Synway CTI Series

SHD-30/60/120A-CT/cPCI
SHD-30/60B-CT/cPCI/FAX

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 1.1	2003-09	Initial publication
Version 2.0	2006-11	Changes: made hardware improvement, added illustrations of boards 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 CTI Series SHD-30/60/120A-CT/cPCI and SHD-30/60B-CT/cPCI/FAX are digital trunk voice boards with cPCI bus, and have almost all functions required by call/voice processing systems that connect to E1 trunks.

1.1 Functions

- A single board accommodates 1, 2 or 4 E1 trunks.
- Supports China SS1, SS7 and ISDN connection.
- Supports phone-calling and voice-processing functions.
- Multiple faxing channels can be used with any on-board voice channel for faxing.
- Activity/silence detection
- Automatic Gain Control (AGC) support in recording operation
- FSK detection and transmission
- Allows DTMF transmission and detection during voice recording or playback.
- Includes H.110 bus, facilitating smooth connectivity to third-party boards with H.110 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 eliminates the damage caused by the lightning.
- 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 authorized code identification circuit is designed for software safety. Users can apply to our company for the authorized code.

1.2 Features

- **CompactPCI 2.1 Bus Support**

  Includes CompactPCI 2.1 bus with burst data transmission rate up to 133 MB/s; 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).

- **Two Connection Methods**

  This series voice boards support two connection methods respectively via the front connection panel and the rear connection panel. The use of the rear connection panel eliminates the need for reconnection upon changing a faulty board, which facilitates system development and debugging, and enhances runtime stability.

- **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, meeting various customer requirements.

- **Signaling Processing**

  Installed with loadable signaling processing module, each board supports SS1, 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 up to 4 SS7 links and the signaling hot-backup feature, i.e. signalings can be processed by the standby server at any time when 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 the 16th one, can be used for SS7 and ISDN signaling.

- **Terminal Matching Method**

  Offers easy connection of similar interfaces that support either of two G.703-compliant terminal matching methods - use of the 75Ω unbalanced coaxial cable or the 120Ω balanced twisted-pair cable - with a variety of digital trunks and optical transceivers.

- **Programmable Tone Detector**

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

- **Specialized Driver Algorithm**

  The driver uses SPECDial - a specialized driver algorithm - to perform a complete automatic dial process through digital lines 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 tones 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 function.

