



Synway CTI Series

SHT-16D-CT/PCle

Analog Voice Board

Hardware Manual

Version 1.01

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Contents	i
Copyright Declaration	ii
Revision History	iii
Chapter 1 Overview.....	1
1.1 Functions.....	1
1.2 Features	1
1.3 Operation Principle.....	4
1.4 Functional Modules	4
Chapter 2 Installation	6
2.1 Hardware Structure	6
2.2 System Requirements	9
2.3 Installation Procedure.....	9
Appendix A Technical Specifications.....	13
Appendix B Technical/sales Support.....	14

Note: The text herein below marked with '16D' is applicable to the SHT-16D-CT/PCIe board.

Copyright Declaration

All rights reserved; no part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, without prior written permission from Synway Information Engineering Co., Ltd (hereinafter referred to as 'Synway').

Synway reserves all rights to modify this document without prior notice. Please contact Synway for the latest version of this document before placing an order.

Synway has made every effort to ensure the accuracy of this document but does not guarantee the absence of errors. Moreover, Synway assumes no responsibility in obtaining permission and authorization of any third party patent, copyright or product involved in relation to the use of this document.

Revision History

Version	Date	Comments
Version 1.0	2011-11	Initial publication
Version1.01	2012-08	Add new features

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

Chapter 1 Overview

The CTI Series SHT-16D-CT/PCIe is a 16-channel analog voice board with PCIe bus. All functions found on general voice boards and specific station boards are available with this board by configuring the various functional modules in different ways.

1.1 Functions

- Supports ring-alert for external calls
- Station phones on-hook/off-hook detection
- Direct connection between trunk and station keeps call uninterrupted during power outage
- All voice channels can be used for faxing
- Calling party info (Caller ID) detection, DTMF and FSK support
- Activity/silence detection
- Automatic Gain Control (AGC) support in recording operation
- DTMF transmission and detection
- Automatic line voltage detection
- Automatically checks the number and the type of the modules on the board

1.2 Features

- **PCIe 1.0 Bus Support**

Includes PCI Express 1.0 bus and supports single-way transmission rate up to 2.5Gb, applicable to PCI Express X1, X2, X4, X8, X16 slots.

- **Module Configurable**

8 on-board dual channel modules can be freely arranged in pairs or groups for various complex, multi-functional applications, such as call center and recording functions available on a single board.

- **RJ45 Connectors Available**

A single board has four 8-pin RJ45 jacks, each of which can be converted to four 2-pin RJ11 jack via a four-way hub, making connection easy and malfunctions rare.

- **Teleconferencing**

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.

- **On-board Ringing Current & Battery Feed Power Supply**

Each station channel has a circuit to generate ringing current and battery feed for itself, saving the cost on external power supply and facilitating the use.

- **Flexible Power Supply Scheme**

Multiple power supply schemes are available to provide the 12V power for the boards using station channels. One option is to connect the P4 D-type hard disk power plug of the computer, and another choice is to short the S17 pin header and obtain the power via the PCIe slot. If the power supply inside the computer is insufficient, external connection of 12V power adapter can be a substitute (Refer to Figure 2-2).

- **Overvoltage Protection and Undervoltage Indication**

The board is designed with overvoltage protection and undervoltage indication features. The D1 indicator light is on when the power supply is normal (about 12V). When the voltage is lower than 10.8V, it is off, indicating the power supply failure (Refer to Figure 2-2).

- **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**

Uses SPECDial – a specialized driver algorithm - to perform a complete automatic dial process through analog lines. Accurately identifies called-party statuses and precisely distinguishes an answering machine from a fax machine that is responding at the remote end.

- **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.

The board itself has the capability of 16ms echo cancellation. If it is installed with an E021 module, the capability of echo cancellation will increase to 128ms.

- **Optional Modules**

Compared with the B-type or C-type analog voice boards Synway launched previously, the SHT-16D-CT/PCIe board uses the modularized design more completely. Installing different kinds of modules on a same motherboard of SHT-16D-CT/PCIe can achieve various features and functions. At present, the supported modules are only E021 (with echo cancellation capability) and F021 (with

faxing capability).

- **Various CODECs Support**

Offers a large selection of voice CODECs, including hardware-based A-law, 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.

