



**Synway AST Series**

# User Manual

**Version 1.1.0.0**

**Synway Information Engineering Co., Ltd**

**[www.synway.net](http://www.synway.net)**

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## Revision History

Version	Date	Comments
Version 1.0.0.0	2009-2	Initial publication.
Version 1.1.0.0	2009-7	Add relative content on Dahdi driver.

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

## Preface

Thank you for choosing the Synway AST series boards which are designed to fully support open source IP PBX platform, such as Asterisk, Trixbox, FreeSwitch and so on. Synway AST series includes three subseries.

Subseries	Board Model	Description
Synway FXM	FXM-8A/PCI	Use of modular structure and analog lines
	FXM-16A/PCIe	
Synway TEJ	TEJ-1A/PCI	Use of digital trunks (E1/T1/J1)
	TEJ-2A/PCI	
	TEJ-4A/PCI	
Synway CDC	CDC-1522A/PCI	CODEC board
	CDC-2522A/PCI	
	CDC-3522A/PCI	

The Synway FXM, TEJ and CDC series boards are respectively perfect substitutes for the AEX and TDM series analog voice cards, the TE series digital trunk cards, and the TC400B CODEC card from Digium Inc.

Since the FXM and TEJ boards integrate the capability of echo cancellation, there is no need to get it from extra modules or devices. Compared with similar products from other companies, they are higher in integration and stronger in echo cancellation. Therefore, for use of FXM or TEJ boards, it is not necessary to purchase the VPMADT032 module (to enable echo cancellation) from Digium Inc.

The Synway AST driver program, as a link between the board hardware and open source IP PBX platform, is only used to set up the open source IP PBX platform, but not applicable to secondary development. This manual, as the help file for hardware installation, software installation, test and configuration of the Synway AST products, aims at those installation and maintenance technicians as well as the salesmen who are using the AST boards to set up open source IP PBX application systems.

This document consists of the following chapters.

Chapter 1 illustrates the IP PBX application models and scenarios set up by the Synway AST series boards.

Chapter 2 introduces how to install the Synway AST series boards.

Chapter 3 tells how to install and configure the board driver.

Appendix A provides answers to some problems that may occur when using the Synway AST series boards.

Appendix B shows the contact way of technical support and sales department in Synway.

Although Synway has scrupulously checked through this manual, but cannot guarantee the absence of errors and omissions. We sincerely apologize for any consequent inconvenience brought to you and will be very grateful if you kindly give your advice regarding amendments to this book.

## Chapter 1 Overview

The driver for the Synway AST series boards (hereinafter referred to as 'AST'), which is compatible and must be used with the Zaptel/Dahdi driver, can smoothly and seamlessly support open-source IP PBX platforms.

When using the AST board to establish an open-source IP PBX platform, all that you should do is configure and operate the open-source IP PBX platform, without secondary development by using AST. See Figure 1-1 below for the set-up of the open-source IP PBX application system with the AST board.

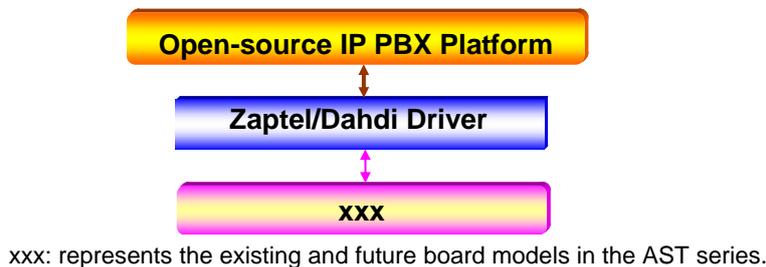
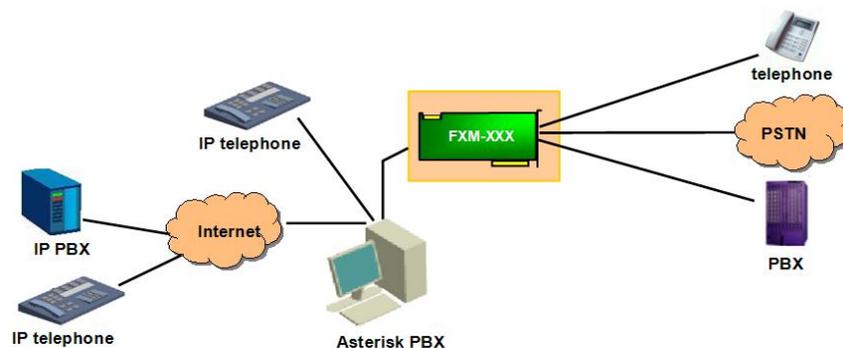


