Synway AST Series

TEJ400P/TEJ401P
TEJ400E/TEJ401E
TEJ800P/TEJ801P
TEJ800E/TEJ801E

Digital Trunk Interface Board

Hardware Manual

Version 1.1

Synway Information Engineering Co., Ltd

www.synway.net

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Copyright Declaration

Revision History

Version	Date	Comments
Version 1.0	2010-5	Initial publication.
Version 1.1	2011-3	Add relative content about the new board models TEJ400P, TEJ401P, TEJ800P, TEJ801P.

Note: Only major revisions to this manual itself recorded herein.

Chapter 1 Overview

The Synway TEJ400P, TEJ400E, TEJ800P, TEJ800E, TEJ401P, TEJ401E, TEJ801P and TEJ801E are digital trunk interface boards which support E1, T1 and J1 in Asterisk. As the second generation of the Synway TEJ series, they are in 2U size, 120mm in length, compact in structure and high in integration. Among them, TEJ400P, TEJ401P, TEJ800P and TEJ801P include 3.3V PCI bus, while TEJ400E, TEJ401E, TEJ800E and TEJ801E include PCIex1 bus, designed especially for various application systems that require high performance.

They all perform echo cancellation by on-board DSPs. The enhanced capability of TEJ401P, TEJ401E, TEJ801P, TEJ801E in echo cancellation reaches 128ms for time delay estimation, which ensures high-quality voice talk without extra modules or devices to support echo cancellation. They are absolutely cost-effective. The design of on-board EMC and lightning-proof circuits further guarantees the security in use.

These boards are completely compatible with Asterisk in hardware and support smooth connection to Asterisk platform. Therefore they have a lot of advanced call features.

Supported Data Modes: Cisco HDLC, HDLC, PPP, Multi-link PPP, Frame Relay.
Supported Voice Modes:

- PRI CPE and PRI NET
  - NI1
  - NI2
  - EuroISDN
  - 4ESS(AT&T)
  - 5ESS(Lucent)
  - DMS100
- E&M
  - Wink
  - Feature Group B
  - Feature Group D
- FXO and FXS
  - Ground Start
  - Loop Start
  - Loop Start with Disconnect Detect

These boards connect the Asterisk server with PSTN, Channel Bank or PBX via T1, E1 or J1 interface to build a specialized telephony network environment. Figure 1-1 and Figure 1-2 below are typical application models with these boards.

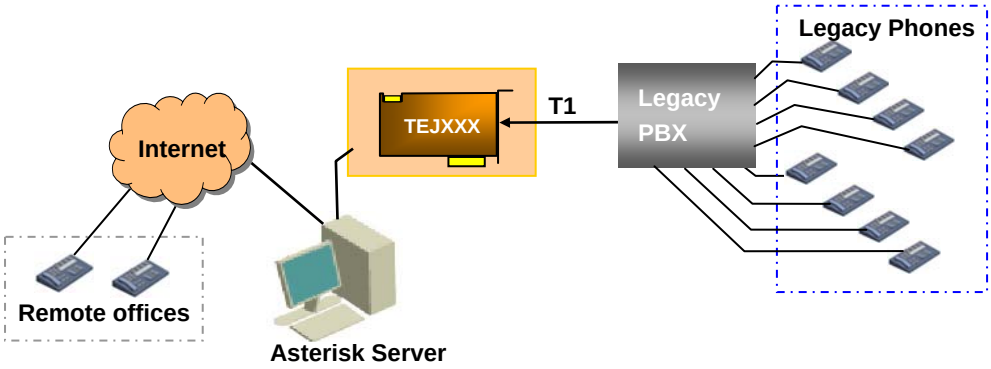
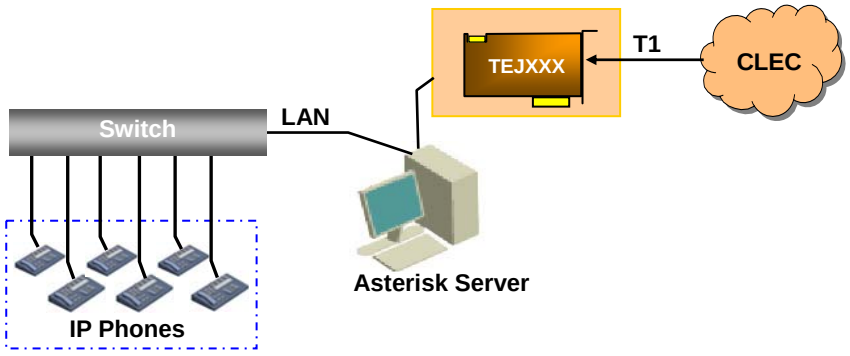


