Synway AST Series

TEJ100P(SSW)
TEJ101P(SSW)
TEJ200P(SSW)
TEJ201P(SSW)
TEJ400P(SSW)
TEJ401P(SSW)
TEJ800P(SSW)
TEJ801P(SSW)

Digital Trunk Interface Board
Special-for-Switch

Hardware Manual

Version 1.0

Synway Information Engineering Co., Ltd

www.synway.net

Contents

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Revision History

Version	Date	Comments
Version 1.0	2010-12	Initial publication

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Chapter 1 Overview

TEJ100P(SSW), TEJ101P(SSW), TEJ200P(SSW), TEJ201P(SSW), TEJ400P(SSW), TEJ401P(SSW), TEJ800P(SSW) and TEJ801P(SSW) are earmarked for Synway intelligent switch. They are digital trunk interface boards which support E1, T1 and J1 environments, all perform echo cancellation by on-board DSPs. The enhanced capability 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 cost-effective.

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 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.

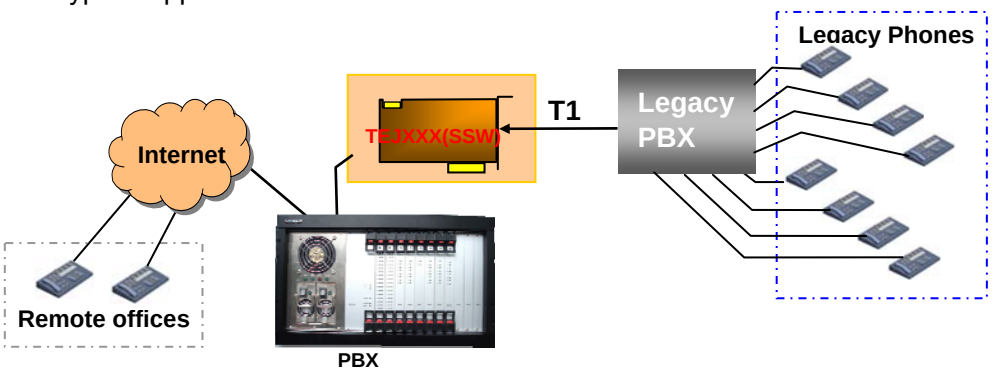
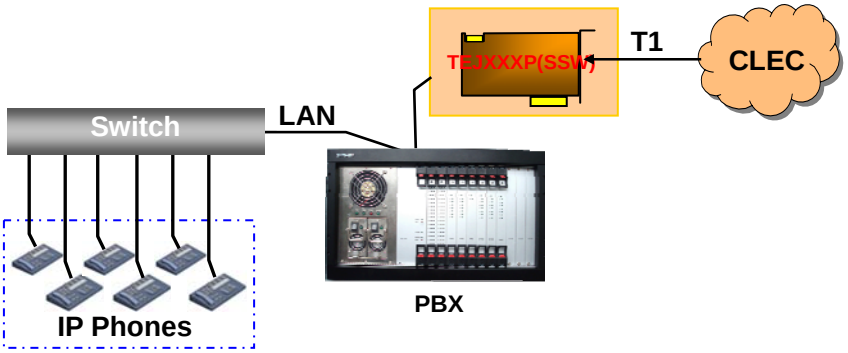


Figure 1-1 Application Model I: Traditional Telephony System



Note: TEJXXXP(SSW) in Figure 1-1and Figure 1-2 represent available special-for-switch TEJ boards

Figure 1-2 Application Model II: VoIP Telephony System

1.1 Features

- **DMA Read and Write**

  Uses the DMA technology to read and write data, greatly reducing the CPU cost.

- **E1/T1/J1 Support**

  Provides an easy selection of the E1, T1 or J1 trunk and its matching impedance via software reconfiguration, not requiring any change in hardware.

- **Compatible with Asterisk**

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

- **Echo Cancellation**

  The echo cancellers developed by Synway for these boards use on-board DSPs to work. TEJ101P(SSW), TEJ201P(SSW), TEJ401P(SSW), TEJ801P(SSW) support up to 128ms for time delay estimation per channel, and TEJ100P(SSW), TEJ200P(SSW), TEJ400P(SSW), TEJ800P(SSW) support 32ms. 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(G.711), μ-law codecs.

