# HEDD -192

## HARMONICALLY ENHANCED DIGITAL DEVICE



# OPERATOR'S MANUAL

## Version 1.2

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# IMPORTANT SAFETY INSTRUCTIONS

1. Read these instructions
2. Keep these instructions
3. Heed all warnings
4. Follow all instructions
5. Do not use this apparatus near water
6. Clean only with dry cloth
7. Install in accordance with the manufacturer's instructions
8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat
9. Protect the power cord from being walked on or pinched particularly at plugs and the point where they exit from the apparatus
10. Only use attachments/accessories specified by the manufacturer
11. Unplug this apparatus during lightning storms or when unused for long periods of time
12. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped
13. CAUTION: To disconnect the unit completely from the MAINS, unplug the unit. Turning the power switch off does not disconnect the unit completely from the MAINS.

INTRODUCTION

HEDD, short for harmonically enhanced digital device, is a technological break through in signal processing. HEDD is engineered to provide musically pleasing sound with the capability of generating tube/analog sounds in the digital domain.

HEDD gives any user who works with digital the ability to sound less digital and more analog.

Applications include: CD preparation, work station input and output, DAT machine A/D and D/A convertor replacement and effects generation ( warming or changing sounds in the digital domain). HEDD can be used in tracking, mixing, and mastering.
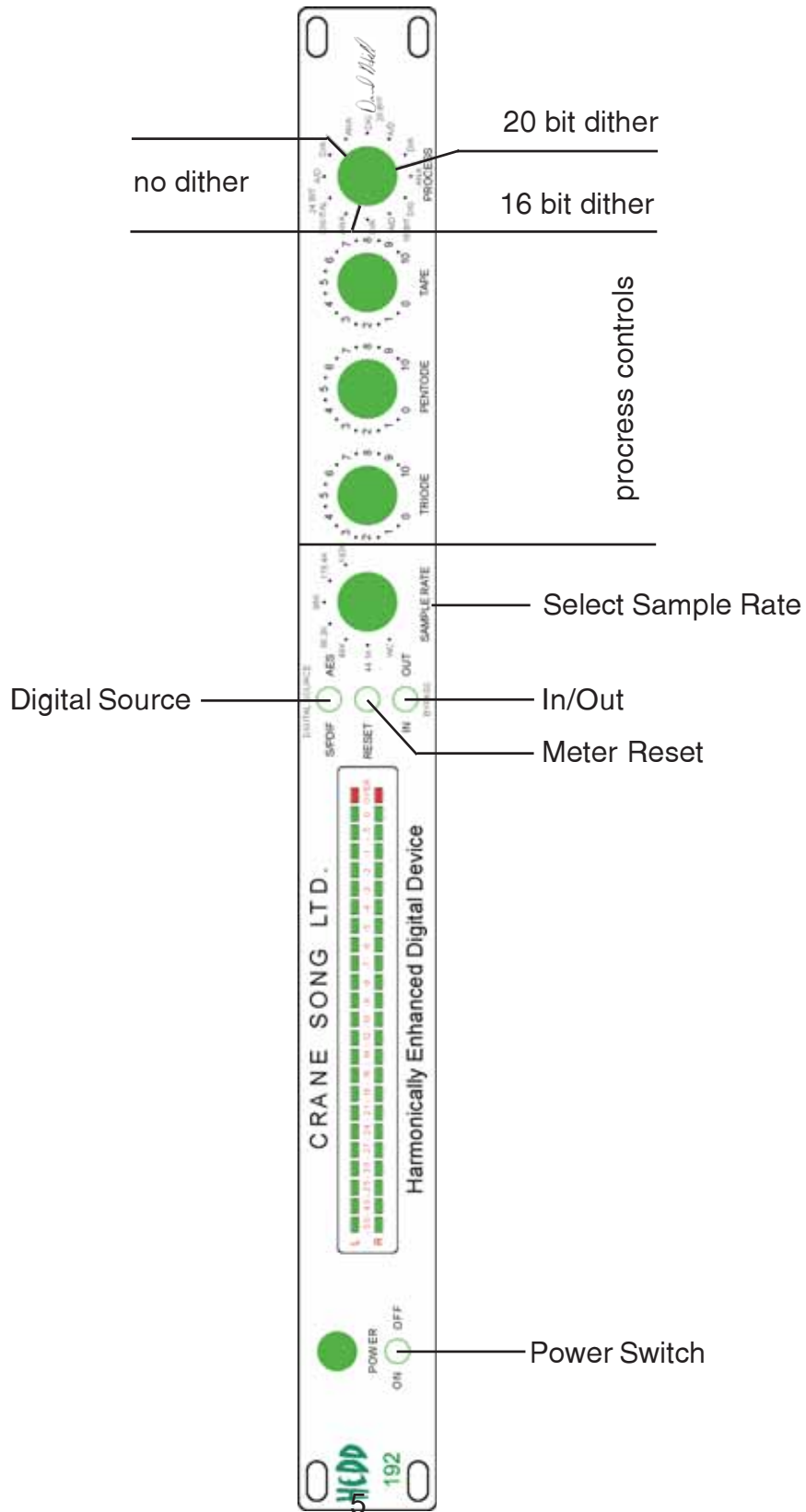
The front panel controls allow the user to select input source, sample rate, and continuously variable triode and pentode sounds. The HEDD can operate as an effects device or as separate A/D and D/A convertor with the harmonic generation process applied to either the A/D or D/A convertor.

