Synway CTI Series

SHD-240/480A-CT/cPCI
SHD-240/480S-CT/cPCI

Digital Trunk Voice Board

Hardware Manual

Version 2.1

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0		Initial publication
Version 2.0	2007-12	Changes: made hardware improvement, added board illustrations for better understanding.
Version 2.1	2009-06	Changes: added the CT_EN jumper and the description on it.

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

Chapter 1 Overview

The Synway CTI Series SHD-240/480A-CT/cPCI and SHD-240/480S-CT/cPCI are huge-capacity digital trunk voice boards with CompactPCI bus, and have almost all functions required by call/voice processing systems that connect with E1 trunks.

1.1 Functions

- 16 E1 per board; 4 boards, 64 E1, 1920 voice channels per system
- Supports full-duplex recording and playback simultaneously on all channels, each with a different format
- Support of DSP-based ADPCM voice compression
- A single board, with all necessary resources for signaling processing, can complete both SS7 and ISDN connections
- Allows DTMF transmission and detection during voice recording or playback
- Automatic Gain Control (AGC) support in recording operation
- Support of self-adaptive echo cancellation and Barge-in features
- Includes H.110 bus, facilitating smooth connectivity to third-party boards with H.110 bus for the exchange of voice signals and the share of resources, without the need for extra bus cables installed between boards
- 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 eliminates the damage caused by the lightning
- Each board has a unique hardware serial number and an authorization code identification circuit, designed for hardware identification and software safety

1.2 Features

- **CompactPCI 2.1 Bus Support**

  Includes CompactPCI 2.1 bus with burst data transmission rate up to 133 MB/s (the CPU cost for data transmission is only 1/15 of that on voice boards with ISA bus); PNP (plug and play) feature eliminates the need for jumper leads; supports hot swap while running the application software (most advanced hot-swap operation for CompactPCI system).

- **Signaling Interface**

  SS7 provides two levels of interfaces: MTP and TUP, meeting various customer requirements.

- **Signaling Processing**

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

- **Signaling Links**

  Each board supports 1 to 8 SS7 links, 4 signaling link sets, multiple OPC and DPC. The signaling hot-backup feature, i.e. signaling messages can be processed by the standby server at any time when something is wrong with the links being used, greatly increases the flexibility and reliability. All the timeslots ranging from 1 to 31, not only the 16th one, can be used as SS7 or ISDN signaling links.

- **Terminal Matching Method**

  Offers easy connection of such interfaces that support either of the two terminal matching methods - use of the unbalanced 75Ω E1 cable and use of the 120Ω balanced E1 cable - with a variety of PBXs and optical transceivers via RJ48T connectors. Besides, we provide several kinds of interface converters for your choice.

- **Various CODECs Support**

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

- **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 1920 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

