SHT-30A/Chbank

SHT-30B/Chbank

Hardware Manual

Version 1.5

Synway Information Engineering Co., Ltd

www.synway.net

Contents

Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0	2005-11	Initial publication.
Version 1.1	2006-04	1. Description of the operation principle and signaling modes. 2. Step-by-step instructions for installation.
Version 1.2	2009-10	Add new features to support the configuration of large-capacity station system in Asterisk with digital trunk boards.
Version 1.3	2012-09	Revise the instructions for installation.
Version 1.4	2012-11	Add information on whether SHD series E-type boards support Chbank.
Version 1.5	2013-09	Add relevant content about SHT-30B/Chbank.

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

Chapter 1 Overview

1.1 Function

SHT-30A/Chbank and SHT-30B/Chbank (hereinafter referred to as 'this product') are channel banks which convert voice data and signaling messages from digital trunks into analog signals so as to enable their transmission on common analog phone lines.

This product equipped with CPU and RTOS is developed on the basis of up-to-date embedded software programming technology. As a staunch advocate of the all-in-one design concept, Synway uses a modularized design featuring a 'Motherboard + Functional Module' structure, which greatly enhances stability and maintainability of the product, and also effectively reduces the upkeep cost.

This product uses the analog module produced by Synway (MU) as the interior functional module and supports up to 30 analog trunks per system. SHT-30A/Chbank provides 30 RJ11 analog station interfaces while SHT-30B/Chbank offers 2 RJ21 cable interfaces. Such features as conversion between E1 and analog trunks and conversion of RJ21 cables, as well as off-hook detection and ring control are performed by in-board CPU and embedded software.

Now this product is widely applied in large-capacity call center, distributed PBX systems, etc.

Recently, it achieves a new feature to support the configuration of large-capacity system with digital trunk boards in Asterisk. Besides all TEJ series digital trunk boards from Synway, this product can also work with digital trunk boards from Digium, OpenVox and other companies.

1.2 Features

- All-in-one design
- Built-in ringing current and battery feed power
- Real-time monitor/play
- E1 trunk interface (RJ45)
- Analog interface (RJ11) or cable interface (RJ21)
- Large capacity: Up to 30 analog station interfaces per system
- CAS support
- Clear Channel Signaling support
- SIG_FXOLS support

- Usable with the following Synway's digital boards

Capacity / Number	1 E1	2 E1	4 E1	8E1
1	SHD-30A-CT/cPCI	SHD-60A-CT/cPCI	SHD-120A-CT/cPCI	—
2	SHD-30A-CT/PCI/SS1	SHD-60A-CT/PCI/SS1	SHD-120A-CT/PCI/SS1	—
3	SHD-30A-CT/PCI/SS7	SHD-60A-CT/PCI/SS7	SHD-120A-CT/PCI/SS7	—
4	SHD-30A-CT/PCI/ISDN	SHD-60A-CT/PCI/ISDN	SHD-120A-CT/PCI/ISDN	—
5	SHD-30B-CT/PCI/FAX	SHD-60B-CT/PCI/FAX	—	—
6	—	SHD-60B-CT/cPCI/FAX	—	—
7	—	—	SHD-120D-CT/PCI/CAS	SHD-240D-CT/PCI/CAS
8	SHD-30E-CT/PCI(SSW)	SHD-60E-CT/PCI(SSW)	SHD-120E-CT/PCI(SSW)	SHD-240E-CT/PCI(SSW)
9	SHD-30E-CT/PCIe	SHD-60E-CT/PCIe	SHD-120E-CT/PCIe	SHD-240E-CT/PCIe
10	SHD-30E-CT/PCIe/EC	SHD-60E-CT/PCIe/EC	SHD-120E-CT/PCIe/EC	SHD-240E-CT/PCIe/EC
11	SHD-30E-CT/PCIe/FAX	SHD-60E-CT/PCIe/FAX	SHD-120E-CT/PCIe/FAX	SHD-240E-CT/PCIe/FAX