- **Audio Output Interface**

The analog tone amplifier circuit equipped on the first (default) channel allows the board to connect directly with the headset or sound box, and enable the voice to be played to a specified channel by simple function calls.

- **TDM Capability**

The use of H.100 CT-BUS facilitates smooth connectivity to third-party boards with H.100 bus for the transfer of acquired voice signals to other devices.

- **Unique Hardware Serial Number**

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.

- **Authorized Code Identification Circuit**

The on-board authorized code identification circuit is designed for software safety. Users can apply to our company for the authorized code.

- **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. Functions such as the detection and analysis of rings, tones and Caller IDs, are available via simple function calls on the driver platform, without having to understand complex call procedures.

1.3 Operation Principle

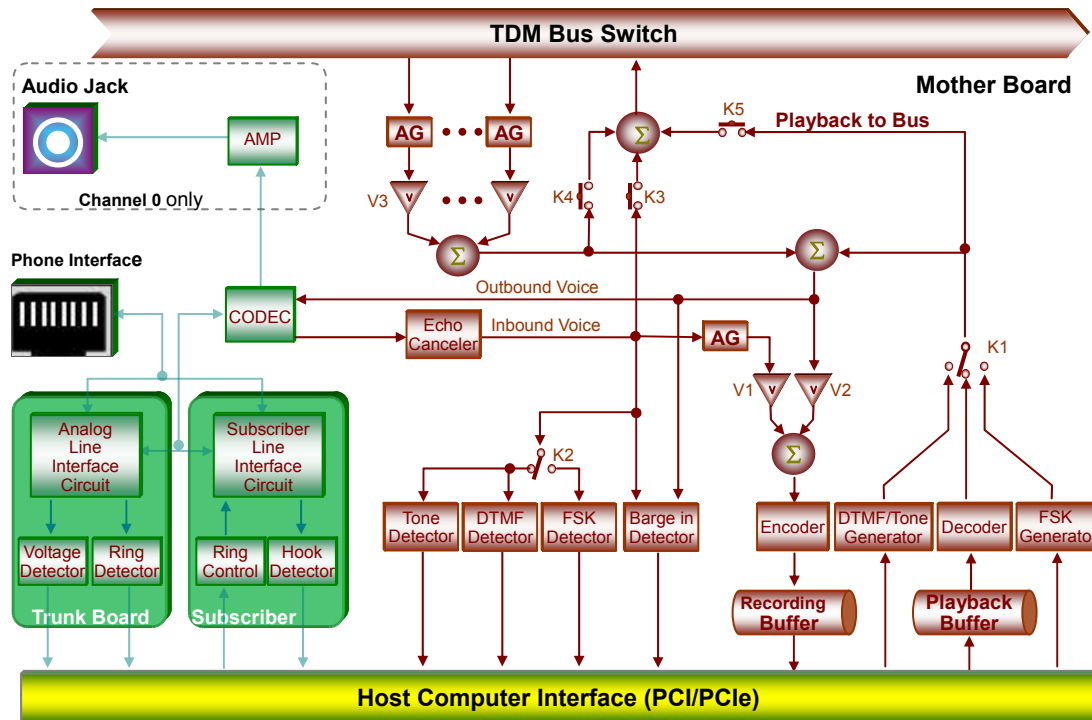


Figure 1-1 Operation Principle

Note: Channel 0 illustrated in this figure corresponds to Channel 1 marked on the board.

1.4 Functional Modules

This board can be used with different kinds of modules from Synway. Now the optional modules are: interface modules - FXS200, FXO200, FXC200; functional modules - E021, F021.

- **FXO200: A module supports 2 FXO lines**

This module can be directly connected to local lines from Central Office Terminal (COT), with the ability to detect line voltage and diagnose line failure. See Figure 2-5.

- **FXS200: A module supports 2 FXS lines**

This module is used to connect ordinary phones to serve as a station. See Figure 2-6.

- **FXC200: A composite module integrated with FXO and FXS lines**

This module contains an analog trunk channel and a station channel, occupying a dual-channel module socket. It ensures safe communication via an automatic direct connection of the analog trunk channel and the station channel when the driver is not running or the PC is powered off. See Figure 2-7.

- **E021: A module with the capability in echo cancellation.**

This modules supports 128ms echo cancellation for 16 channels. See Figure 2-8 and

Figure 2-9.

