Synway CTI Series

SHN-32A-CT/PCI

VoIP Board

Hardware Manual

Version 1.0

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0	2007-6	Initial publication

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

Chapter 1 Overview

The Synway CTI Series SHN-32A-CT/PCI VoIP board provides a majority of services necessary for VoIP application development, such as encoding, decoding, parsing and receiving SIP/H.323 messages, managing on-board channels and IP conversations, transmitting and receiving voice data over IP links, putting voice data onto CT-BUS after encoding and decoding them, etc. It supports the following applications: IP gateway, media server/conference server, Softswitch, IP PBX, IP call center, IP application server, IVR, large-capacity IAD (Integrated Access Device), VoIP solutions, and NGN networking equipment.

1.1 Functions

- A single board has 32 IP channels; a single PC supports up to 2 SHN-32A-CT/PCI boards.
- Each board can be configured to comply with either SIP or H.323 protocol, or both.
- Supports the following functions during the call: voice recording and playing, volume adjustment, active/silence detection, voice QoS service assurance, dynamic CODEC change, etc.
- All channels are allowed to play/record voices simultaneously; supports Automatic Gain Control (AGC) in recording operation.
- Supports call transfer and call hold during IP calls.
- Allows DTMF signal transmission and detection by any of the three methods: in-band, out-of-band (RFC2833), Signaling (SIP-INFO or H245 signaling).
- Includes H.100 bus, compatible with MVIP, SC and ST bus, facilitating smooth connectivity to third-party boards with H.100 bus for the transfer of voice data from/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.
- Each board has a unique hardware serial number written in the firmware to distinguish itself from other boards and prevent piracy.
- The on-board authorization code identification circuit is designed for software safety. Users can apply to our company for the authorization code.

1.2 Features

- **PCI2.2 Bus Support**

  Includes PCI 2.2 bus with 3.3V/5V slot voltage and up to 132 MB/s burst data transmission rate; PNP (plug and play) feature eliminates the need for jumper leads.

- **Multiple Programming Modes Support**

  Our driver supports three programming modes：polling mode, event callback mode and Windows message mode.

- **Various VoIP CODECs Support**

  The supported VoIP CODECs include G.711 A-Law, G.711 μ-Law and G.729A.

- **Voice CODECs Support in Recording/Playing**

  Offers a large selection of voice CODECs, including hardware-based G.711 A-Law, G.711 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.

- **Programmable Tone Detector**

  Detects single or dual tones at any frequency.

- **Barge in**

  Supports the Barge-in function.

- **Highly Efficient and Real-time Call Control and Voice Processing**

  This board enables highly efficient call control, call management and voice processing; the multiple on-board DSPs used for voice processing give a nearly real-time voice effect.

- **Plentiful API Functions**

  Provides two different levels of API interfaces, i.e. SynCTI driver level API (‘SynCTI API’ for short) and SHN board protocol stack level API (‘SHN API’ for short). The former is the interface to Synway’s unified SynCTI driver development platform. It hides the complexity of hardware-to-hardware communications in the driver and is suitable for fast application development. The latter exposes the used communication protocol stack to developers so that the communication process can be well controlled and customized according to actual requirements.

- **Synway’s Unified SynCTI Driver Development Platform**

  Synway owns the intellectual property rights for the unified high-intelligence

SynCTI driver development platform. By simple API function calls on this platform, users can customize such features as call connection and call control, and perform various applications based on IP+IP or IP+TDM. Our API interfaces are highly encapsulated and exported in ANSI C style, which eliminates the need for users to consider the low-level IP communication details.