- Usable with digital boards from other companies such as Digium and OpenVox
- Smooth connection with EXCEL, HARRIS, NORTEL, HUAWEI, ZTE, etc.
- Standard 1U chassis
- Elegant and durable shell made of strong aluminium alloy

1.3 Operation Principle

1.3.1 Hardware Structure

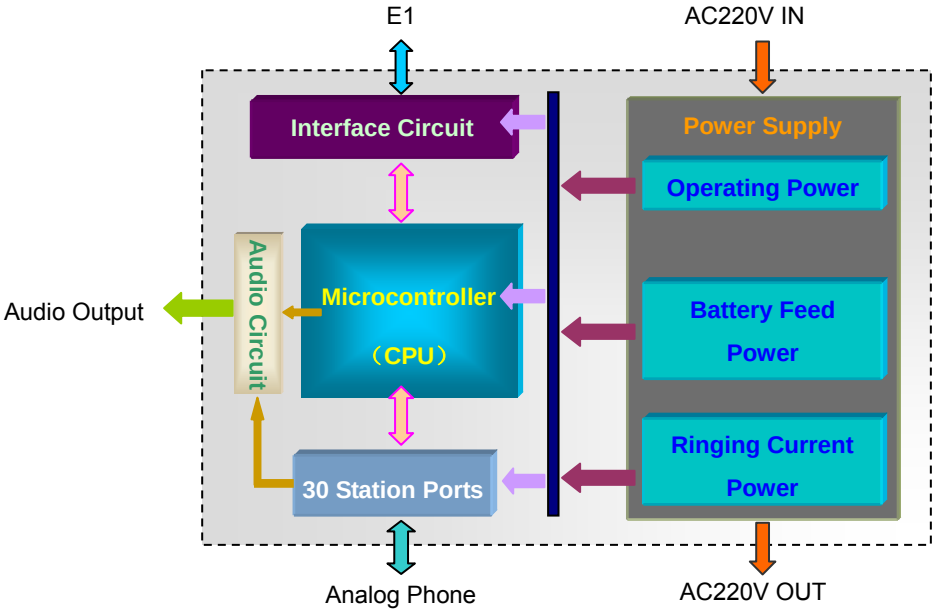


Figure 1-1 Hardware Structure

1.3.2 Operation Principle and Matching Relationship between Timeslots and Station Channels

A micro-controller with built-in logic circuits helps connect this product to switches and monitor signaling pathways. TS0 (Timeslot Zero) of a PCM link is used solely for framing on E1 trunks while TS16 is used to transport data such as CAS through 30 station ports.

Matching relationship between timeslots and station channels:

- TS1 to Channel 1,
- TS2 to Channel 2,
- …...,
- TS15 to Channel 15,
- TS17 to Channel 16,
- TS18 to Channel 17,
- ……,
- TS30 to Channel 29,

- TS31 to Channel 30.

1.4 Signaling Modes

- **Clear Channel**

In this mode, TS0 is used for synchronization while TS16 stays unused.

- **CAS**

In this mode, TS0 is used for synchronization while TS16 for signaling purpose. For the abcd signaling bits, ‘c’ and ‘d’ can not be set to 0 at the same time (i.e. ‘cd’ should not be 00); ‘a’ and ‘b’ are respectively defined as follows.

