

UNIVERSAL AUDIO

Model 2192

Master Digital Audio Interface

Manual Part Number: 65-0701
Revision 1.02

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Notice

Important Safety Instructions

Before using this unit, be sure to carefully read the applicable items of these operating instructions and the safety suggestions. Afterwards keep them handy for future reference. Take special care to follow the warnings indicated on the unit, as well as in the operating instructions.

Water and Moisture – Do not use the unit near any source of water or in excessively moist environments.

Object and Liquid Entry – Care should be taken so that objects do not fall, and liquids are not spilled, into the enclosure through openings.

Ventilation – When installing the unit in a rack or any other location, be sure there is adequate ventilation. Improper ventilation will cause overheating, and can damage the unit.

Heat – The unit should be situated away from heat sources, or other equipment that produces heat.

Power Sources – The unit should be connected to a power supply only of the type described in the operating instructions, or as marked on the unit.

Power Cord Protection – AC power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords at plugs, convenience receptacles, and the point where they exit from the unit. Never take hold of the plug or cord if your hand is wet. Always grasp the plug body when connecting or disconnecting AC.

Grounding of the Plug – This unit is equipped with a 3-wire grounding type plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding-type plug.

Carts and Stands – The unit should be used only with a cart or stand that is recommended by the manufacturer. The unit and cart combination should be moved with care. Quick stops, excessive force and uneven surfaces may cause the unit and cart combination to overturn.

Wall Or Ceiling Mount – The unit should be mounted to a wall or ceiling using only equipment designed for that purpose.

Cleaning – The unit should be cleaned only with a damp cloth and mild soap if necessary. Chemical cleaners may damage the silkscreen and/or finish.

Nonuse Periods – The AC power supply cord of the unit should be unplugged from the AC outlet when left unused for a long period of time.

Damage Requiring Service – The unit should be serviced by qualified service personnel when:

- The AC power supply cord or the plug has been damaged;
- Objects have fallen or liquid has been spilled into the unit;
- The unit has been exposed to rain;
- The unit does not operate normally or exhibits a marked change in performance;
- The unit has been dropped, or the enclosure damaged.

Servicing – The user should not attempt to service the unit beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved by Universal Audio could void the user's authority to operate the equipment.

Disclaimer

This manual provides general information, preparation for use, installation and operating instructions for the Universal Audio 2192 Master Digital Audio Interface. The information contained in this manual is subject to change without notice.

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Introduction

Analog Ears, Digital Minds

Thank you for using the 2192 Master Digital Audio Interface, the first product to combine Universal Audio's long history of creating high-quality vintage analog gear with its advanced digital technology.

Conversion

The soul of the 2192 is the analog circuitry used in the A/D and D/A converters.

The analog signal path uses DC-coupled, fully dual-differential, matched-FET, all discrete Class-A circuitry, resulting in ultra-low noise, excellent transient response and unmatched sound. No capacitors or DC servos are used in the signal path since these degrade audio quality and image stability, and introduce phase distortion.

Our no-compromises design approach and extensive history in analog and digital circuit design ensure your converted signals are totally accurate and of the highest possible fidelity.

Analog to Digital

Analog signals can be converted to digital at sampling rates of 44.1, 48, 88.2, 96, 176.4, and 192kHz. The digital output signal is always 24-bit format.

During A/D conversion, the digital signal is output to all digital outputs (AES/EBU, S/PDIF, and ADAT S-MUX) simultaneously. Audio digitized at rates above 96kHz is carried over AES/EBU in single- or dual-wire mode, and ADAT optical I/O with S-MUX interleaving. The S/PDIF specification, which includes 192kHz 24-bit audio, is fully implemented.

The 2192 analog outputs can be set to monitor the converted analog inputs. In this scenario the D/A converters output the signals from the A/D converters, enabling "true confidence" analog monitoring of the digitized signal.

Digital to Analog

Any of the digital input sources (AES/EBU, S/PDIF, or ADAT S-MUX) can be converted to analog. The clock source used during the D/A conversion can come from the internal clock, the digital audio source signal, or from an external clock source that is separate from the digital audio.

D/A conversion is accomplished at the sample rate of the digital audio source signal, even if the 2192 is synchronized to an external clock source that is running at a multiple or submultiple of the digital audio sample rate (subclock/overclock).

Clocking

The internal digital clock of the 2192 was designed for extreme stability and jitter-free operation. The internal clock conditioner removes jitter from external sources, so conversion quality is unaffected by clock source.