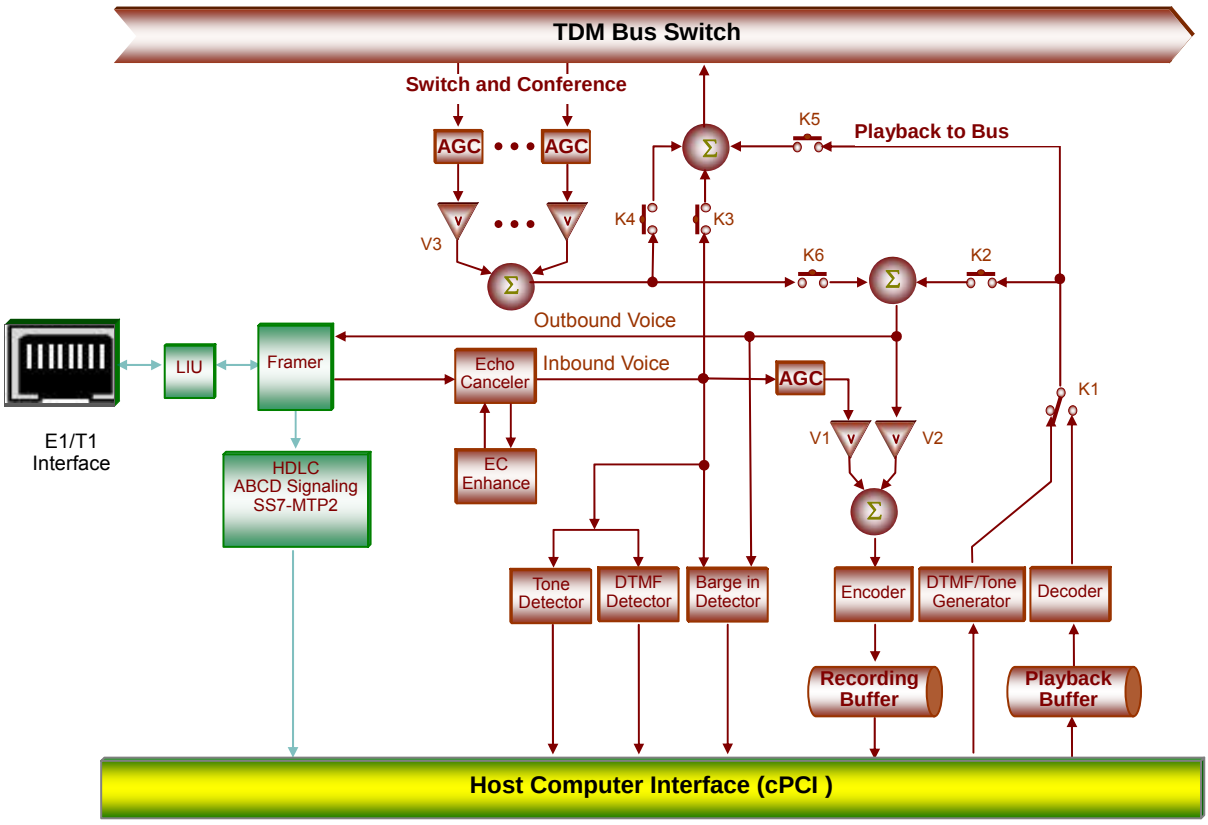

Figure 1-1 Operation Principle

Chapter 2 Installation

2.1 Hardware Structure

- **SHD-240A-CT/cPCI or SHD-240S-CT/cPCI Board**

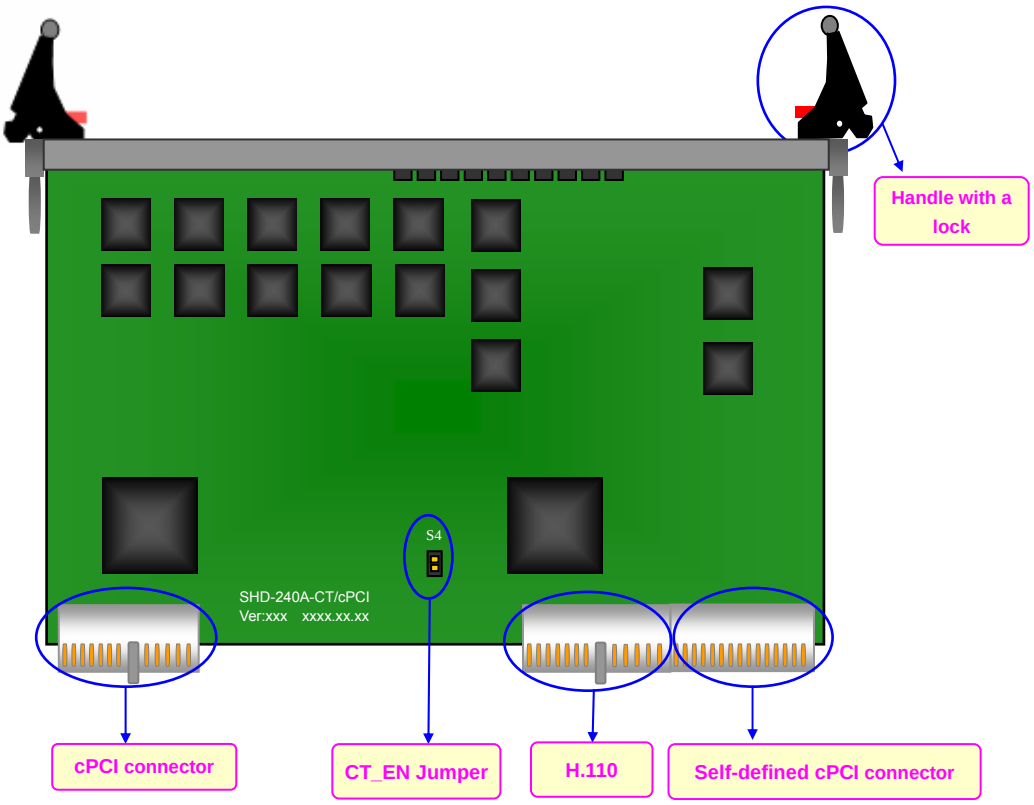

Figure 2-1 Front View

- **SHD-480A-CT/cPCI or SHD-480S-CT/cPCI Board**

