Synway AST Series

# FXM32

## Analog Voice 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 | 2009-9 | Initial publication |
| | | |

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

# Chapter 1 Overview

FXM32 is designed with a smart appearance and a flexible structure. The voice quality it provides is rather splendid. The echo canceller which we developed out independently to cancel echoes in hardware supports 128ms for time delay estimation. With the extendable daughterboards and the selectable modules, you can customize systems to what you want. The 2U height and the half-length design it has minimize the space to install in a chassis so that most common main frames you find in daily life are big enough to hold it. In a word, this product is really cost effective.

Figure 1-1 below shows the overall structure of FXM32.

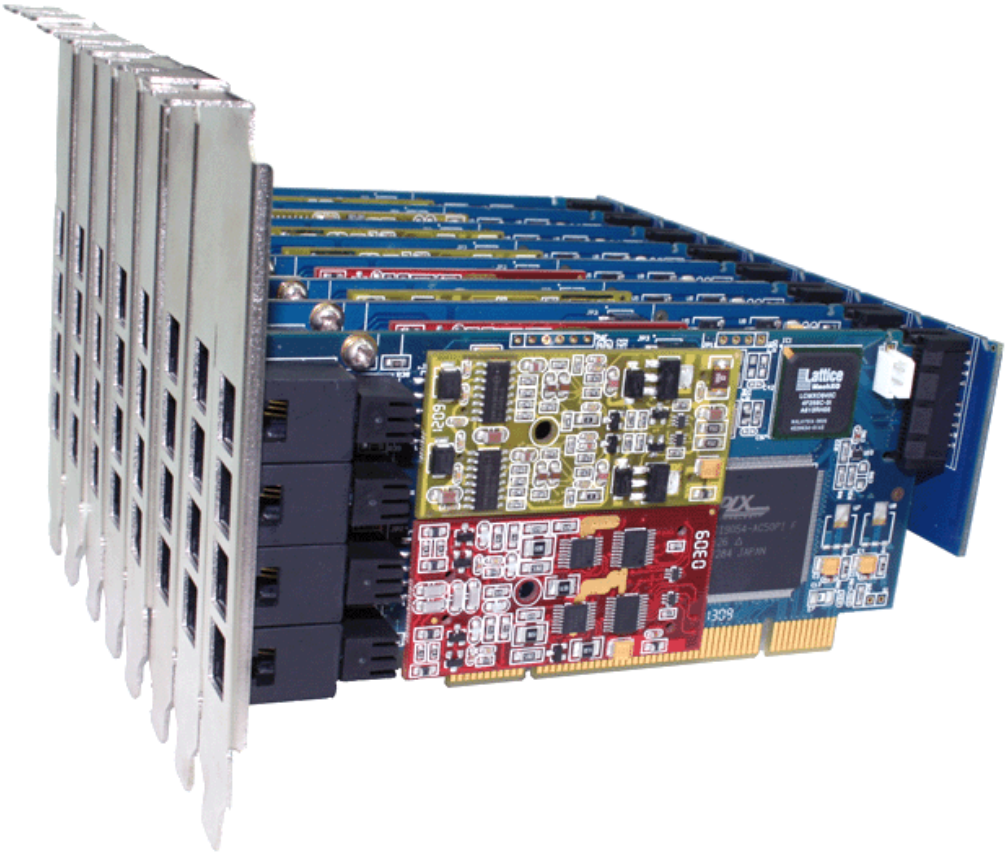


Figure 1-1 Overall Structure of FXM32

**Note: When installing motherboards and daughterboards, there will be no difference to put whichever one in front. They can be inserted into any slot on the backboard. See Figure 2-1.**

## 1.1 Features

- **Echo Cancellation**

  1) Compliant with G.168-2002.

  2) The basic motherboard supports 256 point (32ms) for time delay estimation on each

channel while the enhanced motherboard supports 1024 point (128ms).

3) Uses the DSPs on the motherboard to process echoes, not wasting any host resources.

4) Not only cancels out the effect of voice playback on DTMF and busy tones detection, but also avoids self-excited oscillation and howling, minimizes the possibility of registering wrong DTMF and busy tones in a conference call, especially suitable for VoIP application environments.

- **DMA**

Uses the DMA technique for data reading and writing, greatly minimizing the cost of host CPU.

- **Structure**

1) Assembles piecemeal just like piling up building blocks. A motherboard offers 4 channels and you may use the backboard to extend with up to 7 daughterboards. Then 32 channels are available in total. Although these daughterboards take some space, they can work without the need of PCI/PCIe slots.

2) Several kinds of modules are optional for you to install with the mother/daughter boards to achieve different purposes. Actually, we provide FXS, FXO and FXC (a compound body of FXS and FXO). FXC has the capability to ensure safe communication even when the PC is powered off, which eliminates the damage caused by sudden power cuts.

3) The 2U height and the half-length design (Height: 55mm, Length: 120mm) minimize the space it needs for installation, allowing a great many choices of mainboards and main frames.

4) You are allowed to fix the module by bolt and the backboard by ouch onto the mother/daughter board to prevent them from loosening or disengaging during transportation or in removal.

- **Compatibility in Software and Hardware**

1) Compatible with all commercial and home mainboards.

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

Includes PCI Express 1.0a bus with the single-way transmission rate up to 2.5Gb; supports PCI Express X1, X2, X4, X8, X16 slots.

3) Supports Unix, Linux and Solaris.

4) This board driver is compatible with Zaptel. So it supports a lot of open source PBX systems, like Asterisk, Trixbox, Yate, CallWeaver, FreeSwitch, etc.

- **Interface**

The on-board RJ11 jack can connect directly to telephone lines, making connection easy and

malfunctions rare.

- **Power**

  The power for motherboard is supplied by PCI/PCIe slot, while that for backboard and daughterboard is supplied by host-computer power.

- **Indicator**

  Rear projection indicators. We make use of the gaps between RJ11 jacks and the light-admitting quality of the jack to hide the indicators behind the RJ11 jacks. Such design not only ensures the neatness of the board, but also allows you to get the module type and errors in running without opening the main frame.

## 1.2 Operation Principle

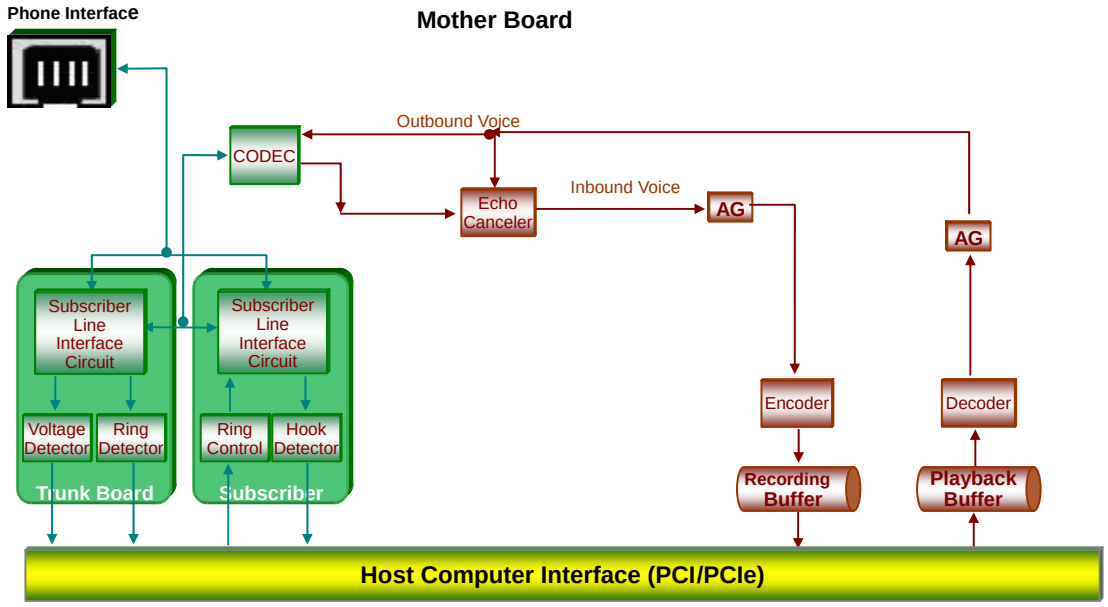



Figure 1-2 FXM32 Operation Principle

# Chapter 2 Installation

## 2.1 Hardware Structure

See Table 2-1 below for available models of FXM32 motherboard, daughterboard, module and backboard.

