



**Synway CTI Series**

**SHD-120D-CT/PCI/CAS**

**SHD-240D-CT/PCI/CAS**

**Digital Trunk Board**

# **Hardware Manual**

**Version 2.0**

**Synway Information Engineering Co., Ltd**

**[www.synway.net](http://www.synway.net)**

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## Revision History

Version	Date	Comments
Version 1.0	2008.08	Initial publication
Version 2.0	2009.03	Modify 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-120D-CT/PCI/CAS and SHD-240D-CT/PCI/CAS are digital trunk voice boards with PCI bus, and have almost all functions needed for call/voice processing systems which are connected to them through E1 trunks. Designed to support Synway channel bank products, they are able to convert an E1 digital trunk to a common analog phone line so as to connect directly with an ordinary phone to constitute a station or extension phone.

## 1.1 Functions

- A single board accommodates 4 or 8 E1 trunks
- Supports China SS1 connections in E1 mode
- Supports phone calling and voice processing
- Support of Synway channel bank products
- Activity/silence detection
- Automatic Gain Control (AGC) support in recording operation
- 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

- **PCI 2.1 Bus Support**

Includes PCI 2.1 bus and uses the universal PCI design supporting 3.3V and 5V PCI slots as well as the PCI-X slot.

- **DMA Read and Write**

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

- **Signaling Interface**

SS1 provides two levels of interfaces respectively for MFC transmission/receipt and SS1 connection.

- **Signaling Processing**

Installed with loadable signaling processing modules, each board supports SS1, 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.

- **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 same board supports 2 kinds of trunks which differ in impedance: 120Ω E1 twisted-pair cable and 75Ω E1 coaxial cable, each of which can be used based on a proper software configuration. What's more, both the transmit and receive terminals are specified via software configurations. As a result, the board is enabled to connect with a variety of digital trunks and optical transceivers without the need for extra hardware devices.

- **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.

- **Barge in**

Supports the Barge-in feature.

- **Various CODECs Support**

Offers a large selection of voice CODECs, including hardware-based A-Law (G.711),  $\mu$ -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

