



Synway AST Series

FXM32 Full-length

Analog Voice Board

Hardware Manual

Version 1.2

Synway Information Engineering Co., Ltd

www.synway.net

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Revision History

Version	Date	Comments
Version 1.0	2010-4	Initial publication
Version 1.1	2011-8	Add description on the daughterboard FXD1610
Version1.2	2012-5	Add description on the motherboards FXM3210E and FXM3211E

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

Chapter 1 Overview

The FXM32 full-length board 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 half-height and full-length design it has minimizes 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.

Note: The FXM32 full-length motherboard can extend only with a daughterboard to set up a system involving up to 32 ports. To be exact, each motherboard supports up to 16 channels and the extension with a daughterboard which is achieved by the backboard BP200, enables the support of 32 channels. 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 16 channels and you may use the backboard to extend with a daughterboard to support up to 32 channels. Although the daughterboard takes some space, it works 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 half-height and full-length design (Height: 64mm, Length: 270mm) minimizes the space for installation, allowing a great many choices of mainboards and main frames.
- 4) You may use the spring steel buckle to fix the backboard on the mother/daughter board so as 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**

Four on-board RJ45 jacks: to connect with analog voice paths (don't forget to install analog modules correspondingly), use the four-way hub for RJ45 to convert each RJ45 to four RJ11 jacks which can connect directly to telephone lines, making connection easy and malfunctions rare.

- **Power**

The power is supplied by the host computer. In case only the motherboard is used, connect it with the HD power plug. In case the backboard and the daughterboard are also used, connect the backboard with the HD power plug.

1.2 Operation Principle

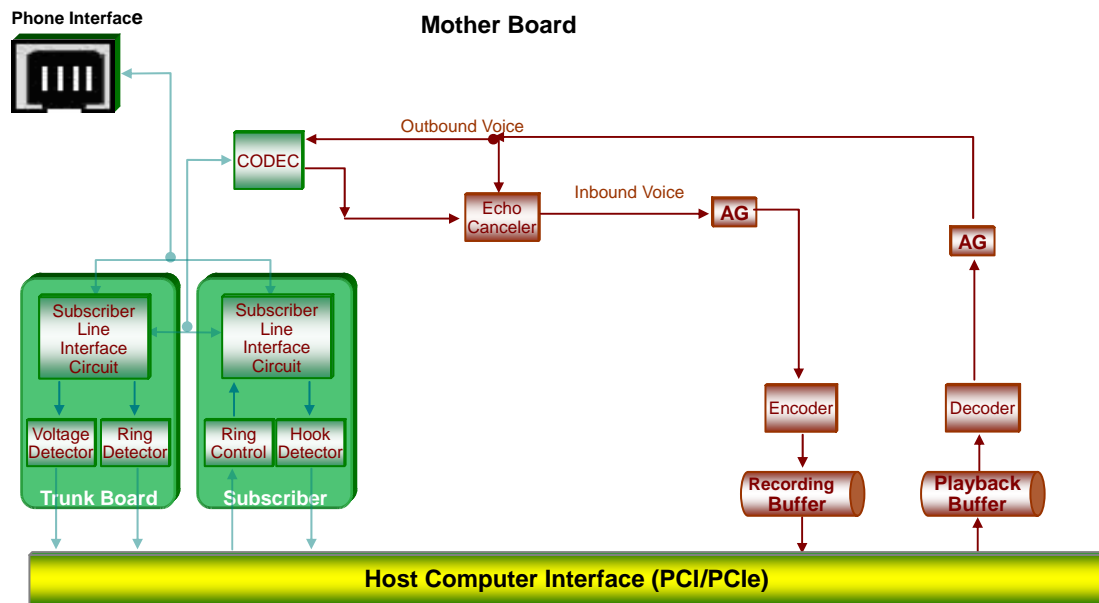


Figure 1-1 FXM32 Full-length Board Operation Principle

Chapter 2 Installation

2.1 Hardware Structure

See Table 2-1 below to find the available models of motherboards, daughterboards, modules and backboards for the FXM32 full-length analog voice board (models in grey are not yet published).