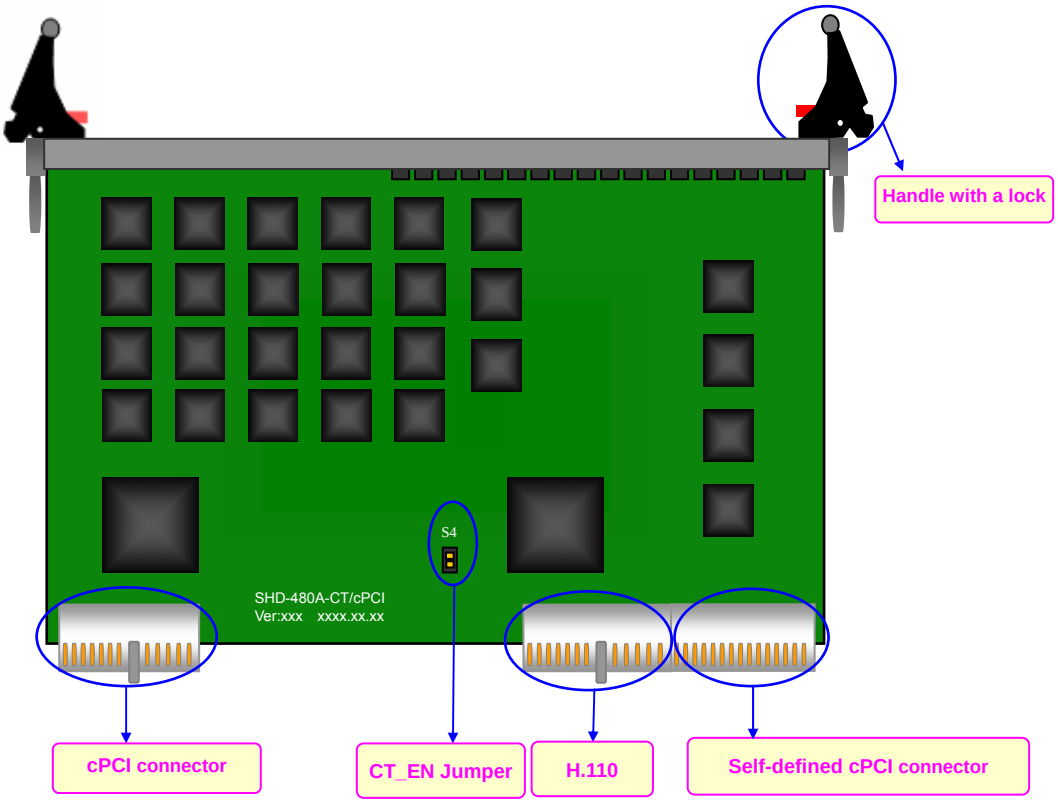

Figure 2-2 Front View

- **SHD-240/480A-CT/cPCI or SHD-240/480S-CT/cPCI Board (Rear View)**

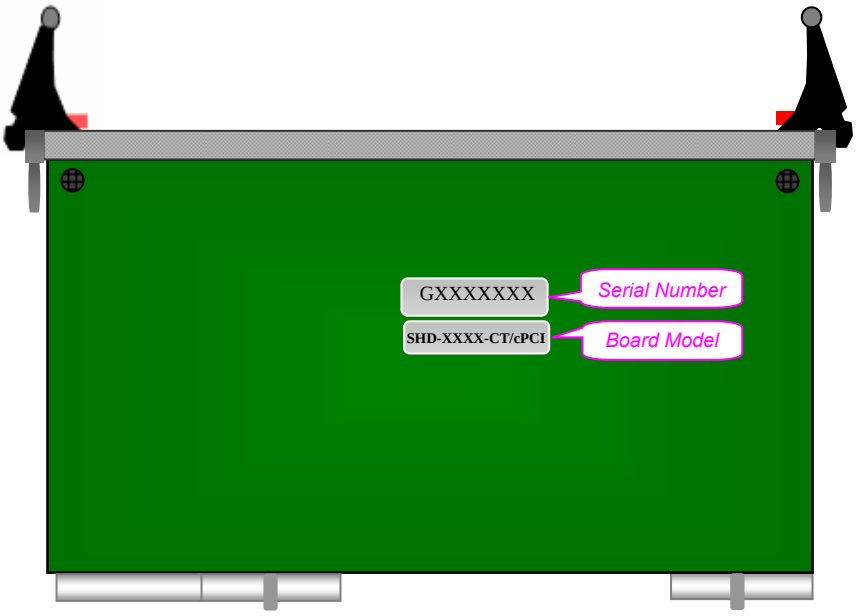

Figure 2-3 Rear View

- **SHD-240A-B/cPCI Rear Connection Panel**