Extension calls switch					Switch calls extension			
Switch		Extension			Switch		Extension	
A	**B**	**A**	**B**		**A**	**B**	**A**	**B**
0	**0**	**0**	**0**	**Idle/disconnect**	**0**	**0**	**0**	**0**
0	**0**	**1**	**0**	**Off-hook/answer**				
				Ringing	**1**	**0**	**0**	**0**
—	—	**1**	**1**	**Blocking**	**1**	**1**	—	—

Table 1-1 Definition of Codes ‘a’, ‘b’, ‘c’, ‘d’ in CAS

- **SIG_FXOLS**

Extension calls switch									Switch calls extension							
Switch				Extension					Switch				Extension			
A	**B**	**C**	**D**	**A**	**B**	**C**	**D**		**A**	**B**	**C**	**D**	**A**	**B**	**C**	**D**
0	**1**	**0**	**1**	**0**	**1**	**0**	**1**	**Idle/disconnect**	**0**	**1**	**0**	**1**	**0**	**1**	**0**	**1**
0	**0**	**0**	**1**	**1**	**1**	**0**	**1**	**Off-hook/answer**								
								Ringing	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**1**
1	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**Blocking**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Table 1-2 Definition of Codes ‘a’, ‘b’, ‘c’, ‘d’ in SIG_FXOLS

Chapter 2 Installation

2.1 Form Factor and Interfaces

2.1.1 Front View

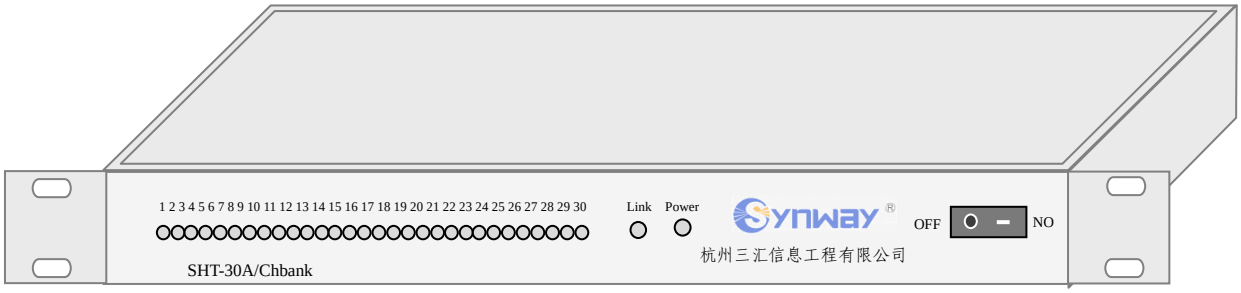


Figure 2-1 Front View of SHT-30A/Chbank

Note: Apart from the symbol of board model, the front side of SHT-30B/Chbank is the same as that of SHT-30A/Chbank.

1~30： Off/on-hook Indicator

Indicators 1 through 30 respectively indicate the off/on-hook status of channels 1 through 30. In case Channel N (1-30) is off-hook, the corresponding indicator light will be on. Otherwise, the light will be off.

Link： E1-status Indicator

The indicator light stays green when telecommunication is normal, but turns red or goes out otherwise (signaling error or link disconnection).

Power：Power Indicator

The indicator lights up once power is turned on, but goes out in case power is turned off or operation is interrupted.

OFF，ON：Power On/off Button

The ON/OFF button is used to turn the power on or off.