| Component | Maximum Quantity | Model | Comments |
|---|---|---|---|
| Motherboard | 1 | FXM3200P | Half-length basic motherboard with PCI bus |
| | | FXM3201P | Half-length enhanced motherboard with PCI bus |
| | | FXM3200E | Half-length basic motherboard with PCIe bus |
| | | FXM3201E | Half-length enhanced motherboard with PCIe bus |
| Daughterboard | 7 | FXD400 | Half-length daughterboard |
| Module | 16 | FXO200 | Trunk module |
| | | FXS200 | Station module |
| | | FXC200 | Composite module |
| Backboard | 1 | BP200 | Offers 2 slots |
| | | BP300 | Offers 3 slots |
| | | BP400 | Offers 4 slots |
| | | BP600 | Offers 6 slots |
| | | BP800 | Offers 8 slots |

Table 2-1 Model list for FXM32 Motherboard, Daughterboard, Module and Backboard

What the following Figure 2-1 illustrates is composed of an FXM3201P motherboard, an FXD400 daughterboard, a BP800 backboard, an FXO200 trunk module and an FXS200 station module.

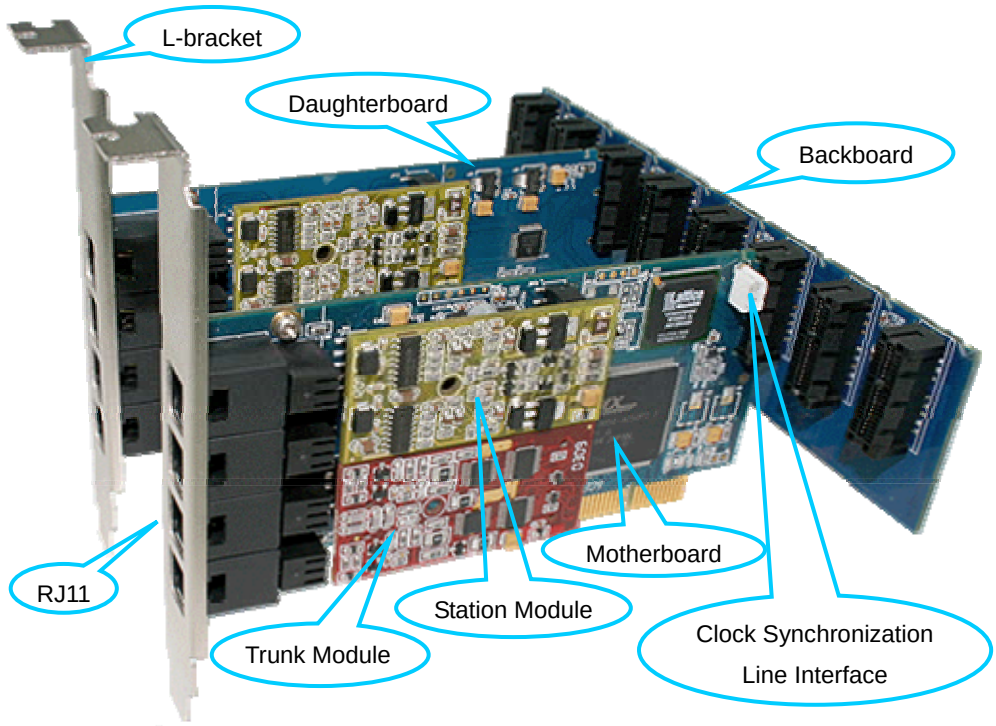



Figure 2-1 Overall Structure