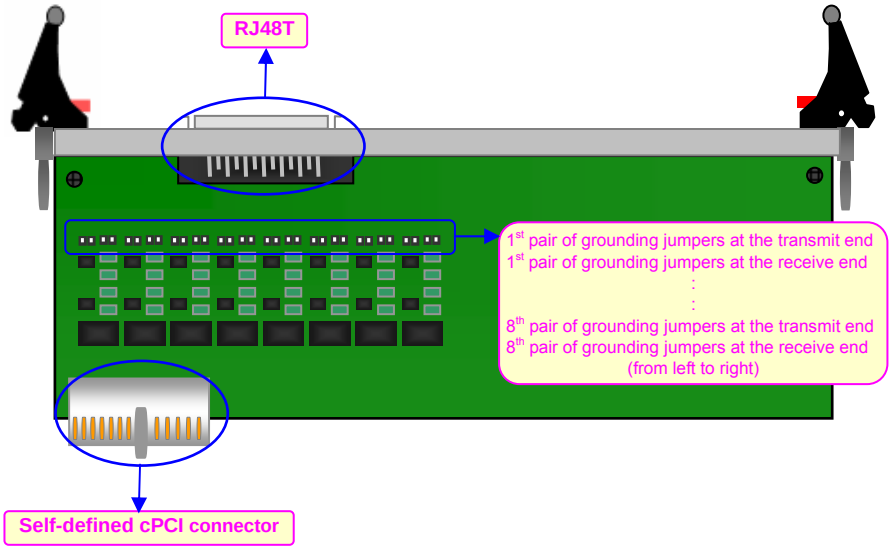

Figure 2-4 Front View

- **SHD-480A-B/cPCI Rear Connection Panel**

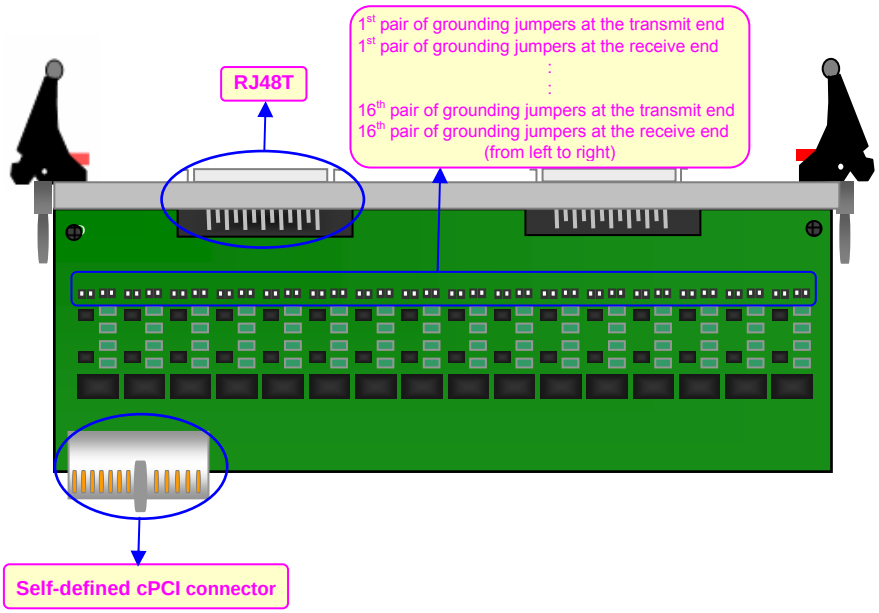

Figure 2-5 Front View

- **SHD-240/480A-CT/cPCI or SHD-240/480S-CT/cPCI Board (Left View)**

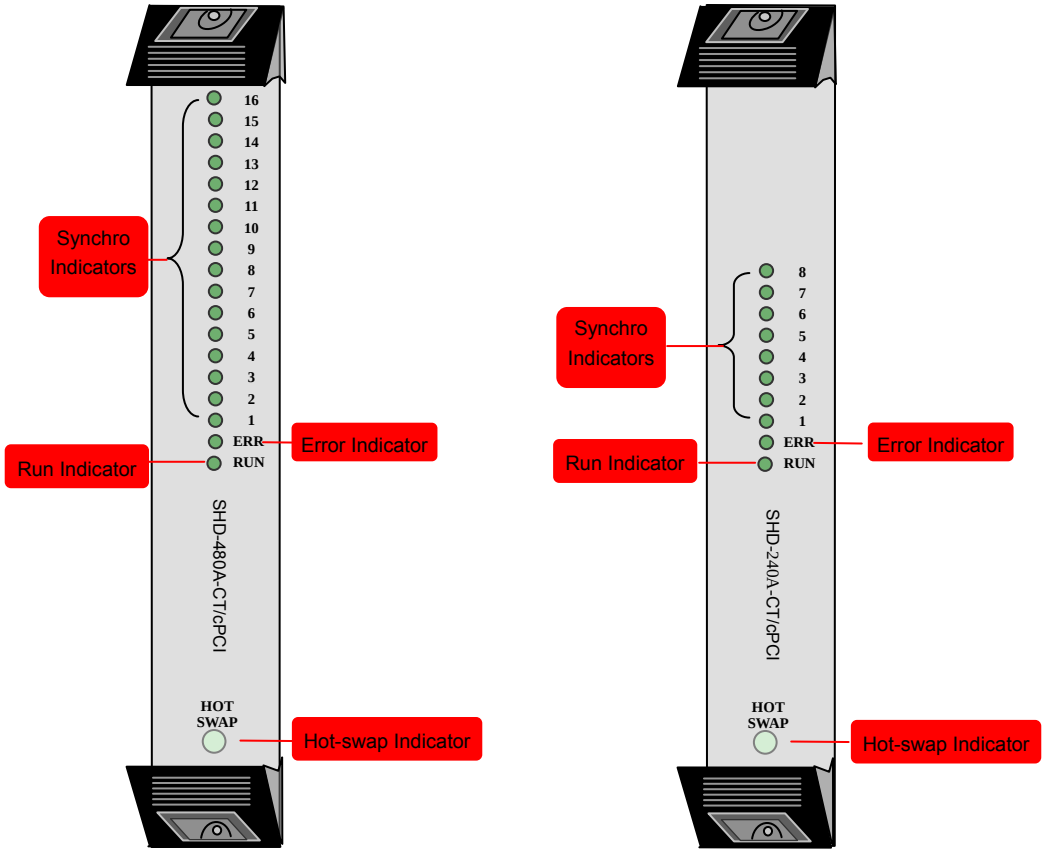

