Synway CTI Series

SHT-16C-CT/PCI/EC

SHT-16C-CT/PCI/FAX

Analog Voice Board

Hardware Manual

Version 1.1

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0	2007-6	Initial publication
Version 1.1	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

The Synway CTI Series SHT-16C-CT/PCI/EC, SHT-16C-CT/PCI/FAX are the 16-channel analog voice boards with PCI 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

- A single board can be installed with at most 8 dual-channel modules, supports 16 voice channels
- 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
- Calling party info (Caller ID) detection/transmission, DTMF and FSK support
- Activity/silence detection
- Automatic Gain Control (AGC) support in recording operation
- DTMF transmission and detection
- 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
- Includes H.100 bus, compatible with MVIP bus, SC bus and ST bus, facilitating smooth connectivity to third-party boards with H.100 bus for the transfer of acquired voice signals to other devices
- Includes audio output interface. The first channel on the board equipped with an analog audio amplifier circuit can directly connect to the headset or sound box, and play voices to a particular channel via a simple function call
- Automatic line voltage detection
- Automatically checks the board to determine the number and type of modules on the board
- 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
- The on-board lightning-proof circuit reaches the telecom standard and eliminates the damage caused by the lightning
- The fax channel on the SHT-16C-CT/PCI/FAX board can be shared by all the voice channels, supports the transmit/receive rate of 14400bps
- Each channel on the SHT-16C-CT/PCI/EC board supports 64ms echo cancellation

1.2 Features

- **PCI 2.2 Bus Support**

  Includes PCI 2.2 bus with 32/64-bit PCI slot and 3.3V/5V slot voltage; Operable on device platforms which support PCI-X.

- **On-board SIMM Slots**

  Fit modules to board. Contacts on both sides greatly improve connection and ease installation.

- **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 Jack**

  A single board has four 8-pin RJ45 jacks, each of which can be converted into four 2-pin RJ11 jacks via a proper 4-way hub to serve as the analog telephone line interfaces, making connection easy and malfunctions rare.

- **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 PBXes and key telephone 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. Compared with the B Series voice boards, the C Series EC boards have the enhanced capability in echo cancellation, i.e. each channel supports 64ms echo cancellation, designed especially for the VoIP and teleconferencing applications.

- **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 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. 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