Figure 1-1 Application Model I: Traditional Telephony System



Note: TEJXXX in Figure 1-1 and Figure 1-2 represent available TEJ series boards

Figure 1-2 Application Model II: VoIP Telephony System

1.1 Features

- **PCI/PCIe Bus Support**

  TEJ400P/TEJ401P/TEJ800P/TEJ801P includes PCI bus, PCI r2.2 compliant; in the universal PCI design, it supports 3.3V/5V PCI slot and PCI-X slot.

  TEJ400E/TEJ401E/TEJ800E/TEJ801E includes PCIe bus, PCI Express r1.0a compliant; supports PCI Express X1, X4, X8, X16 slots and the PNP (plug and play) feature.

- **DMA Read and Write**

  The use of DMA technique for data reading and writing helps minimize the cost of the host CPU.

- **Compatible with Asterisk**

  Entirely compatible with Asterisk in hardware, with all source codes open.

- **RJ48C Jack**

  The TEJ400P, TEJ400E, TEJ800P, TEJ800E, TEJ401P, TEJ401E, TEJ801P, TEJ801E boards all have four RJ48C jacks. Among them, TEJ400P, TEJ400E, TEJ401P and TEJ401E have common RJ48C jacks which can either connect directly with digital trunks or convert to BNC connectors via a proper adapter, while TEJ800P, TEJ800E, TEJ801P and TEJ801E have special RJ48C jacks (RJ48C/M) each of which can convert to two common

RJ48C jacks via a two-way hub, making connection easy and malfunctions rare.

- **Echo Cancellation**

  The echo cancellers that Synway developed for these boards use on-board DSPs to work. TEJ401P, TEJ401E, TEJ801P and TEJ801E support up to 128ms for time delay estimation per channel, while TEJ400P, TEJ400E, TEJ800P and TEJ800E support 32ms, really cost-effective. It not only cancels out the effect of voice playback on DTMF and busy tones detection, but also avoids self-excited oscillation and howling, and minimizes the possibility of registering wrong DTMF and busy tones in a conference call, designed especially for VoIP application environments.

- **Voice CODEC Support**

  Supports A-law, μ-law codecs.

- **Clock Sync Support**

  Supports input and output of CT clock, allowing clock synchronization with multiple boards.