The signal processor performs 24 Bit Processing on digital or analog source.

HEDD has transformerless balanced analog inputs and outputs, transformer isolated digital inputs and outputs, and uses separate power transformers and supplies for the analog and digital sections. The unit is 1 rack space tall and operates from 110V, 115V, 230V or 240V mains.

The HEDD-192 will operate at sample rates from 44.1K to 192K

Upgrading to 192K

no dither

20 bit dither

16 bit dither

procress controls

Select Sample Rate

Digital Source

In/Out

Meter Reset

Power Switch

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Harmonically Enhanced Digital Device

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## THE CONTROLS

SAMPLE RATE SWITCH
The A/D clock rate can be set from 44.1Khz to 192KHz or an external WC reference. The units taht were shipped going to 96k only will defult to 44.1K if rates above 192k are selected. When a valid word clock is applied and WC is selected a red light next to the switch will light indicate lock. If lock is lost, HEDD-192 will default to 44.1Khz and the light will be off. Whenever the sample rate is changed, the A/D convertor is re calibrated. This will keep the convertor working as accurately as possible.

OVER RESET BUTTON
Clears the overload LED. It also clears the peak memory value.

BYPASS SWITCH
The switch enables or disables the DSP process. There is a small time lag when the process is turned on and off to reduce the possibility of clicks in the audio.

INPUT SWITCH
The input switch selects between the AES and S/PDIF inputs

TRIODE
The triode function creates a triode like harmonic structure. This process contains strong even order harmonics, but is not strictly even order. This affects the bottom of your signal by fattening it up and it should be noted that even order harmonics are difficult to hear. The harmonic structure changes with signal level and the amount of process being applied, just like it does in a tube and the analog world. This control does make a low level zipper noise when it is turned

PENTODE
The pentode function creates mostly third harmonic information but contains some higher order odd harmonics depending on the signal level and the amount of process. It is like driving a pentode into over load. The pentode process makes things sound brighter, and brings out detail. This can also be described as a compression effect. The pentode process affects the triode process because the two processes are in series.

TAPE
The tape function emulates magnetic recording tape. Tape distortions are odd harmonic, starting with the third and fifth. As you increase the level on tape the harmonic content increases and higher odd harmonics are added. A tape recorder also contains record and reproduce equalizers that modify the harmonic content. The result is a sound that fattens up the bottom and midrange of a recording and as you increase the process. There can be loss of hi frequencies with respect to low frequencies if driven far enough, and the high frequencies start compressing sooner then the low frequencies. This is a result of the compression function and eq. curves in the process. The compression also squashes peaks and results in a higher average level. The tape process is in series after the triode and pentode processes and thus modifies them both.

PROCESS SWITCH
The process switch selects whether the signal processor is attached to the D/A convertor, A/D convertor, is configured for digital in - digital out, or analog in - analog out. An analog generated dither source is available to the A/D convertor and to the digital in - digital out modes. The dither is enabled by selecting the process in the 16 or 20 bit groupings


## THE PROCESS
The harmonic process runs 24 bit internal. The digital inputs and outputs are also 24 bit. If you feed 24 bit digital in you will get 24 bit digital out. If you are recording 16 bit digital, it is Recommended that you listen to your 16 bit data and adjust the process so it sounds good. Keep in mind that HEDD generates harmonically related information. It was arrived at by analyzing harmonic distortion in prized equipment and a lot of listening. If you feed 16 bit audio into the HEDD-192, it will generate 24 bit data because of its internal 24 bit calculations. This extra resolution is harmonically related information. If you use only 16 bits of the output it is not a problem. We recommend that if you are recording to 16 bits, monitor the process from the 16 bit output of your system to get optimum results in adjusting HEDD.