Component	Max. Quantity	Model	Comments
Motherboard	1	FXM3210P	Basic full-length motherboard with PCI bus
		FXM3211P	Enhanced full-length motherboard with PCI bus
		FXM3210E	Basic full-length motherboard with PCIe bus
		FXM3211E	Enhanced full-length motherboard with PCIe bus
Daughterboard	1	FXD1610	Full-length daughterboard
Module	16	FXO200	Trunk module
		FXS200	Station module
		FXC200	Composite module
Backboard	1	BP200	Offers 2 slots

Table 2-1 Model list of Motherboards, Daughterboards, Modules and Backboards for FXM32 Full-length Board

Figure 2-1 below illustrates the structure of the FXM32 full-length analog voice board which is composed of a motherboard, a daughterboard, a backboard and some pieces of modules.

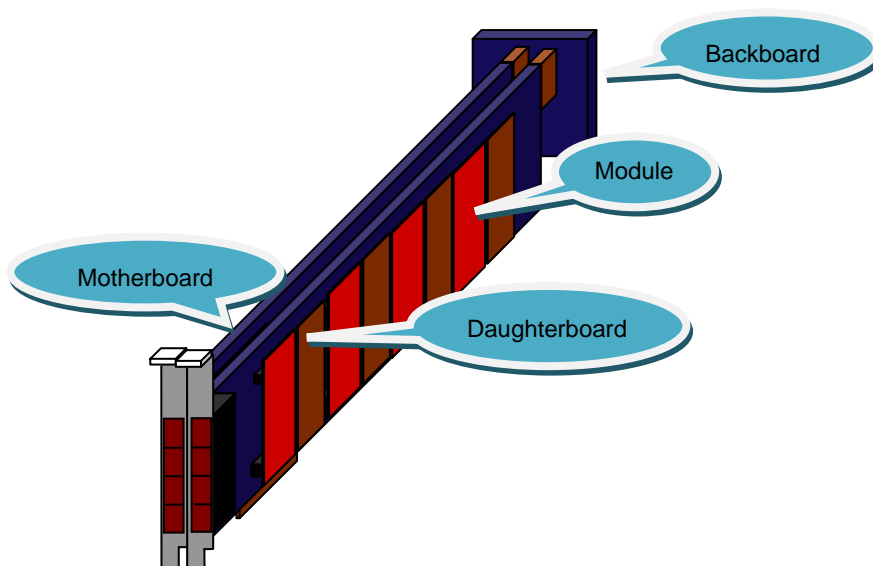