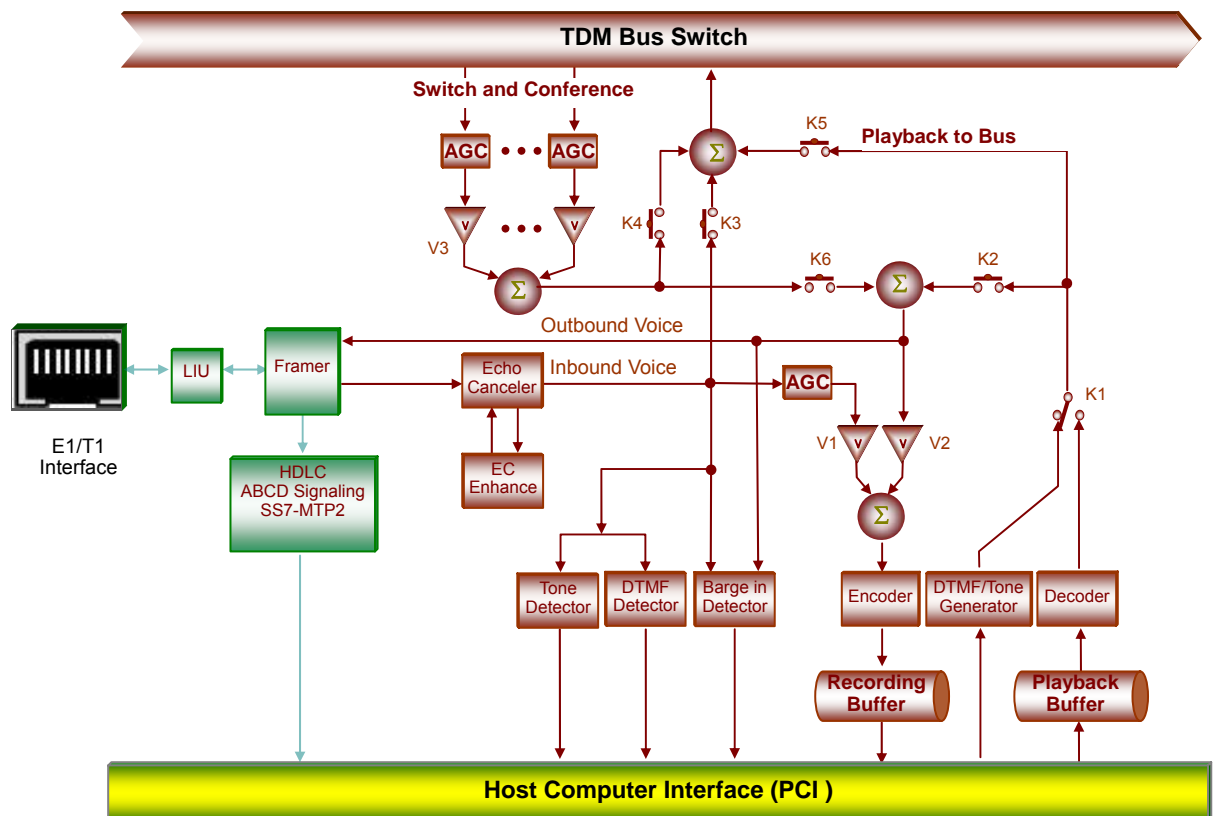


Figure 1-1 Operation Principle of SHD-120/240D-CT/PCI/CAS Board

# Chapter 2 Installation

## 2.1 Hardware Structure

### ● SHD-120D-CT/PCI/CAS Board

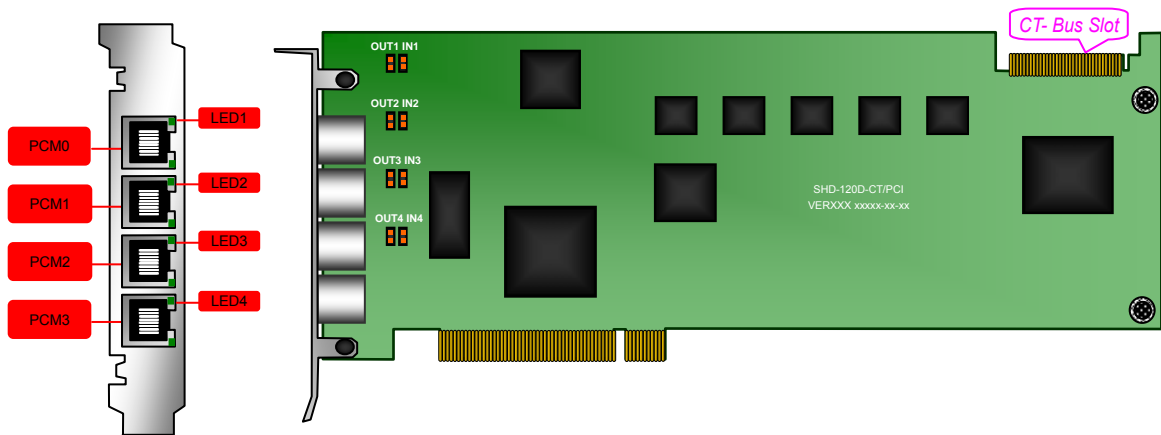


Figure 2-1 Left and Front Views

#### Notes:

1. In Figure 2-1, PCM0~PCM3 respectively indicate the 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-1), m=1~4.

### ● SHD-240D-CT/PCI/CAS Board

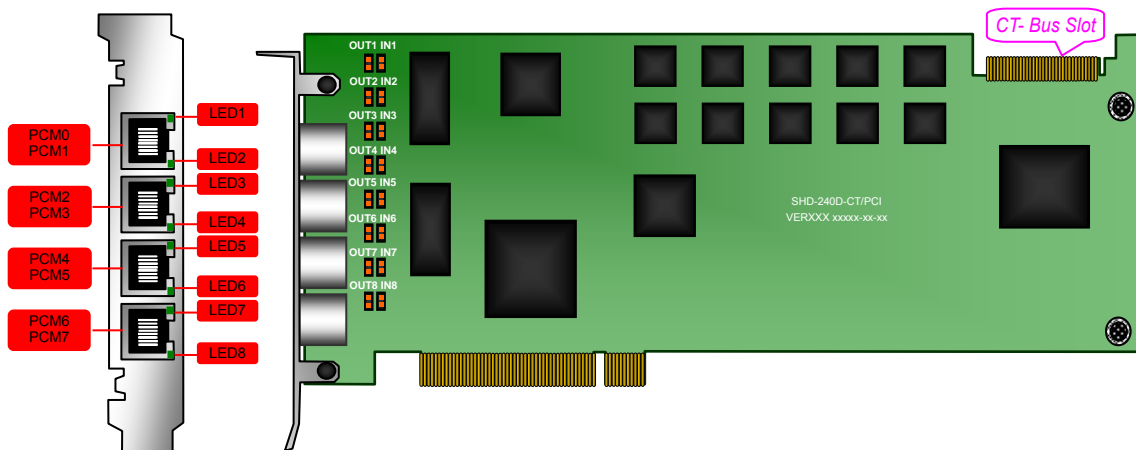


Figure 2-2 Left and Front Views

#### Notes:

1. In Figure 2-2, PCM0~PCM7 respectively indicate the 8 trunk interfaces;
2. LED1~LED8 represent the synchronization indicators respectively for PCM0~PCM7;