Figure 2-6 SHD-480A-CT/cPCI or SHD-480S-CT/cPCI (Left) and SHD-240A-CT/cPCI or SHD-240S-CT/cPCI (Right)

- **SHD-240A-B/cPCI or SHD-480A-B/cPCI Rear Connection Panel (Left View)**

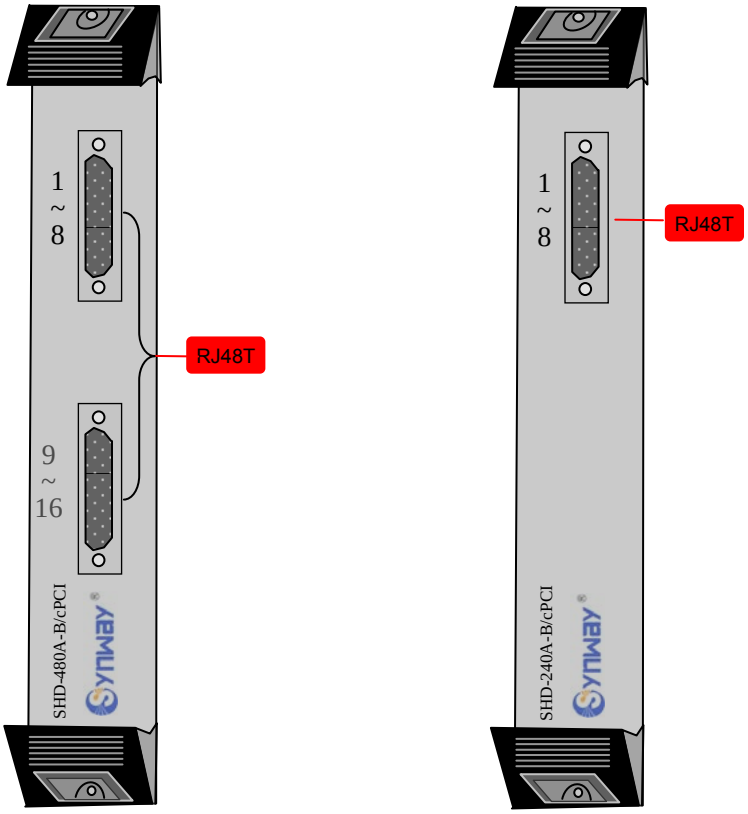

Figure 2-7 SHD-480A-B/cPCI (Left) and SHD-240A-B/cPCI (Right)