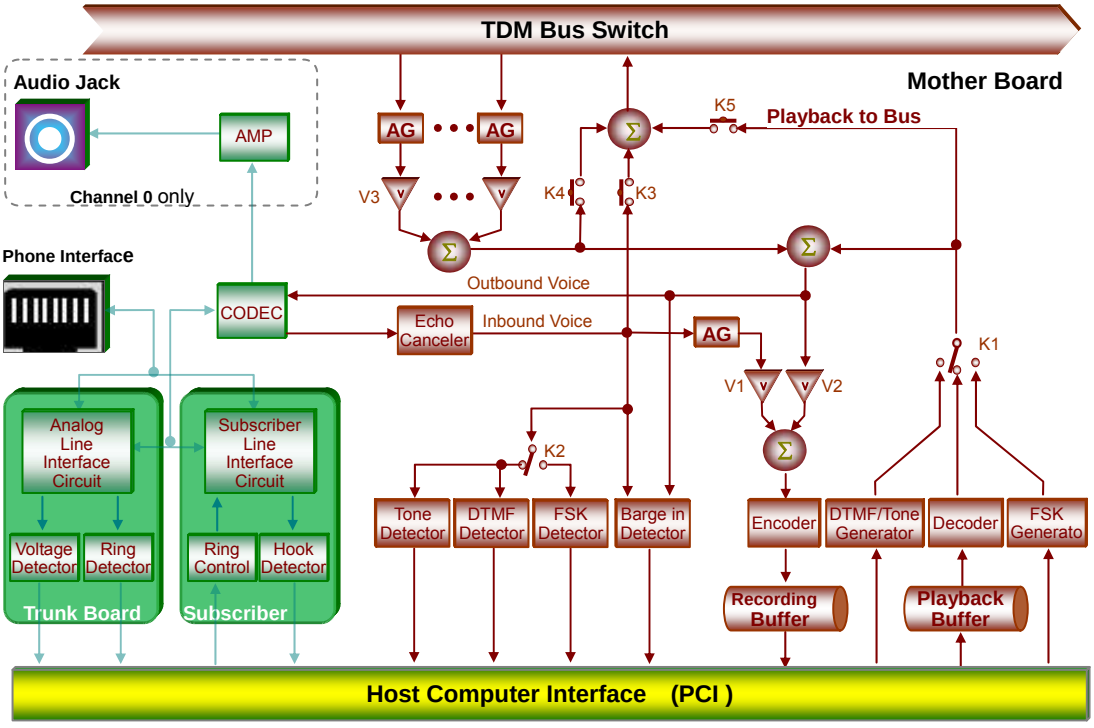


Figure 1-1 Operation Principle

1.4 Functional Modules

These boards can be used with the 2.0 series modules from Synway, including analog trunk module, station module, trunk-station composite module, trunk-record composite module and magnet module.

- **Analog Trunk Module**

  This module is equipped with the lightning-proof circuit that reaches the telecom standard, and connects its corresponding channel directly to local lines from Central Office Terminal (COT), with abilities to detect line voltage, diagnose line failure, and judge the on-hook/off-hook state of the station phone which is linked with it. See Figure 2-4 and Figure 2-5 for more information.

- **Station Module**

  This module functions either as a station phone provided it links directly to a telephone or as an extension phone for the PBX, supporting delivery of the calling party information in FSK/DTMF to the phone. It uses -40V battery feed voltage and the integrated overcurrent/overvoltage circuit protection system, can accommodate a subscriber line in length of up to 5.5km. Refer to Figure 2-6 and Figure 2-7 for details.

- **Trunk-Station Composite Module**

  This module accommodates an analog trunk channel and a station channel, ensuring 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 2-8 and Figure 2-9 for details.

- **Trunk-Record Composite Module**

  This module embraces two channels. One is for high-impedance recording in parallel connection and the other works as an analog trunk. See Figure 2-10 and Figure 2-11 for more information.

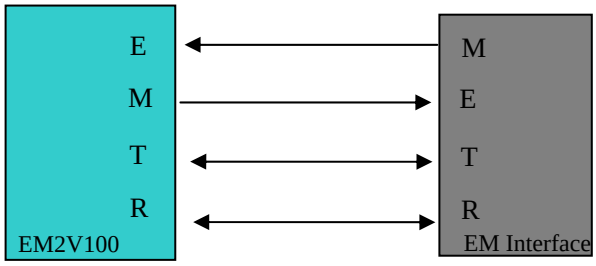
- **Magnet Module**

  This module enables the direct connection of its corresponding channel with a magnet phone line so as to simulate the functions provided by magnet telephones. Refer to Figure 2-12 and Figure 2-13 for details.

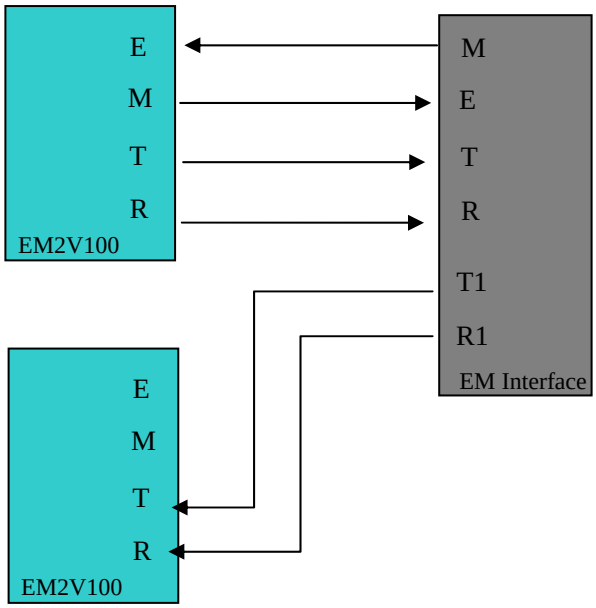
- **EM2V100 Module**

  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 2-14 and Figure 2-15.