### 2.1.1 Motherboard

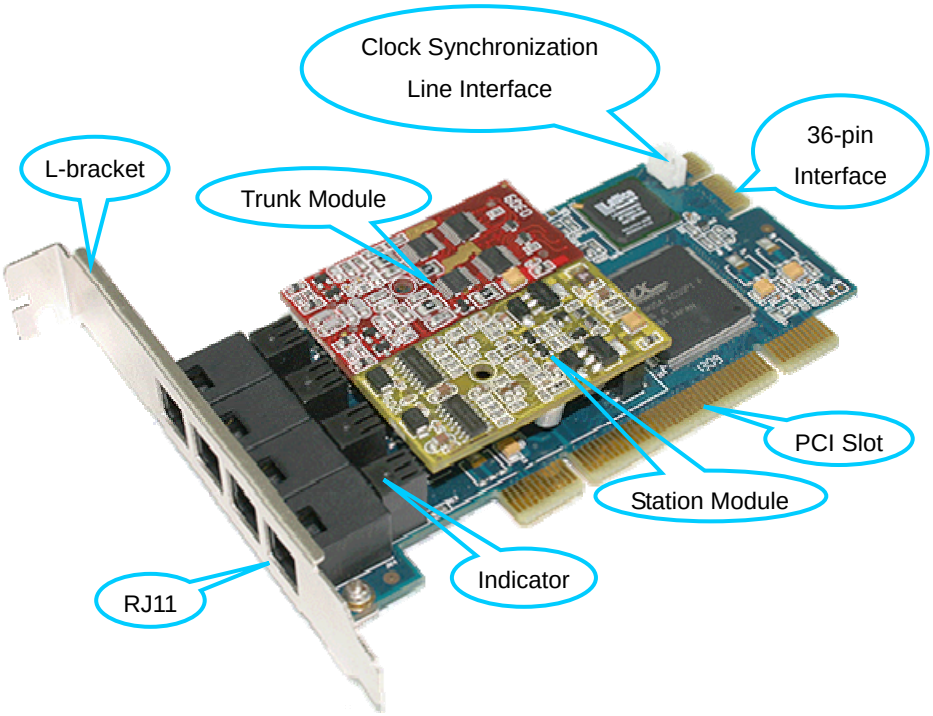



Figure 2-2 FXM3201P Motherboard

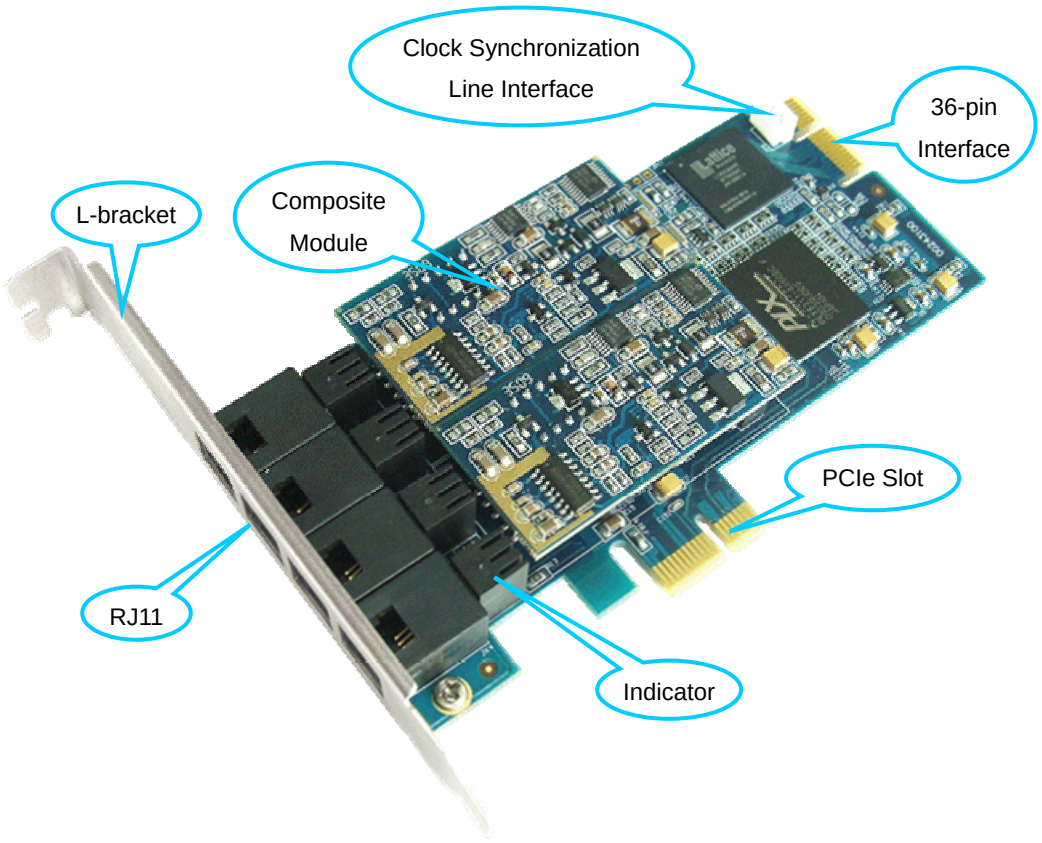



Figure 2-3 FXM3201E Motherboard

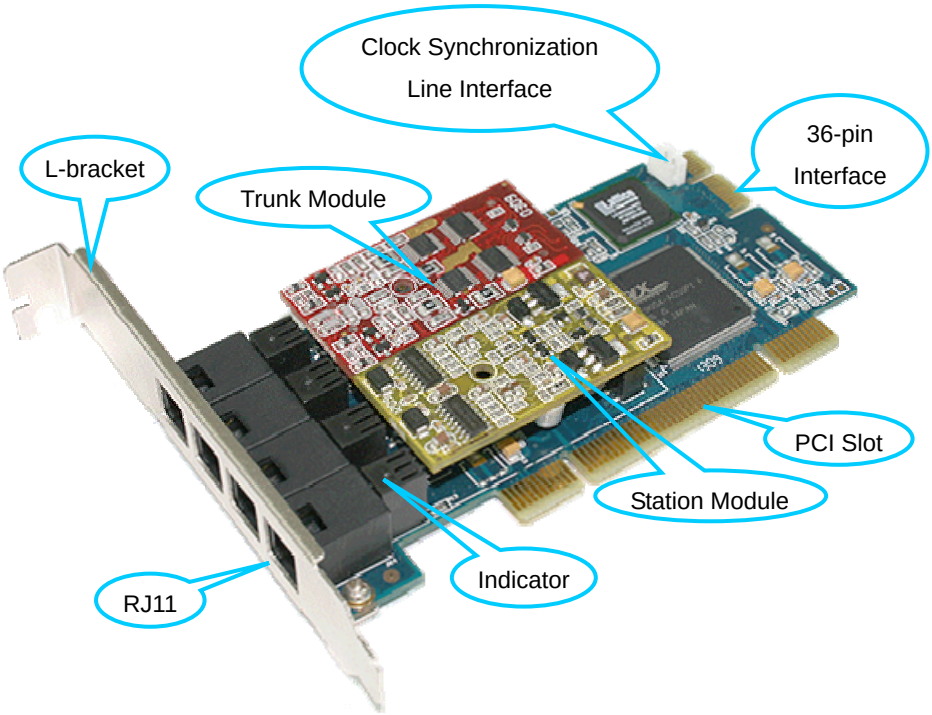



Figure 2-4 FXM3200P Motherboard

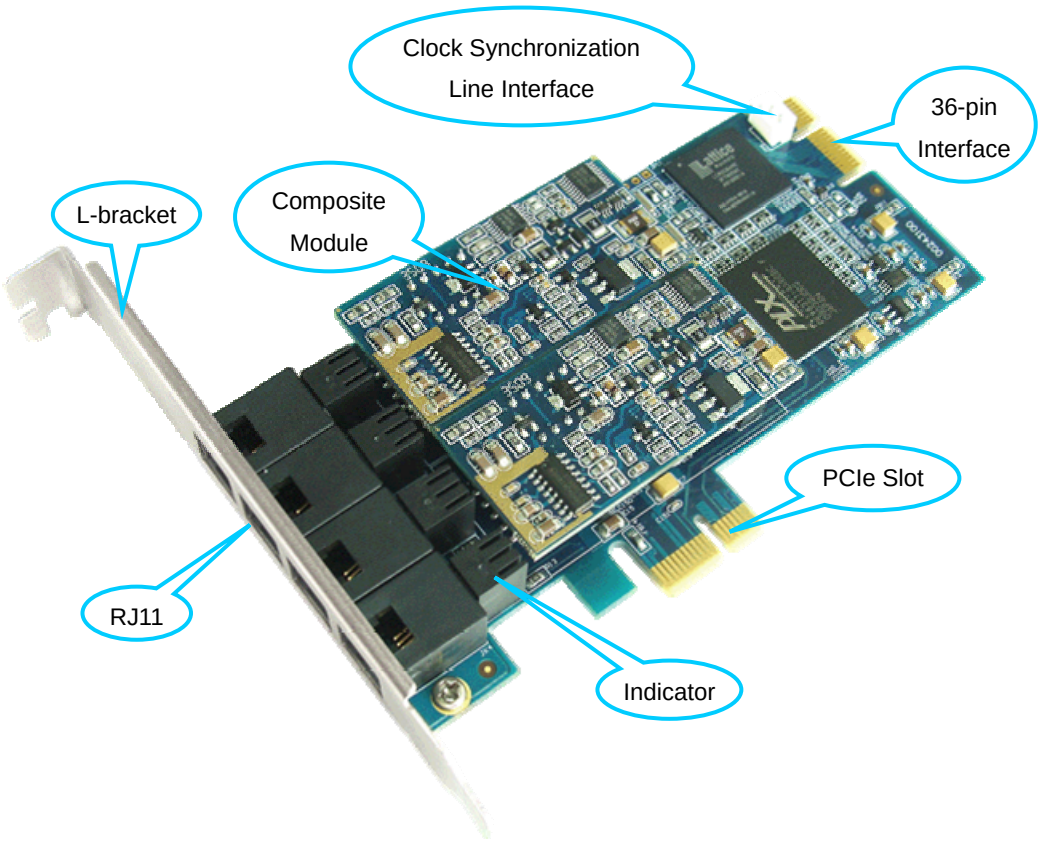



Figure 2-5 FXM3200E Motherboard

### 2.1.2 Daughterboard

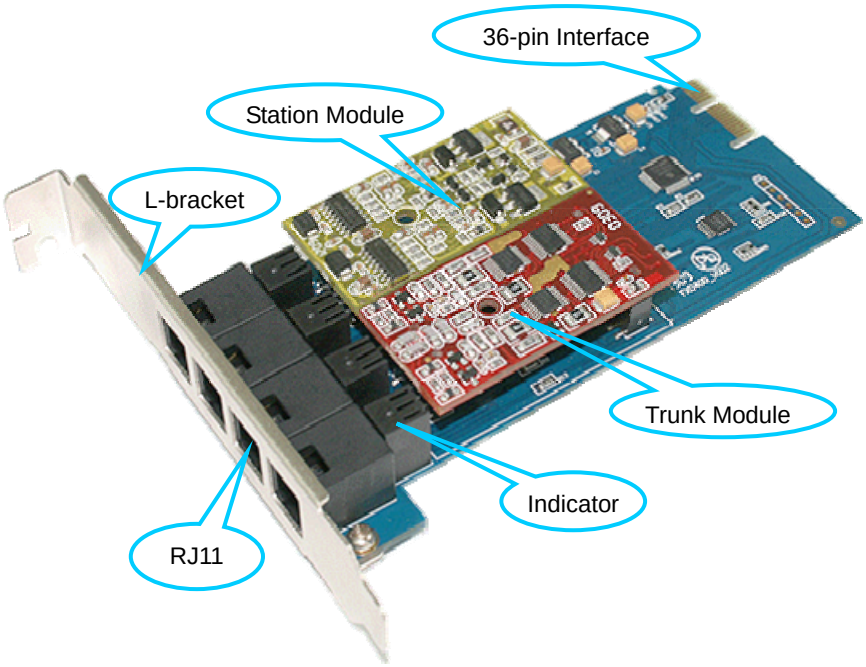



Figure 2-6 FXD400 Daughterboard

### 2.1.3 Backboard

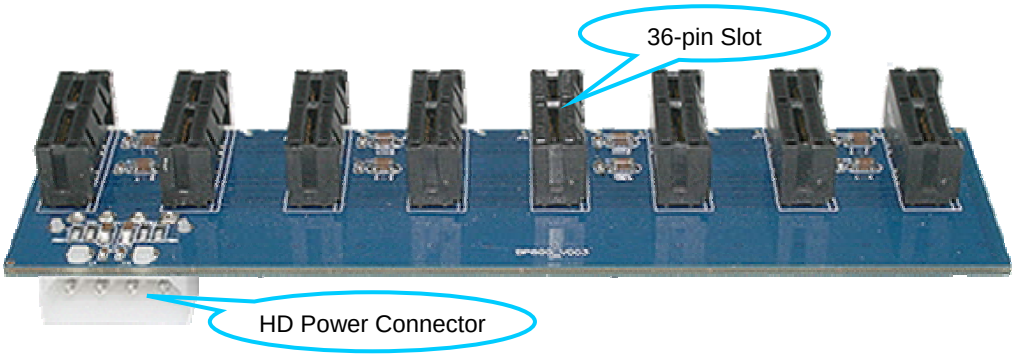



Figure 2-7 BP800 Backboard

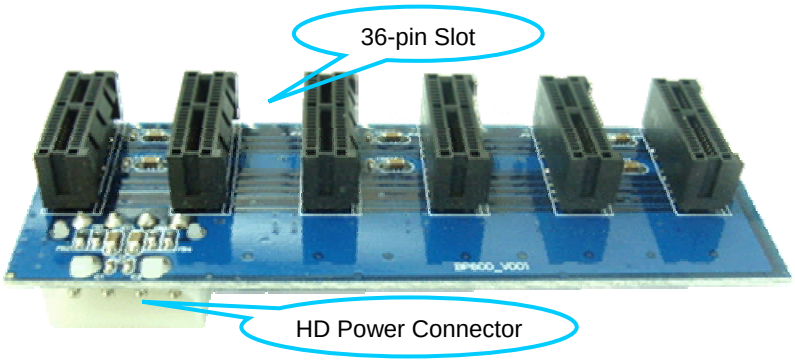



Figure 2-8 BP600 Backboard

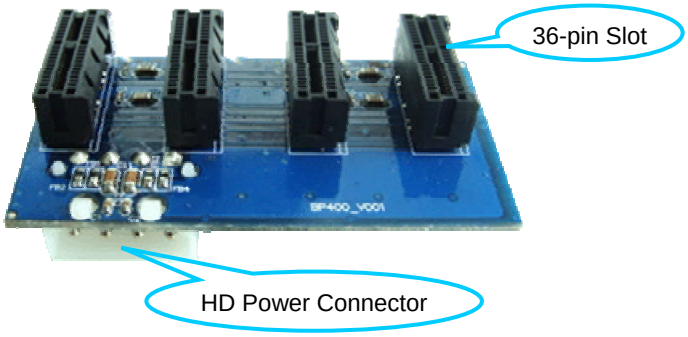



Figure 2-9 BP400 Backboard

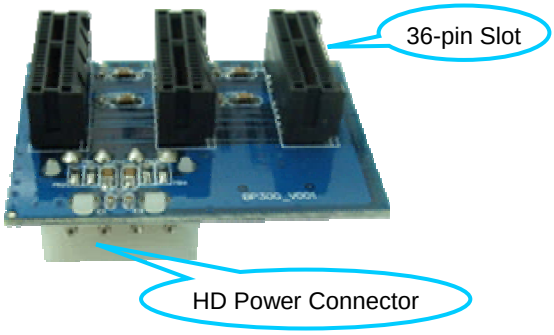



Figure 2-10 BP300 Backboard

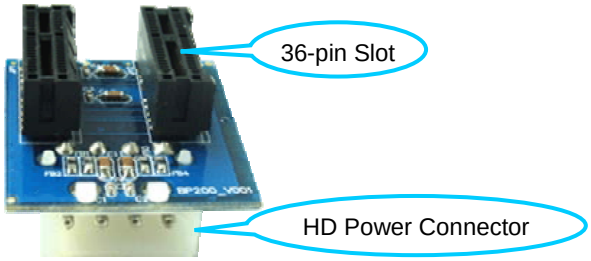



Figure 2-11 BP200 Backboard

### 2.1.4 Module

The FXM32 can have FXO, FXS or FXC (composite module) only, or be equipped with two or three of them at the same time.