- **SHD-240A-JB/BNC Interface Converter (Optional)**

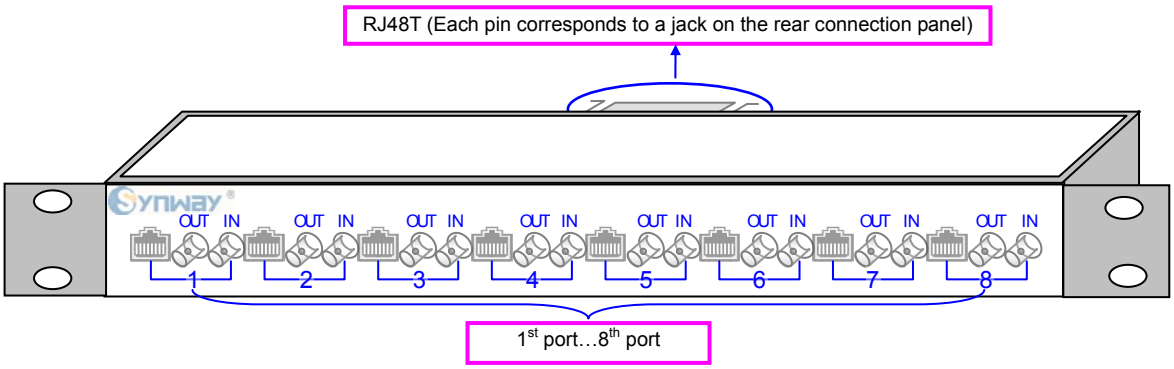

Figure 2-8 Front View

Note:

Each port in the figure above includes an RJ48C jack and two BNC connectors. See Table 2-1 below for which BNC connector transmits signals and which receives signals.

No.	Line	Status	Meaning
1	1st Port	OUT	Transmit
		IN	Receive
2	2nd Port	OUT	Transmit
		IN	Receive

3	3rd Port	OUT	Transmit
		IN	Receive
4	4th Port	OUT	Transmit
		IN	Receive
5	5th Port	OUT	Transmit
		IN	Receive
6	6th Port	OUT	Transmit
		IN	Receive
7	7th Port	OUT	Transmit
		IN	Receive
8	8th Port	OUT	Transmit
		IN	Receive

Table 2-1 BNC Connector

- **SHD-240/480A-JB/S Interface Converter (Optional)**

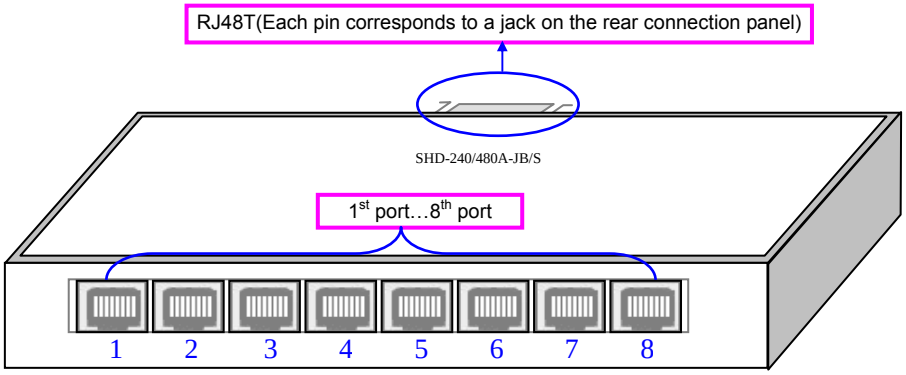

Figure 2-9 Front View

Notes:

- **The indicators illustrated in Figure 2-6 are described below:**

Synchro Indicator	Definition	Lamp Status	Implication
Green Lamps	Sync	ON	synchronous
		OFF	asynchronous
		Flash	synchronous but unsteady

Table 2-2 E1 Synchronization Indicators

RUN Indicator	Lamp Status	Runtime Status
Green Lamp	ON	not running
	OFF	not running
	FLASH	running

Table 2-3 RUN Indicator

Hot-swap Indicator	Lamp Status	Runtime Status
Blue Lamp	ON	in the course of hot swap

	OFF	normal

Table 2-4 Hot-swap Indicator

- This file illustrates the A- and S-type boards with cPCI bus from Synway. Please check the label on the board to get the exact board model before your use. See below for all models this file is applicable to.

No.	Board Model	E1	SS7/ISDN/SS1	Voice CODEC	EC	Conferencing	Rear Connection Panel
1	SHD-240A-CT/cPCI	8	√	√	√	√	SHD-240A-B/cPCI
2	SHD-480A-CT/cPCI	16	√	√	√	√	SHD-240A-B/cPCI
3	SHD-240S-CT/cPCI	8	√	√	√	-	SHD-480A-B/cPCI
4	SHD-480S-CT/cPCI	16	√	√	√	-	SHD-480A-B/cPCI

Table 2-5 List of A- and S-type boards with cPCI bus

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

Step1： Select a proper terminal-matching method.