- **F021: A module with the capability in faxing.**

This module supports V.17 fax for 4 channels. See Figure 2-10 and Figure 2-11.

Chapter 2 Installation

2.1 Hardware Structure

- SHT-16D-CT/PCIe Board

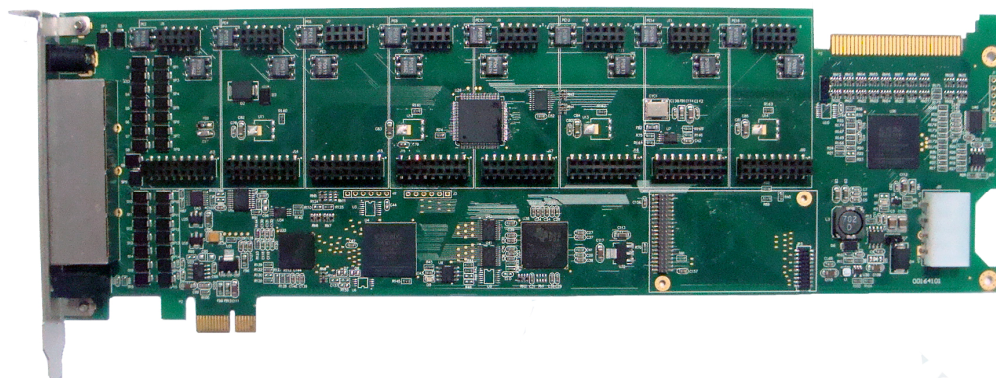


Figure 2-1 Front View

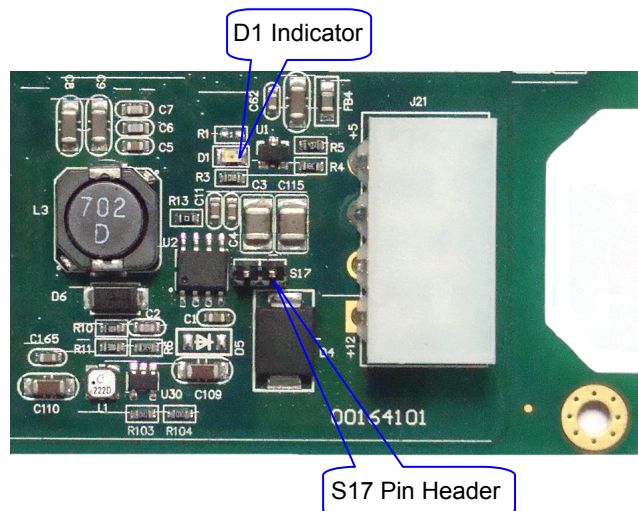


Figure 2-2 Partial Enlarged View

D1 indicator: Power supply indicator. It is off when the power supply is lower than 10.8V.