Figure 2-1 Overall Structure

2.1.1 Motherboard

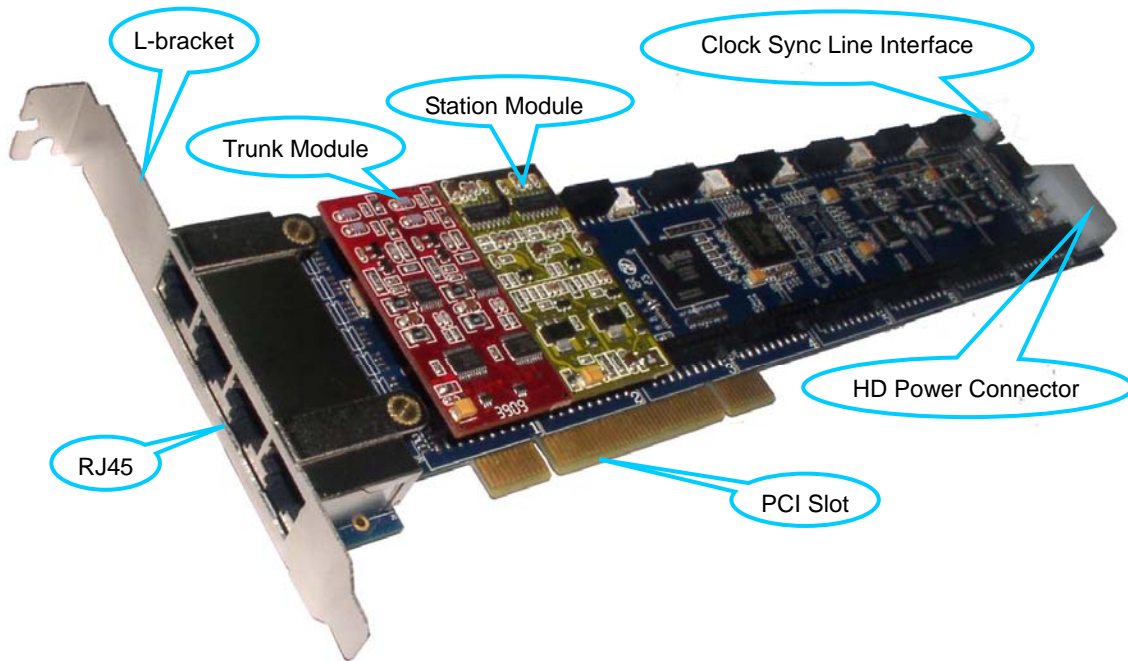


Figure 2-2 FXM3210P Motherboard

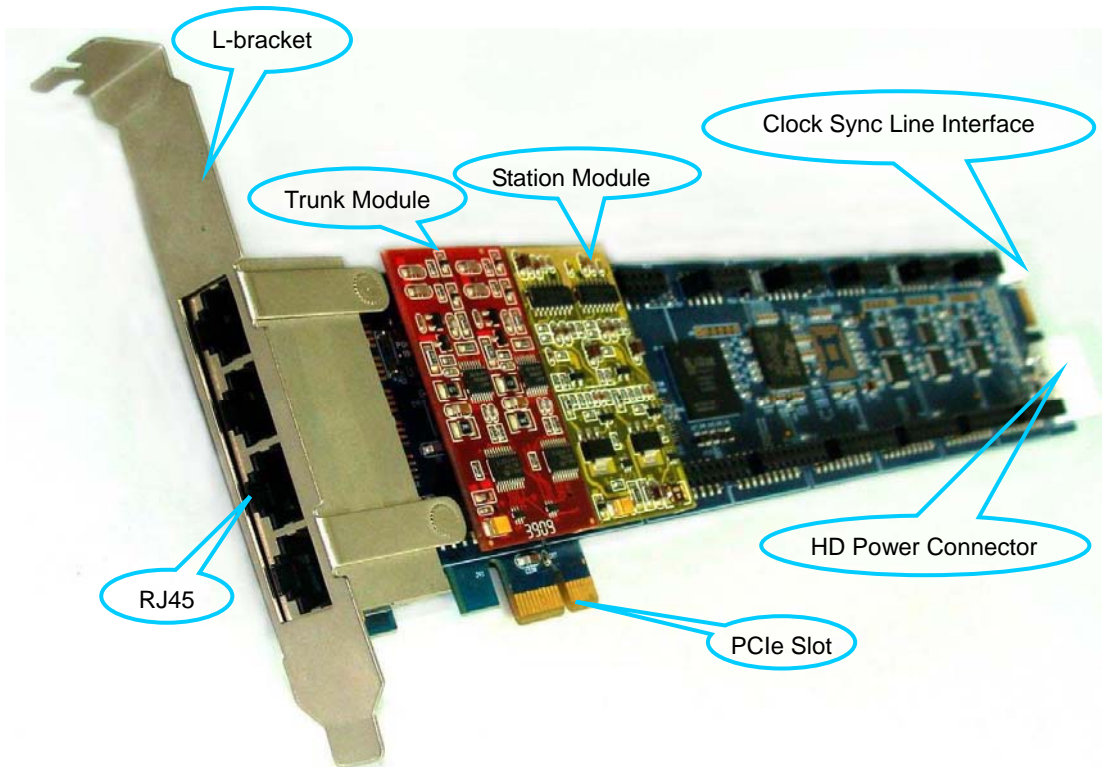


Figure 2-3 FXM3210E Motherboard

2.1.2 Daughterboard

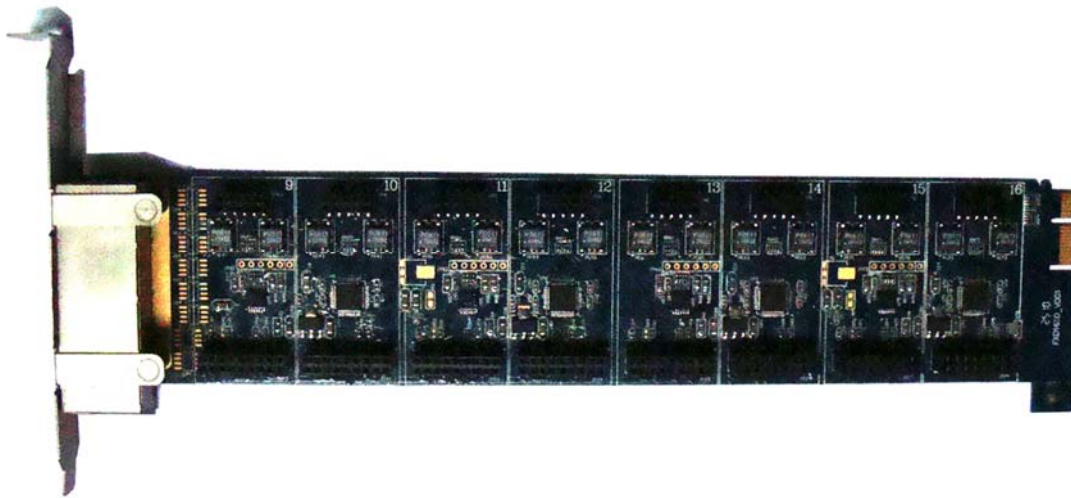


Figure 2-4 FXD1610 Daughterboard

2.1.3 Backboard

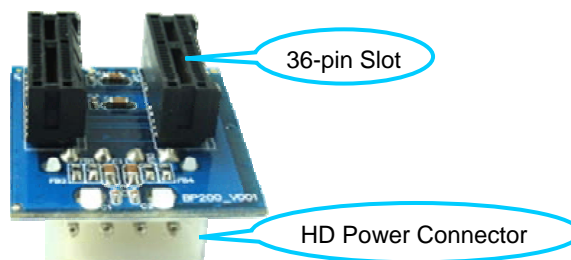


Figure 2-5 BP200 Backboard

2.1.4 Module

The FXM32 full-length board can work with only one of the three modules FXO, FXS and FXC (composite module), or work 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 2-6 for its hardware structure.

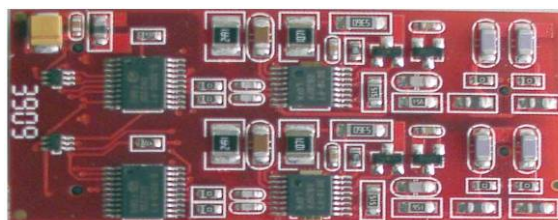


Figure 2-6 Trunk Module

● 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 2-7 for its hardware structure.

