Xorcom Hardware Echo Canceller
Software Installation and Configuration Instructions

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Starting with DAHDI version 2.5, the Xorcom Hardware Echo Cancellation (HWEC) module is supported by the officially released DAHDI package. Due to the fact that the HWEC firmware developed by Octasic is not an open source product, the firmware is not provided as a part of the standard DAHDI package and must be applied manually (complete instructions are provided below).

Xorcom IP-PBX models can be upgraded as per the process described here:
http://www.xorcom.com/upgrades/xorcom-ip-pbx-upgrades.html

For Astribanks connected to a non-Xorcom IP-PBX it is necessary to download, build and install the latest DAHDI software, as per the instructions in the Software Installation section of this document.

Before you configure a system that includes the Xorcom hardware-based echo cancellation module you should be aware of a few design limitations:

1. HWEC is not supported in the XR1000 models.
2. For certain telephony module combinations not all port types will be able to use the HWEC.

Detailed information about supported configurations can be found in the Application Notes section of this document.

I. HWEC Configuration

DAHDI Configuration

The echo canceller type is defined in the `/etc/dahdi/system.conf` file.

DAHDI Version 2.5 and Beyond
Starting with DAHDI 2.5, if a HWEC module is installed then the HWEC is automatically enabled, regardless of the echo canceller type defined in the `echocanceller` parameter. The intention is to avoid cases where users have purchased a HWEC module but forget to define the '`hwec`' echo canceller name in the DAHDI configuration. While in most cases it is not necessary to make changes in the DAHDI configuration, this override behavior can be

changed if it is necessary to specify the echo canceller type on per channel basis. (See the [Application Notes](#) section of this document for more information.) In this case it is necessary to define the following parameter for the `dahdi` kernel module:

```
hwec_overrides_swec=0
```

This should be done in the `/etc/modprobe.d/dahdi.conf` file:
```
options dahdi hwec_overrides_swec=0
```

Then configure the echo canceller in the usual manner. For example, if you have an Astribank with 1 T1 port and 8 FXO ports and you would like to define the '`oslec`' echo canceller for the FXO ports:

```
echocanceller=hwec,1-23
echocanceller=oslec,25-32
```

DAHDI Version Prior to 2.5
For channels where the HWEC must be enabled, define the '`hwec`' as the echo canceller type in the '`echocanceller`' parameter. For example, if you need to enable the HWEC for channels 1-23 and the software-based '`mg2`' echo canceller for channels 25-32, then:

```
echocanceller=hwec,1-23
echocanceller=mg2,25-32
```

Once DAHDI is configured and restarted you will be able to check the echo canceller configuration per channel. In the `lsdahdi` output you should see "`EC: XPP`" for the channels where the HWEC is enabled:

```
# lsdahdi
### Span  1: XBUS-00/XPD-00 "Xorcom XPD #00/00: T1" (MASTER)
  1 T1         Clear        (In use) (EC: XPP - INACTIVE)
  2 T1         Clear        (In use) (EC: XPP - INACTIVE)
….........
  23 T1         Clear        (In use) (EC: XPP - INACTIVE)
### Span  2: XBUS-01/XPD-00 "Xorcom XPD #01/00: FXO"
 25 FXS        FXOKS        (In use) (EC: OSLEC - INACTIVE)
 26 FXS        FXOKS        (In use) (EC: OSLEC - INACTIVE)
….......
```

Note: "INACTIVE" indicates that the echo canceller is inactive because no call is currently taking place.

You also will see the HWEC module as '`Unregistered`' span in the output of '`dahdi_hardware -v`':

```
# dahdi_hardware -v
usb:001/002        xpp_usb+      e4e4:1162 Astribank-modular FPGA-firmware
 LABEL=[usb:X1234567]      CONNECTOR=@usb-0000:00:03.3-2
         XBUS-00/XPD-00: T1    (24)   Span 1   DAHDI-SYNC
         XBUS-00/XPD-10: FXO   (8)    Span 2
         XBUS-00/XPD-20: ECHO  (0)    Unregistered
```

Asterisk Configuration

The possible values for the **echocancel** parameter in the `/etc/asterisk/chan_dahdi.conf`
(or in other files 'included' in the `chan_dahdi.conf`):
* **no** – echo canceller disabled
* **yes** – echo canceller is enabled with the default number of taps of cancellation: 128 taps (16ms) for software echo cancellers and 1024 (128 ms) for the Xorcom HWEC
* **32, 64,128 or 256** – 32 taps (4 ms), 64 taps (8 ms), 128 taps (16 ms) or 256 taps (32 ms) for software echo cancellers and 1024 taps (128 ms) for Xorcom HWEC regardless of the defined number.

It is recommended to disable the `echotraining` parameter (`echotraining=no`) for the channels for which the Xorcom HWEC or OSLEC is defined. These echo cancellers do not require the 'training' procedure.

Xorcom HWEC Licensing

Please note that the Xorcom HWEC requires a license to function.