1.3 Operation Principle

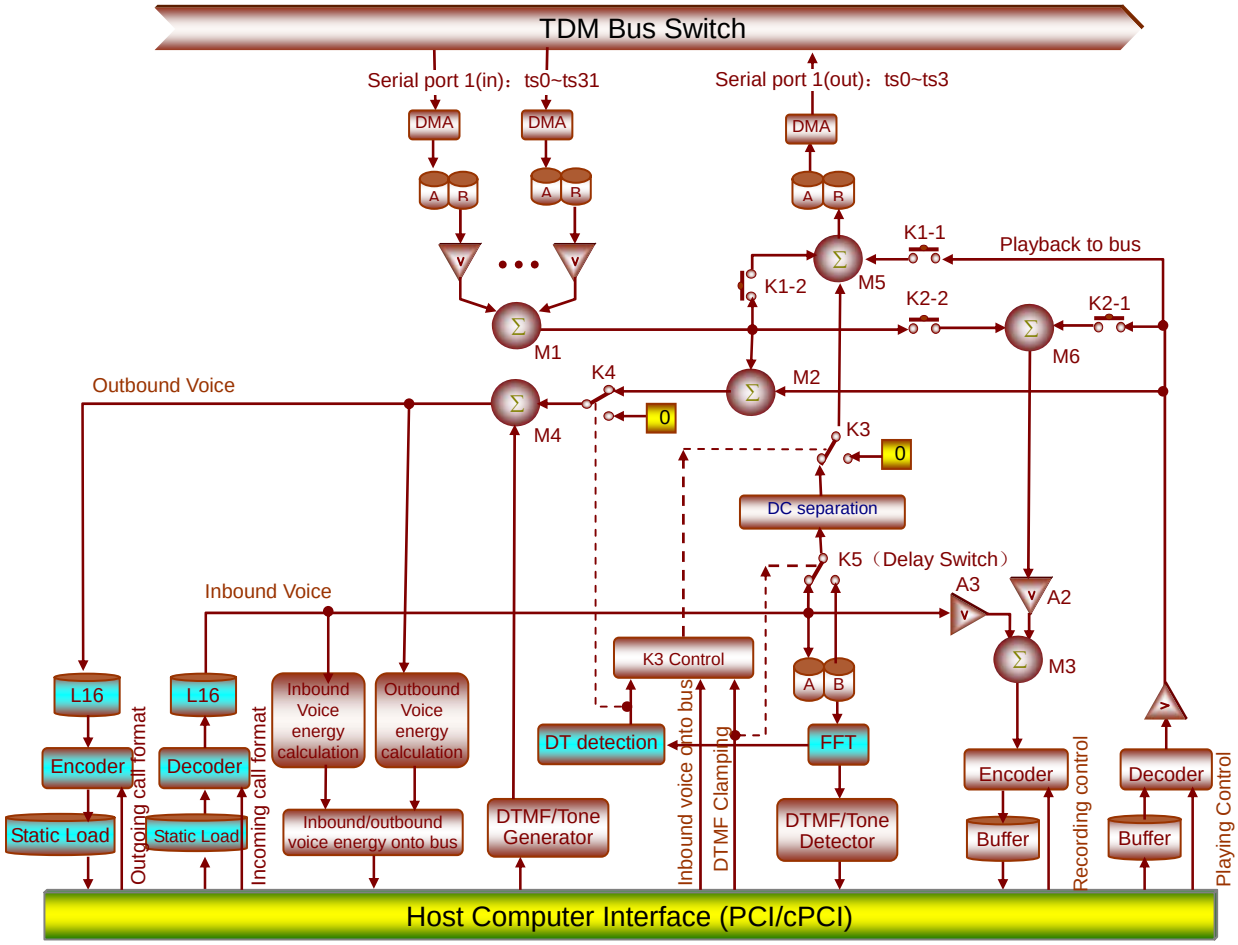


Figure 1-1 Operation Principle

The switches in this figure are described as follows:

K1_2: Determines whether to put the mixed voice onto bus.

K1_1: Determines whether to put the played voice onto bus.

K2_1: Determines whether to put the voice played in file mode into the mixer during a mixed recording.

K2_2: Determines whether to put the mixed voice from bus into the mixer during a mixed recording.