2.1.2 Rear View

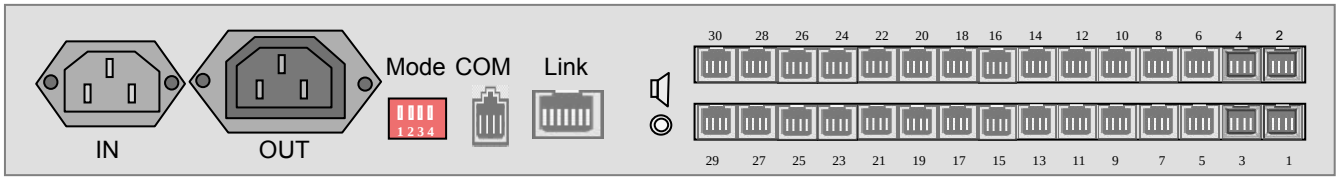


Figure 2-2 Rear View of SHT-30A/Chbank

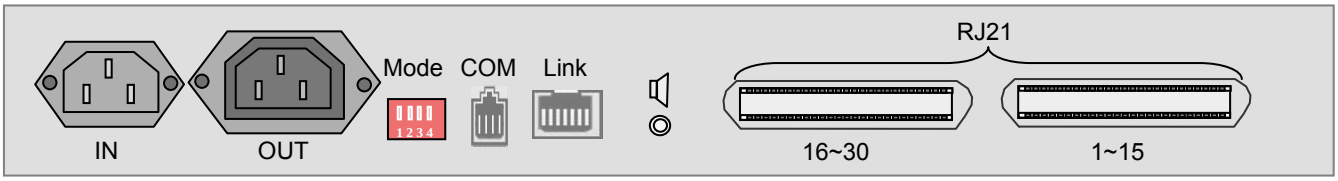


Figure 2-3 Rear View of SHT-30B/Chbank

1~30：Analog Station Interface

SHT-30A/Chbank adopts analog station interfaces (RJ11 interfaces). Numbers 1 through 30 respectively represent channels 1 through 30. Each pin in the RJ11 connector functions as follows.

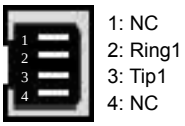


Figure 2-4 Analog Station Interface

RJ21 Interface:

SHT-30B/Chbank adopts two RJ21 interfaces each of which accommodates 15 channels. One corresponds to channels 1 through 15 and the other corresponds to 16 through 30. Each pin in the RJ21 connector functions as follows.

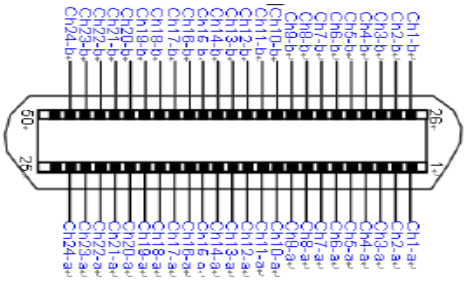


Figure 2-5 RJ21 Interface

The pins Ch1-a/b through Ch15-a/b on the RJ21 interface will be used respectively corresponding to channels 1 through 15.

An RJ21 interface can be converted to 24 RJ11 interfaces through an RJ21-to-RJ11 adapter. See Figure 2-6 for the connection. SHT-30B/Chbank needs two 24-port RJ21-to RJ11 adapters of which the first 15 slots will be used.