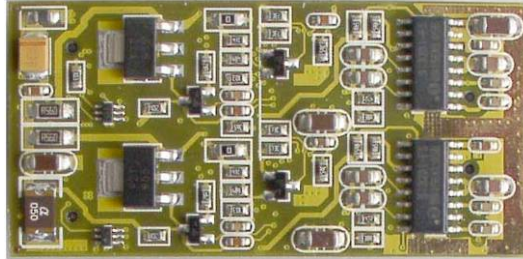


Figure 2-7 Station Module

- **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.

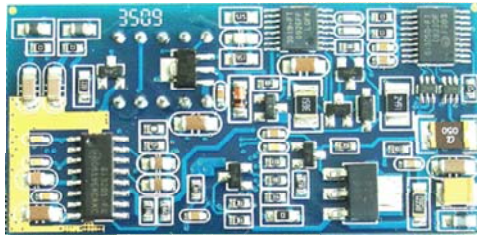


Figure 2-8 Composite Module

2.2 Interface and Channel Number Identification

The FXM32 full-length board uses the RJ45 interface. The motherboard and the daughterboard respectively provide four 8-pin RJ45 jacks each of which corresponds to two modules. The pin layout of the RJ45 jack is shown as follows.

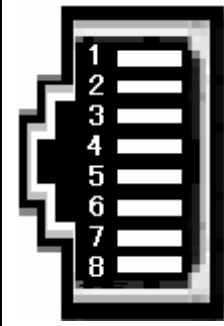
	Pin	Note
	1	Tip1
	2	Ring1
	3	Tip2
	4	Ring2
	5	Tip3
	6	Ring3
	7	Tip4
	8	Ring4

Table 2-2 RJ45

Pin1 and Pin2 correspond to a channel, Pin3 and Pin4 correspond a channel, and the like. Each RJ45 corresponds to four channels.