K3: DTMF clamping and compulsory switch

a) When putting the played voice data onto bus independently, switch on K1-1 (set to 1) and compulsorily switch off K3 (set to 0);

b) When putting the incoming call data onto bus independently, switch off K1-1

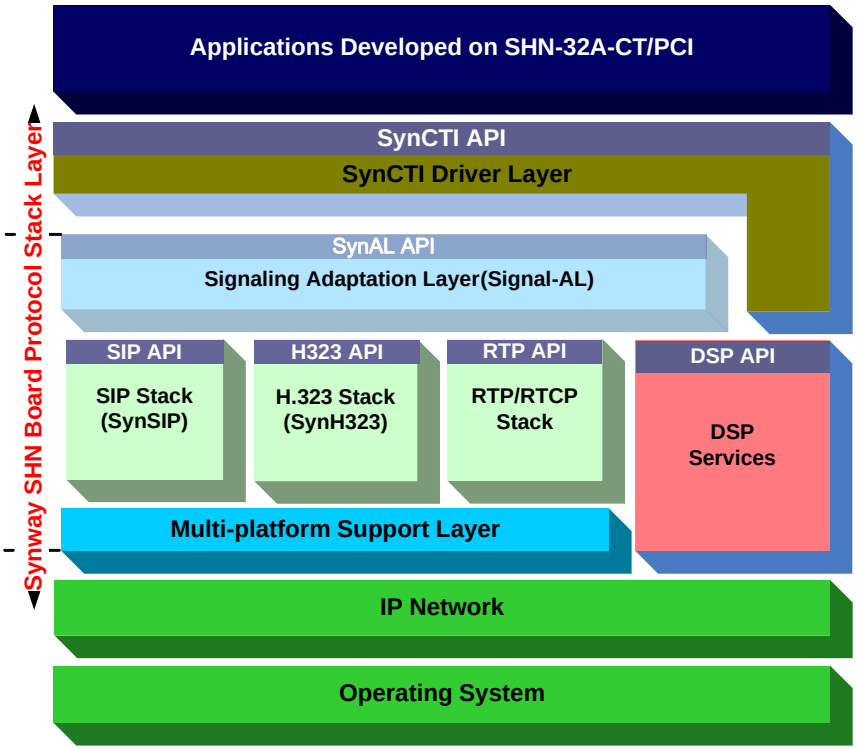
(set to 0) and compulsorily switch on K3 (set to 1);

c) To enable the DTMF clamping feature, you should switch off K1-1 (set to 0) and compulsorily switch on K3 (set to 1) to detect if the incoming call data bring any DTMF signal. Once DTMF signals are detected, if they are required to be clamped, K3 should be switched off (set to 0); otherwise, the clamping switch should be switched on.

K4: Stops voice playing once any DTMF signal is detected in the incoming call. Such operation is automatically done by DSPs.

K5: It is the time delay switch.

1.4 Software System Diagram



SynCTI Driver Layer:

Provides the unified programming interface (SynCTI API) for Synway's voice boards, manages and presents the IP channel state machine, administers and controls the IP call process and such operations as voice processing by DSPs.

SHN Board Protocol Stack Layer:

Includes more than one component, designed to perform such tasks as signaling protocol support, signaling control and transmission, media transmission and management, etc. Each component is described below:

- Signaling Adaptation Layer: Feedbacks signaling messages to SynCTI Driver Layer;

- SIP Stack (SynSIP): Processes SIP-related signaling messages, parses and encodes SDP messages. SynSIP is fully compatible with IETF SIPv2 standard and supports most of the SIP extension standards;
- H.323 Stack (SynH323): Processes H.323-related signaling messages. SynH323 is fully compatible with ITU H.323 Version 4 and supports part of H.323 Version 5;
- RTP/RTCP Stack (SynRTP): Transmits and receives RTP and RTCP packages. SynRTP is compatible with RFC1889/1890 and RFC3550/3551;
- DSP Services: Use on-board DSPs to process voice data.