Combined with its extensive digital I/O, flexible front-panel routing controls, and phase aligned clock conditioner, the 2192 provides high-quality master clock source and clock distribution for your entire studio.

Two separate word clock inputs as well as AES/EBU, S/PDIF, and ADAT S-MUX can be used as external clock sources in addition to the internal clock. Four word clock outputs are provided so the 2192 can be used as a master clock source without daisy-chaining or cascading the clock through external devices, which can degrade the clock signal.

A prominent lamp indicates when the 2192 is successfully synchronized to an external clock source.

Subclock and Overclock

A/D and D/A conversion is accomplished at any available 2192 sample rate, even if the 2192 is synchronized (slaved) to an external clock source that is running at a multiple or submultiple of the 2192 sample rate.

Subclocking occurs if the 2192 is synchronized to an external clock that is running at 2x or 4x the 2192 sample rate. Overclocking occurs if the 2192 is synchronized to an external clock that is running at 1/2 or 1/4 of the 2192 sample rate.

See the clocking section on page 29 for more details.

Transcoding

The 2192 can transcode (convert) digital audio between AES/EBU, S/PDIF, and ADAT S-MUX in realtime. For example, you can transfer 192kHz audio from S/PDIF to dual-wire 192kHz AES/EBU or ADAT S-MUX. Transcoding can be performed using any of the available clock sources.

Features

- Ultra-low noise 44.1kHz – 192kHz A/D and D/A converters
- Low jitter internal clock source provides 44.1, 48, 88.2, 96, 176.4 and 192kHz sampling rates
- DC-coupled, fully dual-differential, matched-FET, all discrete Class-A, no-compromises analog signal path
- No capacitors in the signal path to degrade sound quality or introduce phase distortion
- 2 channel ADAT S-MUX I/O for 44.1kHz to 48kHz transmission of 44.1kHz to 192kHz audio
- 2 Channel transformer coupled AES/EBU I/O (44.1kHz – 192kHz)
- Support for single and dual wire AES/EBU at 176.4kHz and 192kHz rates
- 2 Channel transformer coupled S/PDIF I/O (44.1kHz – 192kHz)
- Realtime transcoding between digital formats
- Independent digital and analog output routing
- 4 parallel 75 ohm BNC Word Clock outputs for jitter-free and reflection-free clock distribution
- 2 separate 75 ohm BNC Word Clock inputs capable of synchronizing to 1x house clocks while running at higher 2x and 4x sample rates
- Front panel Sync-Lock indicator
- Sturdy front panel rotary switches provide Clock, Sample Rate, Analog Output and Digital Output source selection
- Full 24-bit digital signal path throughout
- No digital processing of the audio signal
- Multi-segment LED bargraph metering on all analog inputs and outputs, with timed peak-hold digital overload (input) and digital peak (output) indicators
- Internal universal auto-sensing, filtered, multi-stage regulated power supply supports 100-240VAC and 50-60Hz power for trouble-free operation world-wide
- Rugged 1U rack mount steel chassis

Specifications

Analog

- **Inputs:**
 - 2x balanced XLR female connectors
 - DC coupled, dual-differential
 - Common-mode rejection ratio (CMRR): >90dB
 - Impedance: ~1.5k ohms
 - Maximum input level: +31dBu
- **Outputs:**
 - 2x balanced XLR male connectors
 - DC coupled, dual-differential
 - Impedance: ~95ohms
 - Maximum output level: +23dBu
- **Frequency Response (analog input to ADC to DAC to analog output, referenced to 1kHz, $F_s = 192\text{kHz}$):**
 - $\pm 0.1\text{dB}$, 10Hz to 40kHz, -1dB at 74kHz
(See Figure 5: Frequency Response on page 40)
- **Analog Level Trim:**
 - ADC input (Lo-Z source):
 - Max input for 0dBFS: +30dBu
 - Min input for 0dBFS: +5.5dBu (3dBV)
 - DAC output (Hi-Z load):
 - Max output at 0dBFS: +23dBu
 - Min output at 0dBFS: +4dBu (+1.8dBV)
 - Factory trim:
 - Headroom: +18dB
 - Reference level: +4dBu = -18dBFS
 - Max input/output at 0dBFS: +22dBu
 - Trim accessed via 15-turn, rear-panel mounted potentiometer