- **Clock Sync Support**

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

- **A Particular Separation Design**

As the mainboard and the outlet board are designed independent from each other, when you pull out the mainboard or reinsert it or replace it with other boards, there is no need to reconnect lines as long as the outlet board is not changed or removed

- **EMC & Lightning-proof Circuits Available on Outlet Boards**

1.2 Operation Principle

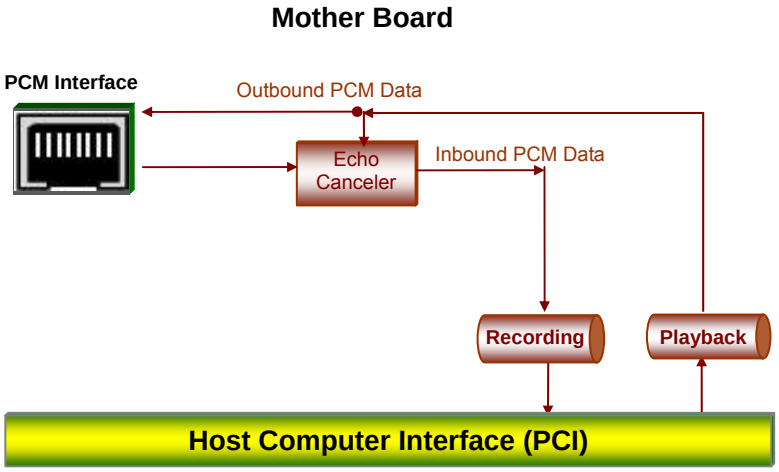


Figure 1-3 Operation Principle

Chapter 2 Installation

2.1 Hardware Structure

- **TEJ100P(SSW)/TEJ101P(SSW) Mainboard**

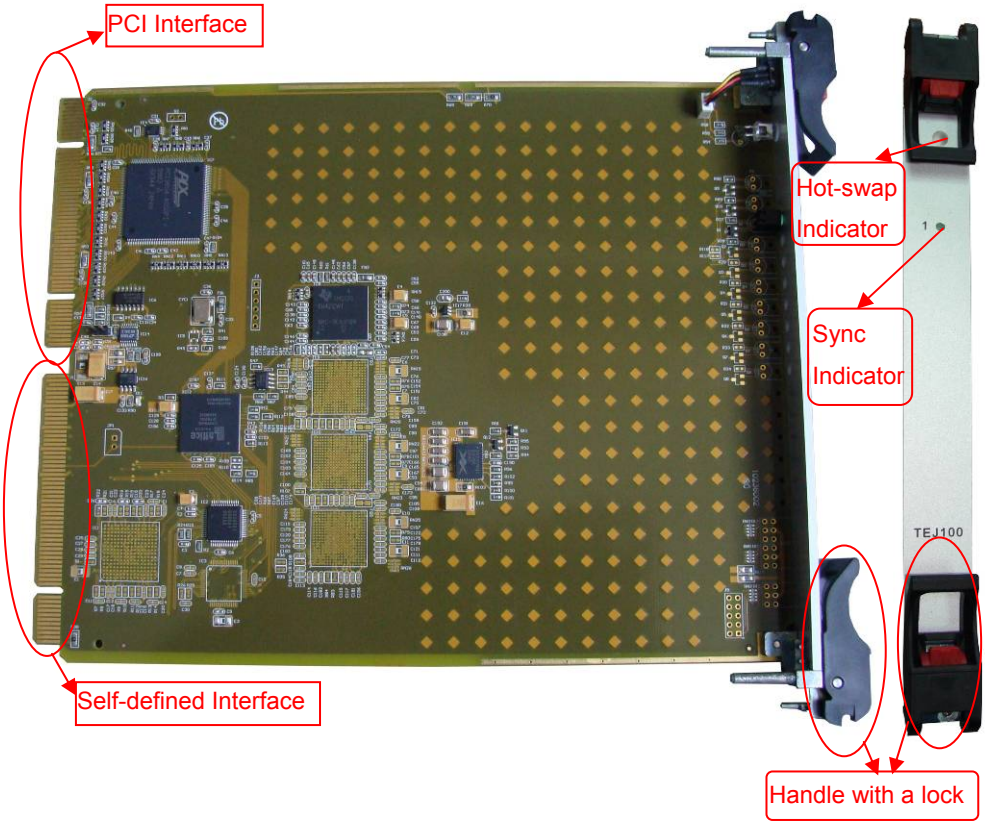


Figure 2-1 Right and Front Views

- **TEJ200P(SSW) Mainboard**

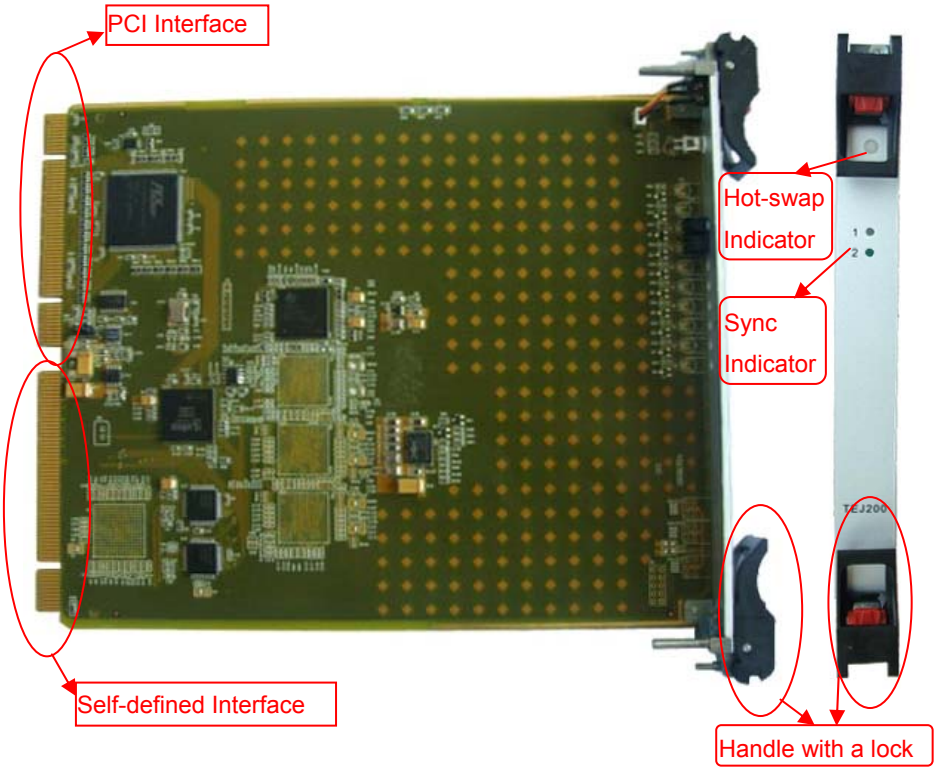


Figure 2-2 Right and Front Views

- **TEJ201P(SSW) Mainboard**

