Synway AST Series

FXM-8A/PCI

FXM-16A/PCIe

Hardware Manual

Version 1.0

Synway Information Engineering Co., Ltd

www.sanhuid.com

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Revision History

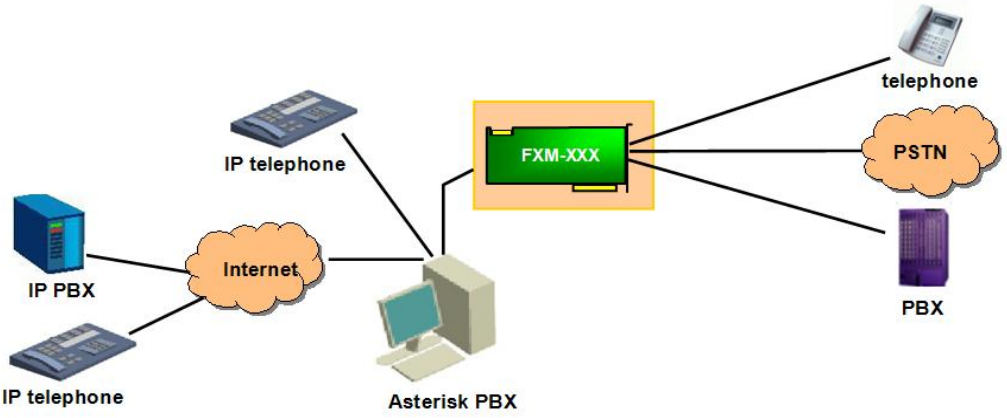
Version	Date	Comments
Version 1.0	2009.02	Initial pubication

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

Chapter 1 Overview

The Synway FXM series are analog voice boards newly developed for Asterisk system. They can work with Asterisk system and allow various configurations by using different modules to provide all features and functionalities of common voice boards. What's more, they have the enhanced capability in echo cancellation (128ms for time delay estimation on each channel). As a link between the board hardware and Asterisk, they are only used to set up the Asterisk platform, but not applicable to secondary development.

Figure 1-1 is a typical application model with FXM.



xxx: represents the existing and future board models in the FXM series

Figure 1-1 Typical Application

1.1 Features

1.1.1 FXM-8A/PCIe Features

- **PCI 2.2 Bus Support**

  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.

- **DMA Read and Write**

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

- **Compatible with Asterisk**

  Entirely compatible with Asterisk at the hardware/driver level, with all source codes open.

- **On-board SIMM Slots**

Fit modules to board. Contacts on both sides greatly improve connection and ease installation.

- **Module Configurable**

  4 on-board dual-channel modules can be freely arranged in pairs or groups for various complex, multi-functional applications.

- **RJ11 Jack**

  The on-board RJ11 jack can connect directly or via a proper 2-way hub with telephone lines, making connection easy and malfunctions rare.

- **External Ringing Current & Battery Feed Power Supply**

  Provides station modules with battery feed, and enables the phones which are linked to station channels to ring.

- **Echo Cancellation**

  The self-adaptive echo cancellation feature gives the board the capability of 128ms echo cancellation so as to effectively eliminate echoes under various conditions, canceling out the effect of voice playback on DTMF and busy tones detection, avoiding self-excited oscillation and howling, and minimizing the possibility of registering wrong DTMF and busy tones in a conference call, designed especially for VoIP application environments.

- **Voice CODEC Support**

  Supports the hardware-based A-law, μ-law codecs. The recorded voice files can be edited and played by audio tools such as Cooledit.

1.1.2 FXM-16A/PCIe Features

- **PCI Express Bus Support**

  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 and DMA transfer.

- **On-board SIMM Slots**

  Fit modules to board. Contacts on both sides greatly improve connection and ease installation.

- **Module Configurable**

  8 on-board dual-channel modules can be freely arranged in pairs or groups for various complex, multi-functional applications, such as call center and recording functions available on a single board.

- **RJ45 Jack**

  A single board has 4 8-pin RJ45 jacks, each of which can be converted to 4 2-pin RJ11 jacks via a four-way hub so as to connect with analog phone lines, making connection easy and malfunctions rare.