Figure 1-1 AST Driver Set-up

### 1.1 FXM

The Synway FXM series boards (hereinafter referred to as 'FXM') are analog voice boards newly developed for open source IP PBX system. FXM are high-performance and cost-effective, which support FXO (Foreign Exchange Office), FXS (Foreign Exchange Station) and FXC (composite module) and allow various configurations by using these three different modules to provide all features and functionalities of common voice boards. The FXM boards improve I/O speed by using DMA technique for data reading and writing on the basis of PCI bus, resulting in reduced CPU usage and increased board density per server. Figure 1-2 below is a typical application model with FXM.



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

Figure 1-2 Application Model

## 1.2 TEJ

The Synway TEJ series boards (hereinafter referred to as 'TEJ') are digital trunks boards newly developed for open source IP PBX system. The TEJ are high-performance, cost-effective digital telephony interface boards and support E1, T1 and J1 environments. The environments are selectable on a per-board basis via software configuration. The TEJ boards improve I/O speed by using DMA technique for data reading and writing based on PCI bus, resulting in reduced CPU usage and increased board density per server.

The excellent combination of the TEJ driver and the Asterisk platform brings the following features to the TEJ series boards.

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

The TEJ series connect Asterisk Server with PSTN, Channel Bank or PBX via T1, E1 or J1 interface. The boards and the corresponding drivers can be used to establish a professional telephony network environment. Figure 1-3 and Figure 1-4 below are typical application models with TEJ.

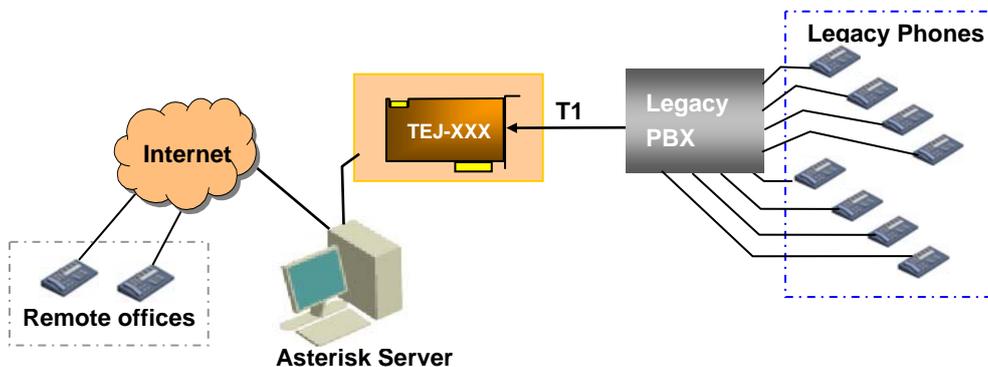
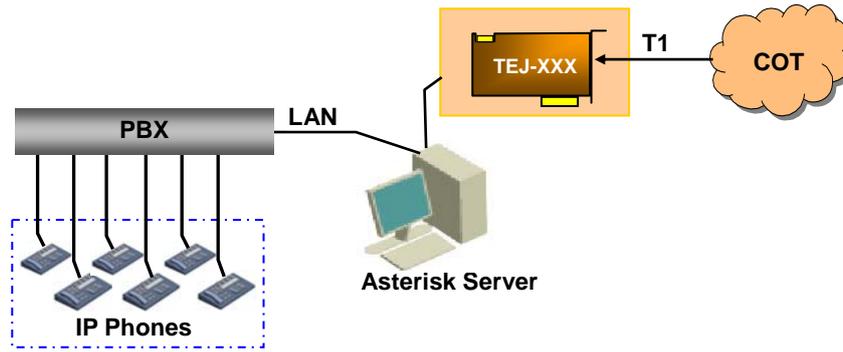