- **Various CODECs Support**

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

- **Supports WAV File**

  The recorded speech 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

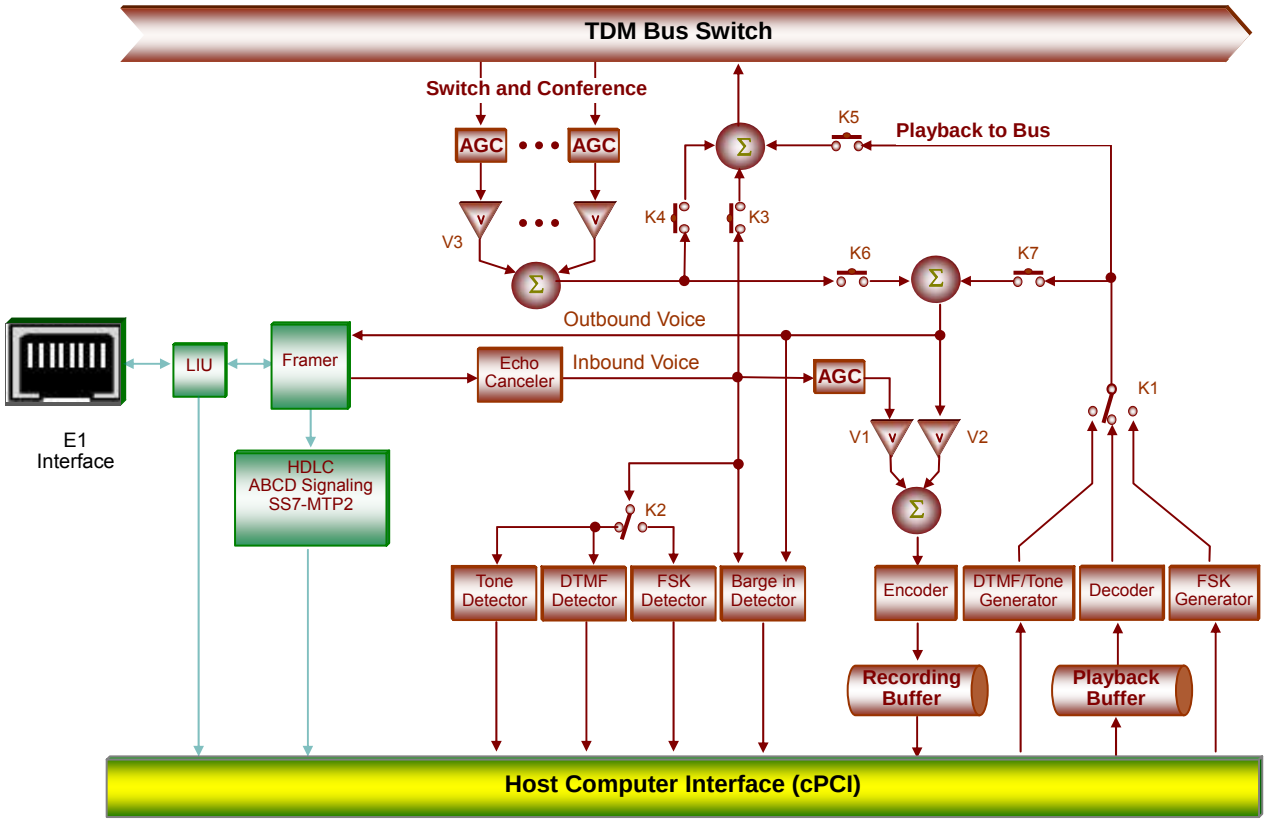

Figure 1-1 Operation Principle

Chapter 2 Installation

2.1 Hardware Structure

- **SHD-120A-CT/cPCI board**

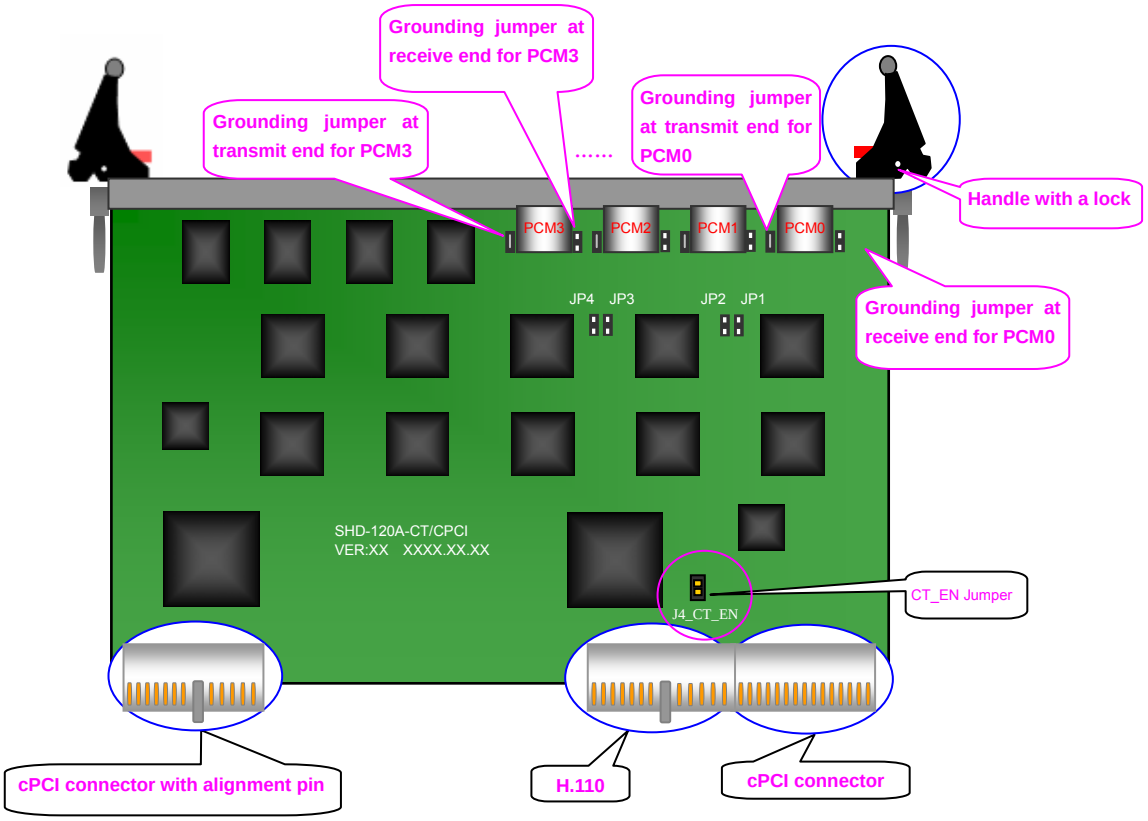

Figure 2-1 Front Side

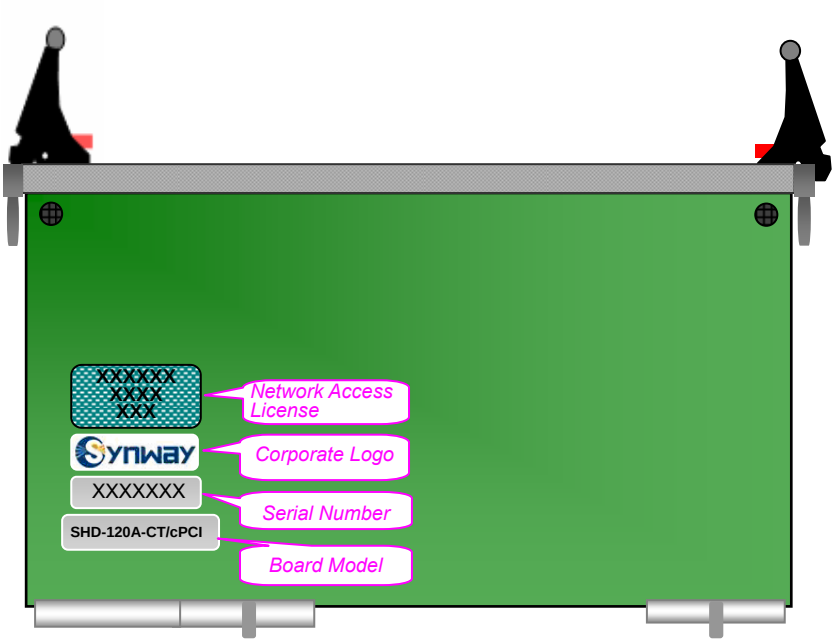

Figure 2-2 Reverse Side

- **Rear connection panel for SHD-120A-CT/cPCI**

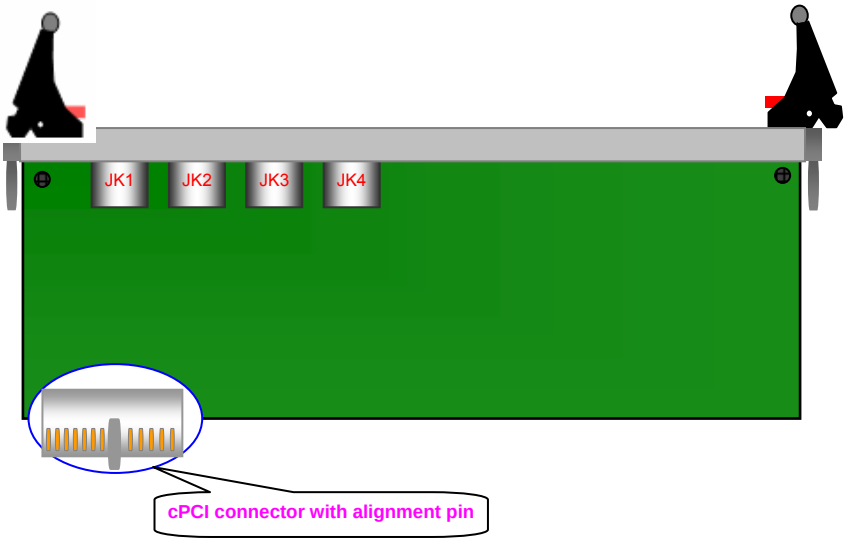

Figure 2-3 Rear Connection Panel

- **Left side of SHD-120A-CT/cPCI board and its rear connection panel**