- **External Ringing Current & Battery Feed Power Supply**

  Provides station modules with battery feed, and enables the phones which are linked to station channels to ring.

- **Echo Cancellation**

  The self-adaptive echo cancellation feature gives the board the capability of 128ms echo cancellation so as to effectively eliminate echoes under various conditions, canceling out the effect of voice playback on DTMF and busy tones detection, avoiding self-excited oscillation and howling, and minimizing the possibility of registering wrong DTMF and busy tones in a conference call, designed especially for VoIP application environments.

- **Voice CODEC Support**

  Supports the hardware-based A-law, μ-law codecs. The recorded voice files can be edited and played by audio tools such as Cooledit.

1.2 Operation Principle

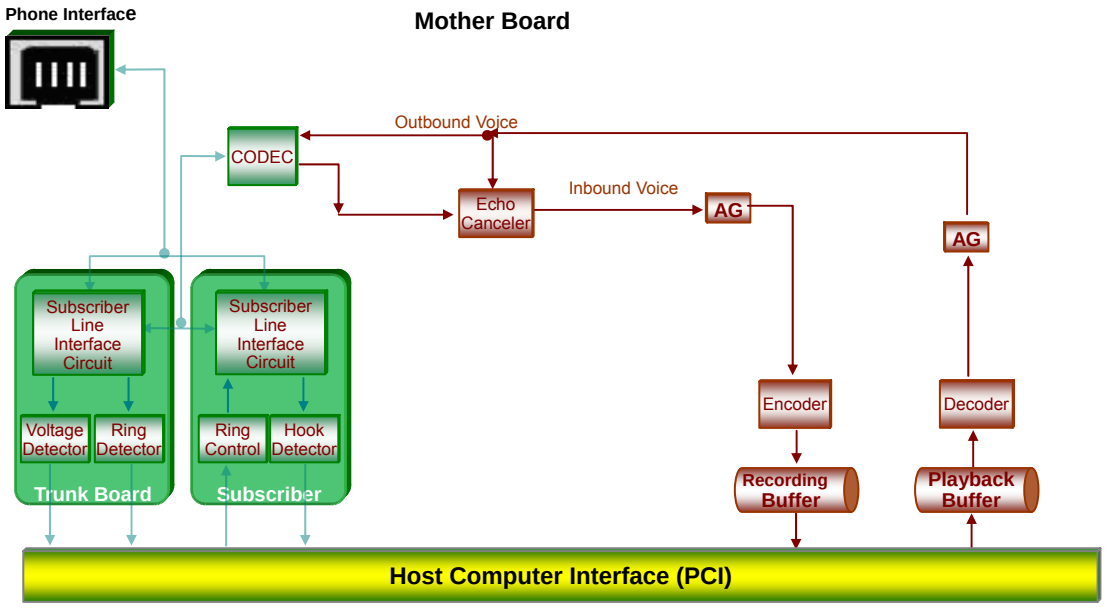


Figure 1-2 FXM-8A/PCI Operation Principle

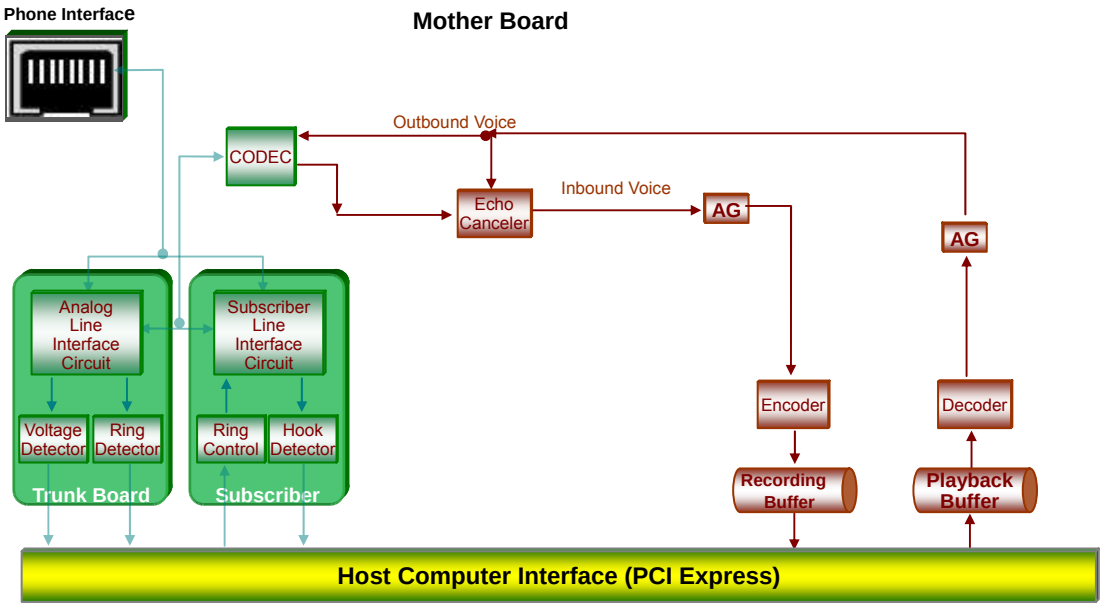
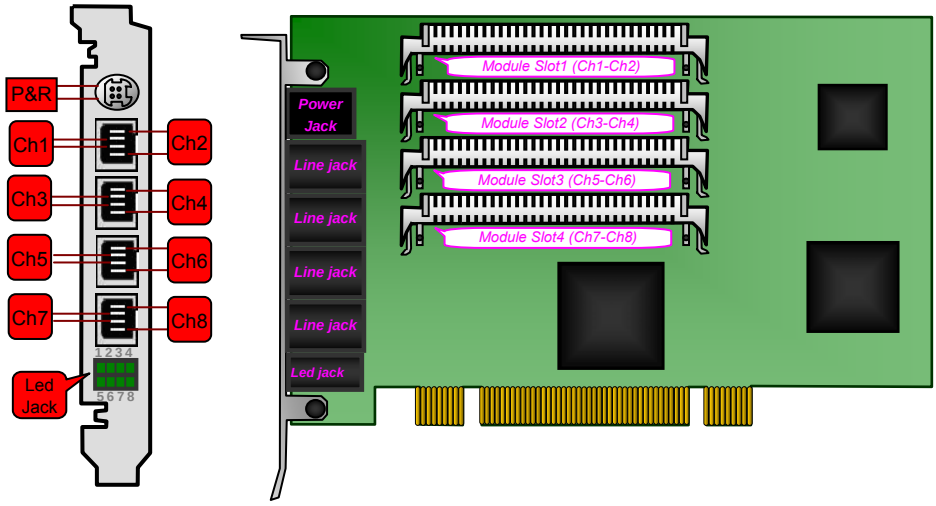


Figure 1-3 FXM-16A/PCIe Operation Principle

Chapter 2 Installation

2.1 Hardware Structure

- **FXM-8A/PCI Board**



P&R: Ringing Current & Battery Feed Power Supply Jack
Ch1～Ch8: Jacks corresponding to Channel 1~Channel 8

Figure 2-1 FXM-8A/PCI (Left and Front Views)

Note: As shown in Figure 2-1 above, the numbers for led jacks from left to right are 1~4 on the top and 5~8 at the bottom. A light on means the corresponding channel is installed with a module; in contrast, a light off indicates no module is installed on the corresponding channel.