Figure 1-3 Application Model I: Traditional Telephony System



Note: XXX in Figure 1-3 and Figure 1-4 represents the existing and future board models in the TEJ series.

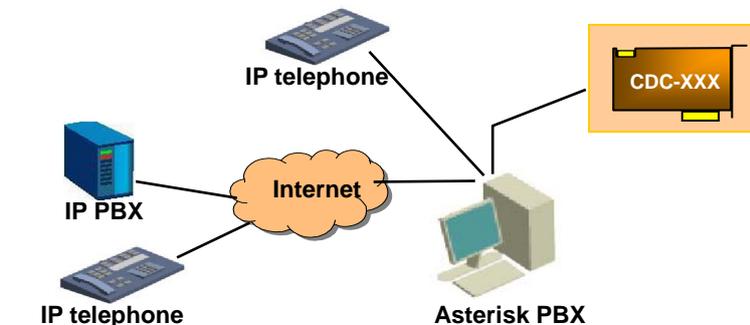
Figure 1-4 Application Model II: VoIP Telephony System

### 1.3 CDC

The Synway CDC series boards (hereinafter referred to as 'CDC') are CODEC boards newly developed for open source IP PBX system. They are multi-channel boards with PCI 2.2 bus, supporting the hardware-based transformations between voice codecs. With the burst data transmission rate up to 132 MB/s and the PNP (plug and play) feature which eliminates the need for jumper leads, this series can be used on 3.3V/5V PCI slot and PCI-X slot.

Asterisk, in software and with Digium G.729a licensing, is capable of transforming the G.729A codec into other codecs for the purposes of call origination or termination, bridging disparate calls, or VoIP to TDM connectivity. These transformations in software are very expensive, in terms of MIPS, and require a substantial amount of CPU time to accomplish. The Synway CDC series uses the PCI-based DMA technique for data reading and writing, minimizing the CPU cost. It is fully compatible with the API functions of Asterisk and supports the transformations among G.711 A-Law,  $\mu$ -Law and G.729A, which ideally cover the shortage of Asterisk. Besides, the CDC board has many DSPs on it to provide powerful voice processing, which brings a nearly real-time voice effect to users.

Figure 1-5 below is a typical application model with CDC.



xxx: represents the existing and future board models in the CDC series.

Figure 1-5 Application Model

## Chapter 2 Hardware Installation

Refer to the board model to find the relevant hardware manual. Install the board successfully before going to the next chapters for software installation. The hardware manual provided for your reference is under the directory '/doc' of the installation package. Table 2-1 shows the corresponding relationship between the board model and the hardware manual.

Subseries	Board Model	Hardware Manual
FXM	FXM-8A/PCI	AST_FXM
	FXM-16A/PCIe	
TEJ	TEJ-1A/PCI	AST_TEJ
	TEJ-2A/PCI	
	TEJ-4A/PCI	
CDC	CDC-1522A/PCI	AST_CDC
	CDC-2522A/PCI	
	CDC-3522A/PCI	

Table 2-1 Board Model and Corresponding Hardware Manual

## Chapter 3 Driver Installation & Configuration

Generally speaking, users who are familiar with the installation and configuration of the open-source IP PBX may complete the driver installation and configuration by using the script in the installation package (see Section 3.1) or manually (see Section 3.2). To those who are not familiar with the installation and configuration of the open-source IP PBX, we advise them to refer to Section 3.3.