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-16C-CT/PCI/FAX board**

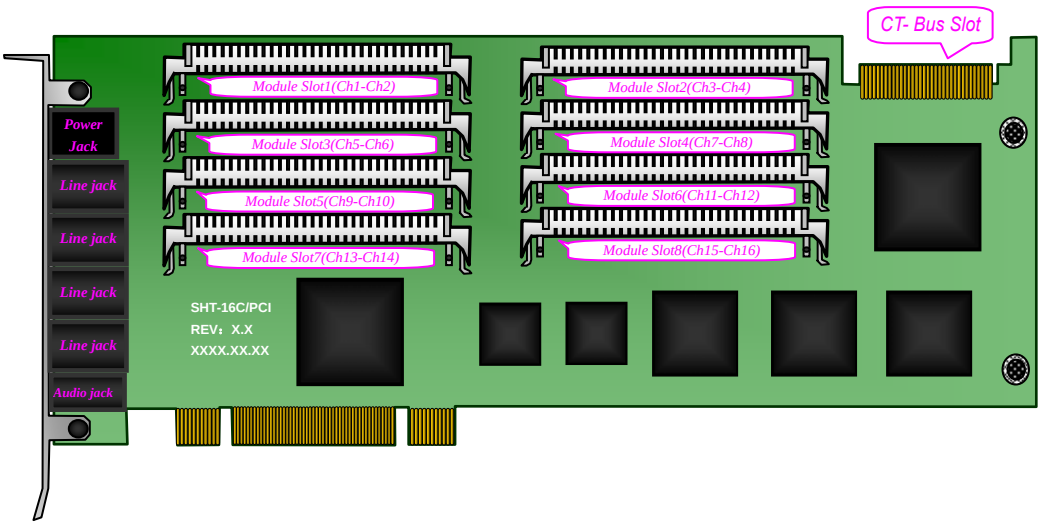


Figure 2-1 Front View

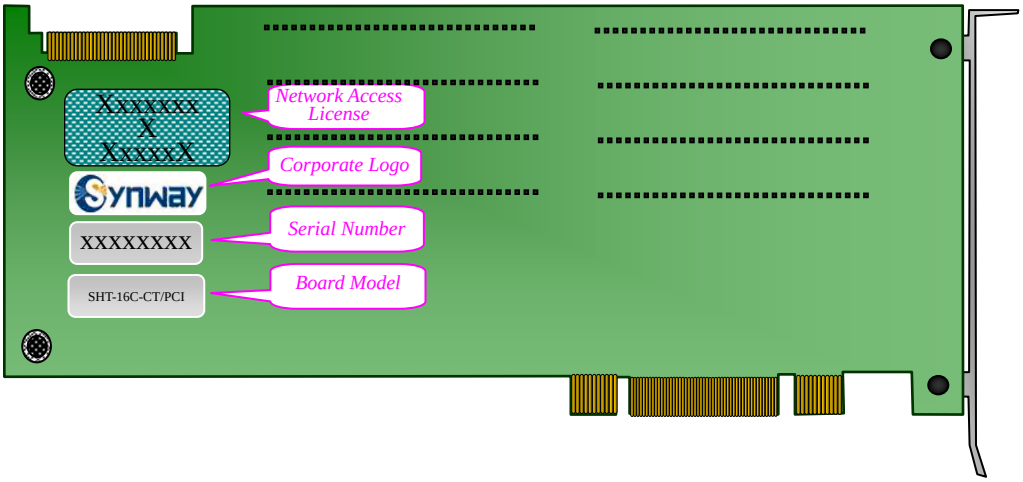


Figure 2-2 Rear View

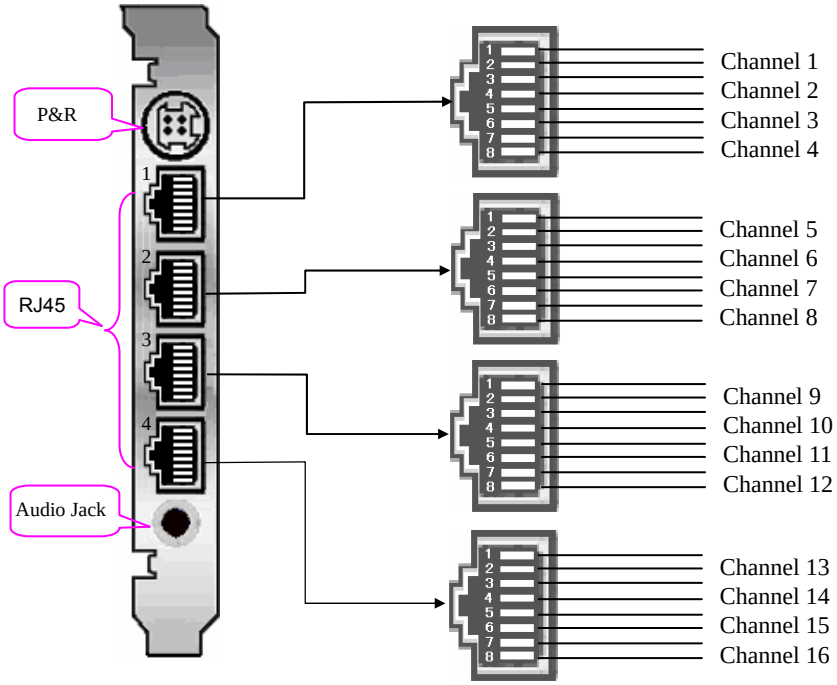


Figure 2-3 Left View

Note：This file only illustrates the SHT-16C-CT/PCI/FAX board with the above figures but is also applicable to the SHT-16C-CT/PCI/EC board which has the similar hardware structure. Always check the label on the board to get the board model before your use.