Conversion

- **A/D:**
 - Dynamic range (measured using -38dBu = -60dBFS input at 1kHz
(See Figure 6: A/D Dynamic Range on page 41))
 - 118dB (A-weighted), 115dB (unweighted)
 - Frequency response (relative to 1kHz):
 - $\pm 0.02\text{dB}$, 10Hz to 20kHz @ $F_s = 44.1\text{kHz}$
 - $\pm 0.04\text{dB}$, 10Hz to 40kHz @ $F_s = 96\text{kHz}$
 - Phase response:
 - $<0.1^\circ$, 10Hz to 1kHz
 - -1.0° at 20kHz

- Residual noise (200Hz-20kHz):
 - < -145dBFS (-123dBu)
- Total Harmonic Distortion + Noise (measured at 1kHz):
 - -110dB, with +4dBu input
 - -114dB, with -10dBu input
- **D/A:**
 - Dynamic range (measured with -60dBFS = -38dBu output at 1kHz (See Figure 7: D/A Dynamic Range on page 41)
 - 122dB (A-weighted), 119dB (unweighted)
 - Frequency response (relative to 1kHz):
 - +- 0.03dB, 10Hz to 20kHz @ $F_s = 44.1\text{kHz}$
 - +- 0.04dB, 10Hz to 20kHz @ $F_s = 96\text{kHz}$
 - Phase response:
 - <0.5°, 10Hz to 1kHz
 - -10° at 20kHz
 - Residual noise (200Hz-20kHz):
 - < -145dBFS (-123dBu)
 - THD+N (measured at 1kHz):
 - -98dB, with +4dBu output
 - -103dB, with -10dBu output

Clock

- **Sample Rate (internal):**
 - 44.1, 48, 88.2, 96, 176.4, 192 kHz
- **Sample rate (external):**
 - +- 12.5% vari-speed lock at all rates
- **4x BNC Clock Outputs:**
 - 75 ohm
 - 5V CMOS drive
- **2x BNC Clock Inputs:**
 - 75 ohm internal termination
 - AC coupled
 - 1.2V(p-p) minimum
 - 5V(p-p) maximum, 50mA maximum over-voltage current (20 ohms/volt)
- **BNC Clock In to Clock Out Delay:**
 - 50ns maximum
 - Negative edge aligned when synchronized at multiple or submultiple rate

Digital

- **2-Channel S/PDIF:**
 - Dual stacked RCA
 - Unbalanced, transformer driven output
 - AC coupled input
- **2-Channel AES/EBU:**
 - Transformer isolated, balanced XLR (x4)
 - Single wire and dual-wire modes (for sample rates above 96kHz)
 - AES/SPDIF input bits:
 - SCMS: Ignored
 - Preemphasis: Ignored
 - Professional/consumer: Ignored
 - AES/SPDIF output bits:
 - SCMS: Not set
 - Preemphasis: Not Set
 - Professional/consumer: Set to Professional
- **2-Channel ADAT Optical:**
 - Dual in-line optical TX/RX (reinforced)

Physical

- **Physical dimensions:**
 - 1RU standard 19" rack-mount chassis
 - 11.5" depth behind front panel
 - 1" front panel clearance
 - 17" chassis width
 - Total dimension: 1.75" H, 19" W, 12.5" D
- **Thermal:**
 - 0° C to 50° C
- **AC Line:**
 - IEC 3-pin power (safety ground ties to chassis at entry point)
 - 100-240VAC, 50-60Hz, auto-sensing
 - 40 Watts

~ All specifications are subject to change without notice ~

Front Panel

Figure 1 below displays the names of the 2192 front panel elements along with an index number. Table 1 below indicates the page number where a complete description of the indexed item can be found.