### 3.1 By Script

#### 3.1.1 Based on Zaptel

```
#cd /opt                                # enter the directory to source codes
#tar -zxvf SynAST-1.1.0.0.tar.gz         # decompress the synast driver
#tar -zxvf zaptel-1.4.8.tar.gz          # decompress the zaptel driver
#cd SynAST-1.1.0.0                       # enter the directory to the synast driver
#cd for_zaptel                           # enter the directory to the 'synway ast for zaptel' driver
#./Setup install                          # install the driver

Would you like to install SynAST AST package now? y    # enter 'y' to install

Please enter working zaptel directory [q](exit install) : /opt/zaptel-1.4.8
                                                    # enter the directory to zaptel source codes

SELECT TEJ MODE [t, e, j] :e             # select the tej mode, or the driver will be installed in e1 mode

SELECT [75, 120]ohm :                    # set the impedance of the TEJ board, 75 for coaxial cables, 120
                                                    for twisted-pair cables
```

**Note:** Users also can install the driver manually. Refer to [Manual Installation](#).

#### 3.1.2 Based on Dahdi

**Note:** To publish a dahdi version, there are two ways: one is to publish driver and tools together, and the other is to publish driver and tools separately. Here is a version for which driver and tools are published together. For how to install those versions for which driver and tools are published separately, see [Appendix A FAQ](#).

```
#cd /opt                                # enter the directory to source codes
#tar -zxvf SynAST-1.1.0.0.tar.gz         # decompress the synast driver
#cd SynAST-1.1.0.0                       # enter the directory to the synast driver
```

```

#cd for_dahdi                #enter the directory to the 'synway ast for dahdi' driver
#./Setup install             # install the driver

Would you like to install SynAST AST package now? y        # enter 'y' to install

Please enter working dahdi directory [q](exit install) : /opt/dahdi

                                # enter the directory to dahdi source codes

SELECT TEJ MODE [t, e, j] :e    # select the tej mode, or the driver will be installed in e1 mode

SELECT [75, 120]ohm :          # set the impedance of the TEJ board, 75 for coaxial cables,
                                120 for twisted-pair cables
    
```

**Note:** Users also can install the driver manually. Refer to [Manual Installation](#).

## 3.2 Manually

### 3.2.1 Manual Installation

#### 3.2.1.1 Based on Zaptel

##### Step1: Install the zaptel driver

```

#cd /opt                    # enter the directory to the package of zaptel source codes
#tar -zxvf zaptel-1.4.8.tar.gz    # decompress the source codes
#cd zaptel-1.4.8            # enter the directory to zaptel source codes
#./configure
#make                       # compile the driver
#make install              # install the driver
#modprobe zaptel           # load the driver
    
```

##### Step2: Install the SynAST driver

```

#cd /opt                    # enter the directory to the package of SynAST source codes
#tar -zxvf SynAST-1.1.0.0.tar.gz    # decompress the source codes
#cp -rf /opt/SynAST-1.1.0.0/for_zaptel/src/fxm/fxm8apci /opt/zaptel-1.4.8

                                # copy the fxm8apci driver to the zaptel directory. You should
                                copy a driver that corresponds to your used AST board (see
                                the table below to find each board model and its
                                corresponding driver) to replace the part 'fxm/fxm8apci' of this
                                command. If the zaptel version is above 1.4.11, where you
                                should copy to is /opt/zaptel-[version]/kernel.
    
```

```
#cd /opt/zaptel-1.4.8/fxm8apci      # enter the directory to SynAST source codes in zaptel. If the
                                   zaptel version is above 1.4.11, execute the command #cd
                                   /opt/zaptel-[version]/kernel/fxm8apci.

#make                               # compile the driver

#insmod fxm8apci.ko                # load the driver
```

**Note:** When using other AST series boards except FXM-8A/PCI, you should refer to Table 3-1 to find the corresponding driver file and use the filename to replace the parts 'fxm' and 'fxm8apci' in the above commands.