- **FXO (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 the 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 2-12 for its hardware structure.

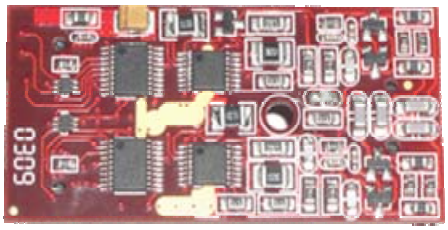


Figure 2-12 Trunk Module

- **FXS (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 -48V standard 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 2-13 for its hardware structure.

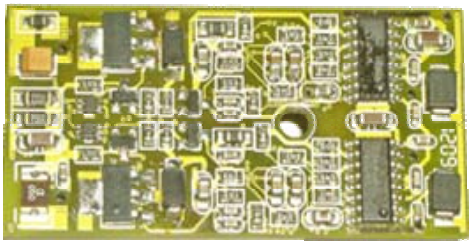


Figure 2-13 Station Module

- **FXC (Composite Module)**

A composite module accommodates a trunk channel and a station channel. It has a special capability of ensuring safe communication via an automatic direct connection of the trunk and station channels when the driver is not running or the PC is powered off.

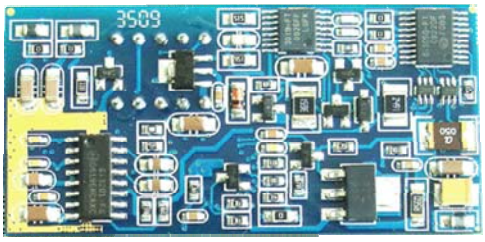


Figure 2-14 Composite Module

## 2.2 Interface Identification

Each mother/daughter board has 4 RJ11 jacks on the bracket and each jack connects with a dual-channel module. That is, an FXM32 set can provide 2~32 RJ11 jacks for use.