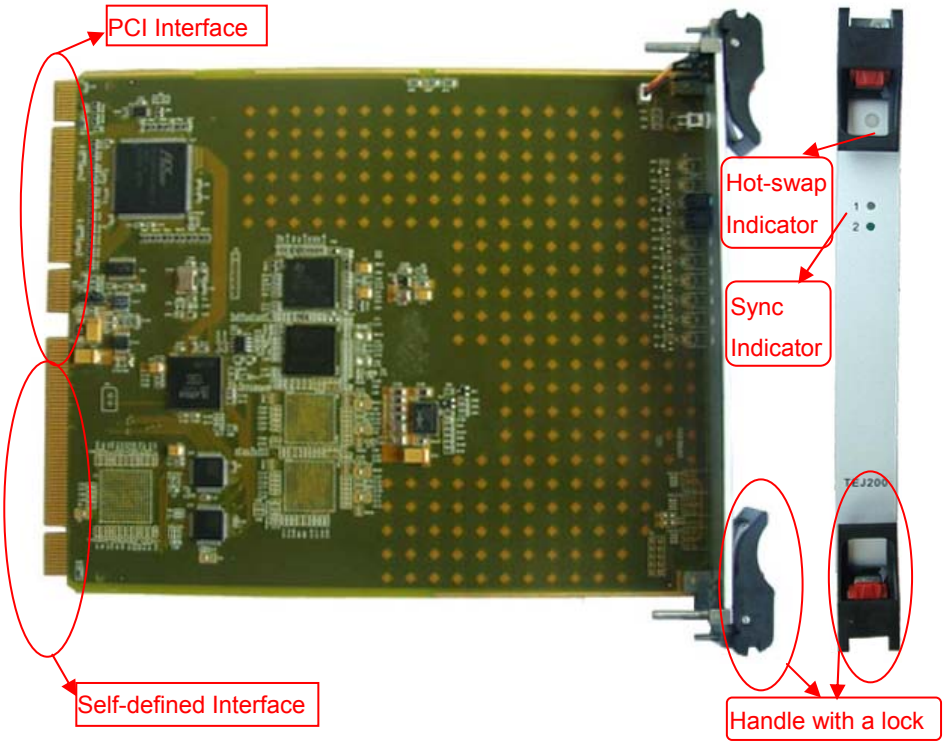


Figure 2-3 Right and Front Views

- **TEJ400P(SSW)/TEJ401P(SSW) Mainboard**

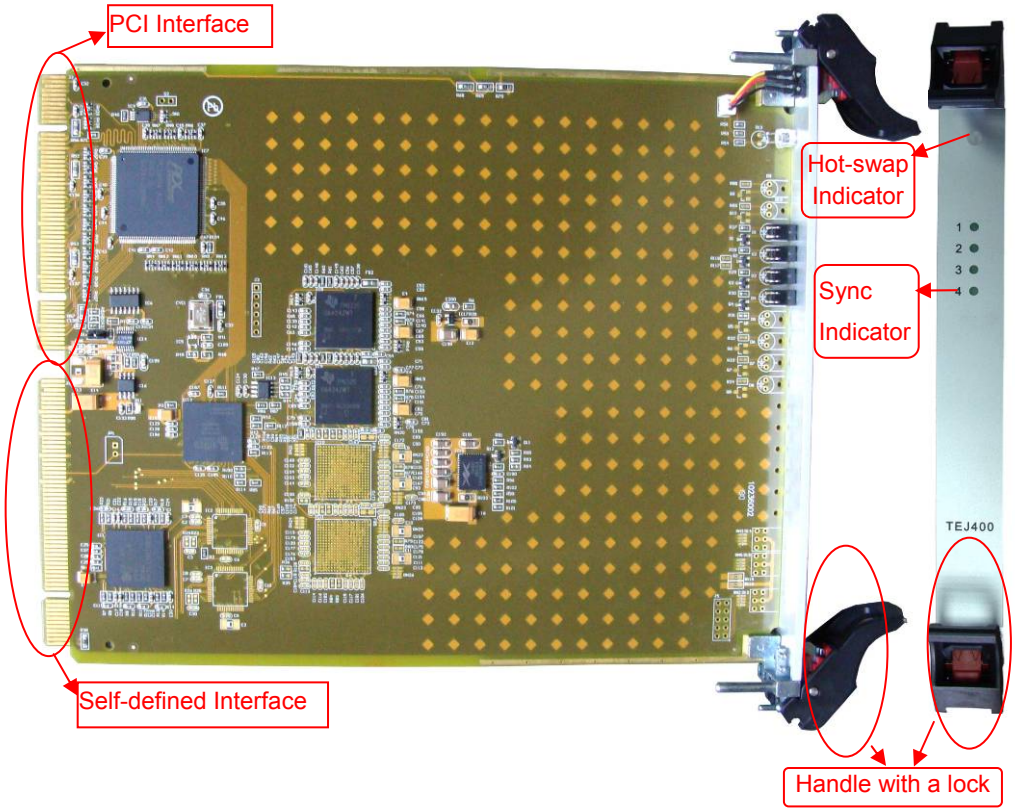


Figure 2-4 Right and Front Views

- **TEJ800P(SSW)/TEJ801P(SSW) Mainboard**

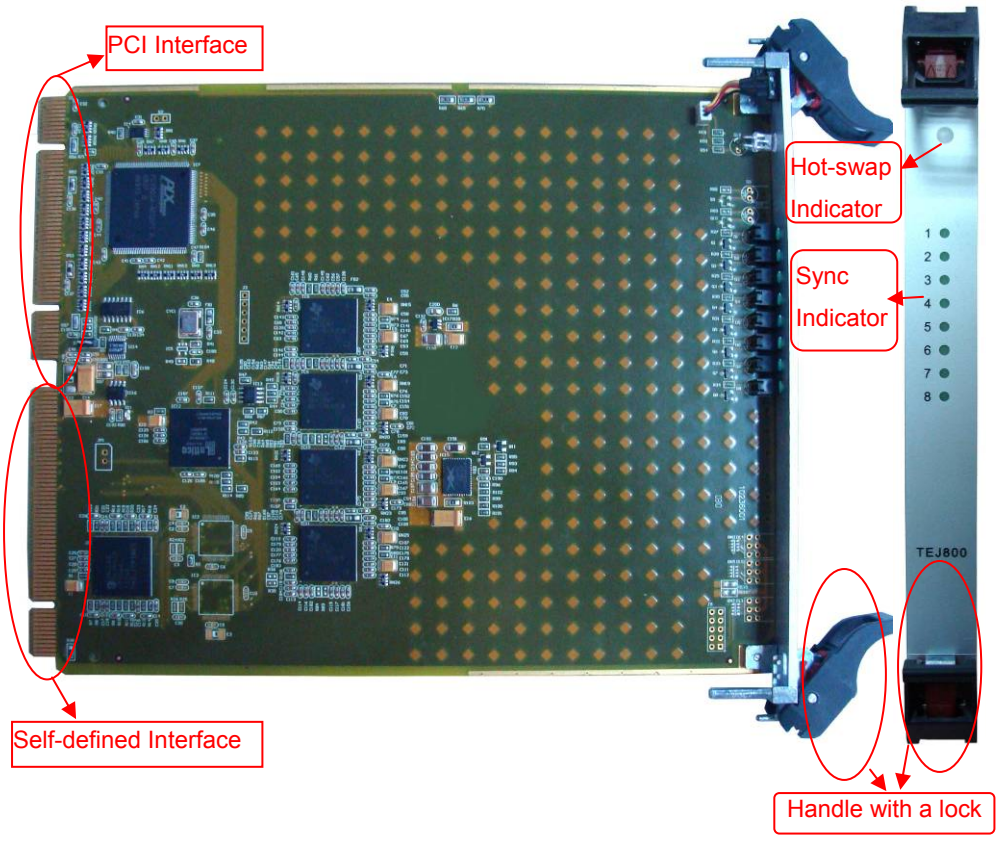


Figure 2-5 Right and Front Views

- **TEJ100P(SSW)/ TEJ101P(SSW)/ TEJ200P(SSW)/ TEJ201P(SSW)/ TEJ400P(SSW)/ TEJ401P(SSW)/ TEJ800P(SSW)/ TEJ801P(SSW) Mainboard**