1.5 Supported SIP Standards and Applications

(1) **Supported SIP Standards**

- IETF RFC 3261 (SIP: Session Initiation Protocol)
- IETF RFC 3262 (Reliability of Provisional Responses in Session Initiation Protocol (SIP))
- IETF RFC 3263 (Locating SIP Servers)
- IETF RFC 3264 (An Offer/Answer Model with Session Description Protocol (SDP))
- IETF RFC 3265 (SIP Specific Event Notification)
- IETF RFC 3266 (Support for IPv6 in Session Description Protocol (SDP))
- IETF RFC 2327 (SDP–Session Description Protocol)
- IETF RFC 3550 and 3551 (RTP/RTCP)
- IETF RFC 2833 (DTMF)
- Part of SIP extension draft and XCAP protocol

(2) **Characteristics of SIP Protocol Stack**

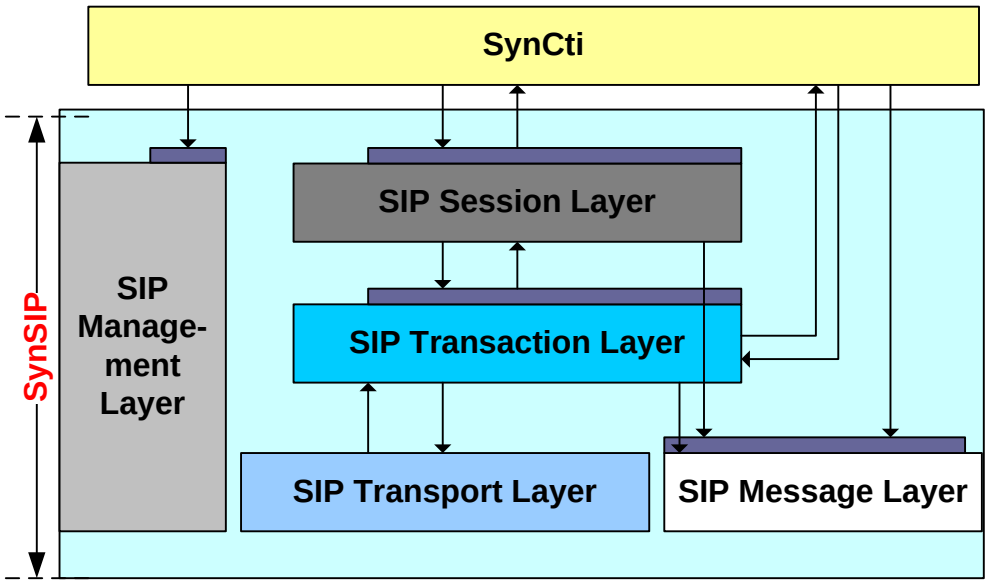
- Allows signaling to be transmitted over UDP
- Supports Digest Authentication
- Supports the call progress of INVITE and reINVITE
- Supports the ’183’ response (rings playback and return)
- Supports the MESSAGE message
- Supports the PRACK message
- Supports of the UPDATE message
- Supports the INFO message

- Supports the REFER message
- Supports the SUBSCRIBE-NOTIFY(SIP Events) message
- Supports part of SIP-T standard
- Supports the REGISTER message and the authentification process
- Supports the message to include Multi-Part MIME Bodies
- Supports the communication with SIP server
- Supports call hold
- Supports DNS enquiry (SRV support)
- Supports call status monitoring (Session Timer)
- Intelligent analytical mechanism for URL Scheme
- Supports the rPort setting in the VIA field (for NAT/FW traversal)
- Dynamic VIA field control
- Supports DTMF transmission and reception by the method of in-band, SIP-INFO or out-of-band (RFC2833)
- Internal multi-threading mechanism
- May launch multiple SIP protocol stack instances to work simultaneously
- Supports dynamic address selection
- Supports the heartbeat mechanism based on UDP packets

(3) Advanced Programming with SIP Protocol Stack

Synway's SIP protocol stack (SynSIP) provides the low-level programming interfaces which are exported in ANSI C style and offers an optional development method to users.