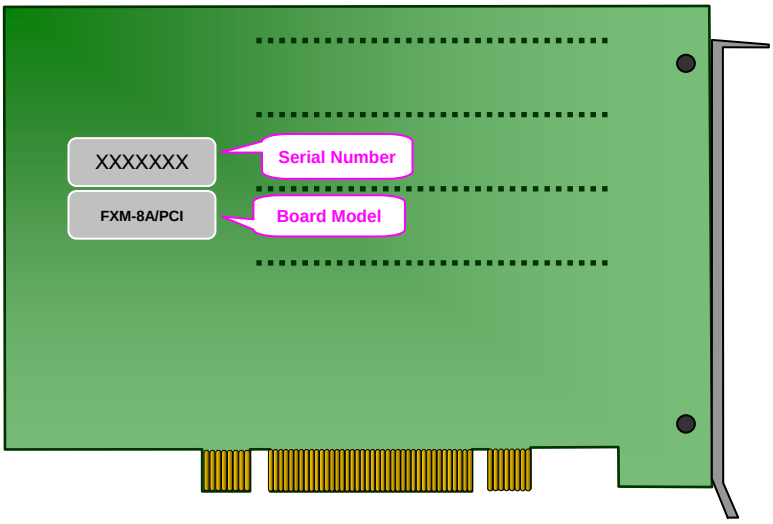


Figure 2-2 FXM-8A/PCI (Rear View)

- **FXM-16A/PCIe Board**

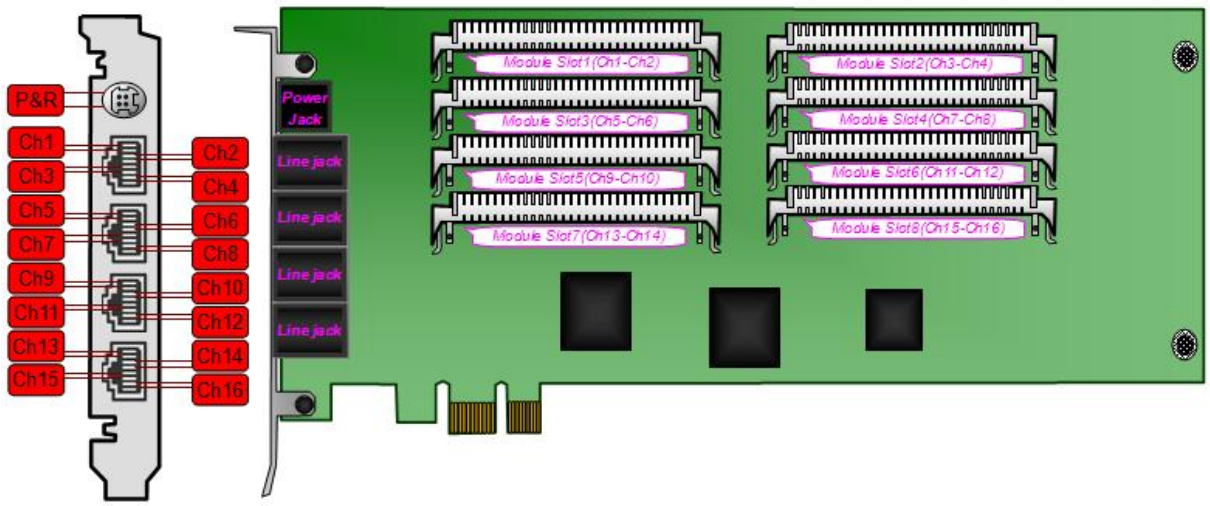


Figure 2-3 FXM-16A/PCIe (Left and Front Views)