- **Analog Trunk Module**

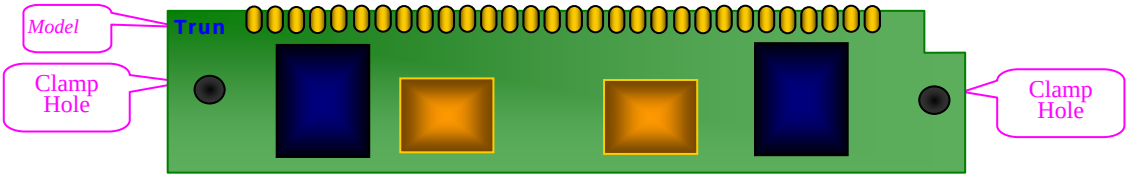


Figure 2-4 Front View

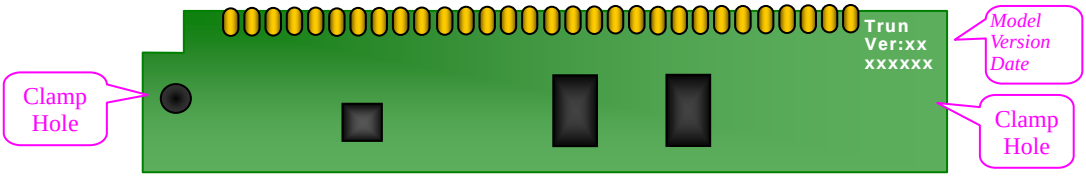


Figure 2-5 Rear View

- **Station Module**

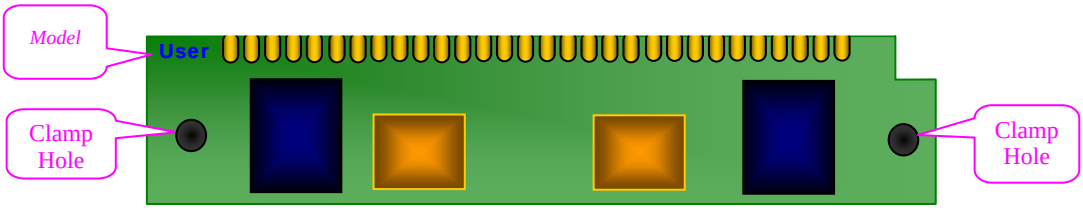


Figure 2-6 Front View

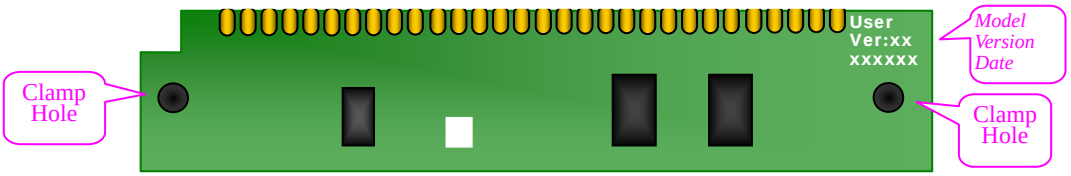


Figure 2-7 Rear View

- **Trunk-Station Composite Module**

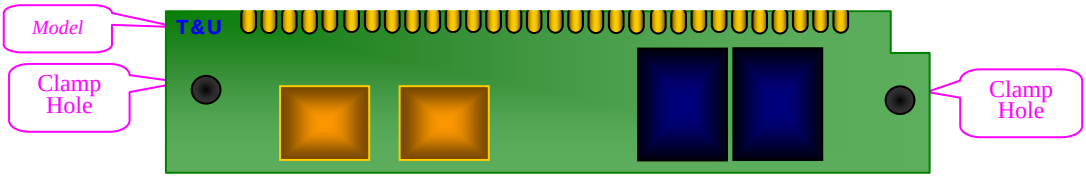


Figure 2-8 Front View

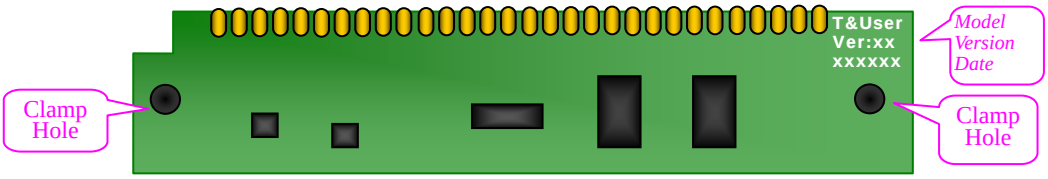


Figure 2-9 Rear View

- **Trunk-Record Composite Module**

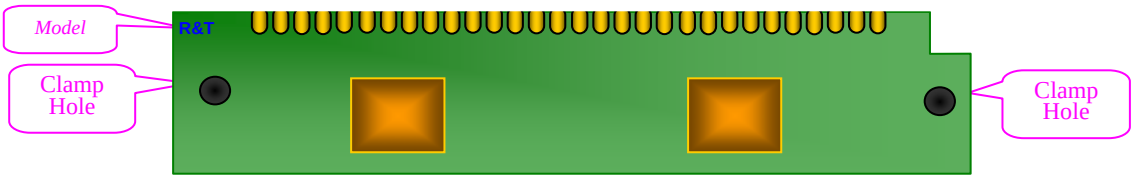


Figure 2-10 Front View

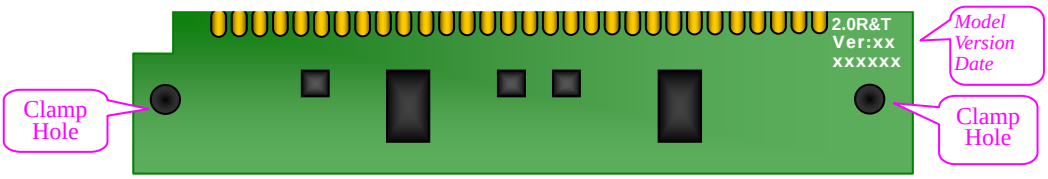


Figure 2-11 Rear View

- **Magnet Module**

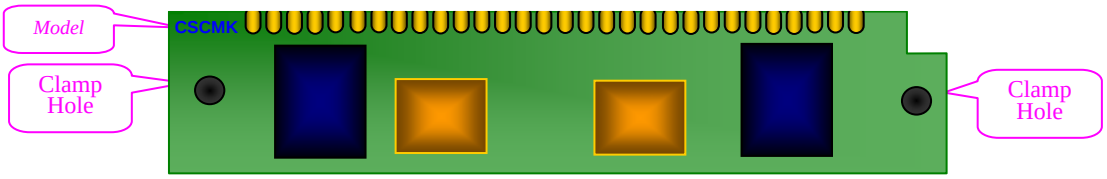


Figure 2-12 Front View

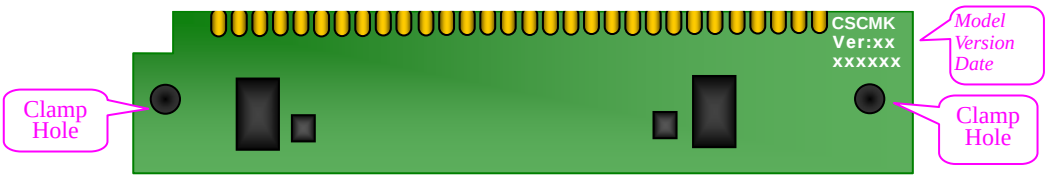


Figure 2-13 Rear View

- **EM2V100 Module**

Figure 2-14 Front View

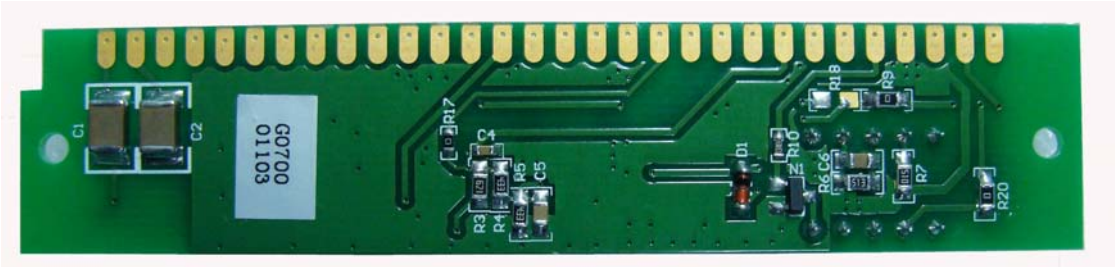


Figure 2-15 Rear View

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

Note: Always turn off the power before installation!

Step 1: Plug the desired 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.

A single voice board has four RJ45 jacks, each of which can be converted through a 4-way hub or reconstructed by users to connect with four analog channels. The figure below illustrates the physical structure of the 4-way hub from Synway.