- **EMC & Lightning-proof Circuits Available**

1.2 Operation Principle

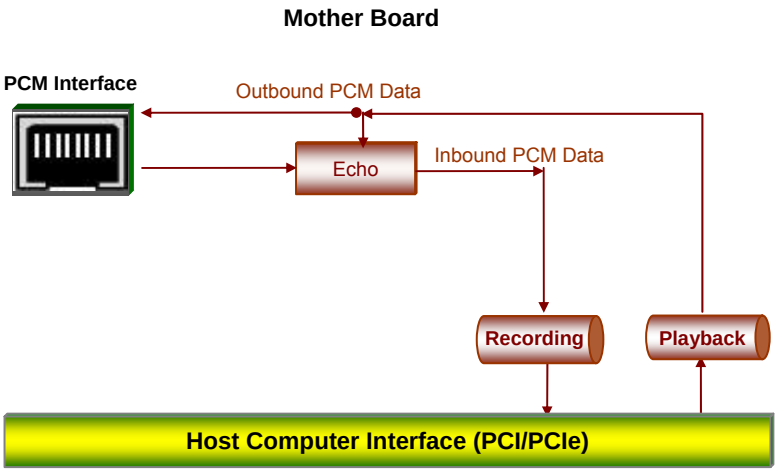


Figure 1-3 Operation Principle

Chapter 2 Installation

2.1 Hardware Structure

- **TEJ800P/TEJ801P Board**

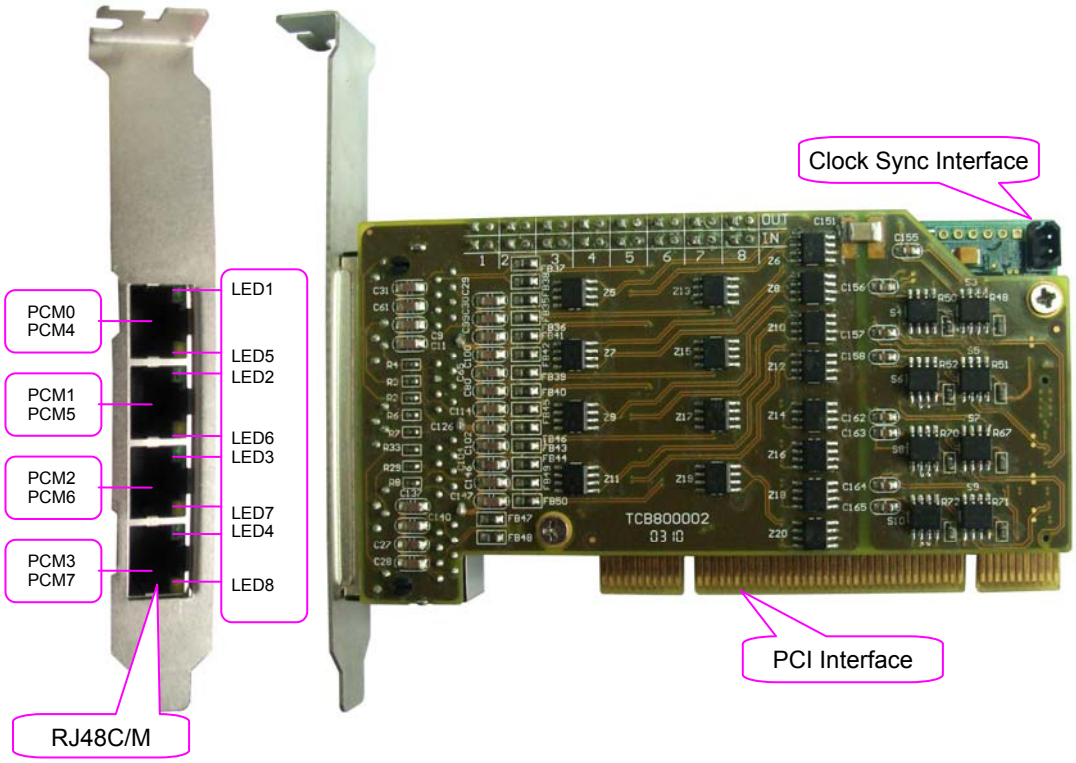


Figure 2-1 Left and Front Views

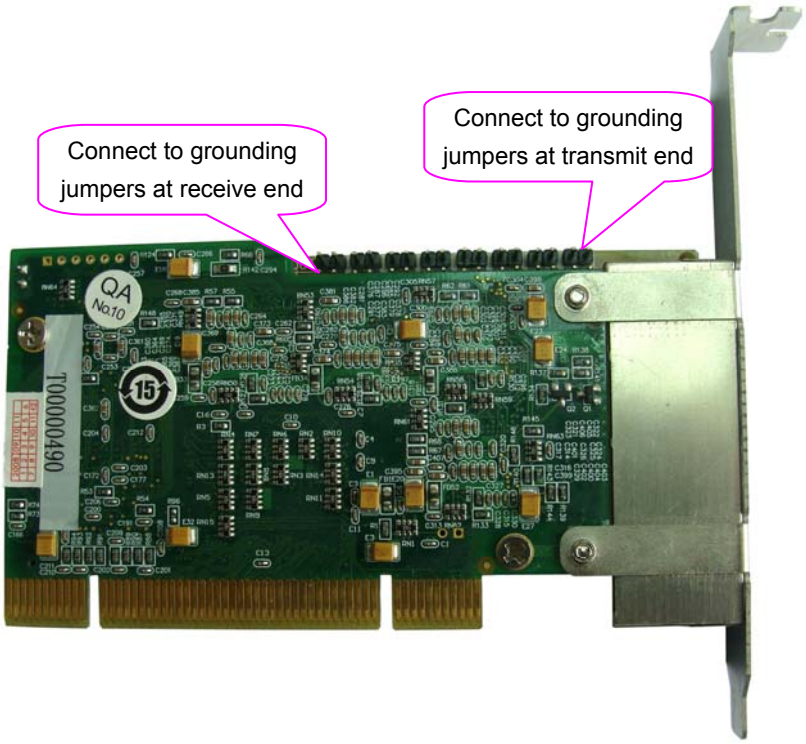


Figure 2-2 Rear View

- **TEJ800E/TEJ801E Board**

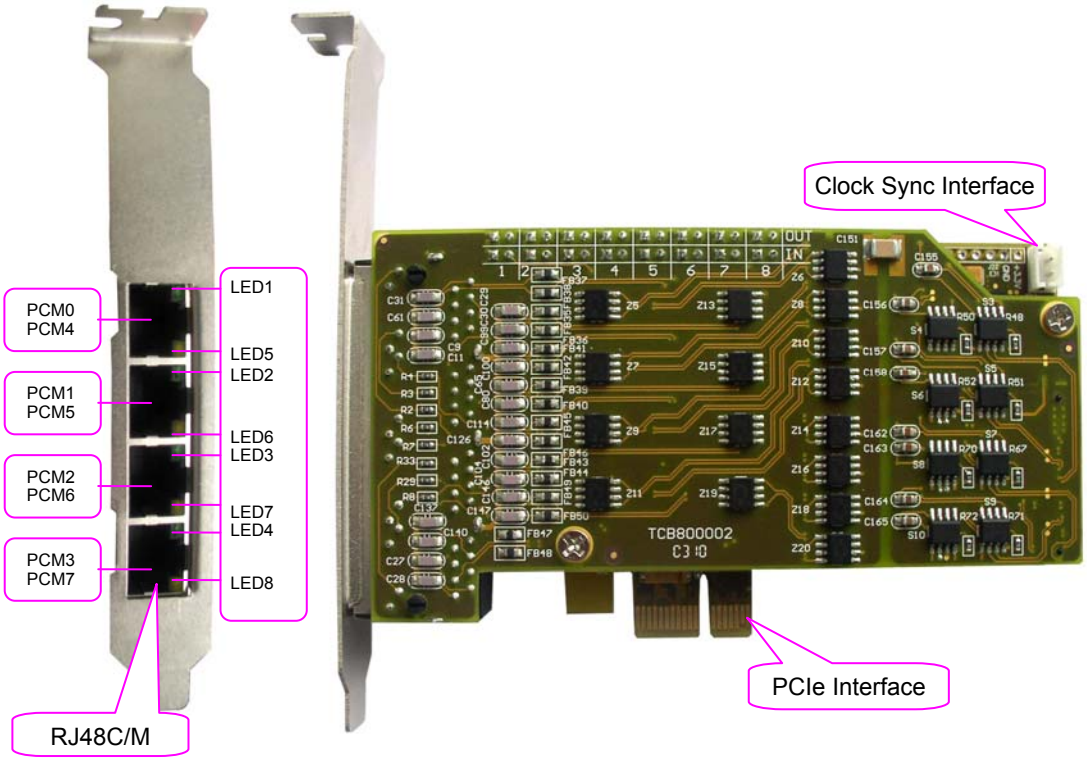