Subseries	Board Model	Directory to Source Codes	Driver File	Remark
FXM	FXM-8A/PCI	fxm8apci	fxm8apci.ko	Follow the above example.
	FXM-16A/PCIe	fxm16apcie	fxm16apcie.ko	Use the name of the driver file which corresponds to the board model you use to replace the parts 'fxm' and 'fxm8apci' in the above commands.
TEJ	TEJ-1A/PCI	tejxapci	tejxapci.ko	
	TEJ-2A/PCI			
	TEJ-4A/PCI			
CDC	CDC-1522A/PCI	cdc522apci	cdc522apci.ko	
	CDC-2522A/PCI			
	CDC-3522A/PCI			

Table 3-1 Board Model and Corresponding Driver

### 3.2.1.2 Based on Dahdi

#### Step1: Install the dahdi driver

```
#cd /opt                          # enter the directory to the package of dahdi source codes

#cd dahdi                          # enter the directory to dahdi source codes

#./configure

#make                               # compile the driver

#make install                       # install the driver

#modprobe dahdi                    # load the driver
```

#### Step2: Install the SynAST driver

**Note:** To publish a dahdi version, there are two ways: one is to publish driver and tools together, and the other is to publish driver and tools separately. Here is a version for which driver and tools are published together. For how to install those versions for which driver and tools are published separately, see [Appendix A FAQ](#).

```
#cd /opt                          # enter the directory to the package of SynAST source codes

#tar -zxvf SynAST-1.1.0.0.tar.gz   # decompress the source codes
```

```
#cp -rf /opt/SynAST-1.1.0.0/for_dahdi/src/fxm/fxm8apci /opt/dahdi/linux/drivers/dahdi
# copy the fxm8apci driver to the dahdi directory

#cd /opt/dahdi/linux/drivers/dahdi/fxm8apci
# enter the directory to SynAST source codes in dahdi

#make
# compile the driver

#insmod fxm8apci.ko
# load the driver
```

**Note:** When using other AST series boards except FXM-8A/PCI, you should refer to Table 3-2 to find the corresponding driver file and use the filename to replace the parts 'fxm' and 'fxm8apci' in the above commands.

Subseries	Board Model	Directory to Source Codes	Driver File	Remark
FXM	FXM-8A/PCI	fxm8apci	fxm8apci.ko	Follow the above example.
	FXM-16A/PCle	fxm16apcie	fxm16apcie.ko	Use the name of the driver file which corresponds to the board model you use to replace the parts 'fxm' and 'fxm8apci' in the above commands.
TEJ	TEJ-1A/PCI	tejxapci	tejxapci.ko	
	TEJ-2A/PCI TEJ-4A/PCI			
CDC	CDC-1522A/PCI CDC-2522A/PCI CDC-3522A/PCI	cdc522apci	cdc522apci.ko	

Table 3-2 Board Model and Corresponding Driver

## 3.2.2 Manual Configuration

Here we take the FXM-16A/PCle and TEJ-4A/PCI boards for the example, to show you how to configure systems. Please read the section applicable to your driver environment.

### 3.2.2.1 Configure Zaptel

**Step1:** Follow the table below to modify the configuration file.

Board Config File	TEJ-4A/PCI				FXM-16A/PCle (top 4 slots: trunk; bottom 4 slots: station)
	E1 Mode		T1/J1 Mode		
/etc/zaptel.conf	ISDN	SS1	ISDN	SS1	
	loadzone=us defaultzone=us				

