X100P SE Setup Guide
- Global Line Standards

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Technical Support: This guide is freely available to anyone in the Open Source Community to help solve configuration and installation issues. However, email based technical support is only available to customers that have purchased Open Source telephony equipment directly from Novavox.

Updates: Due to the number of alternative Open Source IP PBX software packages available and new versions being regularly released, it is difficult to keep Open Source documentation fully up to date. If you find any out of date or inaccurate information within this document then please let us know by emailing us at feedback@novavox.co.uk and we will update the document as soon as possible.

Disclaimer: This document has been compiled based on experience resolving real world customer configuration issues as well as information available within the Open Source community. References to source material have not been included as it would make the document less easy to read. Also, keeping the references up to date would be very time consuming. However, if you discover information contained within this document for which you believe you are the original source and you would like to receive acknowledgement, then please let us know and we will add the appropriate reference.

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- OpenVox 4 port modular analogue PCI Express cards
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Contents

1   Introduction

This document describes how to configure an Open Source IP PBX with an X100P Special Edition (SE) FXO PCI card installed to support Caller ID received from a UK BT PSTN line. The configuration requires implementing a patch for Asterisk®/Zaptel that was originally written for the UK but has also been known to work in other countries. The guide provides detailed step-by-step installation instructions specifically for Trixbox® 2.6.07. However, with a few modifications the same steps can be used for other Trixbox® versions as well as any Asterisk®/Zaptel based IP PBX system including AsteriskNOW®, Elastix® and PBX in a Flash.

The X100P SE shown below is a single port analogue computer telephony PCI card developed by X100P.com specifically for leading open source IP PBX software such as Digium® Asterisk® and Trixbox®.

The X100P SE provides a single, full featured FXO (Foreign Exchange Office) interface for connecting an Open Source IP PBX to the PSTN's (Public Switched Telephone Network's) CO (Central Office). The X100P SE works out of the box using the official Zaptel driver and is perfect for home and SOHO (Small Office Home Office) environments.

2   Background

The Zaptel wcfxo driver has two user configurable modes of operation, FCC to support US line standards and CTR21 to support European line standards. The Silicon labs Si3012/Si3035 DAA chip used in the original Digium X100P card and low cost X100P clone cards only supports FCC mode. However, the Si3014/Si3034 DAA chip used on the X100P SE supports global line standards.

There are two key differences between the CTR21 and FCC standards, which are concerned with AC/DC termination:

	FCC	CTR21
AC Termination	A real, nominal 600 Ω termination which satisfies the impedance requirements of FCC part 68, JATE, and other countries.	May use a complex impedance which satisfies the impedance requirements of European NET4 countries such as the UK and Germany **OR** 600 Ω termination.
DC Termination	Supports a transmit full scale level of –1 dBm at TIP and RING. This mode meets FCC requirements in addition to the requirements of many other countries.	Provides current limiting, while maintaining a transmit full scale level of –1 dBm at TIP and RING. In this mode, the dc termination will current limit before reaching 60 mA.

2.1   FCC Mode

FCC is the default mode for the Zaptel wcfxo driver, which supports line standards for the US and a number of other countries. If you are from one of the countries that the FCC mode supports then you do not need to make any changes to the default operation mode setting. Based on information from the Si3014/Si3034 DAA chip specification, the following countries should use FCC mode:

Argentina	El Salvador	Kuwait	Singapore
Bahrain	Guam	Macao	Slovakia
Canada	Hong Kong	Mexico	South Korea
Chile	Hungary	Peru	UAE
Colombia	India	Romania	USA
Ecuador	Indonesia	Saudi Arabia	Yemen

2.2   CTR21 Mode

The Silicon labs Si3014/Si3034 DAA chip used in the X100P SE supports 600 Ω impedance and complex impedance to meet CTR21 line standards. However, the Zaptel wcfxo driver only supports CTR21 mode with 600 Ω AC termination, which may or may not be the correct setting depending on the country and the phone system in use. For example, in the UK BT PSTN lines use complex impedance, whereas PSTN lines from some cable companies may use 600 Ω impedance.