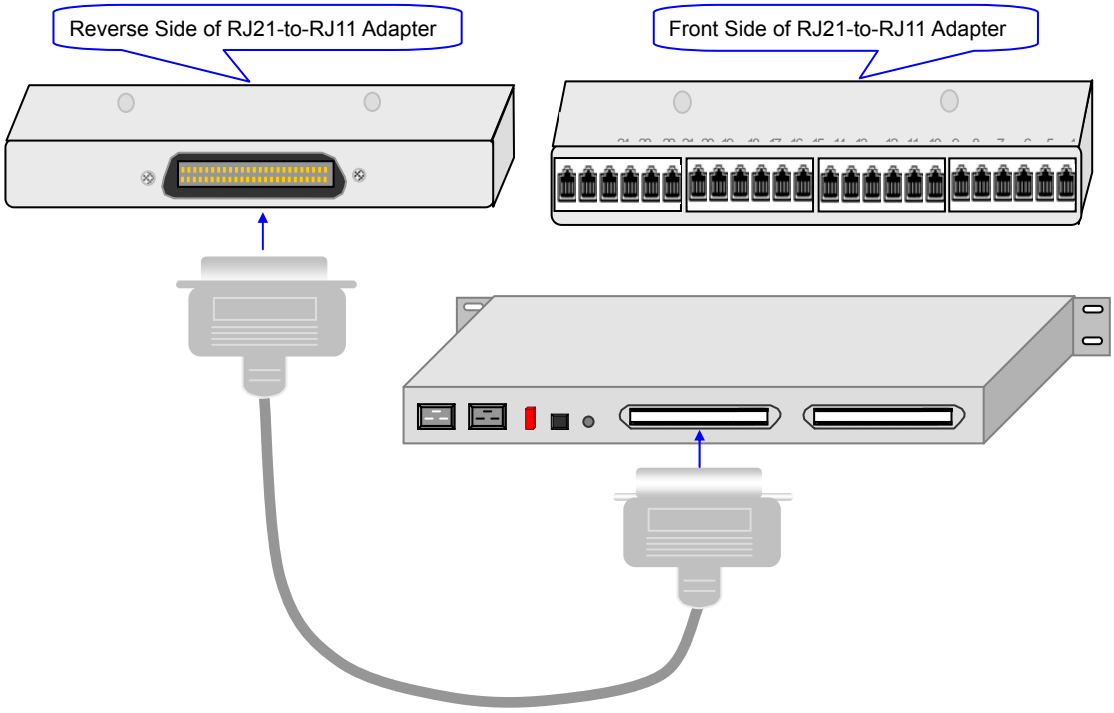


Figure 2-6 Connecting RJ21-to-RJ11 adapter

Users can also use the RJ21 connecting cable directly.

Note: *The RJ21 cable we provide has 3 specifications (3m, 5m and 10m). They are all 25-twisted-pair communication cables using the international standard spectrum, and can connect directly to our device. The 25 pairs of pins in RJ21 can be arranged by color in two different ways. See Table 2-1 and Table 2-2 for details. (To be exact, the 1st and the 26th pins are the first pair; the 2nd and the 27th pins constitute the second pair; …; the 24th and the 49th pins are the 24th pair; the 25th and the 50th pins constitute the 25th pair.)*

Pair Number	1	2	3	4	5	6	7	8
Color	White Blue	White Orange	White Green	White Brown	White Grey	Red Blue	Red Orange	Red Green
Pair Number	9	10	11	12	13	14	15	16
Color	Red Brown	Red Grey	Black Blue	Black Orange	Black Green	Black Brown	Black Grey	Yellow Blue
Pair Number	17	18	19	20	21	22	23	24
Color	Yellow Orange	Yellow Green	Yellow Brown	Yellow Grey	Purple Blue	Purple Orange	Purple Green	Purple Brown

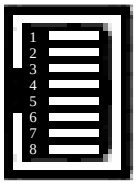
Table 2-1

Pair Number	1	2	3	4	5	6	7	8
Color	Black Grey	Black Brown	Black Orange	Black Green	Black Blue	Red Grey	Red Brown	Red Orange
Pair Number	9	10	11	12	13	14	15	16
Color	Red Green	Red Blue	Yellow Grey	Yellow Brown	Yellow Orange	Yellow Green	Yellow Blue	Purple Grey
Pair Number	17	18	19	20	21	22	23	24
Color	Purple Brown	Purple Orange	Purple Green	Purple Blue	White Grey	White Brown	White Orange	White Green

Table 2-2

Link Port：E1 Interface

Each pin in the RJ45 connector functions as follows.



1: RX+
2: RX -
3: NC
4: TX+
5: TX-
6: NC
7: NC
8: NC

Figure 2-7 E1 Interface

“”Jack：It is a headset interface only for the first voice path.

Mode：Switch Settings for Configuring Signaling/Operating Mode

Different signaling/operating modes can be configured via switch settings. See the table below for more information.

1	2	3	4	Operating Mode	Signaling Mode
OFF	OFF	OFF	OFF	Clock Slave	CAS
OFF	OFF	OFF	ON	Clock Slave	Clear Channel
OFF	ON	OFF	OFF	Clock Slave	SIG_FXOLS
ON	OFF	OFF	OFF	Clock Master	CAS
ON	OFF	OFF	ON	Clock Master	Clear Channel
ON	ON	OFF	OFF	Clock Master	SIG_FXOLS
Others				Unusable	Unusable

Table 2-3 Configuration of Signaling/operating Mode

IN：Power Input Socket

Notes: For protection of the device and human safety, follow parameters given in ‘Appendix A Technical Specifications’ when configuring power input.

