Synway CTI Series

SHT-8B/PCI

SHT-8B/PCI/FAX

SHT-16B-CT/PCI

SHT-16B-CT/PCI/FAX

Analog Voice Board

Hardware Manual

Version 2.2

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Note: In this document, '8B' refers to SHT-8B/PCI and SHT-8B/PCI/FAX voice boards, and '16B' represents SHT-16B-CT/PCI and SHT-16B-CT /PCI/FAX voice boards.

Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0	1997-5	For overseas markets only
Version 1.1	1999-2	Rearranged edition: added description on interfaces and their connection.
Version 2.0	2003-10	Changes: made major hardware improvement, added illustrations of boards and modules for better understanding.
Version 2.1	2006-8	Changes: separated call-recoding boards from the CTI series to be a new series.
Version 2.2	2011-11	Changes: added a new module EM2V100.

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

Chapter 1 Overview

8B and 16B boards in this document are 8/16-channel analog voice boards with PCI bus. All functions found on general voice boards and specific station boards are available with these boards by configuring the various functional modules in different ways.

1.1 Functions

- Supports ring detection 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) transmission/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 board to determine the number and type of modules on the board

1.2 Features

- **PCI 2.1 Bus Support**

  Includes PCI 2.1 bus with burst data transmission rate up to 133 MB/s; PNP (plug and play) feature eliminates the need for jumper leads.

- **On-board SIMM Slots**

  Fit modules to board. Contacts on both sides of the SIMM slots greatly improve connection and ease installation.

- **Module Configurable**

  4 or 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.

- **Available Analog Telephone Line Interface**

  The available RJ11 jacks on the SHT-8B/PCI and SHT-8B/PCI/FAX boards can be directly

connected to phone lines, making connection easy and malfunctions rare.

- **Available RJ45 Jack**

  A single SHT-16B-CT/PCI or SHT-16B-CT/PCI/FAX board has four 8-pin RJ45 jacks, each of which can be converted into four 2-pin RJ11 jacks via a 4-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.

- **External Ringing Current & Battery Feed Power Supply**

  Provides station modules with battery feed, and enables the phones which are linked to station channels to ring.

- **Programmable Tone Detector**

  Detects single or dual tones at any frequency, offering facility for use with a variety of switches and enterprise phone systems.

- **Professional Driver Algorithm**

  Uses SPECDial - a professional 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.

- **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.

- **Audio Output Interface**

  The first channel on the board equipped with a tone amplifier circuit can directly connect to the headset or sound box, and play voices to a particular channel via a simple function call.

- **Board & Between-board TDM Capability**

The SHT-16B-CT/PCI and SHT-16B-CT/PCI/FAX boards include H.100 bus, facilitating smooth connectivity to third-party boards with H.100 bus for the transfer of acquired voice signals to other devices.

The SHT-8B/PCI and SHT-8B/PCI/FAX boards are capable of on-board TDM.

- **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.