II. Software Installation

Step 1. Install Required Packages

In order to build the DAHDI the following packages must be installed on your system:
* the kernel source package
* newt-devel for RedHat/CentOS or newt-dev for Debian/Ubuntu
* libusb-devel for RedHat/CentOS or libusb-dev for Debian/Ubuntu

If you run a kernel package from your distribution, the distribution will typically provide you with a package including a partially compiled kernel tree. Please follow the instructions below (which vary based on your Linux distribution), in order to install the prerequisite packages. You may need to change the Linux kernel package name, depending on the kernel that is installed on your system.

* **Debian/Ubuntu**
```
apt-get install linux-headers-`uname -r` build-essential libnewt-dev libusb-dev
```

* **RedHat/CentOS**
```
 yum install -y kernel-devel-`uname -r` gcc newt-devel libusb-devel
```

If you are using CentOS 5 then you also have to install the fxload package:
```
rpm -Uvh http://updates.xorcom.com/astribank/fxload/fxload-2002_04_11-5xr.i386.rpm
```

Step 2. Download, Build and Install the DAHDI

Download and unpack the latest DAHDI sources package from
http://www.asterisk.org/downloads

Copy http://updates.xorcom.com/astribank/hwec/OCT6104E-256D.ima to the source tree
before running "`make install`":
```
  wget http://updates.xorcom.com/astribank/hwec/OCT6104E-256D.ima
  mv OCT6104E-256D.ima drivers/dahdi/xpp/firmwares/
```

Step 3. Reset the Astribank(s)

Each DAHDI package contains the corresponding Astribank firmware. In order to force the Astribank to reload the firmware it is necessary to either reset it or simply switch it off/on.

III. Application Notes

Xorcom has designed a hardware echo canceller module for its award-winning Astribank telephony interfaces and Asterisk-based IP-PBX appliances. The module provides a high level of echo cancellation and voice enhancement while reducing load on the CPU, as compared to OSLEC, the software-based echo cancellation solution provided in the standard Asterisk framework.

Possible Scenarios

Case 1

When the chassis includes both a digital module (E1/T1 or BRI) *and* one or more FXO modules, the HWEC *will not work* for the FXO modules.

Recommendation:

- If using HWEC for the FXO channels *is not crucial* then software echo cancellation should be configured for those specific channels in the DAHDI configuration.
- If using HWEC *is crucial*, a separate Astribank should be used for the FXO module(s) and HWEC. Keeping the digital modules and the FXO modules in different chassis will allow the HWEC to function for all these ports.

Case 2

If the chassis includes one or more FXO modules and one or more FXS modules, and the unit

is **not** the DAHDI synchronization master, the HWEC *will not work* on the FXS modules. Xorcom drivers automatically determine, per configuration, which unit should be the Sync Master. All other devices are synchronized to the Sync Master. The synchronization algorithm chooses a Sync Master according to the following priority:

1. E1/T1 connection
2. BRI connection
3. Astribank/Xorcom IP-PBX that has at least one FXO module
4. Astribank/Xorcom IP-PBX with FXS module

Examples of HWEC Behavior

The examples below demonstrate the HWEC behavior in various scenarios:

Example 1: E1/T1 Chassis + FXS+FXO Chassis

The configuration consists of an E1/T1 chassis and an FXS+FXO chassis. The Sync Master role will be given to the E1/T1 device and the FXS+FXO chassis will work as a Sync Slave. In this case the HWEC *will not handle* the FXS ports of the FXS+FXO chassis.

Example 2: E1/T1 Chassis + FXO Chassis

For a configuration of one E1/T1 chassis and one FXO-only chassis, the HWEC *will handle* all ports on both chassis.

Example 3: FXO Chassis + FXS+FXO Chassis

The configuration consists of a chassis with one or more FXO modules and another chassis with FXS and FXO modules. If the first chassis is defined as the Sync Master, then the FXS ports on the second chassis *will not be handled* by the HWEC.

Example 4: FXS+FXO Chassis + FXO Chassis

This is the same configuration as in the previous example, except that the chassis with the FXS and FXO modules is defined as the Sync Master. In this case, the HWEC *will handle* all ports on both chassis.

Example 5: FXO Chassis + FXO Chassis

For a configuration with two FXO-only chassis, the HWEC *will handle* all ports on both chassis.

Recommendations

- When HWEC is required for all ports (including FXS), make sure the units are configured homogeneously (all analog units are populated with either FXS or FXO modules, i.e., not mixed).

- If there is a chassis containing both FXS and FXO modules, make sure this chassis is the Sync Master by using the XPP_SYNC parameter in the /etc/dahdi/init.conf file (refer to DAHDI documentation for instructions). *Note: This is possible only when there is no digital – E1/T1 or BRI – equipment in the configuration.*

- If there is a chassis containing both FXS and FXO modules and it is not possible to define it as the Sync Master, software echo cancellation should be defined for the FXS ports that are not supported.

Licensing

The Xorcom licensing mechanism automatically detects configurations that have unsupported ports and does not charge the HWEC license fee for these specific ports.