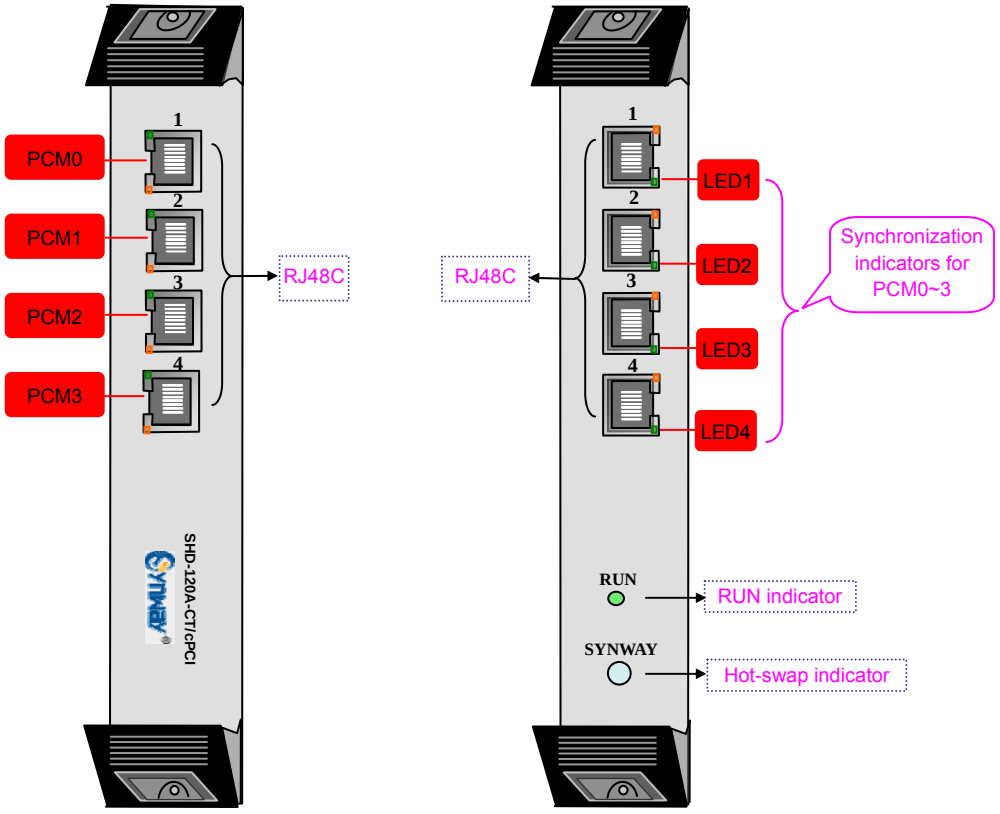

Figure 2-4 Board (Left) and Rear Connection Panel (Right)

The indicators illustrated in Figure 2-4 function as follows:

LED1～4	Definition	Lamp Status	Implication
Green Lamps	Sync	ON	synchronous
		OFF	asynchronous
		FLASH	synchronous but unsteady

Table 2-1 Synchronization Indicators

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

Table 2-2 RUN Indicator

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

Table 2-3 Hot-swap Indicator

Notes: This file only illustrates the SHD-120A-CT/cPCI board with the above figures but

is also applicable to some other models which have similar hardware structure as listed below in Table 2-4. Always check the label on the board to get the 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	Interface
1	SHD-30A-CT/cPCI	1E1
2	SHD-30B-CT/cPCI/FAX	
3	SHD-60A-CT/cPCI	2E1
4	SHD-60B-CT/cPCI/FAX	
5	SHD-120A-CT/cPCI	4E1

Table 2-4 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

Step1： Select a proper terminal-matching method.

Any board model in this series supports both 120Ω and 75Ω terminal-matching impedances. Selection between the use of 75Ω unbalanced coaxial cables and 120Ω balanced twisted-pair cables can be made simply by changing the jumper mode for the board, without having to change the hardware.