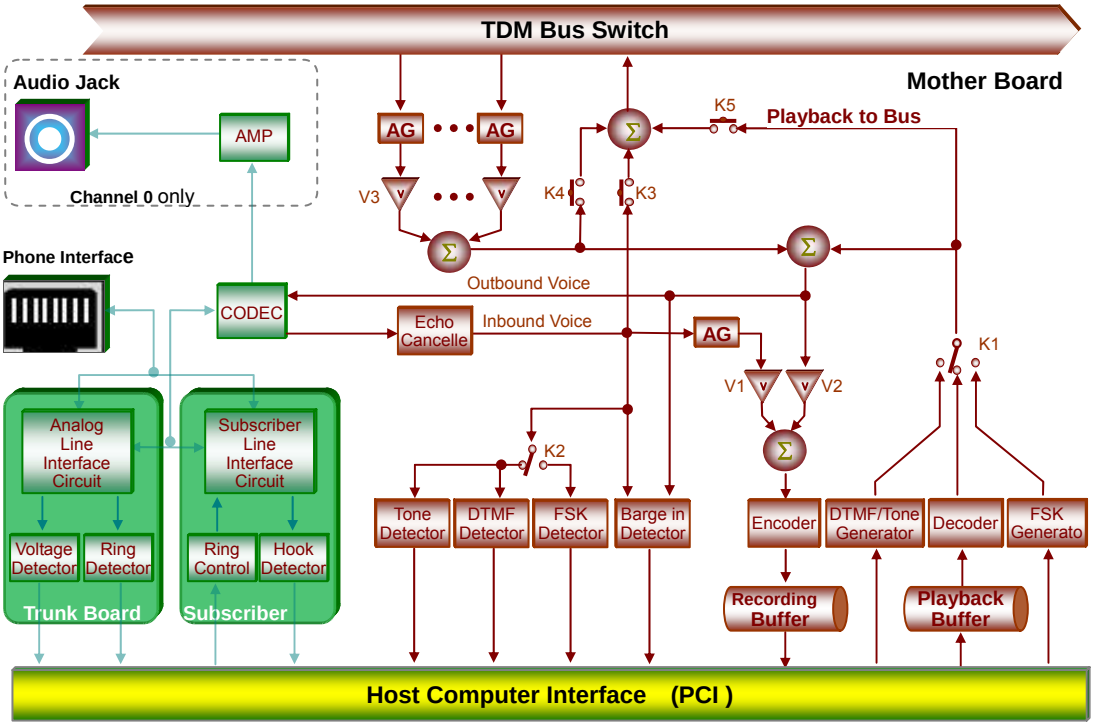
- **Authorized Code Identification Circuit**

  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



Notes: Channel 0 mentioned in this figure corresponds to Channel 1 marked on the board.

Figure 1-1

1.4 Functional Modules

These boards can be used with three kinds of modules: analog trunk module, station module and composite module.

- **Analog Trunk Module**

  Connects directly to local lines from Central Office Terminal (COT), with ability to detect line voltage, diagnose line failure, and can be connected in parallel. See Figure 2-6 and Figure 2-7 for more information.

- **Station Module**

  Connects to common telephones for internal calls. For more information, refer to Figure 2-8 and Figure 2-9.

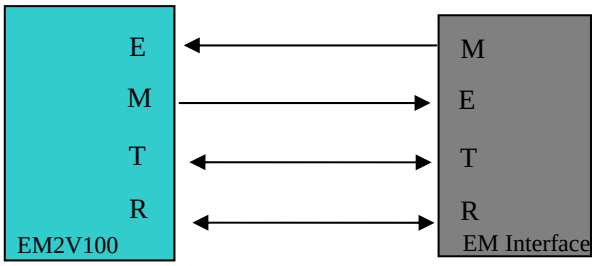
- **Composite Module**

  Seated in a dual-channel module slot, this module contains a trunk channel and a station channel, allowing direct connection between Internal and external lines when the PC is powered off. See Figure 2-10 and Figure 2-11 for details.