Based on information from the Si3014/Si3034 DAA chip specification, CTR21 mode with 600 Ω impedance may work in the following countries depending on the PSTN service provider's network:

Austria	Greece	Norway
Belgium	Iceland	Portugal
Denmark	Ireland	Spain
Finland	Italy	Sweden
France	Luxembourg	Switzerland
Germany	Netherlands	UK

To change the mode to CTR21 with 600 Ω impedance, add the following lines to /etc/modprobe.conf:

```
options wcfxo opermode=1
install wcfxo /sbin/modprobe --ignore-install wcfxo && /sbin/ztcfg
```

> **Note:** Debian based Linux distributions like Ubuntu do not have a /etc/modprobe.conf file. Instead modules can be loaded/unloaded by creating a configuration file with the relevant options and storing it in the /etc/modprobe.d/ directory. For example, you could create a file called modprobe.conf in /etc/modprobe.d/ and add the lines described above. After creating the file run **update-modules** to merge the changes with the system modules configuration.

Then shutdown and restart the IP PBX:

```
#shutdown -r now
```

To check that the correct mode is in operation use the following:

```
#dmesg | more
```

The output should include:

```
...
wcfxo: DAA mode is 'CTR21'
Found a Wildcard FXO: Wildcard X100P
...
```

2.3 Full Global Line Standards Support

To support global line standards we have put together a setup guide that uses a patch to provide additional operational modes to support line standard for all countries. If your country is not supported by the default FCC mode or CTR21 600 Ω impedance mode, then check the pre-installation guidelines in Section 3, and then follow the instructions in Section 4 to configure the appropriate settings for your country.

3   Pre-Installation Guidelines

3.1   Silicon Labs DAA Chip Version

The Silicon Labs Si3034/Si3014 is an integrated direct access arrangement (DAA) chip used in the X100P SE that provides a programmable line interface to meet global telephone line interface requirements. However, the Si3035/Si3012 DAA chip used in the original Digium X100P card and low-cost X100P clone cards only supports FCC/JATE line standards. Therefore, unless you have an authentic X100P SE card it is unlikely that your X100P card will support Global line standards.

If you change the operating mode for a card that doesn't have a Si3034/Si3014 DAA and you are using an up to date Zaptel driver you will receive the following message in the dmesg output:

"This card does not support international settings."

If you are using an older Zaptel driver then you won't get an error message and the card will show the correct operating mode but the mode change will not have any effect.

3.2   IP PBX Software Versions

Detailed instructions are provided for applying the Global Line Standards patch on Trixbox 2.6.07, which is based on the following software:

- Zaptel 1.4.10.1
- Kernel 2.6.18-53.1.4.el5

If you wish to install the patch using a different Trixbox version or another IP PBX software package, then you will need to ensure you check what software is currently running and modify the instructions to download/install the correct software versions.

3.3   Global Line Standards Patch Version

Two patches are provided to support different Zaptel versions. In Zaptel 1.4.9.2 the source code files for the Zaptel modules (e.g. wcfxo.c) were moved into the /usr/src/zaptel/kernel directory. When following the instructions please ensure you use the correct patch for your Zaptel software version.

3.4   Configuration File Backups

When you recompile the Zaptel driver it should not have any effect on your existing configuration files. However, it is recommended to backup current configuration files just in case something goes wrong, particularly if the IP PBX is a working system.

3.5   Software Package Dependencies

If you your IP PBX has additional software packages installed that are dependant Zaptel, then there is a possibility that they may not work properly after recompiling the Zaptel software and they may need to be reinstalled. Also, if you have installed any other patches or modified any of the original Zaptel source code (e.g. to support vendor specific hardware drivers) then you will need to repeat/incorporate the same changes into the installation steps provided in this document.

4   Setup Instructions

The setup instructions provided are based on using yum for package updates/installation and wget to download source code tarballs. However, if preferred alternative methods can be used such as using apt or manually downloading rpm's to update/install packages and using svn to download source code.