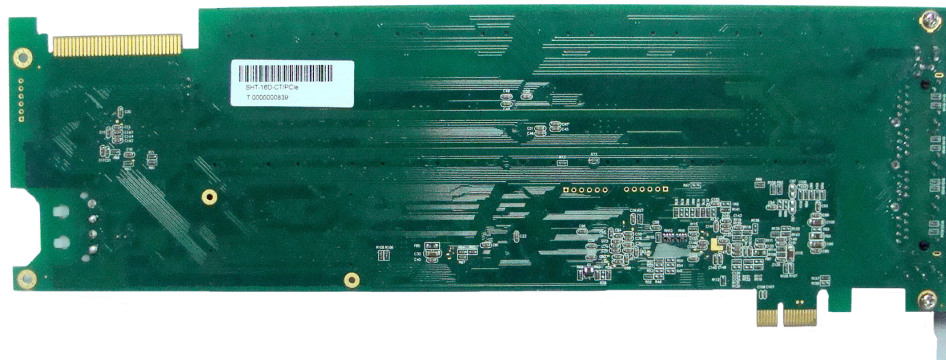
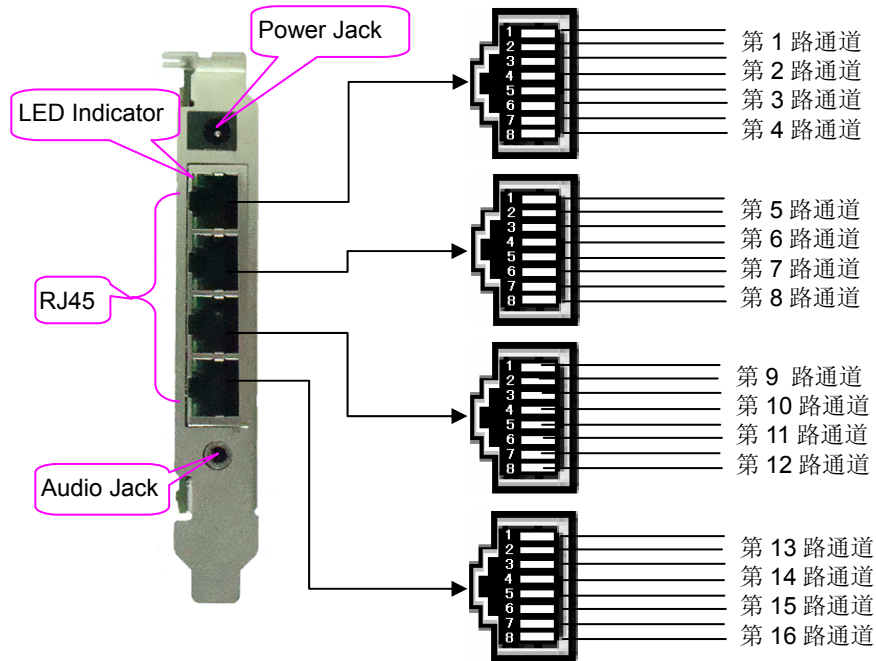


Figure 2-3 Rear View



Audio jack: Audio output interface, $\phi 3.5$ stereo jack.

Power jack: External power interface. When the board is equipped with the FXS channels, external power supply is available. For more details, refer to [2.3 Installation Procedure](#).

Led indicator: Each interface module slot has an indicator light, i.e. 8 indicator lights are available on the board for the 8 interface modules. The indicator light is on when its corresponding interface module is initialized successfully.