Figure 2-16 4-way Hub

Take the first RJ45 jack on the board (Figure 2-3) 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 port
	2	3rd and 4th pins	2nd port
	3	5th and 6th pins	3rd port
	4	7th and 8th pins	4th port

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

Notes:

① The matching relationship for the other three on-board RJ45 jacks and their corresponding pins and channel numbers may be deduced by analogy.

② This 4-way hub is available by purchase from our company. If you prefer to construct lines by yourself, we suggest you follow Figure 2-3 and the matching relationship shown in Table 2-1.

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 & battery feed power supply

Skip this step if no station modules, trunk-station composite modules or EM2V100 modules are used.

If you are using the external ringing current & 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 2-17 below.

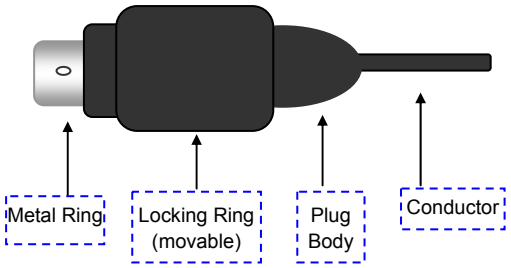


Figure 2-17 Plug Structure

Step 5: Connect to the trunk-station composite module

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

A trunk-station 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.