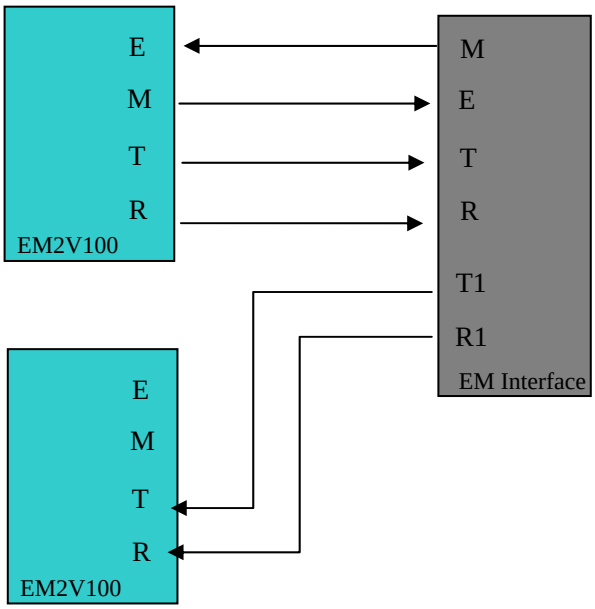
- **EM2V100 Module**

  A single EM2V100 module can transfer 2-line voice data and meanwhile perform EM control. Two EM2V100 modules can be used either as two EM trunk channels each of which carries 2-line voice data or an EM trunk channel which carries 4-line voice data. To use two EM2V100 modules, set 2 voice lines for incoming calls and another 2 voice lines for outgoing calls, and select one from the two pairs of E&M lines to perform EM control. See Figure 2-12 and Figure 2-13.

  See below for the connection of the EM2V100 module.



Connect to EM Interface Carrying 2-line Voice Data



Connect to EM Interface Carrying 4-line Voice Data

See below for the pin definition of a single RJ45.

Pin No.	Pin Definition for EM2V100
1	E0
2	M0
3	Vp0
4	Vn0
5	E1
6	M1
7	Vp1
8	Vn1

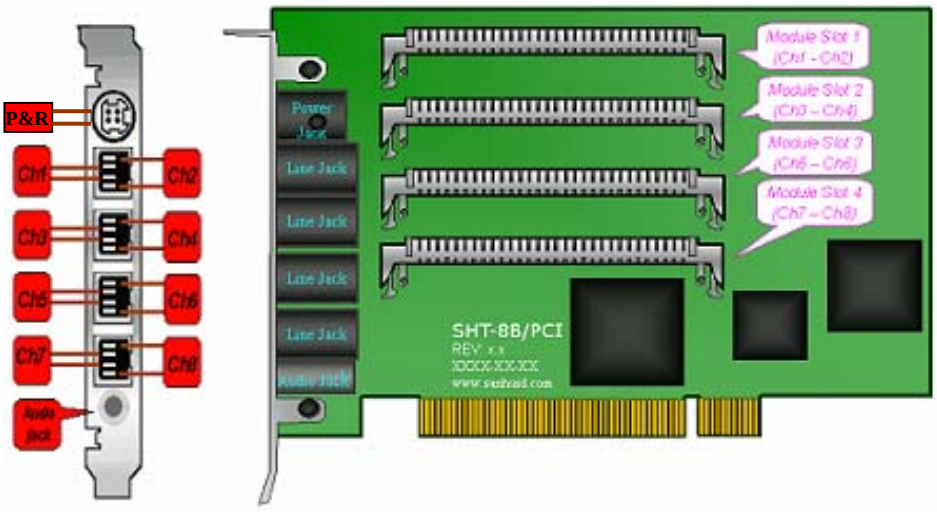
See below for the pin definition of a single RJ11.