> **Note:** When copying text from PDF documents some characters such as hyphens are not copied to the clipboard. It is therefore advisable to input the commands below manually rather than copy and paste them to avoid errors.

4.1   Update Packages

It is recommended that you ensure that all installed software packages are up to date using:

```
#yum update –y
```

> **Warning:** If you have patched any installed packages then these will need to be patched and recompiled again after using yum. As an alternative, you can just update the Zaptel packages as these will need to be patched and recompiled anyway.

4.2   Install kernel Source Tree

First of all check to see if you need to install a kernel source tree by running:

```
#ls –l /lib/modules/`uname -r`/build/.config || echo "Install kernel"
```

If the output shows "Install kernel" then check what kernel type you need as shown below, otherwise proceed to step 4.3.

Check if you are using a smp kernel or not:

```
#uname -r | grep -q smp && echo "Install SMP kernel."
```

If the output shows "Install SMP kernel.", then run:

```
#yum install kernel-smp-devel kernel -y
```

Otherwise run:

```
#yum install kernel-devel kernel –y
```

4.3   Install C/C++ Compiler Packages

Install C/C++ Compilers to Compile Source Code if you don't have them installed on your system:

```
#yum install gcc -y
#yum install gcc-c++ -y
```

4.4   Shutdown and Restart the IP PBX

Reboot and check that everything is still working correctly after installing/updating relevant packages:

```
#shutdown -r now
```

> **Recommendation:** If you are a UK customer and have a BT PSTN line then you may wish to apply the Zaptel/Asterisk patches to support UK Caller ID (CID). Full instructions for applying the patches can be found here:
>
> 📄 Novavox X100P SE UK Caller ID Setup Guide
>
> If you wish to apply the UK CID patches follow steps 4.5 onwards in the UK CID Setup Guide instead of this one, but incorporate step 4.6 below after applying the Zaptel UK CID patch and step 4.10 before rebooting.

4.5   Download Zaptel Source Code

Change to user source code directory and download/unzip the required software packages:

```
#cd /usr/src
```

Download/Unzip Zaptel

```
#wget http://ftp.digium.com/pub/zaptel/releases/zaptel-
1.4.10.1.tar.gz
#tar -xzvf zaptel-1.4.10.1.tar.gz
#ln -s zaptel-1.4.10.1 zaptel
```

4.6   Apply Zaptel Patch

Download and Apply Asterisk Patch

```
#cd /usr/src/zaptel
```

For Zaptel version 1.4.9.2 and newer:

```
#wget http://www.novavox.co.uk/dev/patch/x100pse/x100p-se-global-
mode.1.4.9.2.new.diff
#patch -p0 < x100p-se-global-mode.1.4.9.2.new.diff
```

For Zaptel version 1.4.8 and older:

```
#wget http://www.novavox.co.uk/dev/patch/x100pse/x100p-se-global-
mode.1.4.8.old.diff
#patch -p0 < x100p-se-global-mode.1.4.8.old.diff
```

4.7   Stop Asterisk and Zaptel

First of all stop Asterisk:

```
#amportal stop / CLI>stop now
```

Then stop Zaptel:

```
#service zaptel stop
```

4.8   Remove Existing Zaptel modules

The commands below are correct for removing the Zaptel module directories in Trixbox 2.6.07 (the Zaptel modules may be in one or possibly both directories).

```
#rm -r /lib/modules/`uname -r`/extra/zaptel
#rm -r /lib/modules/`uname -r`/misc
```

If you are using a different Trixbox version or an alternative IP PBX package then you will need to find where the Zaptel modules are currently installed. To find the Zaptel modules directory find the directory that the wcfxo.ko module is stored.

Note: As an alternative to deleting the Zaptel module directory you could make a copy of the directories and then delete the old ones to provide a contingency plan if anything goes wrong.