OUT：Power Output Socket

The power output socket is internally connected in parallel with the 'IN' socket.

COM Port：RS232 Connector

Notes: This connector should only be used by our testers, using it without the guide of our technicians may lead to malfunction or even damage in this product.

2.2 Installation

2.2.1 Connection

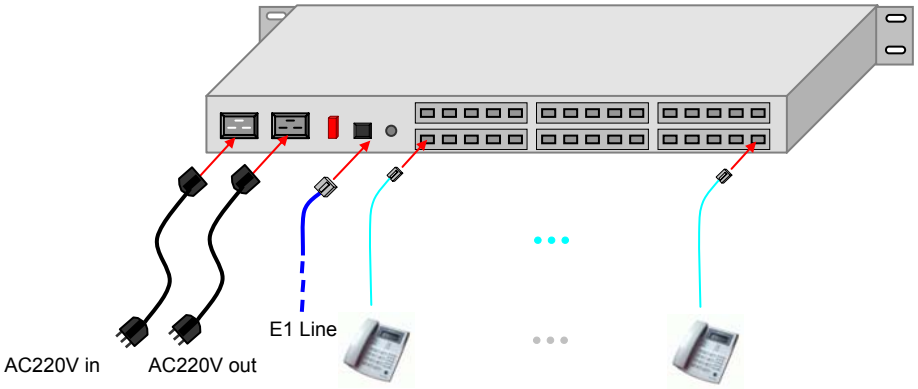


Figure 2-8 SHT-30A/Chbank Connection Model

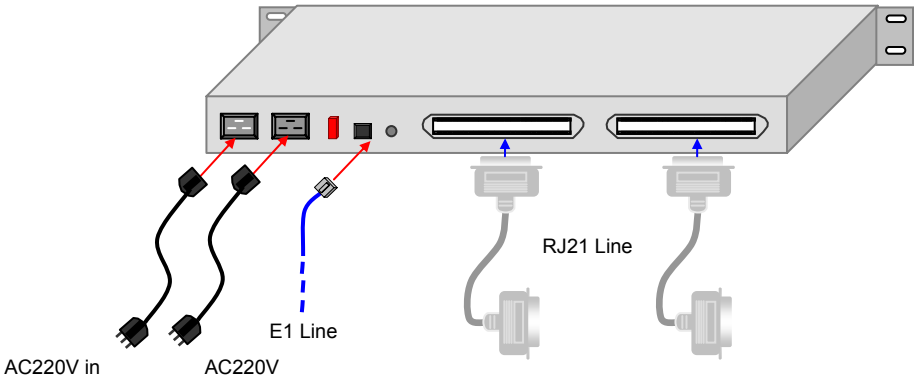


Figure 2-9 SHT-30B/Chbank Connection Model

Note: The RJ21 interfaces on SHT-30B/Chbank need to be converted to 30 RJ11 interfaces using two RJ21-to-RJ11 adapters or connect directly to the distribution frame using RJ21 cables.

2.2.2 Installation Steps

Notes: Turn off the power before installation.