Pin No.	Pin Definition for EM2V100
1	E0
2	M0
3	Vp0
4	Vn0

Chapter 2 Installation

2.1 Hardware Structure

- **SHT-8B/PCI or SHT-8B/PCI/FAX board**



P&R: Interface for ringing current and battery feed power supply

Ch1～Ch8: Interfaces to channels 1-8

Audio jack: Audio output interface, Φ3.5 stereo jack

Figure 2-1 Left and Front Sides

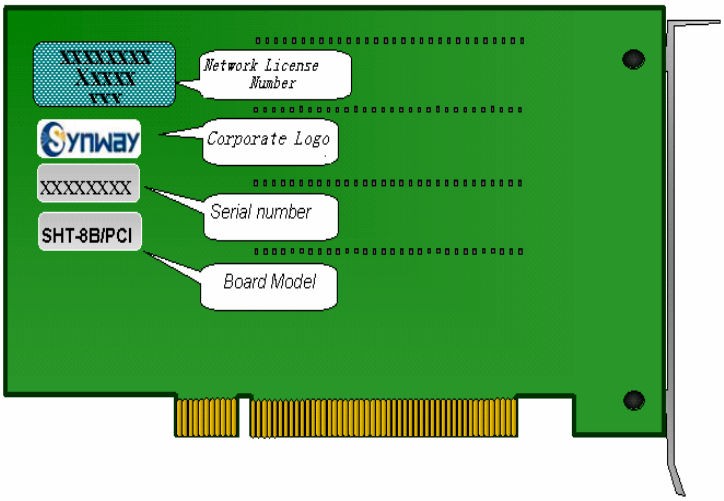


Figure 2-2 Reverse Side

- **SHT-16B-CT/PCI or SHT-16B-CT/PCI/FAX board**

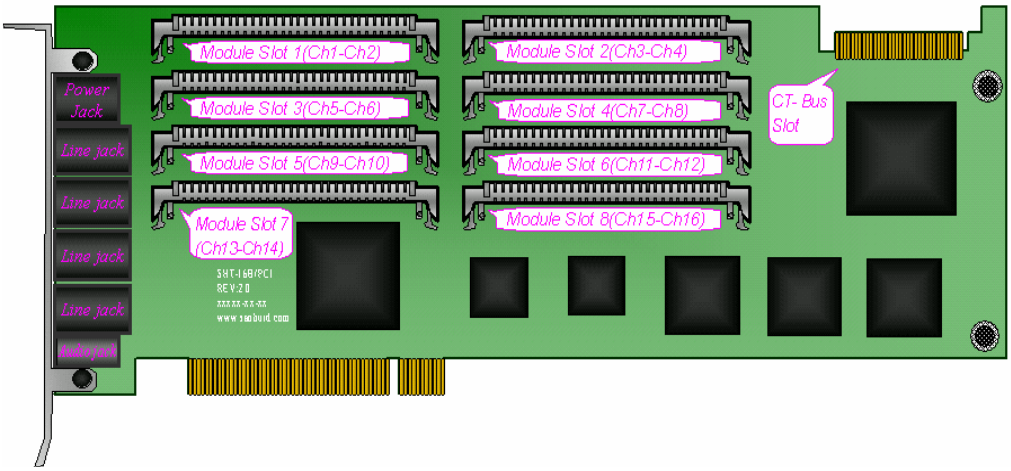


Figure 2-3 Front Side

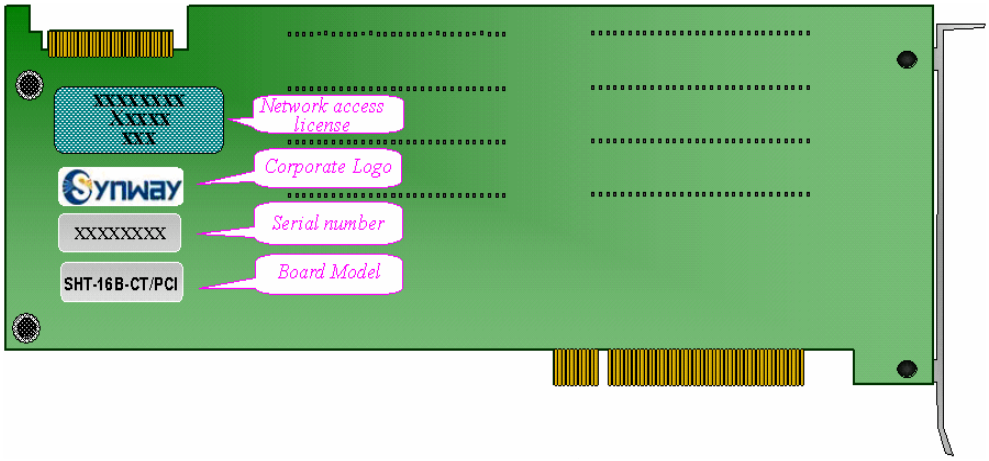
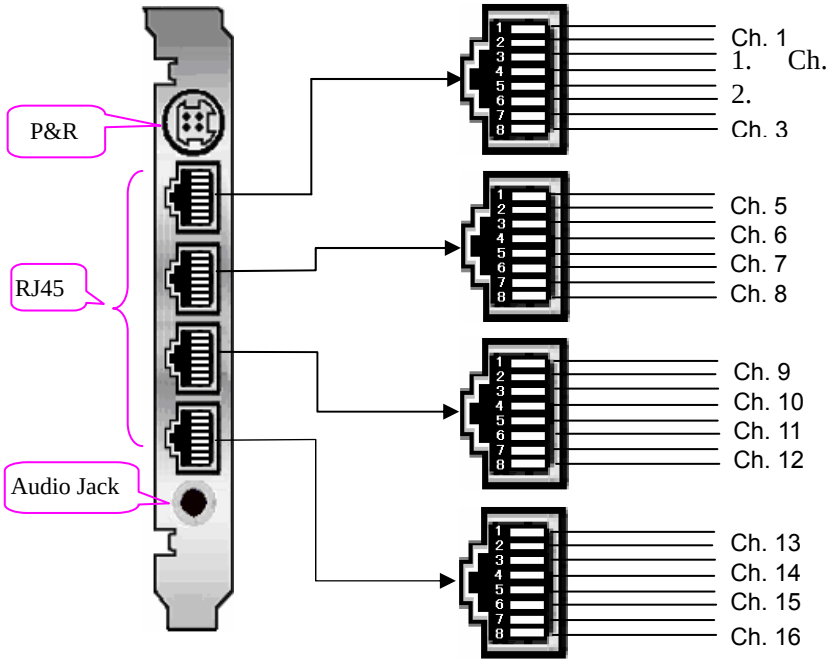