4.9   Compile Source Code

Compile the Zaptel Source Code:

```
#cd /usr/src/zaptel
#make clean
#make
```

You should receive the following message:

```
****
**** The configure script was just executed, so 'make' needs to be
**** restarted.
****
make: *** [config.status] Error 1
```

Continue by running:

```
#make
#make install
#make config
```

The following should be included in the output:
```
...
I think that the zaptel hardware you have on your system is:
pci:0000:04:06.0    wcfxo-        1057:5608 Wildcard X100P
```

4.10   Change the Zaptel wcfxo Driver Mode

The default mode for the Zaptel wcfxo driver is FCC, to change the mode add the following lines to /etc/modprobe.conf:

```
options wcfxo opermode=<mode no.>
install wcfxo /sbin/modprobe --ignore-install wcfxo && /sbin/ztcfg
```

Replace mode with the <mode no.> with the appropriate code for your country as defined in Appendix A, e.g. for UK BT PSTN lines the correct setting is opermode=2, for PSTN lines in Australia the correct setting is opermode=4.

Note: Debian based Linux distributions like Ubuntu do not have a /etc/modprobe.conf file. Instead modules can be loaded/unloaded by creating a configuration file with the relevant options and storing it in the /etc/modprobe.d/ directory. For example, you could create a file called modprobe.conf in /etc/modprobe.d/ and add the lines described above. After creating the file run **update-modules** to merge the changes with the system modules configuration.

4.11   Shutdown and Restart the IP PBX

```
#shutdown -r now
```

To check that the correct mode is in operation use the following:

```
#dmesg | more
```

The output will be dependant on the operating mode configured. For example, the output for an X100P SE card configured for UK BT PSTN lines (opermode=2) should include:

```
...
wcfxo: DAA mode is 'TBR21'
Found a Wildcard FXO: Wildcard X100P
...
```

As another example, the output for an X100P SE card configured for Australian PSTN lines (opermode=4) should include:

```
...
wcfxo: DAA mode is 'AUST'
Found a Wildcard FXO: Wildcard X100P
...
```

> **Note:** If you experience any issues after rebooting your IP PBX check that the settings in all your configuration files are still all correct. The key configuration files to check include:
>
> /etc/asterisk/zaptel.conf
> /etc/asterisk/Zapata.conf
> /etc/asterisk/zapata-auto.conf
> /etc/asterisk/zapata-channels.conf
>
> To verify the configuration settings are correct refer to our X100P SE installation guide:
>
> Novavox X100P SE PCI card Installation guide

Configuration Complete

Your IP PBX is now fully configured to Global line standards using your X100P SE card.

5   Further Assistance

If after following the instruction in this guide you have been unable to configure your X100P SE card to support Global line standards, then please check if there are any solutions to the issues you are experiencing available from the Open Source community. Links to the online forums and wikis for assistance installing Asterisk/Trixbox are provided below:

Asterisk Wiki - http://www.voip-info.org/wiki-Asterisk
Asterisk Forum - http://forums.digium.com
Trixbox Forum - http://www.trixbox.org/forum
Trixbox Wiki - http://help.trixbox.com

For product installation/troubleshooting guides please visit our website support section:

www.novavox.co.uk/support

Novavox customers only: If after using the Open Source community resources available and following the guidance provided on our website you are unable to resolve an installation issue then please contact us at support@novavox.co.uk.

6 Quick Reference

Useful Commands

Command	Description
#amportal start	Start Asterisk
#amportal stop	Stop Asterisk
#asterisk –r	Connect to the Asterisk CLI
#lsmod	Lists information about all loaded modules
#modprobe	Adds a loadable module to the kernel, e.g. zaptel or wcfxo
#yum update	Update installed packages
#yum install	Install new packages
#service stop	Stop a service
#uname -r	Display kernel version
#ztcfg -vv	Reloads the zaptel.conf configuration, "-vv" option provides information on configured zap channels
#zttool	The Zaptel Tool (zttool) command shows the current status of any Zaptel supported interface cards
*CLI>exit	Exit from Asterisk CLI
*CLI>reload	Reload Asterisk
*CLI>zap show channels	Shows Zap channels recognised by Asterisk
*CLI>zap show status	Shows Zaptel devices recognised by Asterisk