Find the corresponding impedance jumper by the way that PCM0 corresponds to JP1, PCM1 to JP2, PCM2 to JP3, PCM3 to JP4, (See Figure 2-1). Make choice of the terminal-matching method depending on your real situation. If you use the jumper cap to short-circuit two pins, this line works under the 75Ω-unbalanced-coaxial-cable mode. Otherwise, it works under the 120Ω-balanced-twisted-pair-cable mode. Our board uses the 75Ω one by default.

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.

In case the board requires the rear panel for connection, you should 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.

Notes:

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.

In case the on-board interface (RJ48C) differs in type from that of the connected digital trunk (BNC), the RJ48C-to-BNC adapter as shown below (see Figure 2-5) is required.

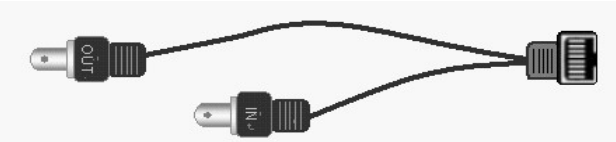

Figure 2-5 RJ48C-to-BNC Adapter

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 line and its corresponding transmit line. Figure 2-6 is the pin layout for RJ48C.

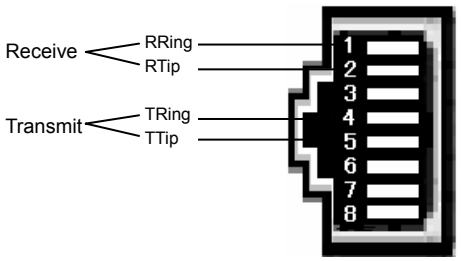

Figure 2-6 Pin Layout for RJ48C

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 judged via synchronization indicators but should be examined by the opposite terminal.

② When you construct lines by yourself for use in the 75Ω-unbalanced coaxial-cable mode, make sure to connect the 1st and 4th pins of the RJ48C connector to the outer shielding layer of the coaxial cable, and the 2nd and 5th pins to the lead inside.

③ On-board synchronization indicators start working only after the PC is powered on and the board is successfully initialized.

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, no additional work by the user is needed provided each board is correctly and properly installed.

Step6： Configure the grounding Jumper

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 transmitting end and the receiving. ①In the 120Ω-balanced-twisted-pair-cable mode, you must disconnect the grounding jumpers and ensure both the transmitting and receiving ends not grounded; ②In the 75Ω-unbalanced-coaxial-cable mode, the grounding jumpers at the receiving end should be disconnected and the ones at the transmitting end be short-circuited, provided that the PC is properly grounded. This configuration is the factory default setting and applicable in most situations so that there is usually no need to change it. ③If there is difficulty in grounding of the PC at the local terminal, you may short-circuit the on-board grounding jumper at the receiving end and use the transmitting end at the opposite terminal for grounding. ④If 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 2-5 for details.

Generally speaking, in the case of proper grounding at both terminals, only the external layer of the coaxial cable (E1 trunk) 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 2-5 Configuration of Grounding Jumpers in 75Ω-unbalanced-coaxial-cable Mode

Step7： Boot your computer and install the driver.

Regarding driver installation, refer to *Driver Installation Manual*.

Step8： Configure the operating parameters for the board

Refer to our *Programmer 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, to 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 prompt 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

230×163mm^2 (excluding handles)

Weight

≈ 350g

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 75Ω unbalanced interface and 120Ω balanced 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 8 digital trunk boards concurrently per system; up to 30/60/120 channels per board

Power Requirements

Maximum power consumption: ≤8W

Signaling

SS1: Compliant with DL and MFC standards stipulated in GF002-9002

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*
VOX	*32kbps*
ADPCM	*32kbps*
GSM	*13.6kbps*
MP3	*8kbps*

Sampling Rate

8kHz

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.

Headquarters

Synway Information Engineering Co., Ltd

http://www.synway.net/

9F, Synway D&R Center, No.3756, Nanhuan Road, Binjiang District, Hangzhou, P.R.China, 310053

Tel: +86-571-88860561

Fax: +86-571-88850923

Technical Support

Tel: +86-571-88864579

Mobile: +86-13735549651

Email: techsupport@sanhuid.com

Email: techsupport@synway.net

MSN: scycindy_sh@hotmail.com

Sales Department

Tel: +86-571-88860561

Tel: +86-571-88864579

Fax: +86-571-88850923

Email: sales@synway.net