- SIP Session Layer: Controls, manages and destroys the SIP call, provides the subscription and registration services
- SIP Transaction Layer: Processes the transaction state machine and triggers corresponding events or callback functions
- SIP Message Layer: Creates, edits and compares SIP messages and message parts
- SIP Management Layer: Sets the system configuration and the log, allocates memory and other resources
- SIP Transport Layer



1.6 Supported H.323 Standards and Applications

(1) **Supported H.323 Standards:**

- H.323 version 5
- H.225.0 version 5
- H.245 version 11
- H.235 version 3 - With Annex D, E and F security procedures
- H.350 - LDAP support
- H.450.1 - Generic functional protocol for the support of supplementary services in H.323
- H.450.2 - Call transfer supplementary service for H.323
- H.450.3 - Call diversion supplementary service for H.323
- H.450.4 - Call hold supplementary service for H.323
- H.450.6 - Call waiting supplementary service for H.323
- H.323/Annex D - Real-time fax over H.323
- H.323/Annex E - Multiplexed Call Signaling over UDP
- H.323/Annex O - Usage of URLs and DNS
- H.323/Annex Q - Far End Camera Control
- IETF RFC 2833 (DTMF)
- IETF RFC 3550 and 3551 (RTP/RTCP)

(2) Characteristics of H.323 Protocol Stack

- Supports IPv4/IPv6 protocol
- Supports the advanced call control as stipulated in H.245 V11
- Supports the security mechanism as stipulated in H.235 V3
- Supports NAT/FW traversal
- Supports DNS enquiry (Annex O)
- Intelligent registration
- Supports quick start of the call
- Supports tunneling calls
- Internal multi-threading mechanism
- Supports dynamic address selection
- Multi-homed IP support