Configuration File Descriptions

File	Description
/etc/zaptel.conf	Used by the Zaptel driver to define the relevant parameters for zaptel supported hardware devices
/etc/asterisk/zapata.conf	Used by Asterisk to store information about Zaptel devices and the features supported
/etc/asterisk/zapata-auto.conf	Automatically generated by genzaptelconf, contains Zaptel hardware configuration information used by Asterisk
/etc/asterisk/zapata-channels.conf	Automatically generated by genzaptelconf / setup-pstn, contains Zaptel hardware configuration information used by Asterisk
/etc/asterisk/indications.conf	Contains information about the sounds that a phone system in a particular country makes for various indications
/etc/sysconfig/zaptel	Zaptel service script used to load Zaptel modules

Appendix A – Global Line Standard Settings

The table below provides details for global line standard settings based on Si3014/Si3034 DAA chip specification. The mode name / no. information corresponds to the mode settings provided by the patch.

Country	OHS	ACT	DCT	RZ	RT	LIM	VOL	Mode Name	Mode No.
Argentina	0	0	2	0	0	0	0	FCC	0
Australia	1	1	1	0	0	0	0	AUST	4
Austria	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Bahrain	0	0	2	0	0	0	0	FCC	0
Belgium	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Brazil	0	0	1	0	0	0	0	JATE	3
Bulgaria	0	1	3	0	0	3	0	TBR21	2
Canada	0	0	2	0	0	0	0	FCC	0
Chile	0	0	2	0	0	0	0	FCC	0
China	0	0	1	0	0	0	0	JATE	3
Colombia	0	0	2	0	0	0	0	FCC	0
Croatia	0	1	3	0	0	3	0	TBR21	2
CTR21	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Cyprus	0	1	3	0	0	3	0	TBR21	2
Czech Republic	0	1	3	0	0	3	0	TBR21	2
Denmark	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Ecuador	0	0	2	0	0	0	0	FCC	0
Egypt	0	0	1	0	0	0	0	JATE	3
El Salvador	0	0	2	0	0	0	0	FCC	0
Finland	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
France	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Germany	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Greece	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Guam	0	0	2	0	0	0	0	FCC	0
Hong Kong	0	0	2	0	0	0	0	FCC	0
Hungary	0	0	2	0	0	0	0	FCC	0
Iceland	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
India	0	0	2	0	0	0	0	FCC	0
Indonesia	0	0	2	0	0	0	0	FCC	0
Ireland	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Israel	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Italy	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Japan	0	0	1	0	0	0	0	JATE	3
Jordan	0	0	1	0	0	0	0	JATE	3
Kazakhstan	0	0	1	0	0	0	0	JATE	3
Kuwait	0	0	2	0	0	0	0	FCC	0
Latvia	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Lebanon	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Luxembourg	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Macao	0	0	2	0	0	0	0	FCC	0
Malaysia	0	0	1	0	0	0	0	JATE	3

Country	OHS	ACT	DCT	RZ	RT	LIM	VOL	Mode Name	Mode No.
Malta	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Mexico	0	0	2	0	0	0	0	FCC	0
Morocco	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Netherlands	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
New Zealand	0	1	2	0	0	0	0	NWZL	5
Nigeria	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Norway	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Oman	0	0	1	0	0	0	0	JATE	3
Pakistan	0	0	1	0	0	0	0	JATE	3
Peru	0	0	2	0	0	0	0	FCC	0
Philippines	0	0	1	0	0	0	0	JATE	3
Poland	0	0	2	1	1	0	0	PLSV	6
Portugal	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Romania	0	0	2	0	0	0	0	FCC	0
Russia	0	0	1	0	0	0	0	JATE	3
Saudi Arabia	0	0	2	0	0	0	0	FCC	0
Singapore	0	0	2	0	0	0	0	FCC	0
Slovakia	0	0	2	0	0	0	0	FCC	0
Slovenia	0	0	2	1	1	0	0	PLSV	6
South Africa	1	0	2	1	0	0	0	SAFR	7
South Korea	0	0	2	0	0	0	0	FCC	0
Spain	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Sweden	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Switzerland	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
Syria	0	0	1	0	0	0	0	JATE	3
Taiwan	0	0	1	0	0	0	0	JATE	3
Thailand	0	0	1	0	0	0	0	JATE	3
UAE	0	0	2	0	0	0	0	FCC	0
United Kingdom	0	0 or 1	3	0	0	3	0	CTR21 or TBR21	1 or 2
USA	0	0	2	0	0	0	0	FCC	0
Yemen	0	0	2	0	0	0	0	FCC	0