Figure 2-4 Reverse Side



P&R: Interface for ringing current and battery feed power supply

Audio jack: Audio output interface, Φ3.5 stereo jack

Figure 2-5 Left Side

- **Analog Trunk Module**

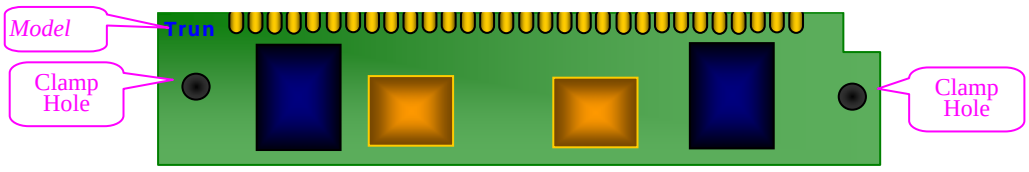


Figure 2-6 Front Side

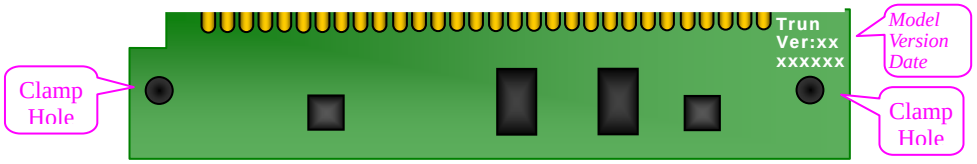


Figure 2-7 Reverse Side

- **Station Module**

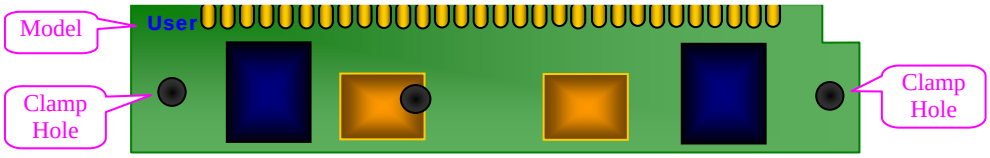


Figure 2-8 Front Side

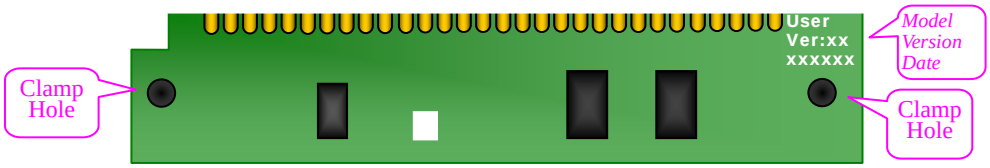


Figure 2-9 Reverse Side

- **Composite Module**

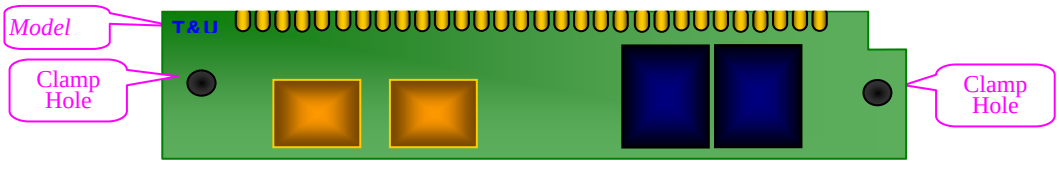


Figure 2-10 Front Side

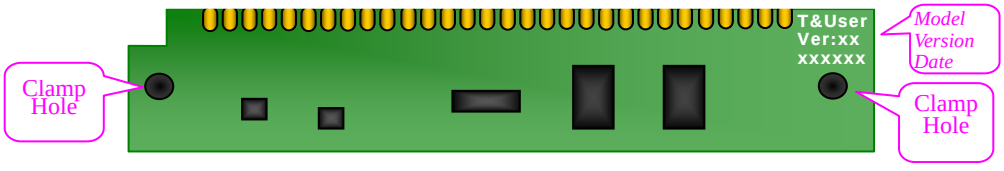


Figure 2-11 Reverse Side

- **EM2V100 Module**

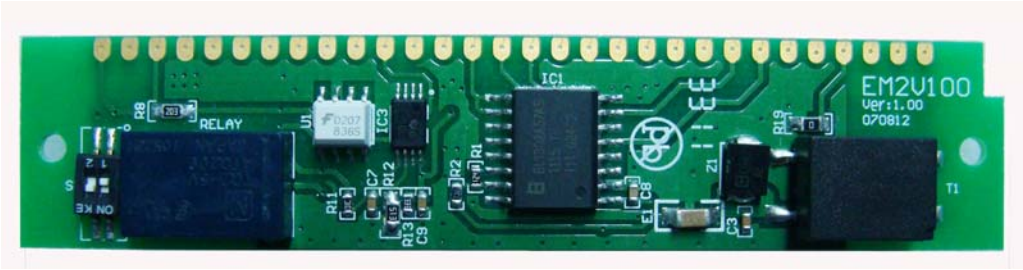


Figure 2-12 Front Side

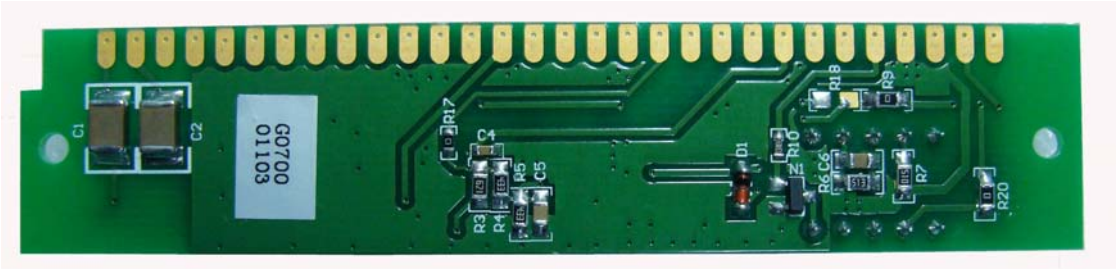


Figure 2-13 Reverse Side

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 modules into the module slots on the board, and fit the board into the PC chasis.