3. INm and OUTm refer to the grounding jumpers respectively at the receiving and transmitting ends for PCM(m-1), m=1~8.



transmitting ends for PCM(m-1), m=1~8.

Table 2-1 below describes the synchronization indicators illustrated in the above figures.

LED	Definition	Lamp Status	Implication
Green Lamps	Sync	ON	synchronous
		OFF	asynchronous
		FLASH	synchronous but unsteady

Table 2-1 On-board Synchronization Indicators

● SHD-120D-CT/PCI/CAS, SHD-240D-CT/PCI/CAS Boards

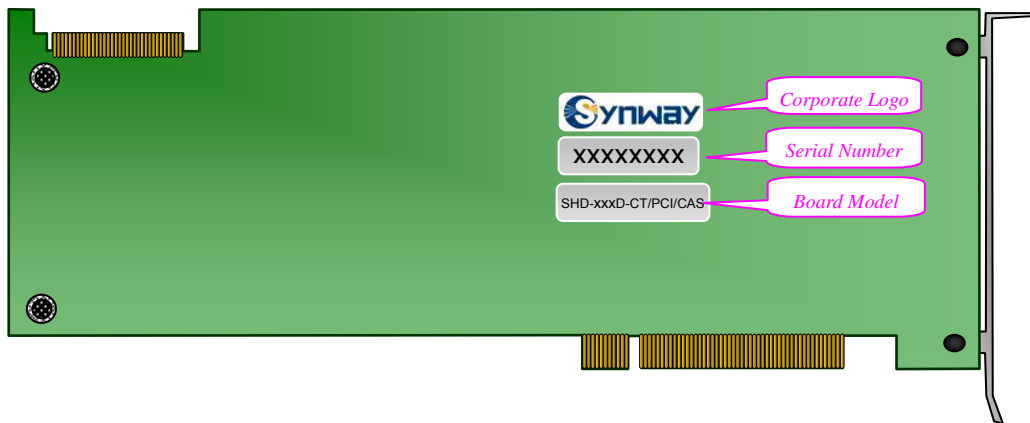


Figure 2-3 Rear View

**Note:**

Here above illustrates the Synway SHD series D-type CAS board models which are listed in Table 2-2. Always check the label on the back of the board to get the exact board model. 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.