Key

OHS – On Hook Speed

0 = Fast On Hook
1 = Slow Controlled on Hook

ACT – AC Termination

0 = Real 600 Ω impedance
1 = Complex impedance

DCT – DC Termination

0 = Reserved
1 = Japan Mode. Low voltage mode. (Transmit level = –3 dBm).
2 = FCC Mode. Standard voltage mode. (Transmit level = –1 dBm).
3 = CTR21 Mode. Current limiting mode. (Transmit level = –1 dBm).

RZ – Ringer Impedance

0 = Maximum (high) ringer impedance.
1 = Synthesized ringer impedance.

RT – Ringer Threshold Select

0 = 11 to 22 VRMS
1 = 17 to 33 VRMS

LIM – Current Limit

0 = All other modes
1 = CTR21 mode

VOL - Line Voltage Adjust

0 = Normal
1 = –0.125 V
2 = 0.25 V
3 = 0.125 V

Appendix B - X100P SE PCI Card Information

Product Overview

The X100P Special Edition (SE) is a single port analogue computer telephony PCI card developed by X100P.com specifically for leading open source IP PBX software such as Digium Asterisk® and Trixbox®. The X100P SE provides a single, full featured FXO interface for connecting an Open Source IP PBX to the PSTN (Public Switched Telephone Network). The X100P SE works out of the box using the official Zaptel driver and is perfect for home and SOHO (Small Office Home Office) environments.

Product Comparison

The X100P SE is the best of breed X100P card available. The table below provides a comparison between the X100P SE and some of the X100 cards available from alternative suppliers.

	Authentic X100P SE	Motorola Wildcard	ATCOM AX-100P	Voxzone X100P	Additional Information
Global Line Standards Support	✔	✘	✘	✘	Supports complex impedance for UK/Europe, Australia and New Zealand
Built in Pass-Thru Port for Analogue Telephone	✔	✔	✘	✔	Built in telephony service backup in case of power or IP PBX system failure
3.3v and 5v PCI Bus Support	✔	✘	✘	✘	3.3v required for low power embedded appliances and some newer PCs
100% Surface Mounted Electrical Components	✔	✘	✘	✘	Most of the ATCOM components are surface mounted but not all
Low Profile PCI Bracket and RJ-45 Modem Cable	✔	✘	✘	✘	Low profile PCI bracket required for 2U high rack servers

Product Highlights

**Global Line Standards and Caller ID Support**

- The X100P SE uses Silicon Labs Si3014/Si3034 DAA chip which supports global line standards including Complex Impedance for UK/Europe, Australia and New Zealand
- Supports Caller ID including countries such as the UK using a Zaptel/Asterisk patch
- Full instructions provided for configuring Global line standards and UK Caller ID support for Trixbox® 2.6.07, instructions can be modified to work with any Asterisk based IP PBX system such as AsteriskNOW®, Elastix®, or PBX in a Flash

Built-in Pass-Thu Port for Connecting an Analogue Telephone

- Enables use of the phone line while not occupied by Asterisk
- Provides a telephony service backup capability in case of power or IP PBX system failure
- Intelligent Call Handling: Introducing a pickup delay allows users to pick up when in-house