Step 2: Connect to analog phone lines or telephones

Each SHT-8B/PCI or SHT-8B/PCI/FAX voice board has four RJ11 jacks, each of which corresponds to 2 channels - the middle two pins link to a channel, and the outer two pins to another. The pin layout and the corresponding channel numbers are shown in Figure 2-1.

Each SHT-16B-CT/PCI or SHT-16B-CT/PCI/FAX voice board has four 8-pin RJ45 jack which can be connected to four 2-pin RJ11 jacks via a 4-way hub. See Figure 2-5 for the physical layout of the jack.

Take the first RJ45 jack for example, the matching relationship among the on-board channel

numbers, the 8 pins of the RJ45 jack and the 4-way hub is shown in Table 2-1 below.

Interface Serial Number	Channel Number	Pins of the RJ45 Jack	4-way Hub
First RJ45 Jack	1	1st and 2nd pins	1st jack
	2	3rd and 4th pins	2nd jack
	3	5th and 6th pins	3rd jack
	4	7th and 8th pins	4th jack

Table 2-1 Matching Relationship among Channel Number, 8 Pins of RJ45 Jack and 4-way Hub

Notes:

① Connection to an RJ11 jack can be done through a 2-way hub or you can construct one by yourself following Figure 2-1.

② Connection to an RJ45 jack can be done through a 4-way hub and the matching relationship for the other three on-board RJ45 jacks and their corresponding pins and channel numbers may be deduced by analogy.

③ 4-way hubs are available on purchase from our company or if you prefer to construct one by yourself, we suggest you follow Figure 2-5.

Step 3: Connect to the EM2V100 module.

Skip this step if EM2V100 modules are not used.

To use the EM2V100 modules, there are two situations as shown below.

1) Used as an EM trunk channel carrying 2-line voice data

In such situation as a single EM2V100 module is used as an EM trunk channel carrying 2-line voice data, follow the figure 'Connect to EM Interface Carrying 2-line Voice Data' to connect lines. To be exact, connect E at the local end to M at the remote end, M at the local end to E at the remote end, and connect TIP and RING at the local end correspondingly to TIP and RING at the remote end.

Case: Use SHT-8B/PCI which includes RJ11 jacks as the motherboard to set up an EM trunk channel carrying 2-line voice data. See below for connection (refer to the pin definition of a single RJ11 jack).

1. E0 ----------→ 2. M0

2. M0 ----------→ 1. M0

3. Vp0 ----------→ 3. Vp0

4. Vn0 ----------→ 4. Vn0

Local Remote

2) Used as an EM trunk channel carrying 4-line voice data

In such situation as two EM2V100 modules are combined to work as an EM trunk channel carrying 4-line voice data, follow the figure 'Connect to EM interface Carrying 4-line Voice Data' to connect lines. There should be two pairs of voice lines for voice transmission, and a pair of E&M lines for EM control.

Case: Use SHT-16B-CT/PCI which includes RJ45 jacks as the motherboard to set up an EM trunk channel carrying 4-line voice data. See below for connection (refer to the pin definition of a single RJ45 jack).

1. E0 ----------→ 2. M0

2. M0 ----------→1. M0

3. Vp0 ----------→ 3. Vp0

4. Vn0 ----------→ 4. Vn0

5. E0 ------X----→ 5. E0

6. M0 ------X----→ 6. M0

7. Vp0 ----------→ 7. Vp0

8. Vn0 ----------→ 8. Vn0

Local Remote

Note: In case two EM2V100 modules are combined to work as an EM trunk channel carrying 4-line voice data, only one pair of E&M lines need to be used. Therefore, the pair of E&M lines on the first module should be connected to the remote end, while that pair on the second module is suggested not to be connected.