Step 1：Connect analog phone lines or RJ21 cables

Notes:

① *Regarding the construction of analog phone lines, please refer to Figure 2-4 Analog Station Interface.*

② *Regarding the connection of analog phone lines, please refer to Figure 2-8 SHT-30A/Chbank Connection Model.*

③ *Regarding the connection of RJ21 cables, please refer to Figure 2-9 SHT-30B/Chbank Connection Model.*

④ *To convert RJ21 interface to RJ11 interface, a 24-port RJ21-to-RJ11 adapter can be used. Please refer to Figure 2-6 Connecting RJ21-to-RJ11 adapter.*

Step 2：Connect E1 Line

Notes:

① *If you need to construct an E1 line by yourself, please follow Figure 2-7 E1 Interface.*

② *Regarding the connection of E1 line, please refer to Figure 2-8 SHT-30A/Chbank Connection Model and Figure 2-9 SHT-30B/Chbank Connection Model.*

Step 3： Set operating/signaling mode

Default operating mode: Clock Slave

Default signaling mode: CAS

Notes:

① *Regarding the configuration of operating/signaling mode, please refer to Table 2-3 Configuration of Signaling/operating Mode.*

② *Any alteration of 'operating/ signaling mode' is prohibited under operating conditions.*

Step 4：Connect power cord

Notes:

① *Regarding the connection of power cord, please refer to Figure 2-8 SHT-30A/Chbank Connection Model and Figure 2-9 SHT-30B/Chbank Connection Model.*

② *For protection of the device and human safety, follow parameters given in 'Appendix A Technical Specifications' when configuring power input.*

Step 5：Boot up

Upon the start of system self test, the 'Power' indicator glows and the 'Link' indicator is flashing red. After the completion of the self test, the 'Link' indicator stays red. (Note: Under CCS mode, the 'Link' indicator goes out after system initialization.) Carefully note that the analog board on the remote end should not be started until the system self test is finished, i.e. the 'Link' indicator stays red. Otherwise the station channels may not be able to be

identified.

When the communication on E1 is normal, the ‘Link’ indicator stays green. Once the pick-up behavior is detected on a channel, the corresponding ‘off/on-hook Indicator’ is lighted. Vice verse, it goes out when the call is hanged up.

Notes：

- It is important to ground telecommunication devices 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.
- Since electrical appliances heat up while being used, please maintain good ventilation, and ensure that the vent is never jammed.

Appendix A Technical Specifications

Dimensions:	438×230×42mm (Standard 1U Chassis)
Weight:	≈5kg
Power Requirements:	AC 220V±10% 50Hz
Input/Output Interface:	Input:
	E1 Interface (1 RJ45 Connector)
	Output:
	SHT-30A/Chbank: 30 RJ11 Interfaces
	SHT-30B/Chbank: 2 RJ21 (50P) Interfaces
Frequency Response:	300-3400Hz（±3dB）
Signal/Noise:	≥38dB
Feed Voltage:	SHT-30A/Chbank: -30V, Current Limiting—28mA/Channel
	SHT-30B/Chbank: -48V, Current Limiting—28mA/Channel
Ringing Current Signal:	SHT-30A/Chbank: -56V AC, 50Hz
	SHT-30B/Chbank: -75V AC, 25Hz
Length of Subscriber Line:	≤2km
Length of E1 Line:	≤250m (twisted pair)
Maximum Power Consumption:	≤60W
Signaling Mode:	CAS (default), Clear-Channel, SIG_FXOLS
Lightning Resistance:	Level 4

Appendix B Troubleshooting

No.	Common Issues:	Solutions:
1	There is no indication when the power on/off button is turned on	（1）Check power cord for proper installation. （2）Ensure input power voltage is correct for your region（AC 220V）.
2	Certain line or lines do not work properly; the corresponding indicators are not on or the lines are filled with noise	（1）Ensure phone lines are properly connected and there is no interfering source nearby. （2）Check the telephones for good operation.
3	Stops by itself in the course of working.	Check if the chassis is overheated. In case the temperature is too high, it is the built-in protective circuit that works. Please wait until the temperature falls below a desirable level and ensure good ventilation as well.

Notes:

For your own safety and the validity of product guarantee, do not open the chassis to perform maintenance without advice from our personnel. Otherwise, you shall be responsible for any consequence incurred thereby!

If you need help for any issue, please feel free to contact our technicians.

Appendix C 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.

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