An FXM32 full-length board can provide up to 32 channels. Each has a fixed number.

Figure 2-9 below illustrates the corresponding relations among the RJ45 interfaces on the motherboard, the channels and the modules.

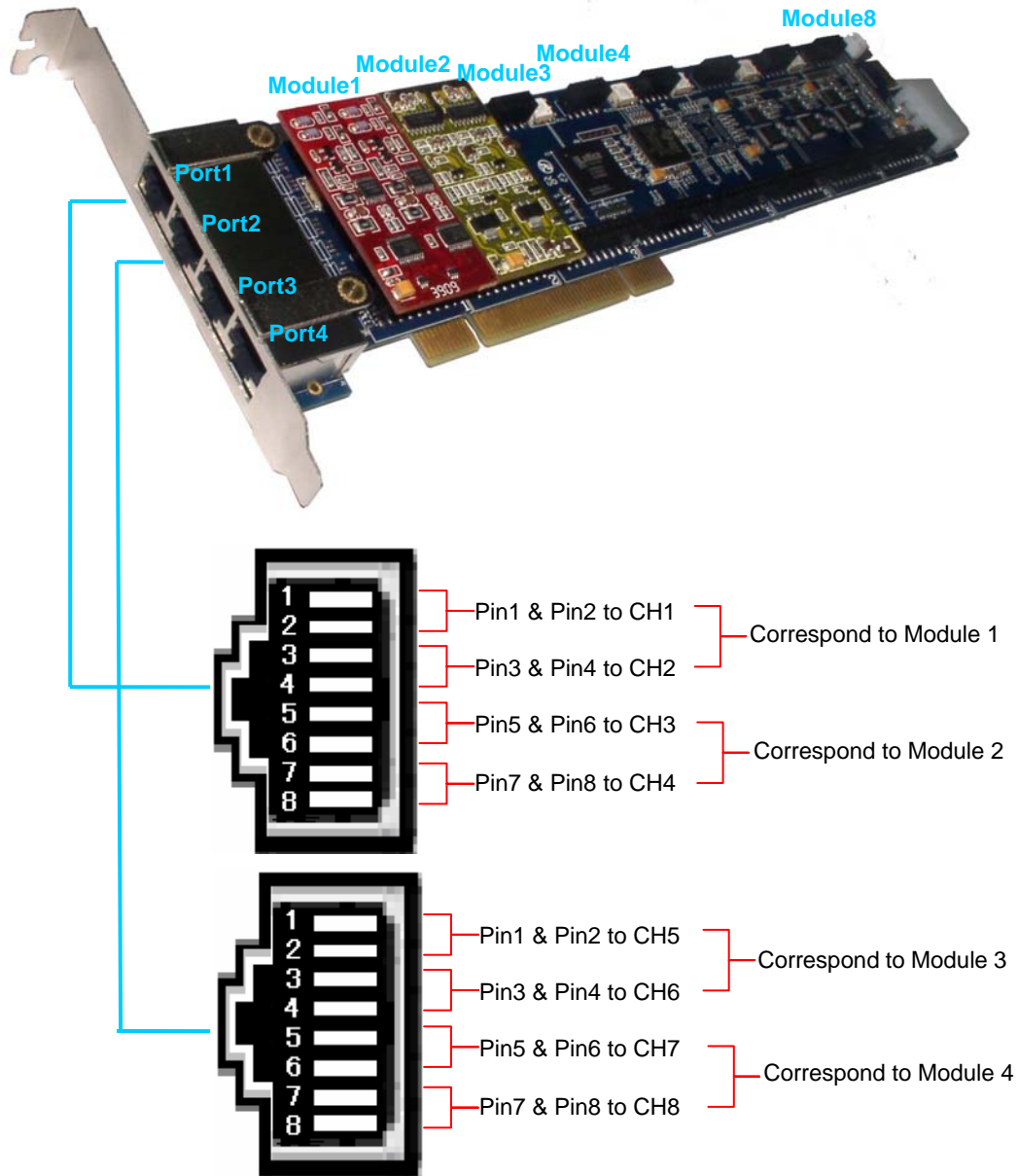


Figure 2-9 Relations among RJ45 interface, Channel and Module

Notes:

- 1) Each RJ45 interface is only related to modules on the corresponding position. As shown in Figure 2-9 above, the interface Port1 only corresponds to Module1 and Module2. It doesn't matter that what kind of modules (FXO, FXS or FXC) Module1 and Module2 are. Likewise, Port2 are related to Module3 and Module4 and the like.
- 2) The relations between the on-board interfaces and the inserted modules for the daughterboard are the same as that for the motherboard. The unique difference just lies on the channel number. When the motherboard is used with the daughterboard, channels on the motherboard are the first 16 channels (CH1~CH16) and those on the daughterboard are the latter 16 channels (CH17~CH32). It doesn't matter that on which position of the backboard the motherboard or the daughterboard is fixed, or whether a slot is inserted with a board or not.

2.3 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

2.4 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.

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

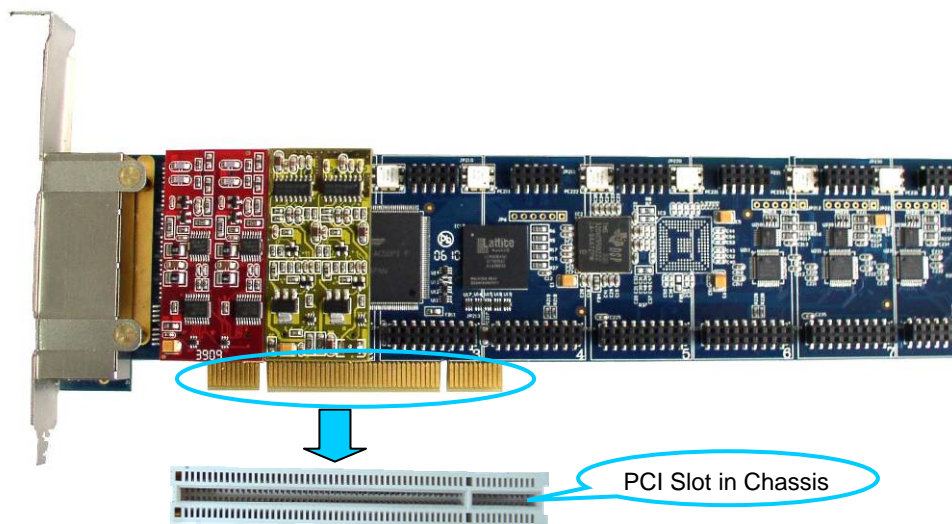


Figure 2-10 Insert Motherboard to PCI/PCIe Slot

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

Note: Skip Step 4 if you do not use any daughterboard in practice.

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.

Step 5: If there is no need for daughterboard extension, the backboard is unnecessarily used. Connect the HD power plug properly to the motherboard; otherwise, the board can not run normally. If there is a need for daughterboard extension, the backboard BP200 must be used. Connect the backboard to the HD power plug and use it to connect the motherboard and the daughterboard.

See Figure 2-11 for how to insert the power plug in the chassis onto the backboard. See Figure 2-12 for how to insert the power plug in the chassis onto the motherboard.