The pin layout of the 4-pin RJ11 jack is shown as follows.

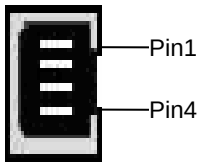
| | Pin | Note |
|---|---|---|
|  | 1 | |
| | 2 | Tip |
| | 3 | Ring |
| | 4 | |

Table 2-2 RJ11

Figure 2-15 below shows the corresponding relationship between the modules on the motherboard and the RJ11 jacks.

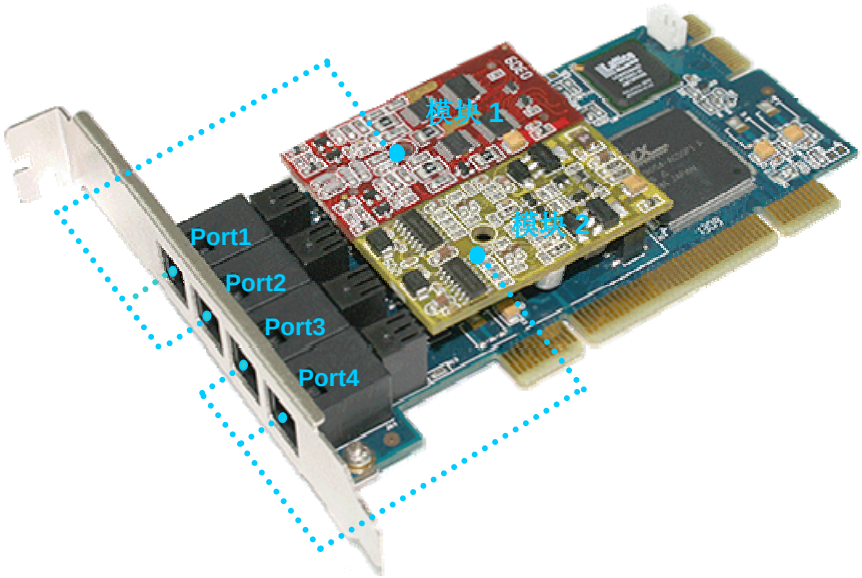



Figure 2-15 Modules and RJ11 Jacks

Note:

1) What each RJ11 jack corresponds to is the module position but not the module type. For example, as shown in Figure 2-15 above, Port 1 and Port 2 are connected to Module 1, no matter Module 1 is FXO, FXS or FXC. Likewise, Port 3 and Port 4 correspond to

Module 2.

2) Interfaces and modules for daughterboards are the same as those on the motherboard.

3) When an FXM32 board is running, the indicators at the RJ11 jacks corresponding to trunk channels stay red, and those at the RJ11 jacks corresponding to station channels stay green. The indicators being unused will not light up. Take the board in Figure 2-15 for example, the color of indicators at each interface are as shown in Figure 2-16 below.

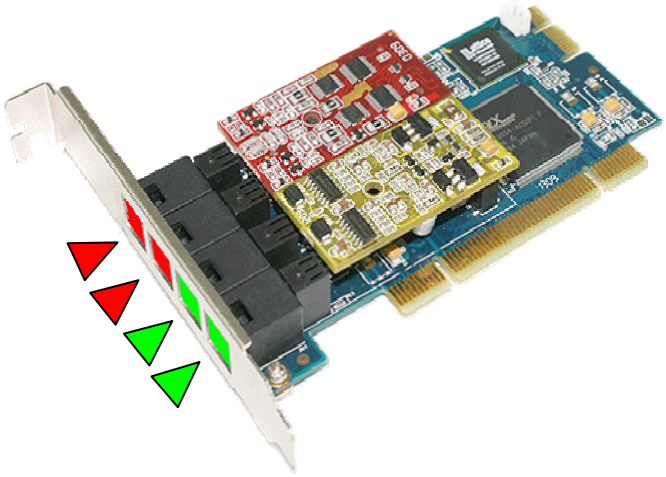
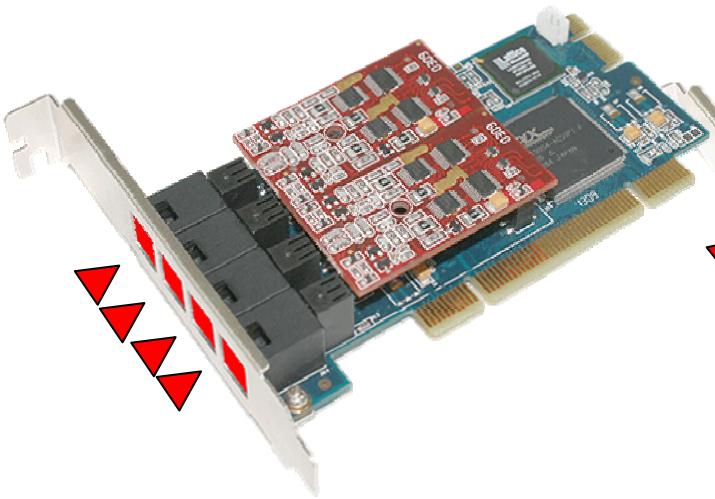
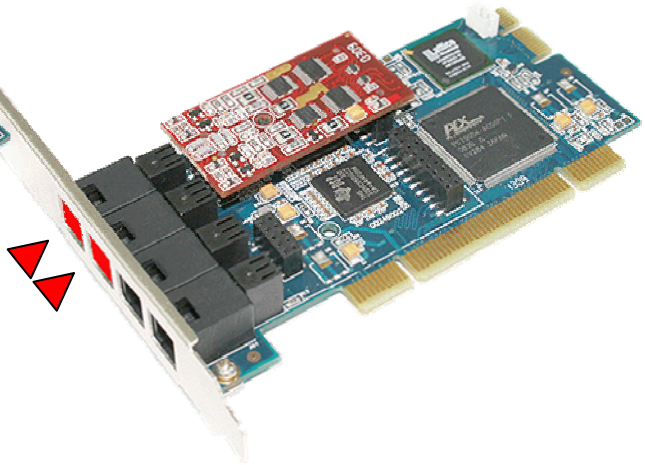