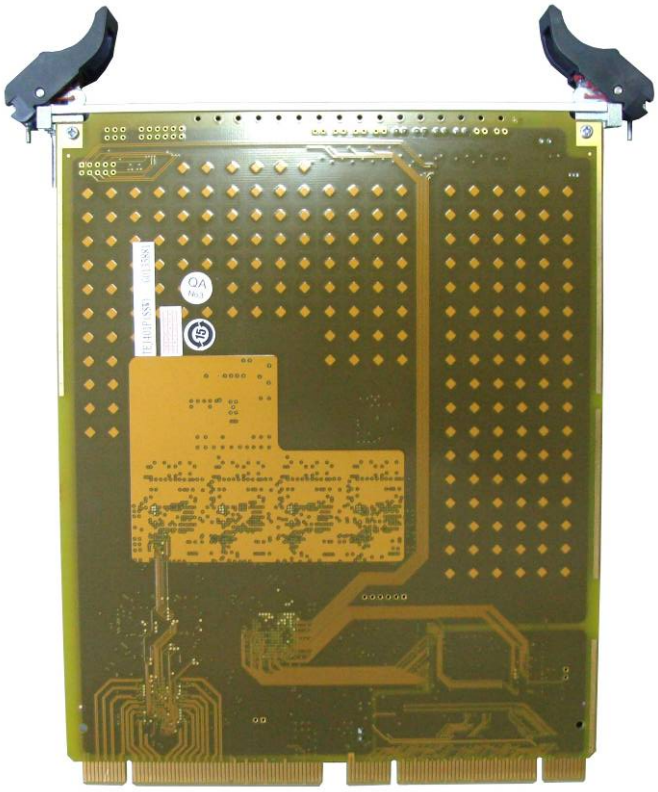


Figure 2-6 Rear View

- **RSD081 Outlet Board**

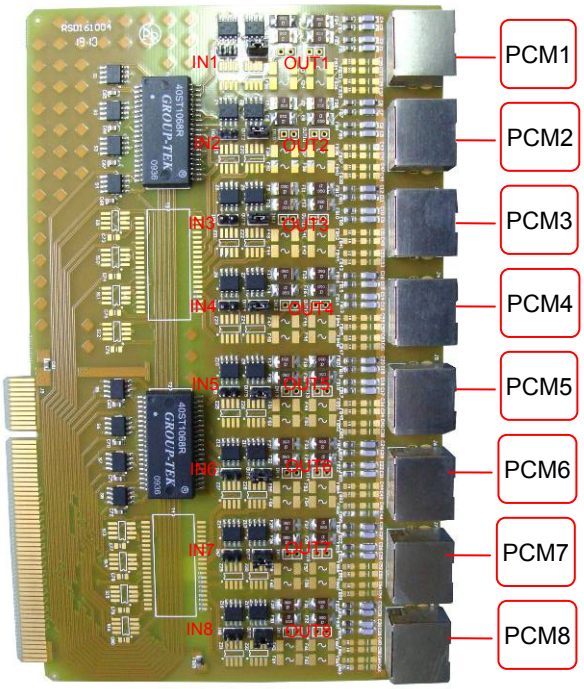


Figure 2-7 Front View

- **RSD082 Outlet Board**

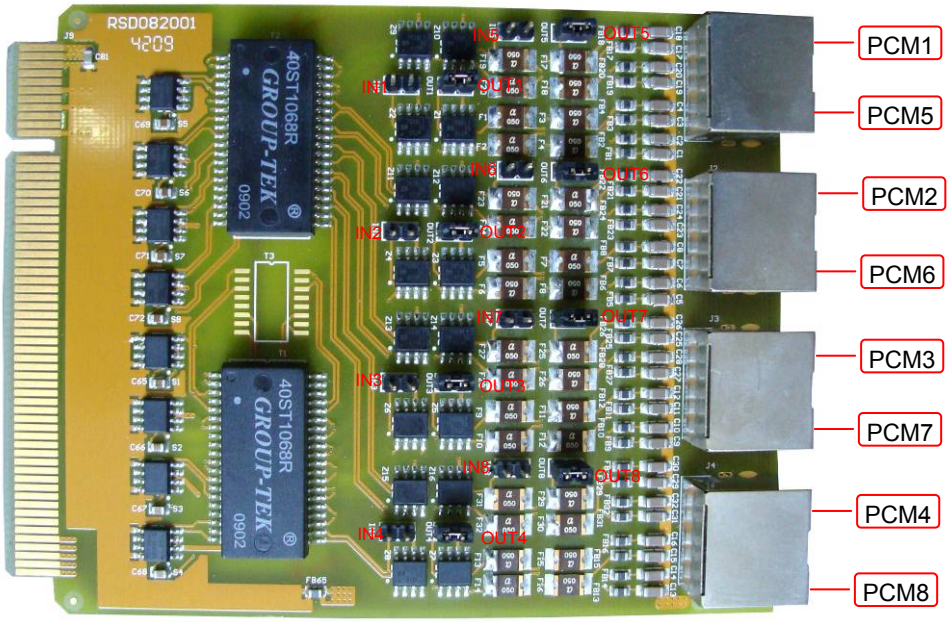


Figure 2-8 Front View

- **RSD042 Outlet Board**

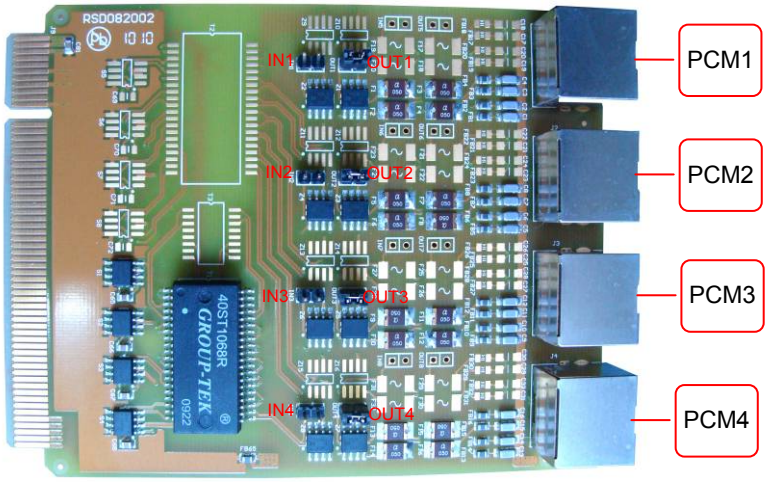


Figure 2-9 Front View

- **RSD043 Outlet Board**

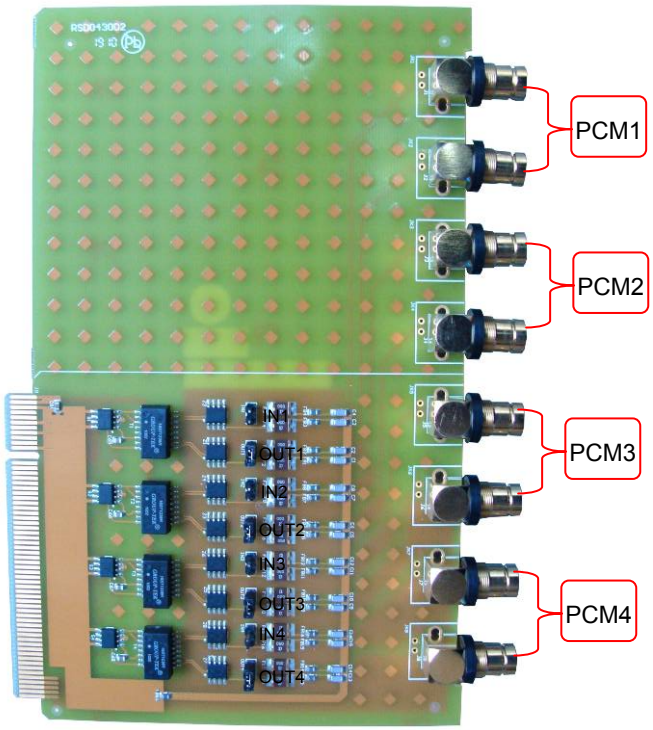


Figure 2-10 Front View

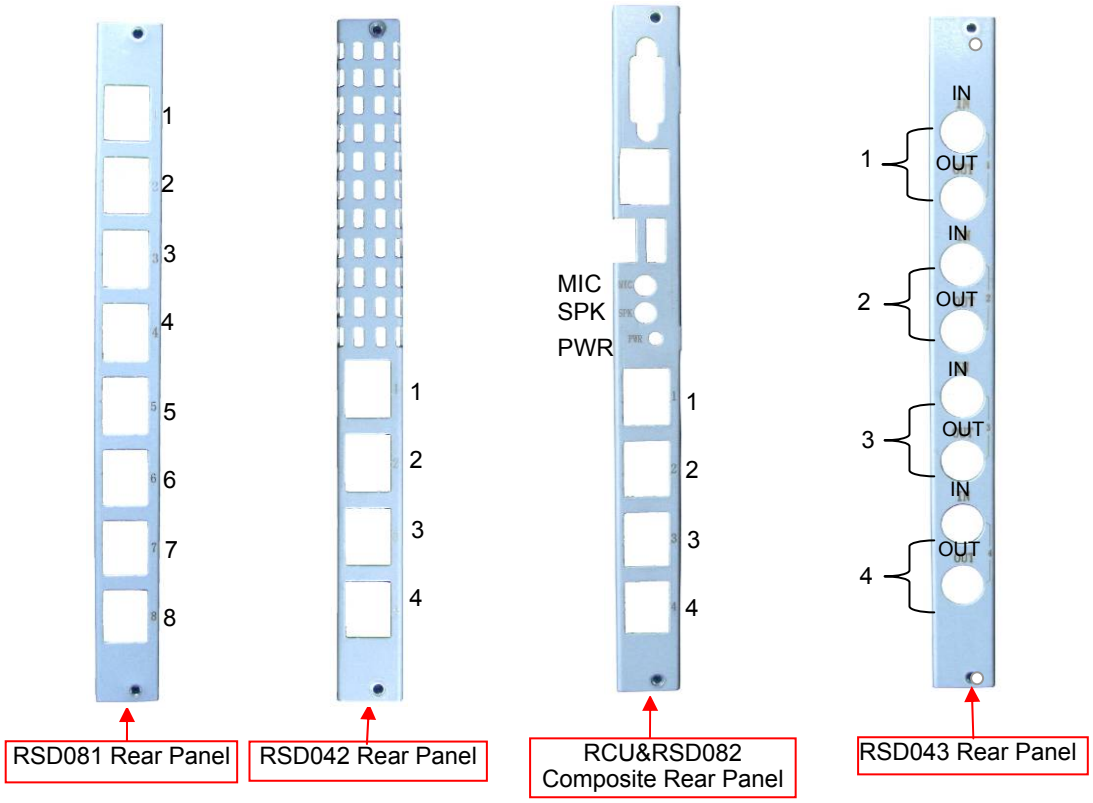


Figure 2-11 Rear Panels Associated with Outlet Boards

Notes:

① Both RSD081 and RSD043 outlet boards are full-length, while RSD082 and RSD042 outlet boards are half-length.

② All kinds of rear panels are made of metal and with U-shaped cross sections.

③ The RSD081 rear panel can work only with the RSD081 outlet board.

④ The RSD043 rear panel can work only with the RSD043 outlet board.

⑤ The RSD042 and RCU&RSD082 rear panels can work only with half-length outlet boards.

Remarks:

① Here above illustrates the hardware structure of the Synway TEJ digital trunk interface boards which are used exclusively for Synway intelligent switch. Always check the label on the back of a board to get the exact board model.

② See