In consideration of various line conditions, this series boards are equipped with two grounding jumpers for each PCM which respectively control the grounding of the transmit end and the receive end.

In use of the balanced 120Ω E1 cable, disconnect all grounding jumpers.

In use of the unbalanced 75Ω E1 cable mode, the grounding jumpers at the receive end should be disconnected and the ones at the transmit end 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 there is difficulty in grounding of the PC at the local terminal, you may short-circuit the on-board grounding jumper at the receive end and use the transmit end at the opposite terminal for grounding.

If the receive end at the opposite terminal is grounded (improper operation), the on-board grounding jumper at the transmit end must be disconnected. Refer to Table 2-6 for details.

Generally speaking, in the case of proper grounding at both terminals, only the external layer of the E1 cable at the transmit end is allowed to be grounded. The grounding of both transmit and receive ends may result in a current loop with ground wires, bringing signal instability. 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 2-6 Configuration of Grounding Jumpers in Use of 75Ω E1 Cable

Step2： Configure the CT_EN jumper.

Short-circuit the CT_EN jumper if the cPCI industrial computer has no CT-BUS slot on the backboard, or, the indicator will be on blue all the time and the board can not work normally; disconnect the CT_EN jumper if the cPCI industrial computer has a CT-BUS slot on the

backboard, or, the hot-swap operation may bring a damage to the computer or the board.

Step3： Fit the required digital trunk board onto the CompactPCI chassis.

Fit both the board and the rear connection panel into a pair of empty slots on the CompactPCI chassis.

With the board completely inserted, push the upper and bottom handles inwards at the same time until a 'click' sound is heard and the red locks flip into position. The board is now properly fitted. The voice board can be further fastened with screws (on the outside of the upper and bottom handles) for extended use and prevention of accidental removal.

Note:

① Due to the structural design of the cPCI IPC, it is necessary to push the board home into the slot until it can go no further, and ensure that it is not inclined at an angle before applying lever action on the handles to secure it. Connecting parts on the mainboard of the IPC may be damaged if:

(I) Handles are used too early
(II) Handles are used while the board is inclined
(III) Force on handles is not applied evenly.

② Board insertion is allowed when computer is powered on. However, as strong static electricity may lead to damages, the operator should touch a grounded conductor to discharge the static electricity on him before inserting the board.

Step4： Connect to digital trunks.

The rear connection panels provided with this series boards use the RJ48T jack to connect with digital trunks, or directly connect with various PBXs and optical transceivers. The SHD-480A-B/cPCI rear connection panel has two RJ48T jacks, one above another, while the SHD-240A-B/cPCI rear connection panel has only one RJ48T jack. The pin layout for RJ48T is shown in Figure 2-10.

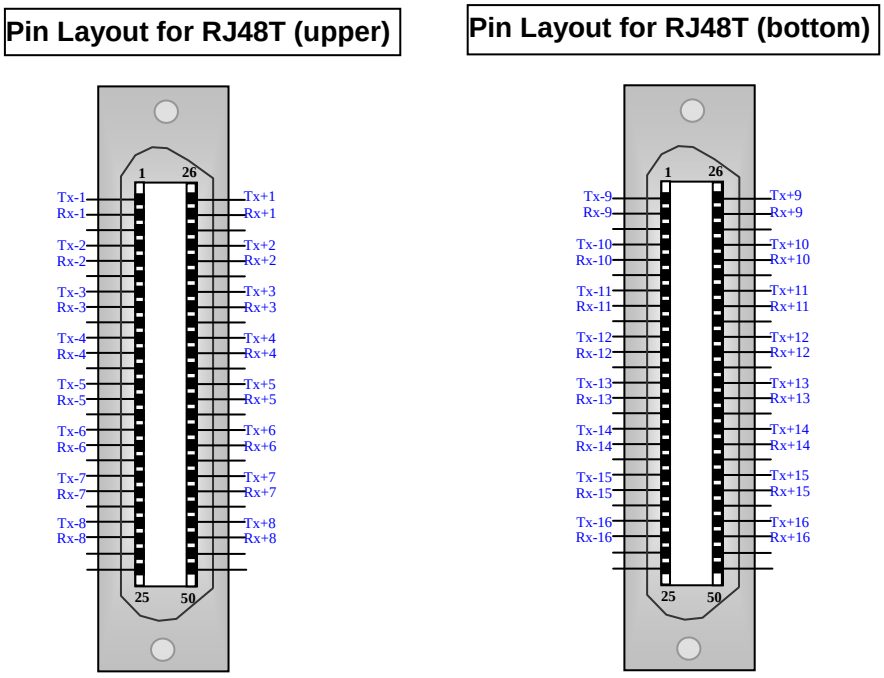

Figure 2-10 Pin Layout for RJ48T

Besides, we offer two kinds of interface converters SHD-240A-JB/BNC and SHD-240/480A-JB/S which can convert a pin in RJ48T to a BNC or RJ48C jack with 8 E1 trunks. The former can be directly fitted on a 19" 1U standard cabinet. For more information about them, refer to corresponding manuals we provide. Figure 2-11 is the pin layout for RJ48C. Also the RJ48C-to-BNC adapter as shown in Figure 2-12 below can be used to help conversion.