Figure 2-16 Color of Indicators

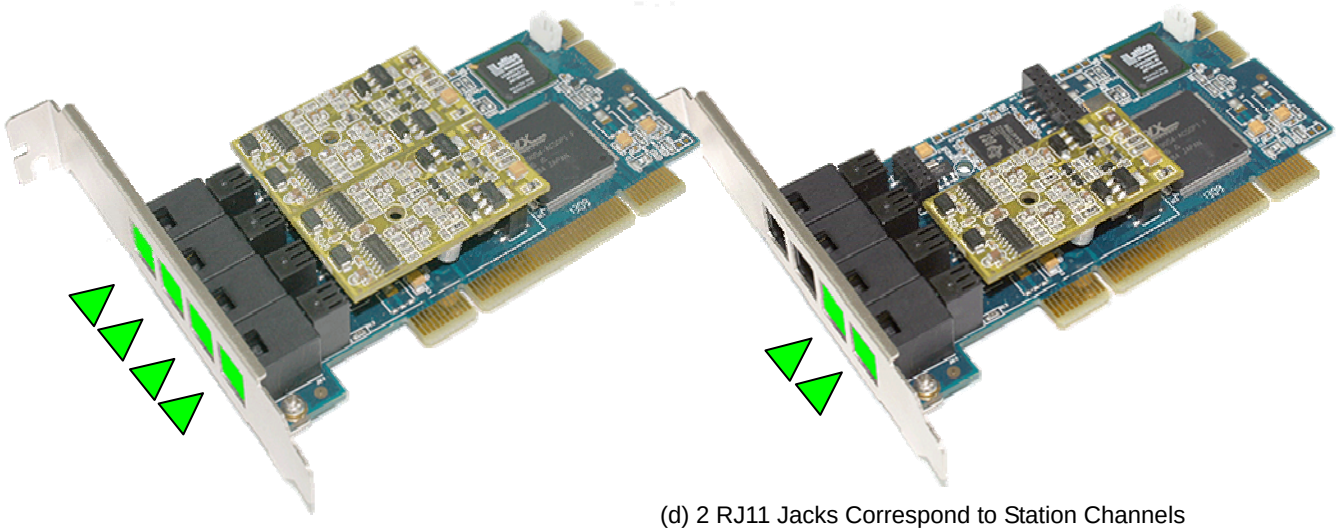
Illustrations (a), (b), (c) and (d) in Figure 2-17 below respectively show how the indicators at RJ11 jacks work with different kind of modules (FXO, FXS or FXC) or with different number of modules on the board.



(a) 4 RJ11 Jacks All Correspond to Trunk Channels



(c) 2 RJ11 Jacks Correspond to Trunk Channels



(b) 4 RJ11 Jacks All Correspond to Station Channels

(d) 2 RJ11 Jacks Correspond to Station Channels

Figure 2-17 Indicators at RJ11 Jacks

## 2.3 Channel Number Identification

An FXM32 set provides up to 32 channels, each of which has a fixed number.

The channel number is only decided by '**the slot position on the backboard**' and '**the port position on the mother/daughter board**'. See Figure 2-18 below. The slots on the backboard are numbered 1~8 from left to right. Then see the following Figure 2-19. The on-board channels are numbered 1~4 from top to bottom.

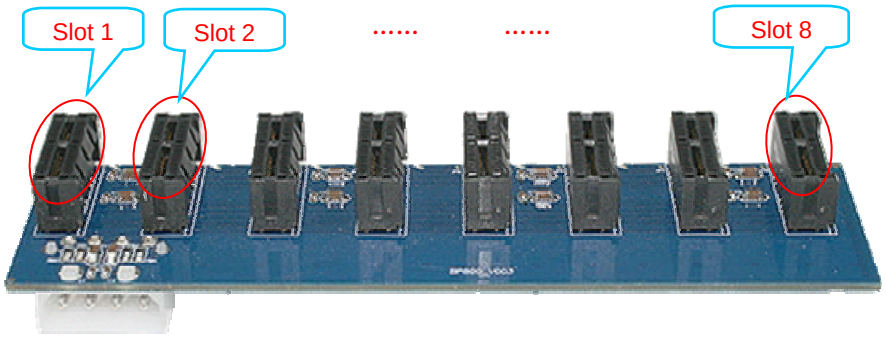



Figure 2-18 Slot Number on Backboard

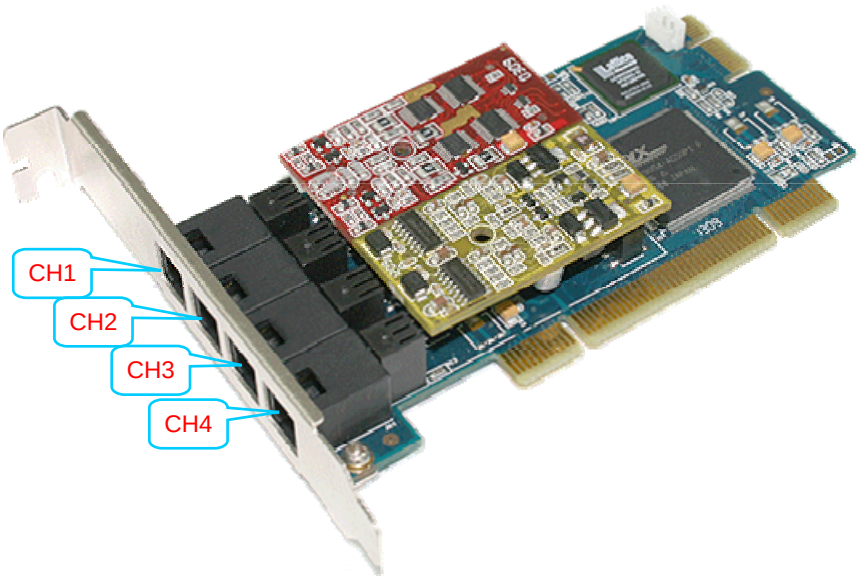



Figure 2-19 Channel Number on Mother/Daughter Board

When the mother/daughter board is fitted to the backboard, **the channels on the board which is inserted to Slot 1 on the backboard are numbered CH1~CH4, and those on the board which is inserted to Slot 2 on the backboard are numbered CH5~CH8. Then in turn, the channels on the board which is inserted to Slot 8 on the backboard are numbered CH29~CH32.**

***Note: Each position has a fixed channel number. It doesn't matter where the mother/daughter board is on the backboard or if there is a board inserted on a slot, just as shown in Figure 2-20 below.***

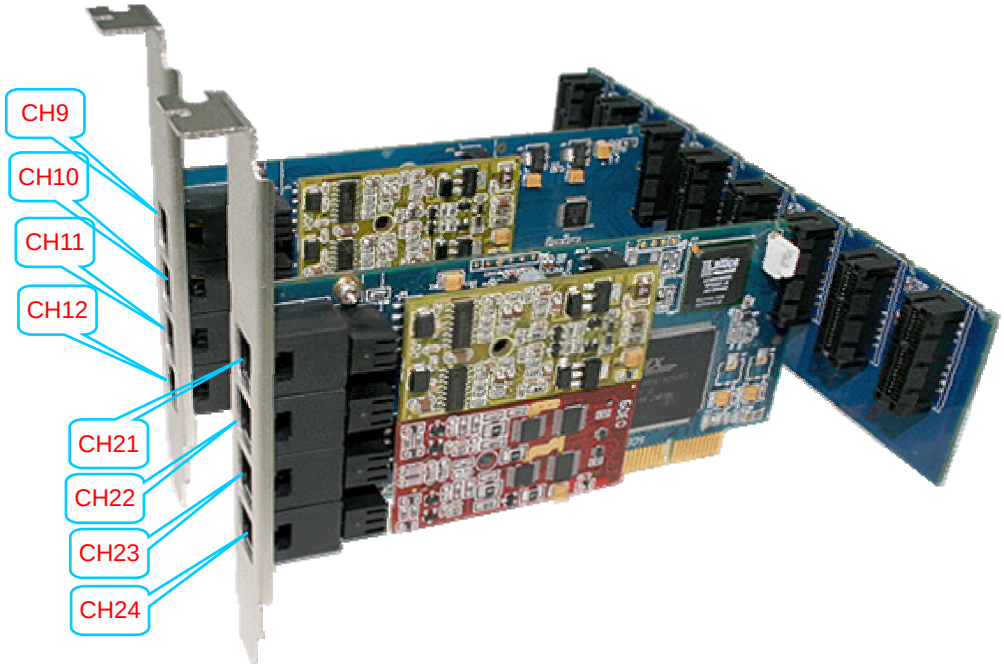



Figure 2-20 Channel Number Identification

## 2.4 System Requirements

Host System Requirements

CPU: 300MHz Intel® Pentium®III or above

Memory: 256M or more

HD: Depends on individual requirements

Supported Operating Systems

Linux RH7.2/RH9.0/AS4/FC4/SUSE10

## 2.5 Hardware Installation

**Note: Always turn off the power before installation!**

**Step 1: Check if all the boards and modules within the package are in good state.**

**Step 2: Plug all modules you need onto the mother/daughter board.**

Follow Figure 2-2 and Figure 2-6 to complete this step.