LED	Lamp Status	Implication
Green Lamps	ON	synchronous
	Flash	asynchronous
	OFF	idle port

Table 2-1 below for detailed information about the synchronization indicators of on-board trunk interfaces mentioned above.

LED	Lamp Status	Implication
Green Lamps	ON	synchronous
	Flash	asynchronous
	OFF	idle port

Table 2-1 On-board Synchronization Indicators

Hot-swap Indicator	Lamp Status	Runtime Status
Blue Lamp	ON	in the course of hot-swap
	OFF	normal

Table 2-2 Hot-swap Indicator

③ Interfaces on outlet boards are all RJ48C connectors. Users may convert them into BNC connectors by using the RJ48C-to-BNC adapter supplied with the board. Board models introduced in this file are all listed below.

No.	Model	Trunk	Associated Outlet Board	Physical Interface
1	TEJ100P(SSW)	1E1/T1/J1	RSD042	1 common RJ48C
			RSD043	2 L9
2	TEJ101P(SSW)	1E1/T1/J1	RSD042	1 common RJ48C
			RSD043	2 L9
3	TEJ200P(SSW)	2E1/T1/J1	RSD042	2 common RJ48C
			RSD043	4 L9
4	TEJ201P(SSW)	2E1/T1/J1	RSD042	2 common RJ48C
			RSD043	4 L9
5	TEJ400P(SSW)	4E1/T1/J1	RSD042	4 common RJ48C
			RSD043	8 L9
6	TEJ401P(SSW)	4E1/T1/J1	RSD042	4 common RJ48C
			RSD043	8 L9
7	TEJ800P(SSW)	8E1/T1/J1	RSD081	8 common RJ48C
			RSD082	4 special RJ48C
8	TEJ801P(SSW)	8E1/T1/J1	RSD081	8 common RJ48C
			RSD082	4 special RJ48C

Table 2-3 Board Model List

2.2 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

2.3 Installation Procedure

Step1: Configure the grounding jumpers.

Disconnect all grounding jumpers for use of the 100ΩT1, 110ΩJ1 or 120Ω E1 balanced twisted-pair cable.

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 75Ω E1 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

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 2-4 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	Transmit End	grounded	grounded	non-grounded	non-grounded

Terminal / Local Terminal	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 2-4 Configuration of Grounding Jumpers for Use of 75ΩE1 Unbalanced Coaxial Cable

Step2: Properly fit the required mainboard and outlet board into the Synway intelligent switch.

Insert the mainboard and outlet board into a pair of vacant slots on the Synway intelligent switch.

With the mainboard completely inserted, push the upper and bottom handles inwards at the same time until a 'click' sound is heard. The board is now properly fitted. It can be further fastened with screws on the handle for extended use and prevention of accidental removal.