When using the process you will affect your average signal level if you turn the process up far enough. When adding harmonic content, the audio is going to get louder if it is modified to a great enough level. With the HEDD process, the peaks in your signal are being reduced while the low-level harmonic content is being increased. What this means is that the HEDD process will not cause any overs. In fact, what it will do, is reduce the level of existing overs. Think of it as a tube or tape doing soft clipping, i.e. "squashing" the peaks and causing analog compression.

HOW MUCH PROCESS TO USE
There are no rules, but here are some general guidelines. Making it sound "good" is what it's all about. The process is level and program dependent. Settings that will work best for one source may not work at all for another source. If you need a general purpose setting try running the process knobs at 3.5 to 6. This should be safe. When you run the knobs in the 5 and up range it is easy to go too far but it could be a cool thing. Because we are not used to a musical device that changes harmonic content with a knob it will take a little ear learning. It is also good to be aware that the ear loves a little harmonic generation. Turning HEDD off can take the life out of your program material, even if you did not notice it turn on.

The amount of process can result in subtle changes or drastic changes depending on what the program is like and how much process is being added. In other words the difference between analog and digital recordings can be subtle or drastic. It will be easier to hear in material that is more open as opposed to material that is very dense. The amount of low frequency information will also affect how we hear the process.

DITHERING
The dither process is proprietary to Crane Song. It is an analog generated source that has been filtered to a spectrum where the ear is least sensitive. We believe that this process sounds better than other systems and is less likely to cause noise problems as compared to other dither sources. The dither is added to the audio source as apposed to a digital process. This is the best way to dither an A/D convertor. It happens in the conversion.

It is also possible to add this dither to an existing audio source.  Dither can be added by running digital in, digital out and selecting the part of the Process switch that is labeled 16 bit or 20 bit depending on what you want to dither to.  To disable the dither run the unit where the process switch is labeled 24 bit.  This will record correctly on a 16 bit recorder

EXTERNAL WC SYNC
The external WC connections are for A/D convertor synchronization with an external world.  They do not effect the digital inputs because the digital inputs provide their own clock information.  The input connection is used to synchronize the A/D convertor to an external source.  The output connection is at the rate of the A/D convertor whether internal or external clock is selected and can be used as a sync. source.  When HEDD recognizes and locks on to external WC and WC is selected on the front panel an LED by the sample rate switch lights up to indicate lock.  If there is no lock HEDD defaults to a 44.1 KHz sample rate.

METER
The meter is calculated by the DSP and follows the HEDD process, as selected by the process switch.  The peak hold can be set to run in one of two different modes.  First is a 2 second hold then the peak indicator will drop back to a lower level.  In the second mode the peak value is held until the OVER RESET button is pushed.  This mode is good for those of us that may have to leave the room and want to know what the maximum value was during the transfer.  There is an internal jumper that can be changed or select either options.  The default mode is memory or hold forever.

OVERS
The Over led lights on detecting a digital over load.  This is done by the DSP.  The Over indicator will respond from the analog input when the process is selected as analog or A/D.  The Over indicator will respond to the digital source when the process is selected as digital or D/A.  We are defining a digital over as a single sample overload.