Chapter 2 Installation

2.1 Hardware Structure

- **SHN-32A-CT/PCI board**

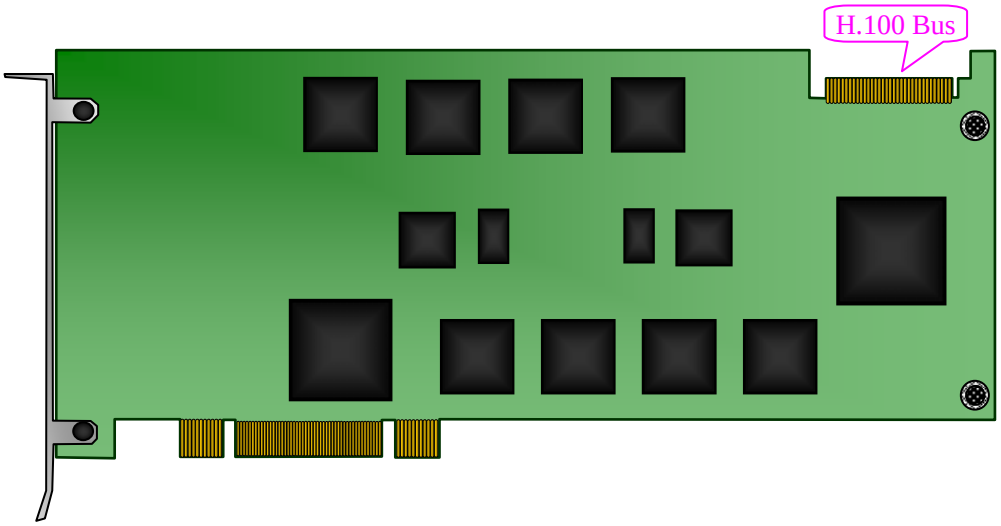


Figure 2-1 Front Side View

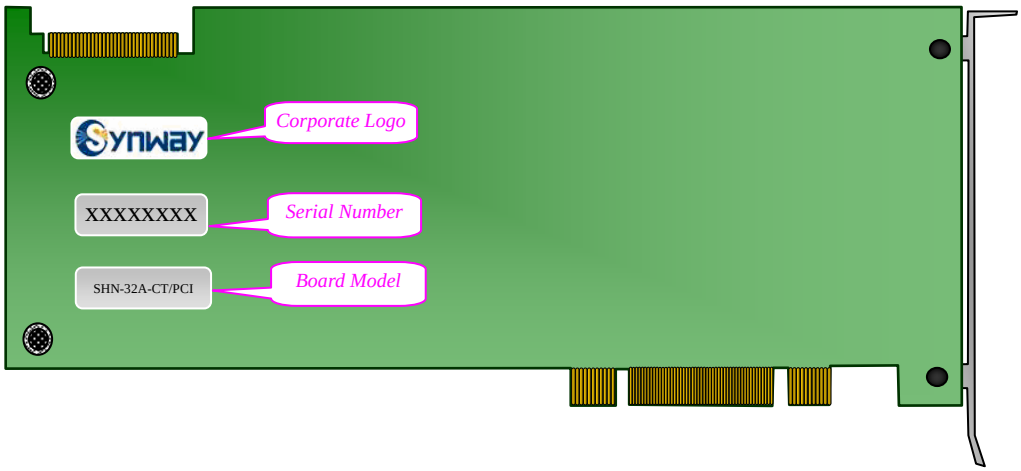


Figure 2-2 Reverse Side View

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: Turn off the power before installation.

Step 1: Properly fit the required VoIP board into the PCI slot on the chassis.

Notes:

① For the installation of other voice boards from Synway which are used with the VoIP board, refer to corresponding hardware manuals.

② Other necessary hardware devices (such as network card, network cable and IP phones) used to set up an integrated VoIP application environment should be installed by users themselves.

Step 2: Connect H.100 bus interfaces on all boards by bus cable.

Through CT-BUS, the VoIP board can easily exchange voice data with other voice boards used with it.

Notes:

① See Figure 2-3 for correct insertion. Do not twist or insert in the opposite direction.

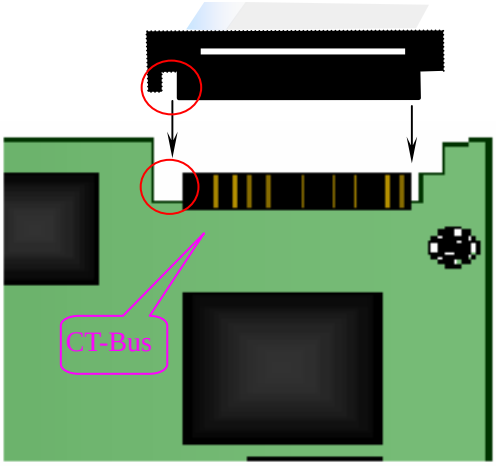


Figure 2-3 Connection of H.100 Bus

② 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 3: Boot your computer and install the driver.

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

Step 4: Configure the operating parameters for the VoIP board

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

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

310×115 mm^2 (excluding L-bracket)

Weight

≈ 250g

Environment

Operating temperature: 0℃—55℃

Storage temperature: -20℃—85℃

Humidity: 8%— 90% non-condensing

Storage temperature: 8%— 90% non-condensing

Recording/Playing Format

A-Law，μ-Law，ADPCM

Maximum System Capacity

Theoretically up to 8 boards concurrently per system; however, we suggest the use of at most 2 boards in a real application

Audio CODEC

G.729，A-Law，μ-Law

Power Requirements

Maximum power consumption: ≤8W

Audio Encoding & Decoding

16Bit PCM	*128kbps*
8Bit PCM	*64kbps*
A-Law	*64kbps*
μ-Law	*64kbps*
VOX	*32kbps*
ADPCM	*32kbps*
GSM	*13.6kbps*
MP3	*8kbps*
G.729	*8kbps*

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