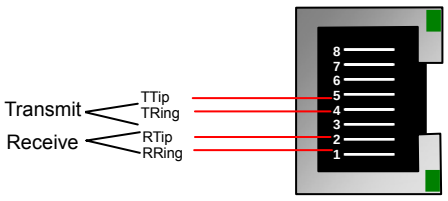

Figure 2-11 Pin Layout for RJ48C

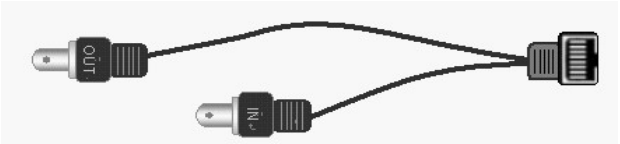

Figure 2-12 RJ48C-to-BNC Adapter

If users would like to construct lines for conversion by themselves, they should not only make the line match the on-board interface, but also ensure correct connection of the receive and transmit lines.

Notes:

① Press or release the buttons at both sides before inserting or extracting the RJ48T

connector.

② 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).

③ On-board synchronization indicators start working only after the PC is powered on and the board is successfully initialized. The state of transmit lines can not be judged via synchronization indicators but should be examined by the opposite terminal or a self-loop testing.

④ When you use the unbalanced 75Ω coaxial cables, make sure to connect the outer shielding layer with the negative pole (－) and the leads inside with the positive pole (＋).

Step5： Connect H.110 bus.

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

The IPC has H.110 slots on the chassis and connecting lines already fixed on them. By installing all the necessary boards, the H.110 bus would have already been inter-connected. Hence, users need not do any additional actions provided each board is correctly and properly installed.

Step6： Boot your computer and install the driver.

Regarding driver installation, refer to the driver installation manual *SynCti_InstManual_cn*.

Step7： Configure the operating parameters for the board.

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

Key Tips:

- As the system is expected to run for long hours unmanned, ‘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.

2.4 Precaution on Hot-swap Operation at Runtime

The board should not be removed while user applications are running, or it may cause instability problems such as system halt or application failure. The correct way is to release the bottom handle (by the red lock on the handle) and notify the application to stop operations on the board, i.e. upon releasing the board, wait for the hot-swap blue lamp to light up before pulling it out from the slot.

Also note to never remove the board when it is being initialized. You must end the application before performing a proper board insertion or extraction following the above steps.

This restriction however, applies only when the board is under operation by a user application.

During software runtime, the RUN indicator blinks at 1-second intervals if the board is working properly, or, it will go on and off at irregular intervals if the driver software detects abnormal behavior by the board and prompts users to replace the existing board. The new board should be of the same model and placed in the same slot as the previous, or software parameters will have to be reconfigured. If the rear connection panel is used, remember to move it along with the voice board. The rear connection panel can be hot-swapped at anytime without interrupting runtime.

Note: Releasing the bottom handle at runtime will cause your board to stop operating!

Appendix A Technical Specifications

Dimensions (excluding handles)

Board: 233(6U)×162.5mm²

Rear Connection Panel: 233×82mm²

Weight

Board: ≈300g

Rear Connection Panel: ≈200g

Environment

Operating temperature: 0℃—55℃

Storage temperature: -20℃—85℃

Humidity: 8%—90% non-condensing

Storage humidity: 8%—90% non-condensing

Input/output Interface

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

Audio Specifications

CODEC: CCITT A/μ-Law 64kbps,
IMA ADPCM 32kbps

Distortion: ≤3%

Frequency response: 300-3400Hz (±3dB)

Signal-to-noise ratio: ≥38dB

Echo suppression: ≥40dB

Maximum System Capacity

Up to 4 digital trunk boards concurrently per system; up to 480 channels per board

Enhanced Echo Cancellation

SHD-240/480A-CT/cPCI: 8ms

SHD-240/480S-CT/cPCI: 8ms

Power Requirements

Maximum power consumption: ≤25W

Signaling

SS1: Compliant with DL and MFC standards stipulated in GF002-9002, supports SS1 with D4, ESF frame structure

SS7: Compliant with related provisions stated in 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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