**Step 3: Fit the motherboard into the PCI/PCIe slot on the chassis.**

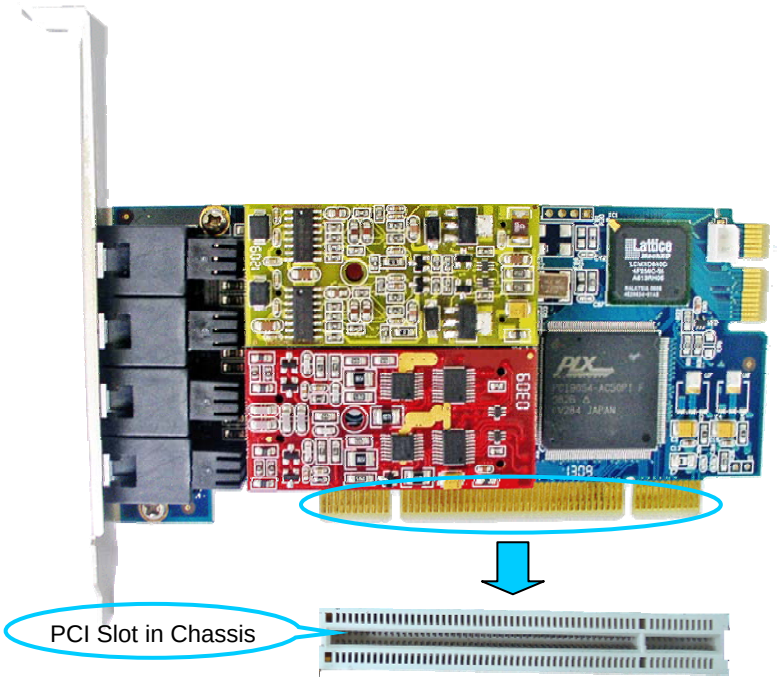



Figure 2-21 Insert Motherboard to PCI/PCIe Slot

Fix the screws on the L-bracket and then go to the next step.

**Note: Skip the following Step 4 and Step 5 if you do not use any daughterboard.**

**Step 4: Fit the daughterboard onto the chassis.**

Likewise, fix the screws on the L-bracket and then go to the next step.

**Note: Daughterboards need not be inserted into PCI/PCIe slots. And it has no difference to put whichever one of them in front.**

**Step 5: Meet the HD power cord to the backboard to connect motherboards with daughterboards.**

Figure 2-22 below shows how to insert the power cord of the chassis to the backboard.

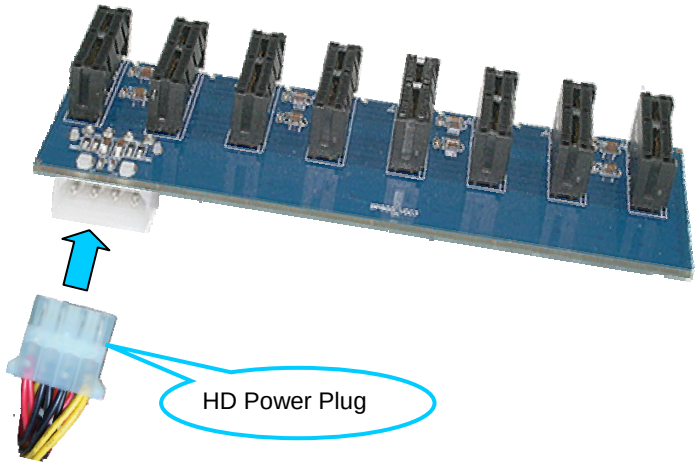



Figure 2-22 Fit HD Power Plug to Backboard

**Note:**

1) **Skip this step if you do not use any daughterboard.**
2) **You may choose a suitable backboard according to how many daughterboards you need. See Table 2-1 to find the backboard models we supply.**

**Step 6: Install the spring steel buckle**

**Notes:**

a) **The spring steel buckle is used to further fasten daughterboards/motherboards to the backboard. Usually there is no need to install the spring steel buckle as a proper connection of daughterboards/motherboards and the backboard is secure enough.**

b) **When all slots on the backboard are inserted with motherboards/daughterboards, install two spring steel buckles at both ends of the backboard, one for each.**

c) **We provide at most two spring steel buckles with a product set in the package.**

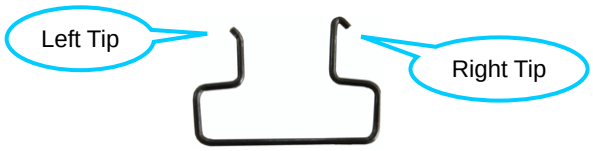



Figure 2-1 Spring Steel Buckle

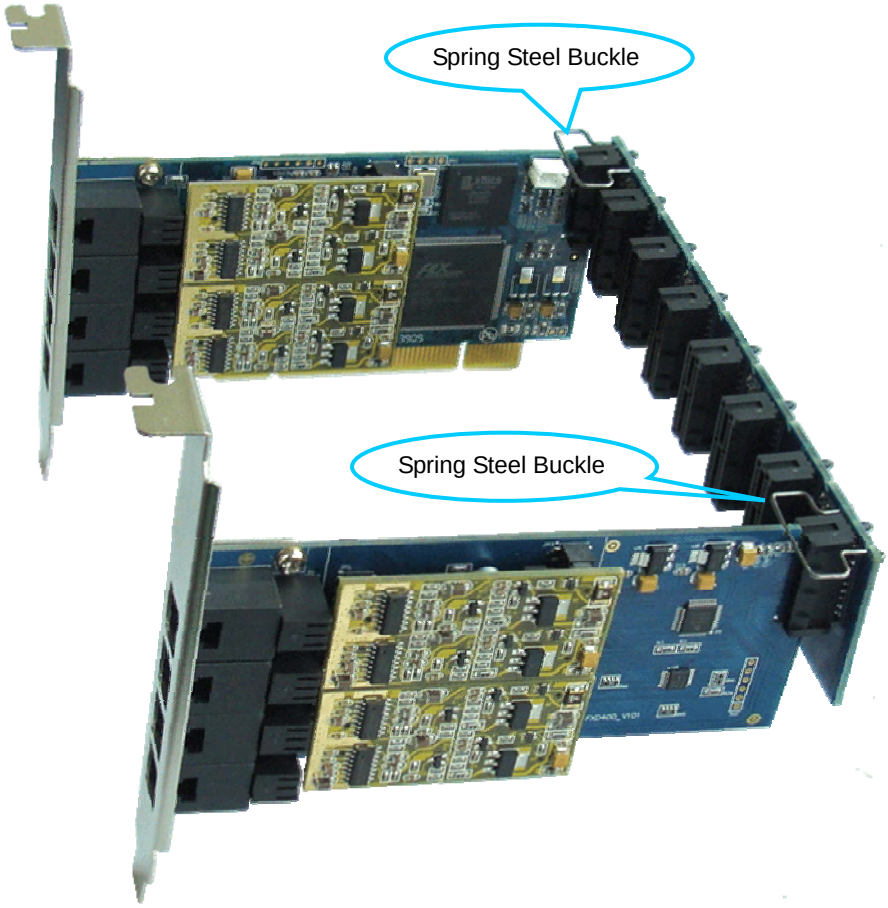



Figure 2-2 Fastened with Spring Steel Buckle

To install the spring steel buckle, follow the steps below:

1) Insert the left tip of the spring steel buckle to the small hole on the backboard. See the figure below.