Figure 2-3 Left and Front Views

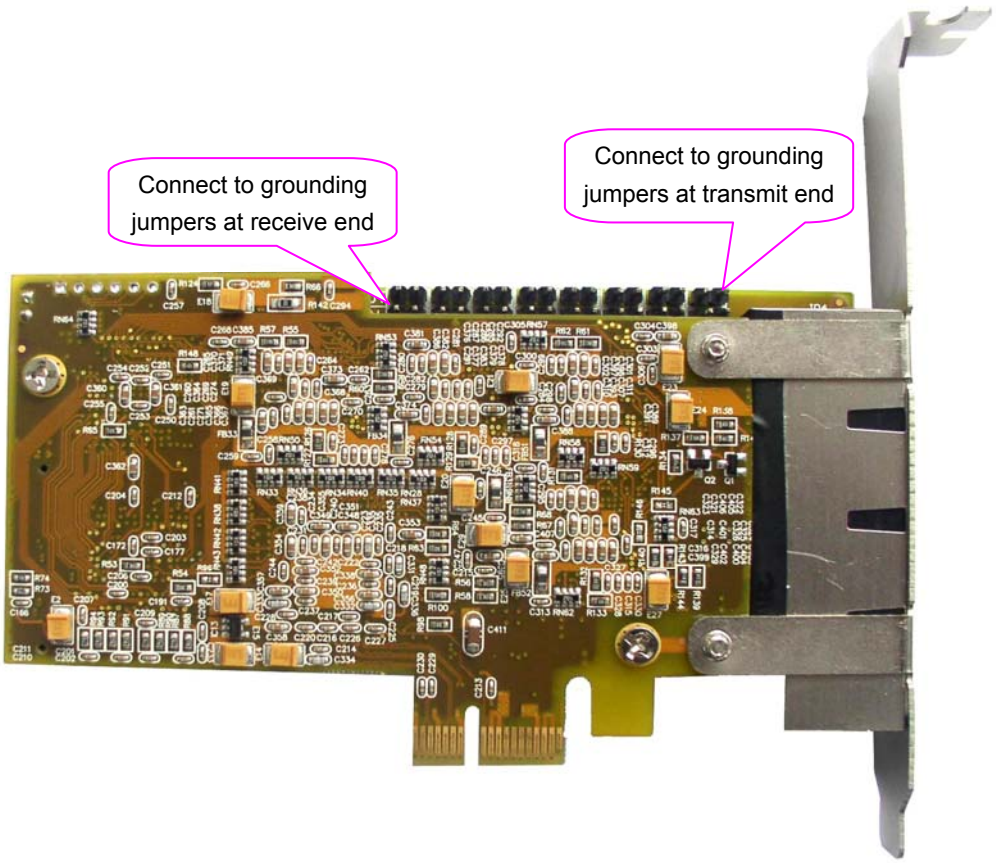


Figure 2-4 Rear View

Notes:

1) PCM0~PCM7 in Figure 2-3 above are 8 transmit/receive interfaces to trunks.

2) LED1~ LED8 are indicators for PCM0~PCM7. They have three states as listed below.

   ①On: PCM synchronous; ②Flashing: PCM not synchronous; ③Off: Port unused

3) INm and OUTm respectively indicate the grounding jumpers at the receive and transmit ends of PCM(m-1), m＝1～8. With regard to the configuration of grounding jumpers, refer to Step 1 in Section 2.5 Hardware Installation.

4) JP12 is an interface to the clock sync line.

5) Except for the number of transmit/receive interfaces to trunks, the TEJ400P/401P board is almost the same as TEJ800P/801P in appearance and the TEJ400E/401E board is almost the same as TEJ800E/801E in appearance. The picture is only for reference, please make the object as the standard.

