the pin layout being unfolded below in Figure 2-15.

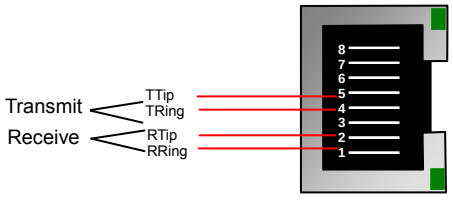

Figure 2-14 Pin Layout for Common RJ48C

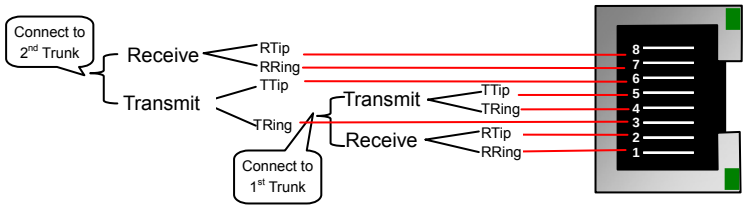

Figure 2-15 Pin Layout for Special RJ48C

When you connect those boards with 8E1/T1/J1 in this series to a digital trunk, it is necessary to convert each special RJ48C connector into 2 common RJ48C connectors. Use the 2-way hub for RJ48C to perform the conversions as shown in Figure 2-16: connect the 1st, 2nd, 4th, 5th pins of the special 8-pin RJ48C connector to the 1st, 2nd, 4th, 5th pins of the first common RJ48C connector, and the 3rd, 6th, 7th, 8th pins to the 1st, 2nd, 4th, 5th pins of the second common RJ48C connector. You are allowed to construct lines for conversion by yourself, but must follow the order in pin connection as specified above.

Figure 2-16 2-way Hub for RJ48C

When connecting a board in this series to a digital trunk, for boards with common RJ48C connectors, use the RJ48C-to-BNC adapter as shown in Figure 2-17 to convert the RJ48C connector to the BNC connector; for boards with special RJ48C connectors, use the 2-way Hub for RJ48C to convert a special RJ48C connector to two common RJ48C before using the RJ48C-to-BNC adapter.

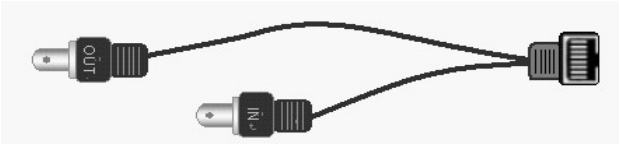

Figure 2-17 RJ48C-to-BNC Adapter

If you would like to construct lines for conversion by yourself, you should not only make the line match the on-board interface, but also ensure the correct connection of receive and transmit lines as shown in Figure 2-14.

Notes:

1) Prevent the cross connection of transmit and receive lines. Such mistake can be found out by observing the on-board synchronization indicators. If the indicator is on, that means the receive line is in a normal state; if the indicator is off or flashing, that means the receive line goes abnormal (probably due to the cross connection). However, the state of transmit lines

can not be checked via synchronization indicators but should be examined by the opposite terminal.

2) On-board synchronization indicators start working only after the PC is powered on and the board is successfully initialized.

Step 4: Connect H.100 bus interfaces on all boards by bus cable.

Skip this step if there is no need for bus exchange between multiple boards.

Notes:

1) See Figure 2-18 for correct insertion. Do not twist or insert in the opposite direction.

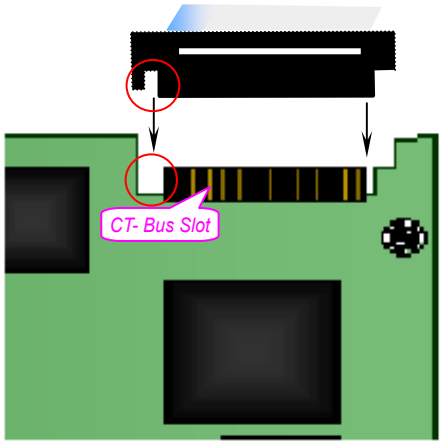

Figure 2-18 Connection of H.100 Bus

2) There are two clock settings for voice boards: When between-board bus exchange is not required, each board sets its own clock and may not be connected to the bus cable; otherwise, each board must be connected to the bus cable to follow the clock of the cable.

3) The bus cable houses a stiff conducting material. Therefore, when it has been shaped, do not bend it repeatedly or violently lest it is broken.

Step 5: Boot your computer and install the driver.

Regarding driver installation, refer to *SynCTI_InstManual.pdf*.

Step 6: Configure parameters for the digital trunk board.

Refer to *SynCTI Programmer's Manual* for details.

Key Tips:

- As the system is expected to run for long hours unmannedly, 'energy-saving' mode should be turned off for both the CPU and the HD in CMOS or WINDOWS operating system. This is to ensure full-speed operation of the computer, or it may lead to a drop in performance or unexpected errors after running for some time.

- A chassis installed with voice boards must be grounded for safety reasons, according to standard industry requirements. A simple way is earthing with the third pin on the plug. No or improper grounding may cause instability in operation as well as decrease in lightning resistance.

Appendix A Technical Specifications

Dimensions

310×115mm^2 (excluding L-bracket)

Weight

≈150g

Environment

Operating temperature: 0℃—55℃

Storage temperature: -20℃—85℃

Humidity: 8%—90% non-condensing

Storage humidity: 8%—90% non-condensing

Input/output Interface

E1 physical ports: Compliant with G.703, including 75Ω unbalanced interface and 120Ω balanced interface

T1 /J1 physical ports：DSX-1 and CSU line build-outs available for different extents of signal losses, including 100Ω and 110Ω balanced interfaces

Audio Specifications

CODEC: CCITT A/μ-Law 64kbps,

Distortion: ≤3%

Frequency response: 300-3400Hz (±3dB)

Signal-to-noise ratio: ≥38dB

Echo suppression: ≥40dB

Maximum System Capacity

Up to 8 digital trunk boards concurrently per system; up to 240 channels per board

Echo Cancellation

SHD-30E/60E-CT/PCIe/EC: 64ms

SHD-30E/60E-CT/PCIe/FAX: 64ms

SHD-120E/240E-CT/PCIe/EC: 64ms

SHD-120E-CT/PCIe/FAX: 64ms

Power Requirements

Maximum power consumption: ≤10W

Signaling

SS1: Compliant with DL and MFC standards stipulated in GF002-9002; supports D4 and ESF framing

SS7: compliant with Q771-Q795

DSS1: compliant with Q.933

Audio Encoding & Decoding

16Bit PCM	*128kbps*
8Bit PCM	*64kbps*
A-Law	*64kbps*
μ-Law	*64kbps*
IMA ADPCM	*32kbps*
GSM	*13.6kbps*
MP3	*8kbps*

Safety

Lightning Resistance: Level 4

Appendix B Technical/sales Support

Thank you for choosing Synway. Please contact us should you have any inquiry regarding our products. We shall do our best to help you.

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