● FXO200 Module

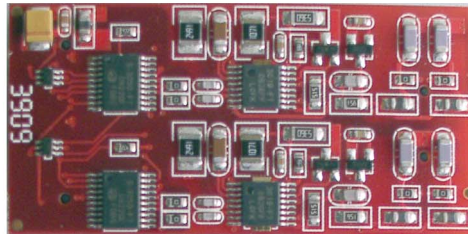


Figure 2-5 Front View

● FXS200 Module

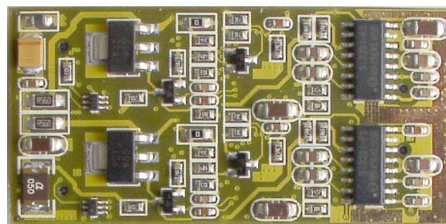


Figure 2-6 Front View

● FXC200 Module

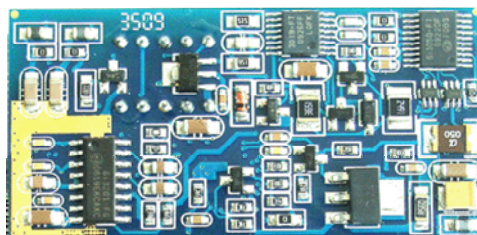


Figure 2-7 Front View

- **E021 Module**

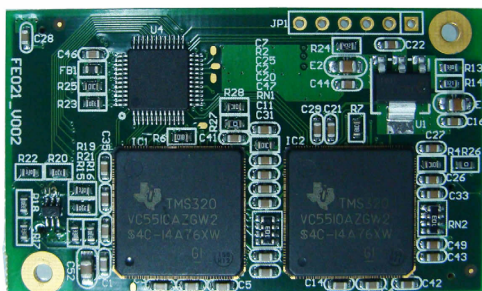


Figure 2-8 Front View

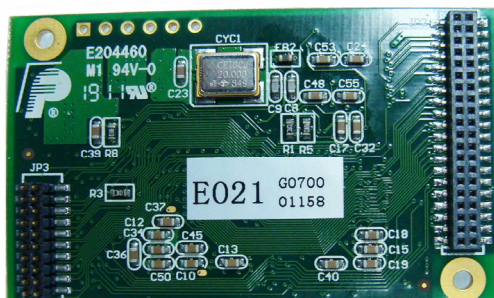


Figure 2-9 E021 Rear View

- **F021 Module**

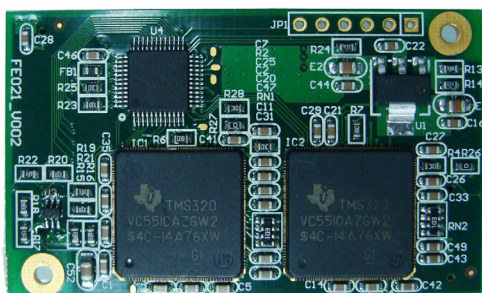


Figure 2-10 Front View

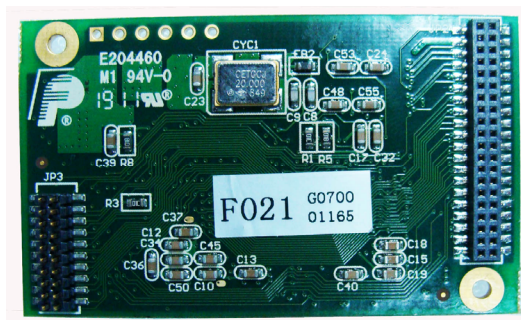


Figure 2-11 Rear View

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: Plug the desired modules into the module slots on the board, and fit the board into the PC chassis.

Step 2: Connect to analog lines or phones.

Each SHT-16D-CT/PCIe board has four 8-pin RJ45 jacks each of which can be connected to four 2-pin RJ11 jacks via a 4-way hub.

Here below we take the first RJ45 jack for example. The corresponding relations among on-board channel number, 8 pins of the RJ45 jack and interfaces of the 4-way hub are shown in Table 2-1.

Jack No.	Channel No.	Pins of RJ45	Interfaces of 4-way Hub
First RJ45 Jack	1	1 st and 2 nd pins	1 st interface
	2	3 rd and 4 th pins	2 nd interface
	3	5 th and 6 th pins	3 rd interface
	4	7 th and 8 th pins	4 th interface

Table 2-1 Corresponding Relations among Channel Number, RJ45 Pins and Hub Interface

Notes:

- ① To use the first RJ45 jack to connect lines, you can refer to the above relations and

convert it correctly via a 4-way hub. The other three RJ45 jacks are used in the same way.

- ② The 4-way hub used to convert the on-board RJ45 jacks can be purchased from Synway. If you'd like to construct lines by yourself, we suggest you strictly follow Figure 2-4.

Step 3: Connect to HD power plug or external 12V power adapter

See Figure 2-12 below for how to connect the HD power plug in the chassis to the motherboard.

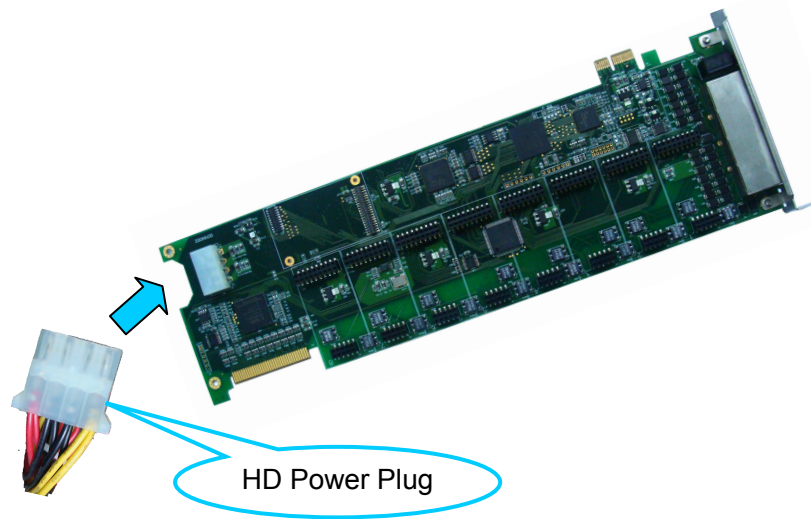


Figure 2-12 Insert HD Power Plug to Board

Note:

- ① For the boards before V101, whatever modules you use, you must ensure the HD power plug is properly connected. For the boards of V101 and above versions, only those equipped with FXS channels are required to be connected with power plug.
- ② As the HD power plug may probably be used in more than one place, we provide a power port extender (one master to three slaves) with the board to offer more plugs. Then you can connect with more boards. However, considering the limit on the on-state current, we suggest a master HD power plug be connected with no more than 4 boards via the power port extender.
- ③ For the boards of V101 and above versions, if the P4 D-type hard disk power plug is not available, the 12V power supply can be obtained via the PCIe slot. In this case, you should short the S17 pin header using the jumper.
- ④ If the power supply inside the computer is insufficient, another option is to connect the external 12V power adapter for the FXS channel. The external power supply should meet the following requirements:
 - a) Provides 12V DC output, with the output current greater than 3A.

- b) Specification of power plug: DC5525.
- c) The 12V DC power adapters can be purchased from Synway. Should you have any requirements, please contact our sales persons.

Step 4: Fit the trunk-station composite module.

Skip this step if direct connection between trunk and station which keeps call uninterrupted during power outage is not required by the system.

When the trunk-station composite module is used, the station phone and the phone line which both share the same module can be directly linked before the board is powered on or the driver software is initialized to allow emergency telecommunication. Once the board application program starts to run, the link automatically breaks and the internal and external lines become independent.

Note: When composite modules are used, the adjacent two channels are by default a station channel and an analog trunk channel. Users can set whichever channel to be a station channel or an analog trunk one by modifying the configuration file.

Step 5: Connect the sound box or other proper sound devices.

Skip this step if there is no need to 'monitor in real time' or 'play'.

Regarding how to choose proper sound devices, refer to 'Input/output Interface' and 'Audio Specifications' in [Appendix A Technical Specifications](#).

Note: The first module slot on the board must be fitted with a module should you wish to play sound via the amplifier.

Step 6: 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 2-13 for correct insertion. Do not twist or insert in the opposite direction.

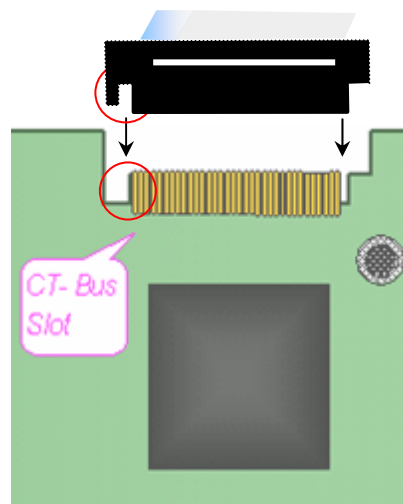


Figure 2-13 Connection of H.100 Bus

- 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 7: Boot your computer and install the driver.

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

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

Board: 312×103mm² (excluding L-bracket)

Weight

Board: ≈ 400g

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

Headset jack: One ϕ 3.5 stereo jack

Telephone line jack: Four 8-pin RJ45 (16B)

Audio Specifications

CODEC: CCITT A/ μ -Law 64kbps,

IMA ADPCM 32kbps

Output power: ≥50mW

Distortion: ≤3%

Frequency response: 300-3400Hz(±3dB)

Signal-to-noise ratio: ≥38dB

Echo suppression: ≥40dB

Maximum System Capacity

With enough system power:

Up to 8 boards concurrently per system; up to 16 channels per board

Power Requirements

+12V DC: 2500mA

3.3V DC: 2000mA (with functional modules)

3.3V DC: 1200mA (without functional modules)

Maximum power consumption: ≤33W (with functional modules, all FXS channels, REN≤3)

Impedance

Input impedance: ≥1M Ω /500V DC;

≥10k Ω /1000V AC

Insulation resistance for PC isolation from telephone line: ≥2M Ω /500V DC

Telephone line impedance:

Compliant with the national standard impedance for three-component network

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

8 kHz

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.

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: +86-18905817070

Email: techsupport@sanhuid.com

Email: techsupport@synway.net

MSN: synway.support@hotmail.com

Sales Department

Tel: +86-571-88860561

Tel: +86-571-88864579

Fax: +86-571-88850923

Email: sales@synway.net