2.2 Interface Identification

TEJ400P, TEJ401P, TEJ400E and TEJ401E adopt common RJ48C jacks. See Table 2-1 below for the pin layout of a standard RJ48C.

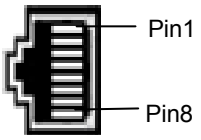
	Pin	Note
	1	RRing
	2	RTip
	3	Not used
	4	TRing
	5	TTip
	6	Not used
	7	Not used
	8	Not used

Table 2-1 Common RJ48C

TEJ800P, TEJ801P, TEJ800E and TEJ801E adopt special RJ48C jacks which we call RJ48C/M. See Table 2-2 below for the pin layout of an RJ48C/M.

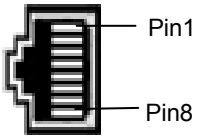
	Pin	Note
	1	Rring1
	2	RTip1
	3	Tring2
	4	Tring1
	5	Ttip1
	6	Ttip2
	7	Rring2
	8	RTip2

Table 2-2 RJ48C/M

2.3 Slot Compatibility

Make sure them compatible with PCI or PCIe slots when using these boards. Users may choose whichever suitable according to the slot patterns illustrated in Figure 2-5 below.

Figure 2-5 PC Slots

Slot Number:

0: AGP Pro slot
1: 64-bit 5.0V PCI slot
2: 64-bit 3.3V PCI slot
3: 32-bit 5.0V PCI slot
4: PCI-Express x1slot
5: PCI-Express x8 slot
6: PCI-Express x4 slot
7: PCI-Express x16 slot

TEJXXP boards support the slots numbered 1, 2, 3 (i.e. PCI slots) in Figure 2-5; TEJXXE boards support the slots numbered 4, 5, 6, 7 (i.e. PCIe slots) in Figure 2-5 and the PNP (plug and play) feature.

2.4 System Requirements

Host System Requirements

CPU: 800MHz Intel® Pentium®III or above

Memory: 64M or more

HD: Depends on individual requirements

Supported Operating Systems

Linux: Debian, Fedora, Rad Hat

2.5 Hardware Installation

Note: Always turn off the power before installation!

Step 1: Configure the grounding jumper.

To use 100ΩT1, 110ΩJ1 or 120ΩE1 balanced twisted-pair cable, disconnect all grounding jumpers.

In consideration of various line conditions, this series boards are equipped with two groups of grounding jumpers on each channel which respectively control the groundings of the transmitting and receiving ends. In case the 75ΩE1 unbalanced coaxial cable is used, the grounding jumpers at the receiving end should be disconnected while those at the transmitting end should be short-circuited, provided that the PC is properly grounded. This configuration is the factory default setting and applicable to most situations so that there is usually no need to change it. If it is difficult to ground the local PC, you may short-circuit the on-board grounding jumper at the receiving end and use the transmitting end at the opposite terminal for grounding. If the receiving end at the opposite terminal is grounded (improper operation), the on-board grounding jumper at the transmitting end must be disconnected. Refer to Table 2-3 for details.

Generally speaking, even in the case of proper grounding at both terminals, only the external layer of the E1 coaxial cable at the transmitting end is allowed to be grounded. The grounding of both transmitting and receiving ends may result in a current loop with ground wires, bringing instability to signals. Therefore, such grounding must be strictly avoided.

Opposite Terminal / Local Terminal					
	Transmit End	**grounded**	**grounded**	**non-grounded**	**non-grounded**
	Receive End	**non-grounded**	**grounded**	**non-grounded**	**grounded**
PC grounded	**Transmit End**	short-circuited	disconnected	short-circuited	disconnected
	Receive End	disconnected	disconnected	short-circuited	short-circuited
PC not grounded	**Transmit End**	short-circuited	short-circuited	manage to make the PC grounded	short-circuited
	Receive End	short-circuited	disconnected		short-circuited

Table 2-3 Configuration of Grounding Jumpers for Use of 75ΩE1 Unbalanced Coaxial Cable

Step 2: Properly fit the board onto the PC chassis.