APPLICATIONS
HEDD can be used for many different tasks.  It can be operated in the following modes; analog in / analog out; digital in / digital out; and as A/D and D/A convertors with the signal processor operation attached to either convertor.
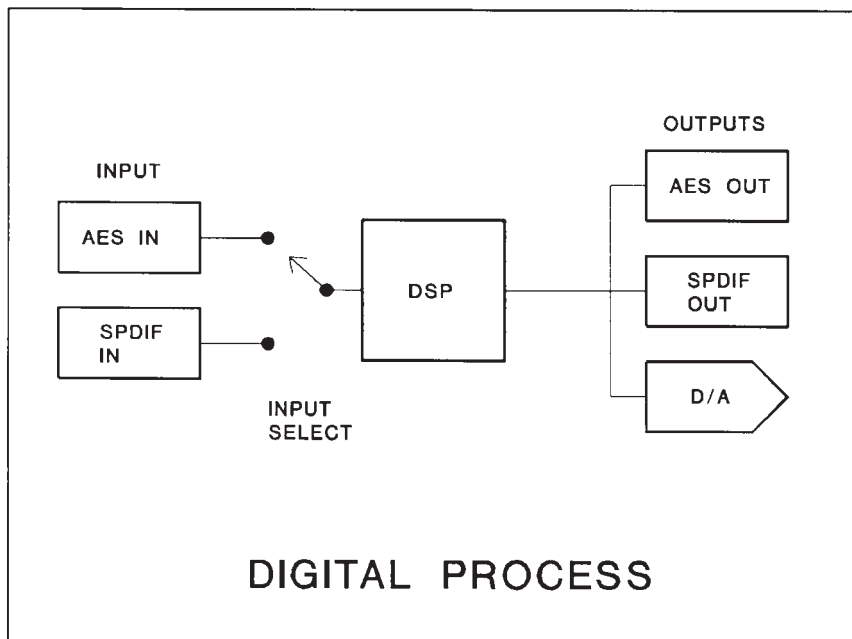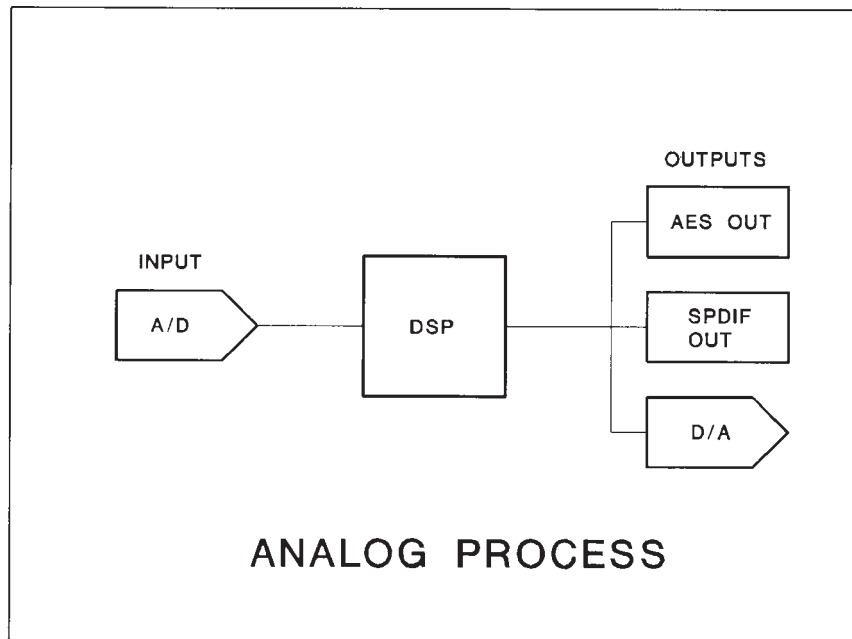
You can put it on the stereo bus of a digital console feeding a digital device or have analog output.  It can be used as the A/D convertor and D/A convertor for  a digital tape multi track or a DAT machine.  It can go between 2 DAT machines in the digital mode to process existing material.  You can even use it to convert to analog for processing and then back to digital.  HEDD is also useful for tracking and mixing, and it can be used analog in, analog out.  It will allow you to do amazing things to individual tracks. HEDD can also be used in mastering as a convertor or as a digital in / digital out processor.  HEDD opens up a new world of signal processing.
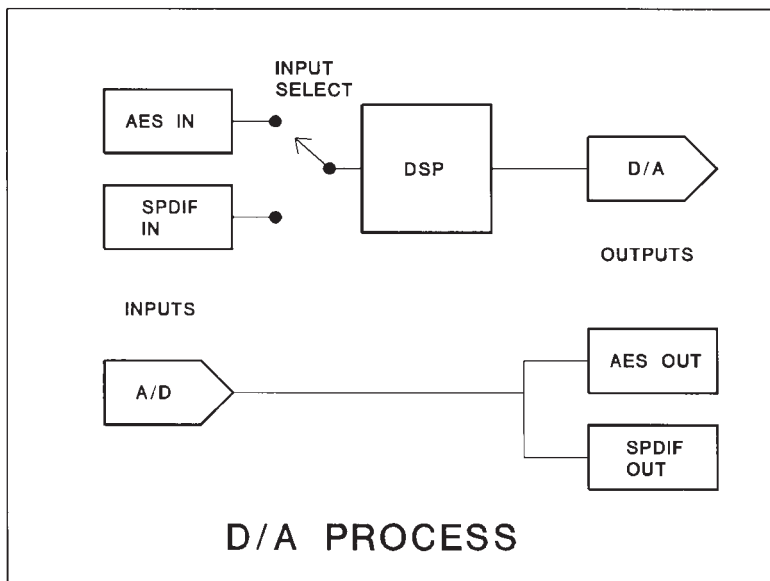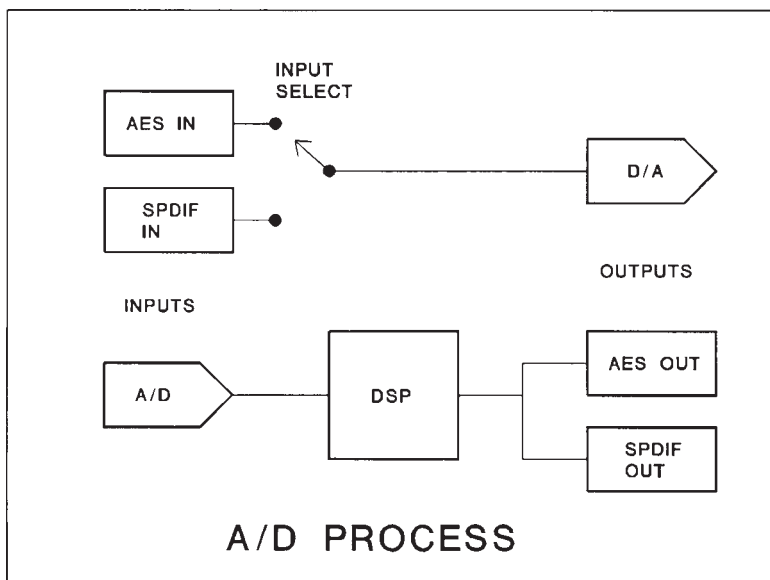
HEDD AS A MASTER CLOCK
Hedd will make a very good master clock, however there are two modes where it will not work as a master clock.  This is with16 and 20 bit dither enabled and running HEDD in the DIGI mode, digital - in - digital - out.  In the 24 bit mode this is not a problem and HEDD will work as a master clock