	span=1,1,0,ccs,hdb3 bchan=1-15 dchan=16 bchan=17-31 span=2,1,0,ccs,hdb3 bchan=32-46 dchan=47 bchan=48-62 span=3,1,0,ccs,hdb3 bchan=63-77 dchan=78 bchan=79-93 span=4,1,0,ccs,hdb3 bchan=94-108 dchan=109 bchan=110-124	span=1,1,0,cas,hdb3 cas=1-15,17-31:1111 span=2,1,0,cas,hdb3 cas=32-46,48-62:1111 span=3,1,0,cas,hdb3 cas=63-77,79-93:1111 span=4,1,0,cas,hdb3 cas=94-108,110-124:1111	span=1,1,0,esf,b8zs bchan=1-23 dchan=24 span=2,1,0,esf,b8zs bchan=25-47 dchan=48 span=3,1,0,esf,b8zs bchan=49-71 dchan=72 span=4,1,0,esf,b8zs bchan=73-95 dchan=96	span=1,1,0,esf,b8zs e&m=1-23 span=2,1,0,esf,b8zs e&m=25-47 span=3,1,0,esf,b8zs e&m=49-71 span=4,1,0,esf,b8zs e&m=73-95	#fxo module fxsks=1 fxsks=2 fxsks=3 fxsks=4 fxsks=5 fxsks=6 fxsks=7 fxsks=8 #fxs module fxoks=9 fxoks=10 fxoks=11 fxoks=12 fxoks=13 fxoks=14 fxoks=15 fxoks=16
--	---	--	---	---	---

Table 3-3 Zaptel Configuration

**Step2: Query the configuration result.**

```
#ztcfg -vv
```

**Note:** If a device has multiple AST boards on it, the on-board channels are numbered according to the order in which the board drivers are loaded; if the AST boards are of the same model, the channels are numbered by the distance from near to far between the on-board PCI/PCIe slots and the CPU. You are allowed to get the information about span number by executing the command '#cat /proc/zaptel/[span number to be checked]'.

**3.2.2.2 Configure Dahdi**

**Step1: Follow the table below to modify the configuration file.**

Board Model	TEJ-4A/PCI				FXM-16A/PCIe (top 4 slots: trunk; bottom 4 slots: station)	
Config File	E1 Mode			T1/J1 Mode		
	ISDN	SS1	ISDN	SS1		
/etc/ dahdi/ system.conf	loadzone=us defaultzone=us					

	span=1,1,0,ccs,hdb3 bchan=1-15 dchan=16 bchan=17-31 span=2,1,0,ccs,hdb3 bchan=32-46 dchan=47 bchan=48-62 span=3,1,0,ccs,hdb3 bchan=63-77 dchan=78 bchan=79-93 span=4,1,0,ccs,hdb3 bchan=94-108 dchan=109 bchan=110-124	span=1,1,0,cas,hdb3 cas=1-15,17-31:1111 span=2,1,0,cas,hdb3 cas=32-46,48-62:1111 span=3,1,0,cas,hdb3 cas=63-77,79-93:1111 span=4,1,0,cas,hdb3 cas=94-108,110-124:1111	span=1,1,0,esf,b8zs bchan=1-23 dchan=24 span=2,1,0,esf,b8zs bchan=25-47 dchan=48 span=3,1,0,esf,b8zs bchan=49-71 dchan=72 span=4,1,0,esf,b8zs bchan=73-95 dchan=96	span=1,1,0,esf,b8zs e&m=1-23 span=2,1,0,esf,b8zs e&m=25-47 span=3,1,0,esf,b8zs e&m=49-71 span=4,1,0,esf,b8zs e&m=73-95	#fxo module fxsks=1 fxsks=2 fxsks=3 fxsks=4 fxsks=5 fxsks=6 fxsks=7 fxsks=8 #fxs module fxoks=9 fxoks=10 fxoks=11 fxoks=12 fxoks=13 fxoks=14 fxoks=15 fxoks=16
--	---	--	---	---	---

Table 3-4 Dahdi Configuration

### Step2: Query the configuration result.

```
#dahdi_cfg -vv
```

**Note:** If a device has multiple AST boards on it, the on-board channels are numbered according to the order in which the board drivers are loaded; if the AST boards are of the same model, the channels are numbered by the distance from near to far between the on-board PCI/PCIe slots and the CPU. You are allowed to get the information about span number by executing the command '#cat /proc/dahdi/[span number to be checked]'.