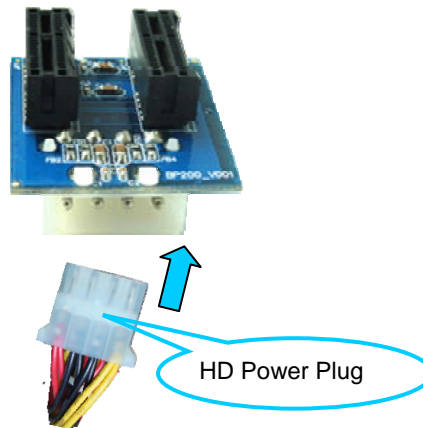


Figure 2-11 Fit HD Power Plug to Backboard

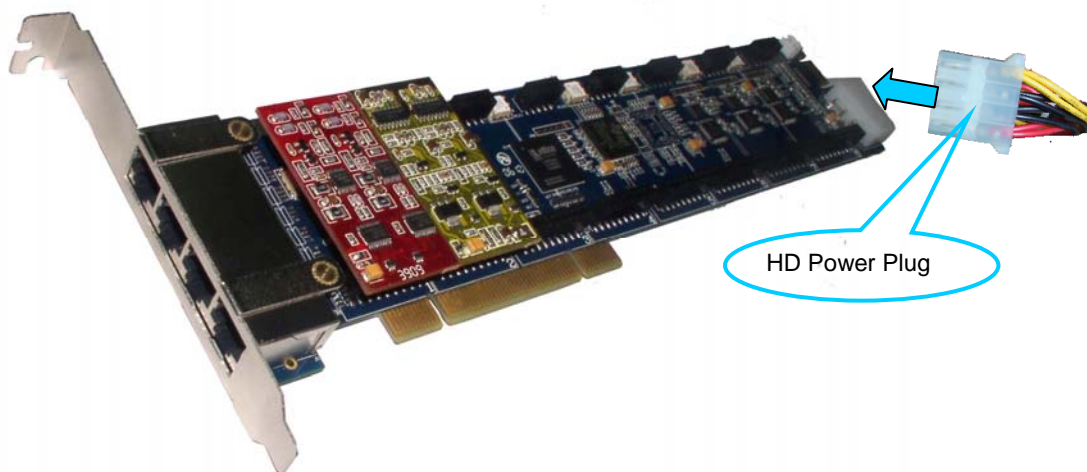


Figure 2-12 Fit HD Power Plug to Motherboard

Note: If you only use the motherboard (without the daughterboard) in practice, make sure to connect the HD power plug with the power interface on the motherboard; or the board will not work.

Step 6: Install the spring steel buckle.

Notes:

- 1) 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.

- 2) 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 end.
- 3) We provide at most two spring steel buckles with a product set in the package.

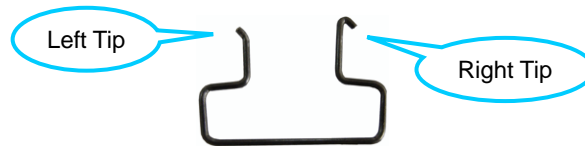


Figure 2-13 Spring Steel Buckle

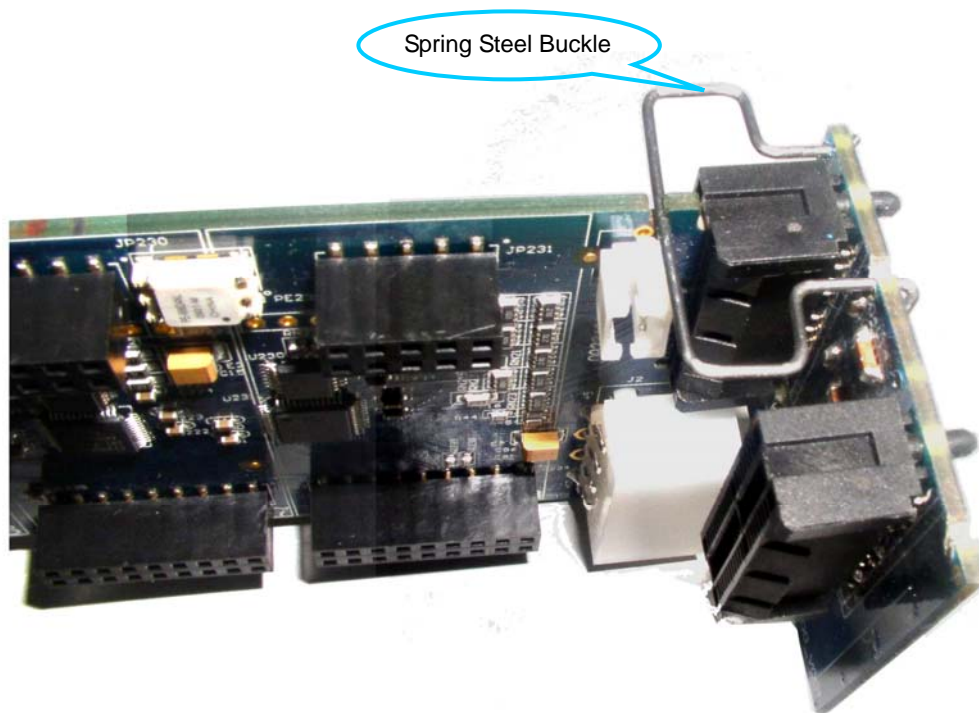


Figure 2-14 Fasten with Spring Steel Buckle

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.