## PROCESS BLOCK DIAGRAMS

**ANALOG PROCESS**

INPUT

A/D

DSP

OUTPUTS

AES OUT

SPDIF OUT

D/A

**DIGITAL PROCESS**

INPUT

AES IN

SPDIF IN

INPUT SELECT

DSP

OUTPUTS

AES OUT

SPDIF OUT

D/A

## PROCESS BLOCK DIAGRAMS  (CONT.)

INPUT
SELECT

AES IN

SPDIF
IN

INPUTS

A/D

DSP

D/A

OUTPUTS

AES OUT

SPDIF
OUT

### A/D PROCESS

INPUT
SELECT

AES IN

SPDIF
IN

DSP

D/A

OUTPUTS

INPUTS

A/D

AES OUT

SPDIF
OUT

### D/A PROCESS

## SPECIFICATIONS

Analog Output:          Transformer-less balanced floating stereo output with XLR connectors. Digital zero is +16dBm.  This allows 12 db of headroom above a +4dBm 0 VU.  Gain adjust trims are on the back panel

Analog Input:          Transformer-less balanced floating stereo with XLR connectors. Digital zero is +16dBm.  This allows 12 db of headroom above a +4dBm 0 VU.  Gain adjust trims are on the back panel

Word Clock Input:      BNC connector takes a TTL level signal at the sample rate to sync the A\D to the external sample rate.  HEDD will sync from 20 kHz to 192K kHz.  The input impedance is 75 ohms.

Word Clock Output:     BNC connector this is a TTL level square wave that can be used to provide sync to other equipment.  The WC output will be the selected sample rate or the rate of the WC input.

Internal Sample
Rate:                      44.1kHz TO 96kHz determined by front panel switch.