It is suggested to fix the L-brackets on the board with screws before going to the next step.

Step 3: Connect to digital trunks.

A TEJ800P, TEJ801P, TEJ800E or TEJ801E board provides 4 RJ48C/M jacks, each of which in use should be converted to 2 common RJ48C jacks via a two-way hub as shown in Figure 2-6 below. Each common RJ48C can either connect directly with digital trunks or convert to 2 BNC connectors via an RJ48C-to-BNC adapter. See Figure 2-7.

Figure 2-6 Two-way Hub for RJ48C/M

Figure 2-7 RJ48C-to-BNC Adapter

A TEJ400P, TEJ401P, TEJ400E or TEJ401E board provides 4 common RJ48C jacks, each of which can either connect directly with digital trunks or convert to 2 BNC connectors via an RJ48C-to-BNC adapter. See Figure 2-7 above.

Step 4: Set up an application environment.

Connect digital trunks with the on-board RJ48C jack to establish an application environment.

Step 5: Connect the clock sync line.

Note: Skip this step if there is no need of clock synchronization with multiple boards.

The on-board clock sync line is used to connect with other boards, such as digital trunk boards, analog boards from Synway or even boards from other companies, to offer a same clock to all boards connected together. This can reduce the error in faxing and guarantee the accuracy in data transmission between boards.

See Figure 2-8 below for the clock sync line provided by Synway.

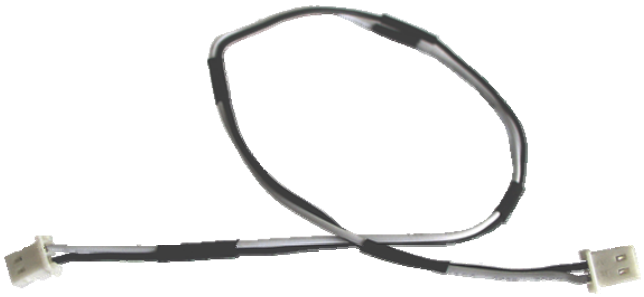


Figure 2-8 Clock Sync Line

Step 6: Boot your computer and install the driver.

Regarding driver installation, refer to the file ‘SynAST UserManual.doc’ for details.

Appendix A Technical Specifications

Dimensions

120×64mm^2 (excluding L-bracket)

Weight

≤120g

Environment

Operating temperature: 0℃—50℃

Storage temperature: -20℃—75℃

Humidity: 10%—90% non-condensing

Storage humidity: 10%—90% non-condensing

Input/output Interface

Digital trunk interface:

TEJ400P/TEJ401P/TEJ400E/TEJ401E:

4 RJ48C jacks

TEJ800P/TEJ801P/TEJ800E/TEJ801E:

4 RJ48C/M jacks

E1 interface:

Compliant with G.703, including 75Ω unbalanced interface and 120Ω balanced interface

T1/J1 interface:

DSX-1 and CSU line build-outs available for different extents of signal losses, including 100Ω and 110Ω balanced interfaces

Audio Specifications

CODEC: CCITT A/μ-Law 64kbps

Distortion: ≤3%

Frequency response: 300-3400Hz (±3dB)

Signal-to-noise ratio: ≥38dB

Echo suppression: ≥40dB

Maximum System Capacity

Depends on the system consumption of Asterisk and the processing capability of computer.

Power Requirements

+3.3V DC: ≈1800mA

Maximum power consumption: ≤6.5W

Audio Encoding & Decoding

A-Law	*64kbps*
μ-Law	*64kbps*

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. However, our technicians and salesmen are mainly responsible for maintaining our boards and providing relative technical support. If there are problems about Asterisk, please keep touch with Digium Inc. for help.

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