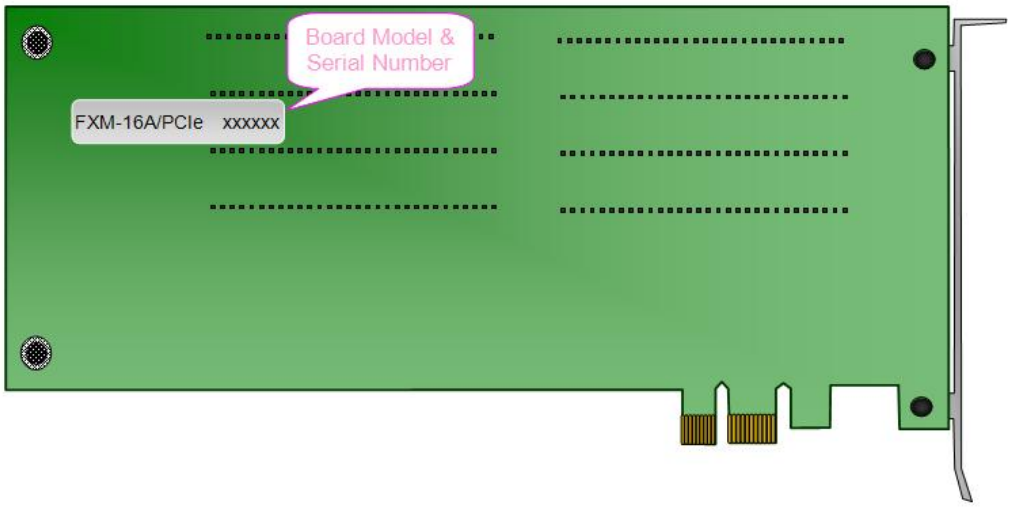


Figure 2-4 FXM-16A/PCIe (Rear View)

2.2 Module Identification

An FXM series board can have FXO, FXS or 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 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 2-5 and Figure 2-6 for hardware structure.

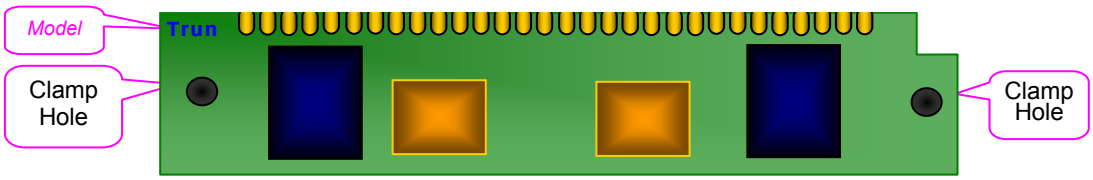


Figure 2-5 Front View

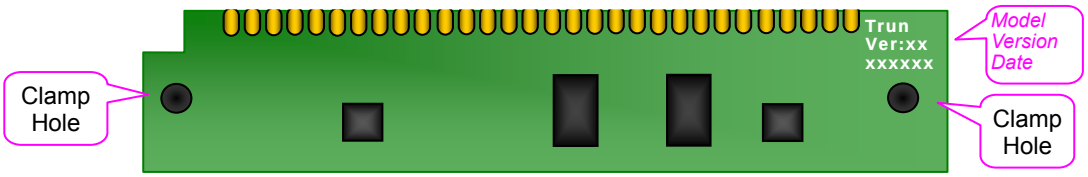


Figure 2-6 Rear View

- **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 -40V 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 and Figure 2-8 for hardware structure.

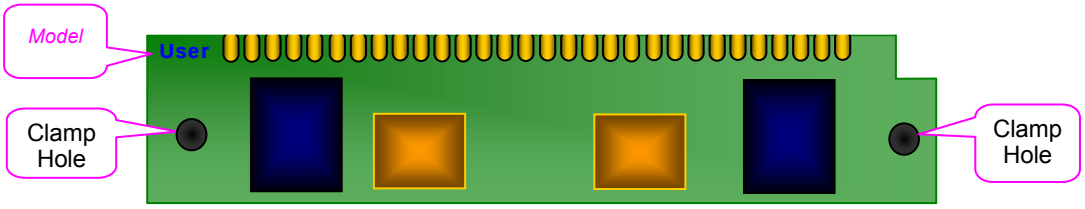


Figure 2-7 Front View

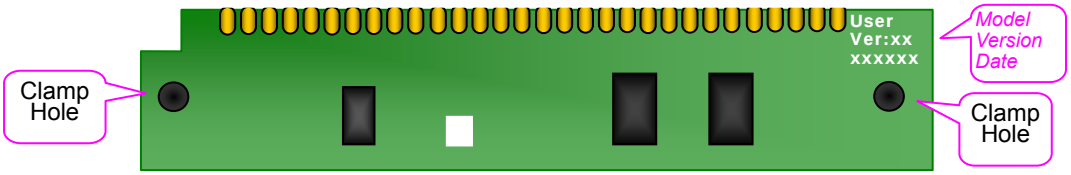


Figure 2-8 Rear View

- **Composite Module**

A composite module accommodates a trunk channel and a station channel, 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. See Figure 2-9 and Figure 2-10 below for hardware structure.