S/PDIF Input:           Unbalanced digital input 75 ohms RCA connector

S/PDIF Output:         Unbalanced digital output 75 ohms RCA connector

AES Input:               Balanced digital input 110 ohms XLR connector

AES Output:             Balanced digital output 110 ohms XLR connector

Power:                        25 watts at 115 or 230 volts,  50 or 60 Hz. Fuse size is MDL .3A for 115 volts; MDL .25A for 230 volts

Pilot Lamp:             # 7335

Shipping Weight:       15 lbs  (6.7kg)

Depth Behind Panel:   10 inches (25.4cm)  plus user input/output connectors

The Convertors:         HEDD uses high Quality 24 Bit A/D and D/A Convertors made by CRYSTAL semiconductor,  with an upgrade path to 192K sample rate convertors

# Hedd upgrades
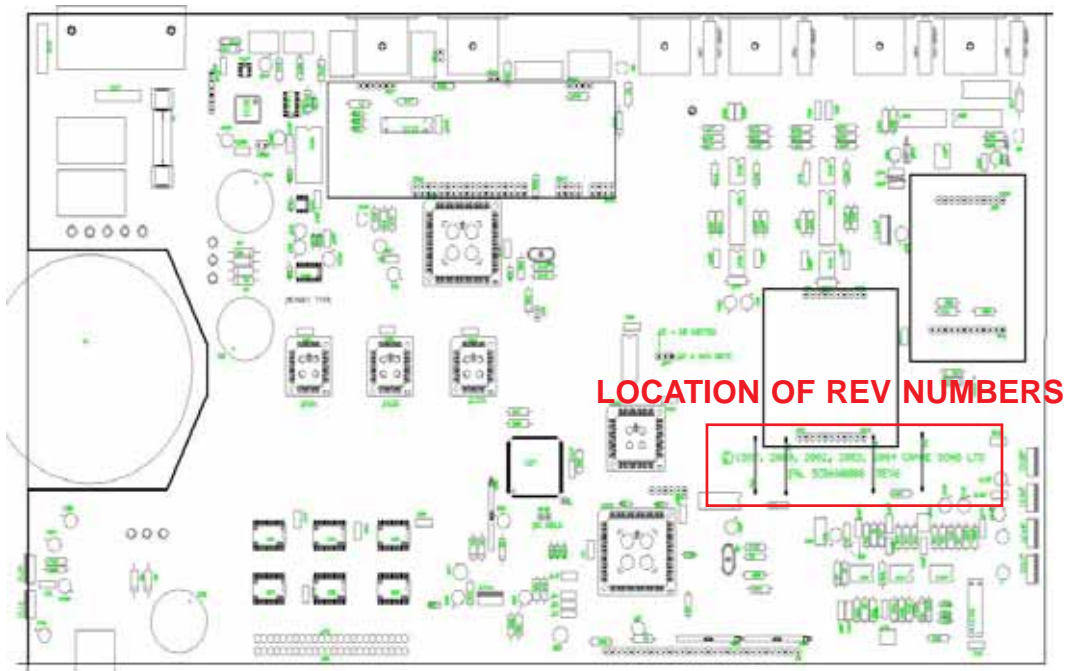
There are two parts to this

First, the D/A and the A/D converter; this requires some modification to the main pcb. How much depends on the version of the pcb and when it was built. The best way to find out is to open the cover and look for the revision number. It is possible to change only the D/A portion. The new D/A is a major improvement in sound qualitily. However depending on some unpredictable things it may be necessary to do some of the pcb modifications. A good tech can do all of it in an hour. A not so good tech will create much damage.