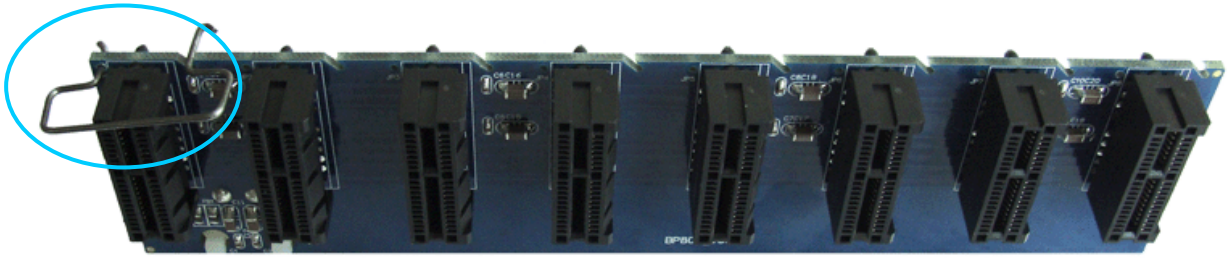


Figure 2-3 Insertion of Left Tip

2) Push the right tip of the spring steel buckle down into the oblique slot on the edge of the backboard. See the figure below.

Figure 2-4 Insertion of Right Tip

3) When the spring steel buckle has been installed properly, insert a motherboard (or daughterboard) as shown in the figure below.

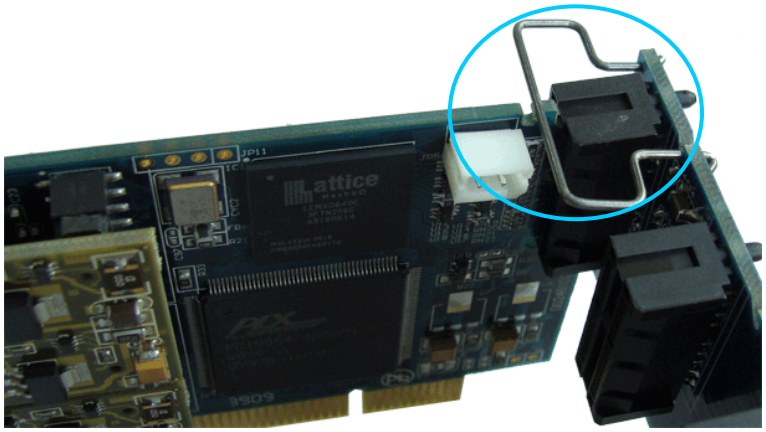


Figure 2-5 Insertion of Motherboard

4) Then push the spring steel buckle down into the little slot prepared on the top edge of the motherboard.

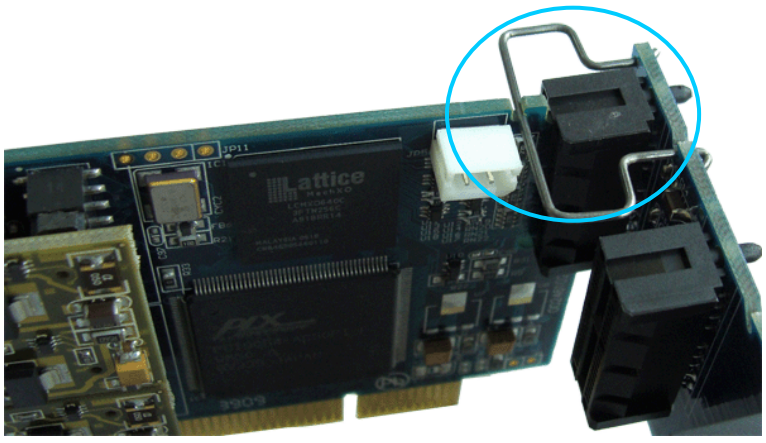


Figure 2-6 Buckling Motherboard

**Attention: The steps to uninstall the spring steel buckle is just contrary to install.**

**Step 7: Set up an application environment**

Connect phone lines with the port to an FXO module and the telephone with the port to an FXS module, to establish an application environment.

**Step 8: Connect the clock synchronization line**

**Note: Skip this step if there is no need to get clock synchronization for multiple boards.**

The clock synchronization line is used to connect more than one FXM32 motherboards or connect FXM32 boards with other kinds of boards (e.g. digital trunk boards) so that these boards can use a same clock to reduce the errors in faxing and to ensure the accuracy of data transmission between different boards. (Note: The synchronization of FXM32 motherboards and daughterboards is achieved by backboards instead of the clock synchronization line.)

After connecting a clock synchronization line with two boards, you have to make proper configurations on it to let these two boards work synchronously. Follow the steps below.

1. For two FXM32 motherboards, when they are connected with a clock synchronization line, powered on and loaded automatically with the driver, please execute the following command to activate the clock synchronization configuration.

   #>echo 12 > /sys/module/fxm32/parameters/clockconf

2. For an FXM32 motherboard and a board of other model (such as a digital trunk board), when they are connected with a clock synchronization line, powered on and loaded automatically with the driver, please execute the following command to activate the clock synchronization configuration.

   #>echo 1 > /sys/module/fxm32/parameters/clockconf

Note: If the file /sys/module/fxm32/parameters/clockconf does not exist, you may try to use the file /sys/module/fxm32/clockconf to replace /sys/module/fxm32/parameters/clockconf on the premise that the driver has been loaded.

See Figure 2-23 below.

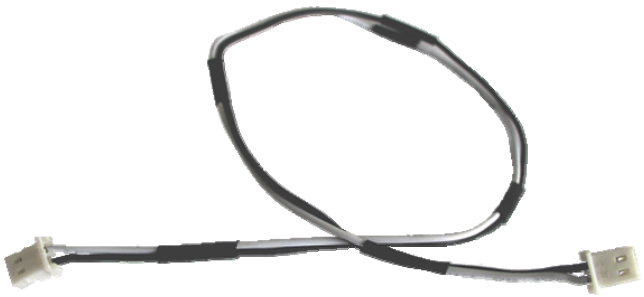


Figure 2-23 Clock Synchronization Line

See Figure 2-2 for the clock synchronization line interface on the motherboard.

**Step 9: Boot your computer and install the driver**

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

# Appendix A Technical Specifications

**Dimensions**

*132.5x64 mm$^2$ (excluding L-bracket)*

**Weight**

*Motheboard：about 70g*

*（excluding modules）*

*Daughtboard：about 55g*

*（excluding modules）*

*Module：about 10g*

*Backboard：≤45g*

**Environment**

*Operating temperature: 0℃—55℃*

*Storage temperature: -20℃—85℃*

*Humidity: 8%—90% non-condensing*

*Storage humidity: 8%—90%*
*non-condensing*

**Input/output Interface**

*Telephone line jack: 2~32 4-pin RJ11*

**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**

*Up to 8 boards concurrently per system;*
*up to 4 channels per board*

**Power Requirements**

***Total Power Consumption includes the electricity use of all motherboards and daughterboards.***

*Only motherboards*
*(with modules fully inserted)*

*+3.3V DC: 1500mA*
*(power consumption: 4.95W)*

*+12V DC: 500mA*
*(power consumption: 6W)*

*Only daughterboards*
*(with modules fully inserted)*

*+5V DC: 600mA*
*(power consumption: 3W)*

*+12V DC: 500mA*
*(power consumption: 6W)*

**Impedance**

*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**

*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

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