Industrial Grade Surface Mounted Electronic Components

- Minimal Signal Interference: Due to significant reductions in component size and lead length
- Increased Reliability: Better mechanical performance under shake and vibration conditions
- Reduced Heat Transference: Reduces chance of damaging the circuit board
- Shipment Safe: Not a single protruding component (except for the RJ-11 phone line socket)
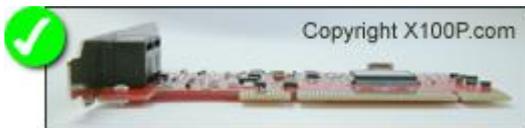
Authentic X100P Special Edition

Inferior, cheaper product

Multiple QC Tests Performed Under Official Asterisk Releases

- Every card Quality Tested/Assured at the X100P.com factory
- Voice Quality, Inbound and Outbound
- Voice Level, Inbound and Outbound
- Dual-tone multi-frequency (DTMF) Dialling, Outbound
- DTMF Detection, Inbound


```
[QC Test]
exten => s,1,wait,1
exten => s,2,answer
exten => s,3,digittimeout,5
exten => s,4,noop(-----------------------)
exten => s,5,noop(                       )
exten => s,6,noop(CallerID: "${CALLERID})
exten => s,7,noop(                       )
exten => s,8,noop(-----------------------)
exten => s,9,wait,2
exten => s,10,record(testsound:ulaw,,4)
exten => s,11,playtones(record)
exten => s,12,wait,1
exten => s,13,background(testsound)
exten => s,14,waitexten(2)
exten => s,15,goto(10)
```

Excerpts from the Asterisk Dial plan used in the X100P.com QC Department

User Changeable Standard and Low Profile PCI Bracket Support

- Low Profile Bracket: Perfect for embedded appliance and Small Footprint server/PC Implementations
- Standard and Low Profile PCI Bracket Included with Every Purchase

Authentic X100P Special Edition
Low Profile Bracket Installed

Authentic X100P Special Edition
Standard Profile Bracket Installed

Enhanced PCI Bus Connectivity and Stability

- High Quality Printed Circuit Board (PCB) with Golden Pins
- Enables Stable PCI Connection
- No More Fatal 'PCI Master Abort'

Un-Retouched Photo Showing:
Authentic X100P Special Edition (Top)
Inferior, cheaper product (Bottom)

Technical Summary

- Half length PCI card compatible with nearly all commercially available PC motherboards
- Fully PCI 2.2 compliant: Auto-sense compatibility for both 5v and 3.3v PCI busses
- Full hardware and software compatibility: Compatible with most well known brands of open source computer telephony equipment
- Global telephony system support: Configurable line interface to meet international telephone line interface requirements
- Surface mounted industrial grade components: Minimal signal interference and increased reliability
- Solid tantalum capacitors: High volumetric efficiency/reliability, low Equivalent Series Resistance (ESR) and temperature stability over the range -55°C to +85°C
- Enhanced PCI Bus Connectivity and Stability
- Latest Revision of the Original DAA chipsets with numerous Bug Fixes
- Support for Digital Gain Control (Transmit and Receive)
- User Changeable Standard and Low Profile PCI Bracket Support
- Built-in Pass-Thru port: Enables use of the phone line while not occupied by Asterisk
- Dimensions excluding PCI bracket (H x L x W): 47mm x 120mm x 16mm / 1.8" x 4.7" x 0.6"
- Certificates: CE, FCC

Appendix C - Acronyms

Acronym	Description
BT	British Telecom
CO	Central Office
DAA	Direct Access Arrangement
CTR21	Common Technical Requirements directive 21
DTMF	Dual-Tone Multi-Frequency
FCC	Federal Communications Commission
FXO	Foreign Exchange Office
FXS	Foreign Exchange Station/Subscriber
IP	Internet Protocol
IP PBX	IP Private Branch Exchange
JATE	Japan Approvals Institute for Telecommunications Equipment
PCB	Printed Circuit Board
PCI	Peripheral Component Interconnect
PSTN	Public Switched Telephony Network
SOHO	Small Office Home Office
SMP	Symmetric Multi-Processing
UK	United Kingdom