Insert the outlet board properly into the slot on the back of switch which corresponds to the mainboard. Push it home and then fasten the corresponding rear panel by two screws (on the upside and underside of the rear panel).

Notes:

① It is necessary to push the board home into the slot until it can go no further, and ensure that it is not inclined at an angle before applying lever action on the handles to secure it. Such problems as poor contact of boards, blue lamp always on which implies the board abnormality, or damages on connecting parts of the PBX may be caused if:

(I) Handles are used too early
(II) Handles are used while the board is inclined
(III) Force on handles is not applied evenly.

② Board is allowed to be inserted when the computer is at power on. However, as strong static electricity may lead to damages, the operator should touch a grounded conductor to discharge the static electricity on him before inserting the board.

Step3: Connect the outlet board to digital trunks.

Among these four models of outlet boards illustrated in Figure 2-11, RSD043 provides L9 connectors especially for users to connect with L9 coaxial line; RSD081 and RSD041 provide common RJ48C connectors to support direct connections to other boards, the pin

layout being shown below in

Figure 2-12; RSD082 provides special RJ48C connectors, the pin layout being unfolded

below in

Figure 2-13.

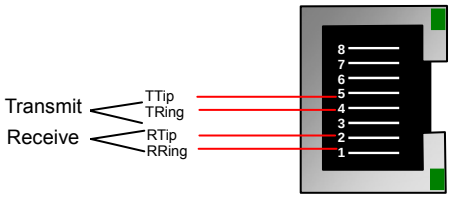


Figure 2-12 Pin Layout for Common RJ48C

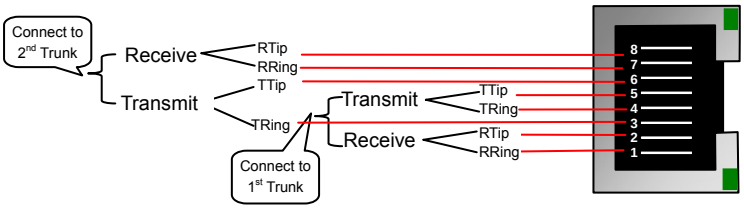


Figure 2-13 Pin Layout for Special RJ48C

You can use the 2-way hub for RJ48C to convert each special RJ48C connector into 2 common RJ48C connectors as shown in Figure 2-14: connect the 1st, 2nd, 4th, 5th pins of the special 8-pin RJ48C connector to the 1st, 2nd, 4th, 5th pins of the first common RJ48C connector, and the 3rd, 6th, 7th, 8th pins to the 1st, 2nd, 4th, 5th pins of the second common RJ48C connector. Besides, you are allowed to construct lines for conversion by yourself, but must follow the order in pin connection as specified above.

Figure 2-14 2-way Hub for RJ48C

If the input line has a BNC coaxial interface, for boards with common RJ48C connectors, use the RJ48C-to-BNC adapter as shown in Figure 2-15 to convert the RJ48C connector to

the BNC connector; for boards with special RJ48C connectors, use the 2-way Hub for RJ48C to convert a special RJ48C connector to two common RJ48C before using the RJ48C-to-BNC adapter.

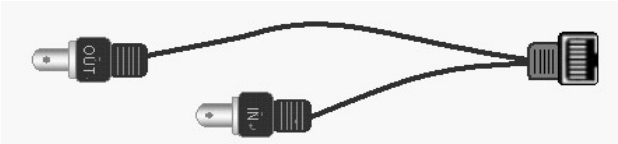


Figure 2-15 RJ48C-to-BNC Adapter

If you would like to construct lines for BNC or L9 conversion by yourself, you should not only make the line match the on-board interface, but also ensure the correct connection of receive and transmit lines as shown in Figure 2-12.

Notes:

① Prevent the cross connection of transmit and receive lines. Such mistake can be found out by observing the on-board synchronization indicators. If the indicator is on, that means the receive line is in a normal state; if the indicator is off or flashing, that means the receive line goes abnormal (probably due to the cross connection). However, the state of transmit lines cannot be checked via synchronization indicators but should be examined by the opposite terminal.

② On-board synchronization indicators start working only after the PC is powered on and the board is successfully initialized.

Step4: Boot your computer and install the driver.

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

Step5: Set up an application environment.

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 (excluding L-bracket)

Mainboard: 218.6×174.5mm²

Full-length outlet board: 180×115.1mm²

Half-length outlet board: 90×115.1mm²

Weight

Main board: ≈250g

Full-length outlet board: ≈175g

Half-length outlet board: ≈75g

Environment

Operating temperature: 0℃—55℃

Storage temperature: -20℃—85℃

Humidity: 8%—90% non-condensing

Storage humidity: 8%—90% non-condensing

Input/output Interface

E1 physical ports: Compliant with G.703, including 75Ω unbalanced interface and 120Ω balanced interface

T1 /J1 physical ports：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

Maximum power consumption: ≤10W

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.

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