No.	Model	Trunk	Physical Interface
1	SHD-120D-CT/PCI/CAS	4 E1	4 Common RJ48C
2	SHD-240D-CT/PCI/CAS	8 E1	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 jumper.

Disconnect all grounding jumpers in the use of the 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 PCI slot on the PC chassis.**

**Step 3: Connect to digital trunks.**

In this series, the SHD-120D-CT/PCI/CAS board provides common RJ48C connectors to support a direct connection to other boards, its pin layout being shown below in Figure 2-4, while the SHD-240D-CT/PCI/CAS board provides special RJ48C connectors whose pin layout is unfolded below in Figure 2-5.

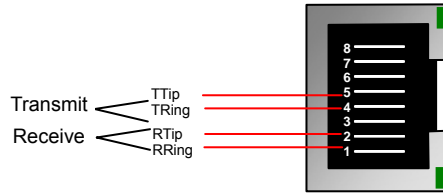


Figure 2-4 Pin Layout for Common RJ48C

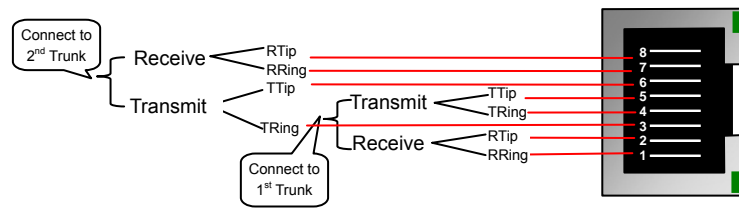


Figure 2-5 Pin Layout for Special RJ48C

When you connect the SHD-240D-CT/PCI/CAS board to the 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 2-6: connect the 1<sup>st</sup>, 2<sup>nd</sup>, 4<sup>th</sup>, 5<sup>th</sup> pins of the special 8-pin RJ48C connector to the 1<sup>st</sup>, 2<sup>nd</sup>, 4<sup>th</sup>, 5<sup>th</sup> pins of the first common RJ48C connector, and the 3<sup>rd</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup> pins to the 1<sup>st</sup>, 2<sup>nd</sup>, 4<sup>th</sup>, 5<sup>th</sup> 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 2-6 2-way Hub for RJ48C

When connecting the SHD-120D-CT/PCI/CAS board to the digital trunk, if it is necessary to convert the on-board RJ48C connector to the BNC connector, you can use the RJ48C-to-BNC adapter as shown below (see Figure 2-7).



Figure 2-7 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 2-4.

**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 2-8 for correct insertion. Do not twist or insert in the opposite direction.

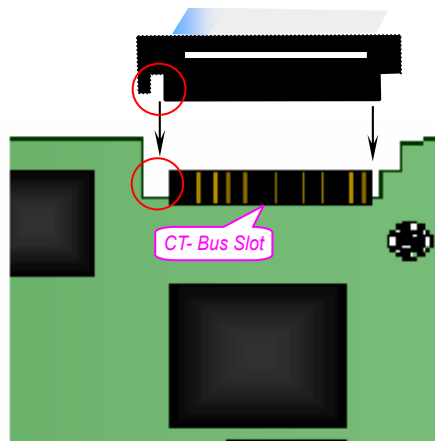


Figure 2-8 Connection of H.100 Bus

- 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 monitoring board.**

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

## Key Tips:

- As the system is expected to run for long hours unattended, '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<sup>2</sup> (excluding L-bracket)

## Weight

≈120g

## Environment

Operating temperature: 0 °C—55 °C

Storage temperature: -20 °C—85 °C

Humidity: 8%—90% non-condensing

Storage humidity: 8%—90% non-condensing

## Input/output Interface

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

## 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 120 or 240 channels per  
board

## Power Requirements

Maximum power consumption: ≤15W

## Signaling

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

## 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

Certification: FCC; CE; CCC

## 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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