Step 4: Connect to the ringing current and battery feed power supply

Skip this step if neither station modules nor EM2V100 modules are used.

When using the external ringing current and battery feed power supply from Synway, note that the plug has a peculiar design for the prevention of improper insertion and extraction. The

correct way is to hold the plug body (not the locking ring, or it cannot be fully inserted) when inserting the plug home into the socket, and to grasp the locking ring (not the plug body or the conductor) when pulling the plug out from the socket. See Figure 2-14 below.

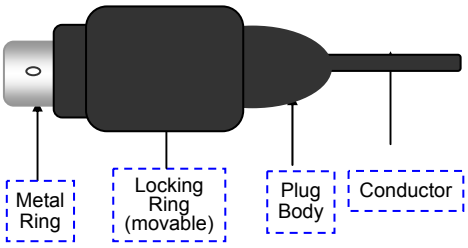


Figure 2-14 Ringing Current & Battery Feed Power Supply Plug

Step 5: Fit composite module

Skip this step if direct connection between internal and external lines is not required when the PC is powered off.

A composite module contains a trunk channel and a station channel, and is seated in a dual-channel module slot. Before the board is powered on or the driver software is initialized, the station phone and the phone line which both share the same module are directly linked to allow emergency telecommunication. Once the board application program starts to run, the link automatically breaks and the internal and external lines become independent.

Notes: 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 6: 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*

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

Step 7: Connect the bus cable with the H.100 bus on each board.

Skip this step if there is no need for bus exchange between multiple SHT-16B-CT/PCI or SHT-16B-CT/PCI/FAX boards.

Note:

① See Figure 2-15 for correct insertion. Do not twist or insert in the opposite direction.

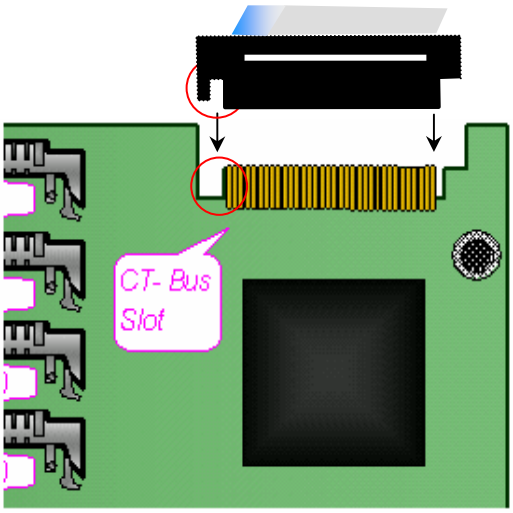


Figure 2-15 Connection of H.100 Bus

② There are two clock settings for our boards: When TDM is not required, each board sets its own clock and does not have to 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 stiff conducting material. Therefore, when it has been shaped, do not bend it repeatedly or violently lest it is broken.

Step 8: Boot your computer and install the driver

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

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.

Appendix A Technical Specifications

Dimensions

8B: 170×108mm^2 (excluding L-bracket)

16B: 310×108mm^2 (excluding L-bracket)

Weight

8B: ≈ 250g

16B: ≈ 400g

Environment

Operating temperature: 0℃—55℃

Storage temperature: -20℃—85℃

Humidity: 8%— 90% non-condensing

Storage humidity: 8%— 90% non-condensing

Input/output Interface

Headset jack: One φ3.5 stereo jack

Telephone line jack: Four 4-pin RJ11 jacks (8B)

Telephone line jack: Four 8-pin RJ45 jacks (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

Up to 10 8B/16B boards concurrently per system; up to 8/16 channels per board

Power Requirements

+5V DC: 600mA

-12V DC: 80mA

+12V DC: 300mA

Maximum power consumption: ≤12W (PC power supply only)

Impedance

Input impedance: ≥1MΩ/500V DC；

≥10kΩ/1000V AC

Insulation resistance for PC isolation from telephone line: ≥2MΩ/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

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

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