The new converters will run at 192K however the firmware to run the HEDD box at 192K is still being worked on.
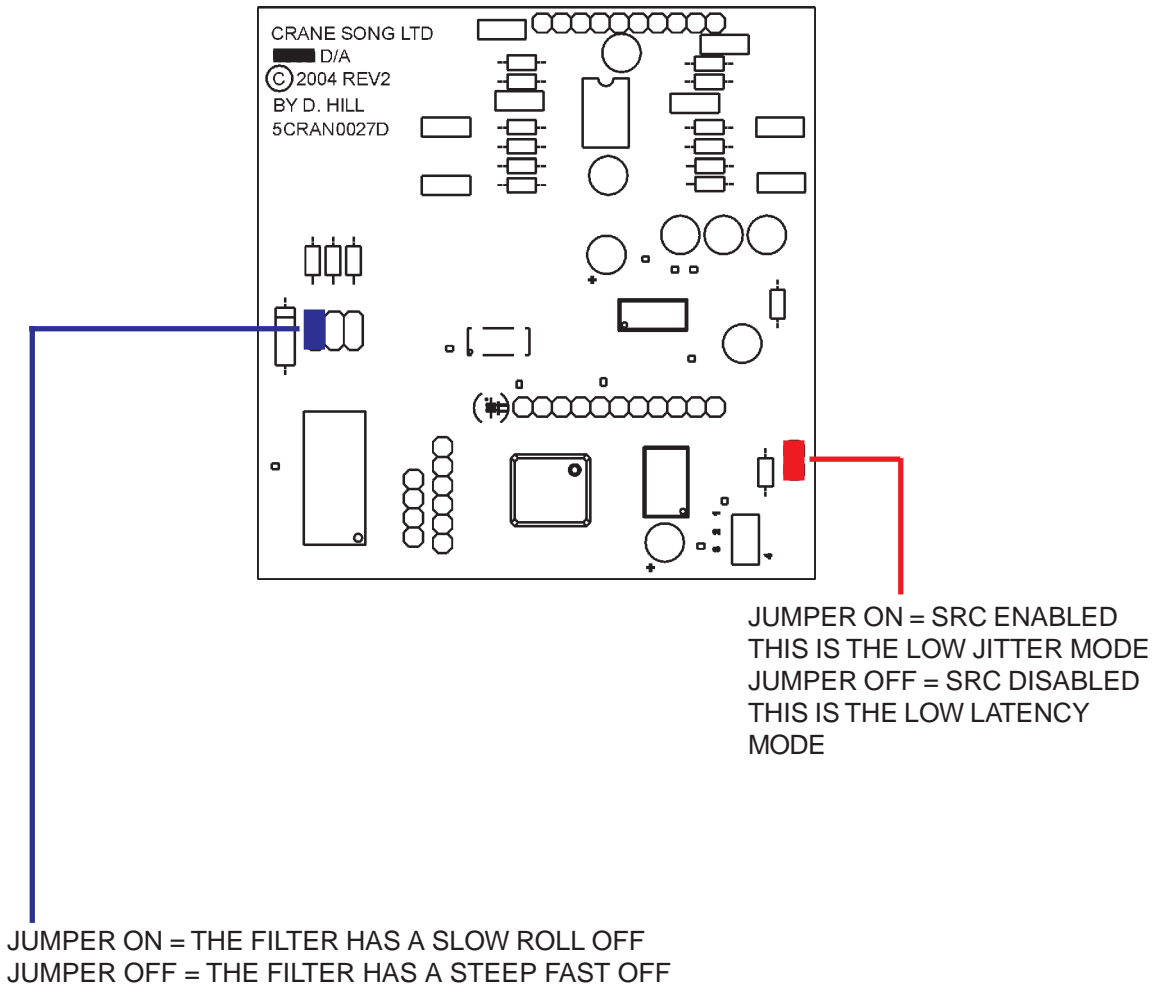
If you are only looking for the converter upgrade it is fine to do this at this time

If you are wanting to run at 192K then it is best to wait until the 192K firmware is ready. There will be some other hardware changes to run at 192K, such as the digital interface. Some of this is the result of bringing all older units up to the same hardware and firmware as the newest rev pcb. This will result in better performance in the older units and it also makes it much easier. We do not have to figure out and maintain several different versions of firmware

Original HEDDs, the 48k units will not upgrade



**LOCATION OF REV NUMBERS**

# jumper options for the D/A converter  Rev 5

CRANE SONG LTD
D/A
© 2004 REV2
BY D. HILL
5CRAN0027D

JUMPER ON = SRC ENABLED
THIS IS THE LOW JITTER MODE
JUMPER OFF = SRC DISABLED
THIS IS THE LOW LATENCY
MODE

JUMPER ON = THE FILTER HAS A SLOW ROLL OFF
JUMPER OFF = THE FILTER HAS A STEEP FAST OFF

This is the A/D convertor upgrade for HEDD-192.  The jumper positions that are showen are the default settings.  If low latency is more important than low jitter you will need to change red jumper to off.  The SRC is being used for jitter reduction of external sources.

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# REGISTRATION FORM

Please fill out this form and return.  It will be used for sending updates and pertinent information as it becomes available.

Thank you.

NAME_____

STUDIO NAME_____

ADDRESS _____

CITY_____STATE_____  ZIP_____

COUNTRY_____PHONE _____

SERIAL # _____

DEALER_____

PURCHASE PRICE _____

E-MAIL_____          WEB_____