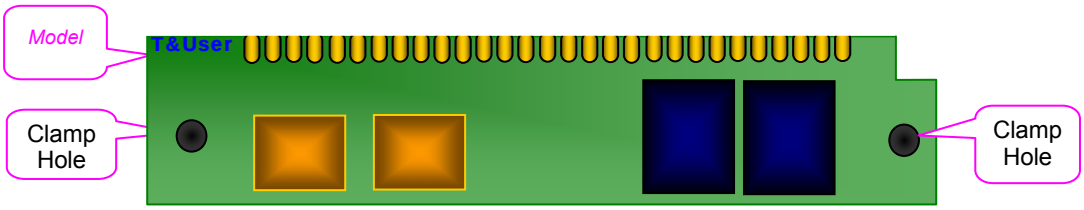


Figure 2-9 Front View

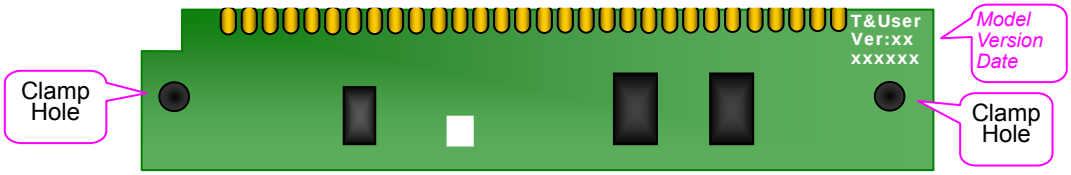


Figure 2-10 Rear View

2.3 Interface Identification

It's quite important to recognize different kinds of interfaces, as such information is necessary for configuration of Asterisk platform. In real practice, not all interfaces on the board are used at a same time. When to use which interface depends on the installed modules and their particular positions on the board.

2.3.1 RJ11

Each FXM-8A/PCI board has 4 RJ11 jacks on the bracket and each jack connects with an independent module interface (may be FXO, FXS or composite module). Jacks 1~4 from top to bottom correspond to Modules 1~4.

A single board of FXM-8A/PCI can be equipped with up to 4 dual-channel modules and supports 8 voice channels. The pin layout of the 4-pin RJ11 jack is shown as follows.

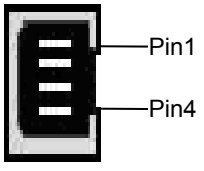
	Pin	Note
	1	Tip2
	2	Tip1
	3	Ring1
	4	Ring2

Table 2-1 RJ11

2.3.2 RJ45

Each FXM-16A/PCIe board has 4 RJ45 jacks on the bracket

A single board of FXM-16A/PCIe can be equipped with up to 8 dual-channel modules and supports 16 voice channels. The pin layout of the 8-pin RJ45 jack is shown as follows.

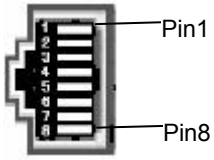
	Pin	Note
	1	Tip1
	2	Ring1
	3	Tip2
	4	Ring2
	5	Tip3
	6	Ring3
	7	Tip4
	8	Ring4

Table 2-2 RJ45

2.4 Slot Compatibility

Make sure it compatible with PCI slots when using an FXM board. Users may choose whichever suitable according to the slot patterns illustrated in Figure 2-11 below.

Figure 2-11 Board with PCI Slot

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-E Slot

The FXM-8A/PCI board includes PCI 2.2 bus with burst data transmission rate up to 132 MB/s; supports the PNP (plug and play) feature which eliminates the need for jumper leads; uses the general PCI design which supports the slots numbered 1, 2 and 3 in Figure 2-11.

The FXM-16A/PCIe board includes PCI-E 1.0a bus and supports PCI-E X1, X2, X4, X8, X16 slots, i.e. the slot numbered 4 in Figure 2-11.

2.5 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

2.6 Hardware Installation

Note: Always turn off the power before installation!

Step 1: Plug the desired modules into the module slots on the board, and fit the board into the PC chassis.

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

Step 2: Connect to analog phone lines or telephones.

- **FXM-8A/PCI**

A single board has four RJ11 jacks, each of which connects to a 4-lead line that corresponds to 2 channels. The two leads in the middle constitute a port and the outer two leads set up another. See Table 2-1 above for the pin layout and the corresponding channel number.