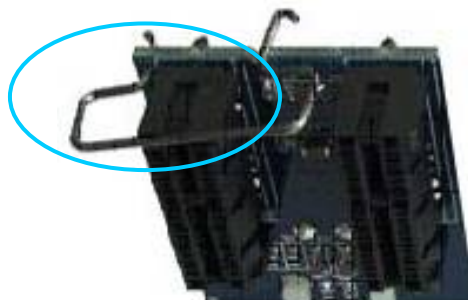


Figure 2-15 Insertion of Left Tip

- 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 2-16 Insertion of Right Tip

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

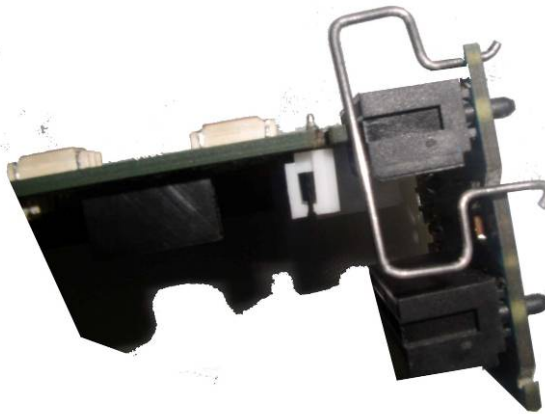


Figure 2-17 Insertion of Motherboard

- 4) Then push the spring steel buckle down into the little slot prepared on the top edge of the motherboard. Now the motherboard is well fastened.

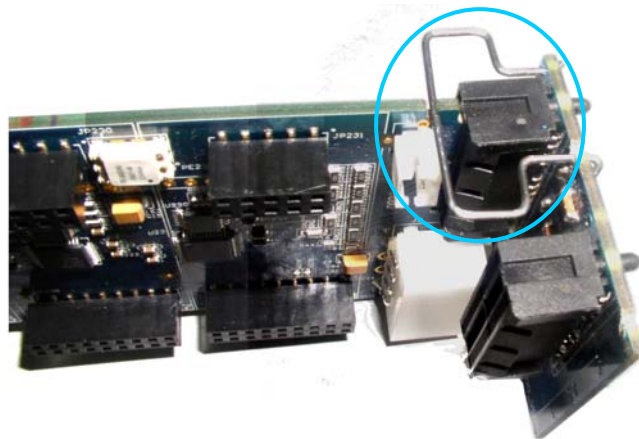


Figure 2-18 Buckling Motherboard

Attention: The steps to uninstall the spring steel buckle are 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 full-length motherboards or connect FXM32 full-length 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 full-length motherboards and daughterboards is achieved by the backboard, not 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 full-length 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 full-length 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 `/sys/module/fxm32/clockconf` to replace `/sys/module/fxm32/parameters/clockconf` on the premise that the driver has been loaded.

See Figure 2-19 below.



Figure 2-19 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 the driver installation, refer to the file 'SynAST UserManual.doc' for details.

Appendix A Technical Specifications

Dimensions

270x64 mm² (excluding L-bracket)

Weight

Motherboard: about 120g
(excluding modules)

Module: about 10g

Backboard: ≤10g

Environment

Operating temperature: 0 °C—55 °C

Storage temperature: -20 °C—85 °C

Humidity: 8%—90% non-condensing

Storage humidity: 8%—90%
non-condensing

Input/output Interface

Telephone line jack: 4 or 8 8-pin RJ45

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

Within the power requirement, up to 8 boards concurrently per system and up to 32 channels per board are supported.

Power Requirements

Total Power Consumption includes the electricity use of all motherboards and

daughterboards.

A single motherboard
(with modules fully inserted)

+3.3V DC: 1100mA
(power consumption: 3.63W)

+12V DC: 2000mA
(power consumption: 24W,
supplied by power socket)

+5V DC: 1600mA
(power consumption: 8W,
supplied by power socket)

A single daughterboard
(with modules fully inserted)

+12V DC: 2000mA
(power consumption: 24W,
supplied by power socket)

+5V DC: 1600mA
(power consumption: 8W,
supplied by power socket)

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.

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