Note: When trunk-station 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*

Note: 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 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 2-18 for correct insertion. Do not twist or insert in the opposite direction.

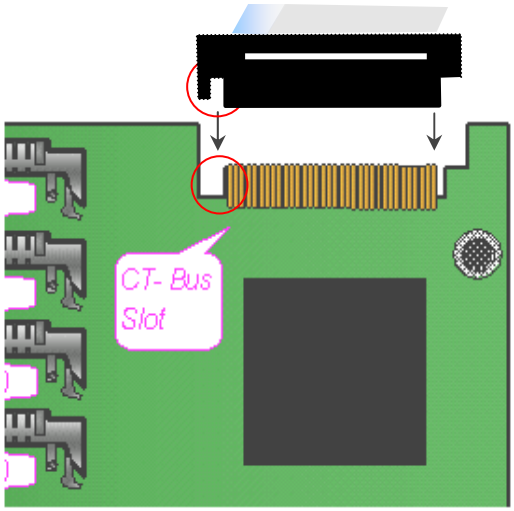


Figure 2-18 Connection of H.100 Bus

② There are two clock settings for our boards: When between-board bus exchange is not required, each board sets its own clock and may not connect to the bus cable; otherwise, each board must be connected to the bus cable, following 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 *SynCti_InstManual.pdf*.

Key Tips:

- As the system is expected to run for long hours unmannedly, '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

310×108mm² (excluding L-bracket)

Weight

≈ 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 8-pin RJ45 jacks

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 analog voice boards concurrently per system; up to 16 channels per board

Power Requirements

+5V DC: 600mA

-12V DC: 80mA

+12V DC: 300mA

Maximum power consumption: ≤12W

(PC power 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

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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