Each RJ11 jack can be converted via a special 2-way hub or constructed by yourself to connect with 2 analog channels. See Figure 2-12 below for the structure of the 2-way hub.

Figure 2-12 2-way Hub

See Table 2-3 for the correspondence between the on-board channels, the 4 pins in an RJ11 jack and the 2 interfaces of a 2-way hub.

Jack	Channel No.	Pins in RJ11	2-way Hub
RJ11	1	2nd and 3rd pins	1st interface
	2	1st and 4th pins	2nd interface

Table 2-3 Correspondence between Channels, Pins in RJ11 and Interfaces of 2-way Hub

Note: When connecting to an RJ11 jack, you can use a special 2-way hub to convert it to two

independent jacks. If you want to construct lines by yourself, please follow Figure 2-1 to connect each channel with corresponding pins.

- **FXM-16A/PCIe**

A single board has four RJ45 jacks, each of which can be converted via a special 4-way hub or constructed by yourself to connect with 4 analog channels. See Figure 2-13 below for the structure of the 4-way hub.

Figure 2-13 4-way Hub

See Table 2-4 for the correspondence between the on-board channels, the 8 pins in an RJ45 jack and the 4 interfaces of a 4-way hub.

Jack	Channel No.	Pins in RJ45	4-way Hub
RJ45	1	1st and 2nd pins	1st interface
	2	3rd and 4th pins	2nd interface
	3	5th and 6th pins	3rd interface
	4	7th and 8th pins	4th interface

Table 2-4 Correspondence between Channels, Pins in RJ45 and Interfaces of 4-way Hub

Step 3: Connect to the ringing current & battery feed power supply

Note: Skip this step if FXS (station module) is not used in the system.

If you are using the external ringing current & battery feed power supply from Synway, note that the plug has a peculiar design for the prevention of improper insertion and extraction. The correct way is to hold the plug body (not the locking ring, or it cannot be fully inserted) when inserting the plug home into the socket, and to grasp the locking ring (not the plug body or the conductor) when pulling the plug out from the socket. See Figure 2-14 below.

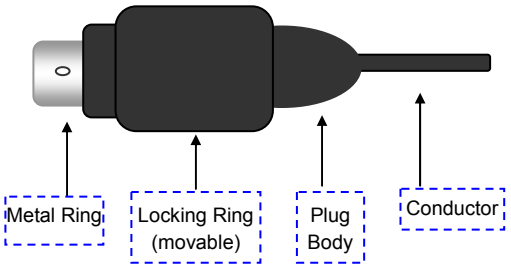


Figure 2-14 Plug Structure

Step 4: 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 5: Boot your computer and install the driver

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

Appendix A Technical Specifications of FXM-8A/PCI

Dimensions

170×115mm^2 (excluding L-bracket)

Weight

≈120g (Excluding modules and external power supply)

Environment

Operating temperature: 0℃—55℃

Storage temperature: -20℃—85℃

Humidity: 8%—90% non-condensing

Storage humidity: 8%—90% non-condensing

Input/output Interface

Ringing current & battery feed power supply jack: One 4-pin MPC-4

Telephone line jack: Four 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 10 boards concurrently per system; up to 8 channels per board

Power Requirements

+5V DC: 600mA

-12V DC: 80mA

+12V DC: 300mA

Maximum power consumption: ≤12W (PC power only)

Impedance

Input impedance: ≥1MΩ/500V DC; ≥10kΩ/1000Hz AC

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

Appendix B Technical Specifications of FXM-16A/PCIe

Dimensions

280×111mm^2 (excluding L-bracket)

Weight

≈200g (Excluding modules and external power supply)

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: Four 8-pin RJ45

Ringing current & battery feed power supply jack: One 4-pin MPC-4

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 10 boards concurrently per system; up to 16 channels per board

Power Requirements

+3.3V DC: 3A

+12V DC: 0.5A

Maximum power consumption: ≤12W (PC power only)

Impedance

Input impedance: ≥1MΩ/500V DC; ≥10kΩ/1000Hz AC

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 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. 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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