## 3.3 All Manuals for You

Except this manual, we provide all the documents shown below in Table 3-5 which involve the installation, configuration and test of several IP PBX platforms the Synway AST series boards support. Please choose what you need for your actual performance. All manuals we provide are put under the 'doc' directory in the installation package. See Table 3-5 for details.

IP PBX	Applicable Manual	Remark
Asterisk	Platform(Asterisk)_InstManual.doc	
Trixbox	Platform(Trixbox)_InstManual.doc	
Elastix	Platform(Trixbox)_InstManual.doc	The platform Elastix is installed, configured and tested in the same way as Trxibox.
FreeSwitch	Platform(FreeSwitch)_InstManual.doc	
Yate	Platform(Yate)_InstManual.doc	
CallWeaver	Platform(CallWeaver)_InstManual.doc	
AsteriskNOW1.5	Platform(AsteriskNow)_InstManual.doc	

Table 3-5 IP PBX and Applicable Installation Manual

## Appendix A FAQ

### Q1: Why do noises appear while using the FXM-8A/PCI or FXM-16A/PCIe board?

It may be due to the incomplete downloading of the firmware after Zaptel/Dahdi installation. Please make sure the network is well connected when you execute the command `./Setup install`.

### Q2: Why do the indicators on the TEJ boards always flash with the circuitry already connected?

It may be due to the incorrect configuration of the board impedance. You can test by pulling the corresponding jumper cap out or plug it into the board.

### Q3: How to determine the board arrangement when there are more than one AST board?

If zaptel is configured automatically, you may check `/etc/zaptel.conf` or `/etc/dahdi/system.conf` to see the board arrangement.

If zaptel is configured manually, you may execute the command `#cat /var/log/messages | grep "Launching card"` to check the board arrangement.

If the board arrangement is determined by their serial number, always pay attention to the time when you execute the command.

### Q4: How to install the SynAST driver in a dahdi version for which driver and tools are published separately?

Please download the driver and tools of dahdi separately.

#### 1. By Script

```
#cd /opt                                # enter the directory to source codes
#tar -zxvf SynAST-1.1.0.0.tar.gz         # decompress the SynAST driver
#cd SynAST-1.1.0.0                       # enter the directory to the SynAST driver
#cd for_dahdi                            # enter the directory to the 'synway ast for dahdi' driver
#./Setup install                          # install the driver

Would you like to install SynAST AST package now? y      # enter 'y' to install

Please enter working dahdi directory [q](exit install) : /opt/dahdi_driver
                                                    # enter the directory to dahdi_driver source codes

Please enter dahdi_tools source directory [q](exit install):
                                                    # enter the directory to dahdi_tools source codes

SELECT TEJ MODE [t, e, j] :e             # select the tej mode, or the driver will be installed in e1 mode
```

SELECT [75, 120]ohm :                    # set the impedance of the TEJ board, 75 for coaxial cables, 120  
  for twisted-pair cables

## 2. Manually

```
#cd /opt                                    # enter the directory to the package of SynAST source codes
#tar -zxvf SynAST-1.1.0.0.tar.gz        # decompress the source codes
#cp -rf /opt/SynAST-1.1.0.0/for_dahdi/src/fxm/fxm8apci /opt/dahdi_driver/drivers/dahdi
                                          # copy the fxm8apci driver to the dahdi_driver directory.
#cd /opt/dahdi/linux/drivers/dahdi/fxm8apci
                                          # enter the directory to SynAST source codes in dahdi
#make                                     # compile the driver
#insmod fxm8apci.ko                     # load the driver

#cd /opt/dahdi_tools                     # enter the directory to dahdi tools
#./configure
#make                                     # compile dahdi_tools
#make install                             # install dahdi_tools
```