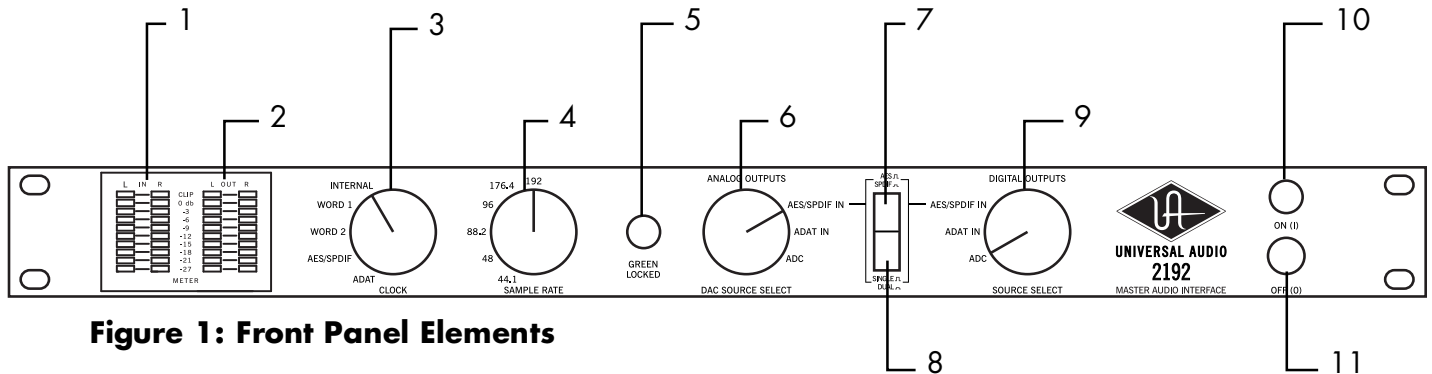


Figure 1: Front Panel Elements

#	Name	Page	#	Name	Page
1	Input Level Meters	23	7	AES/SPDIF Switch	27
2	Output Level Meters	23	8	Single/Dual Switch	27
3	Clock Select	23	9	Digital Outputs Source Select	27
4	Sample Rate Select	25	10	Power Lamp	28
5	Clock Status Lamp	26	11	Power Switch	28
6	Analog Outputs DAC Source Select	26			

Table 1: Front Panel Index

Rear Panel

Figure 2 below displays the names of the 2192 rear panel elements along with an index number. Table 2 below indicates the page number where a complete description of the item can be found.

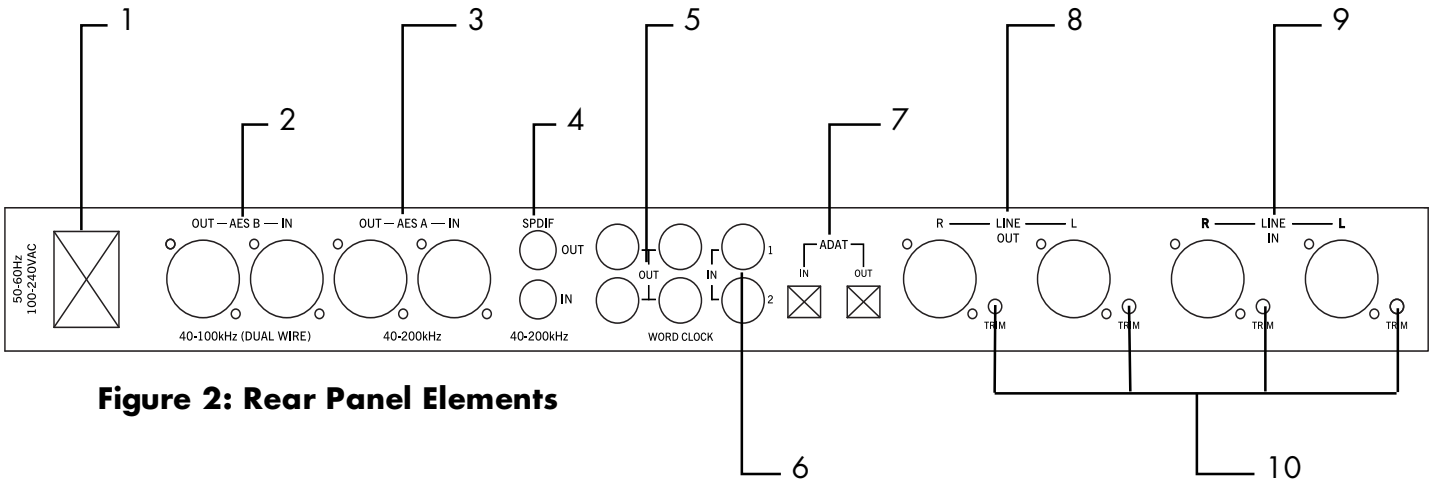


Figure 2: Rear Panel Elements

#	Name	Page	#	Name	Page
1	AC Power Input	16	6	Word Clock Inputs	17
2	AES/EBU Digital I/O – B	17	7	ADAT Optical Digital I/O	18
3	AES/EBU Digital I/O – A	16	8	Analog Line Outputs	18
4	S/PDIF Digital I/O	17	9	Analog Line Inputs	18
5	Word Clock Outputs	17	10	Analog Line Trims	19

Table 2: Rear Panel Index

Block Diagram

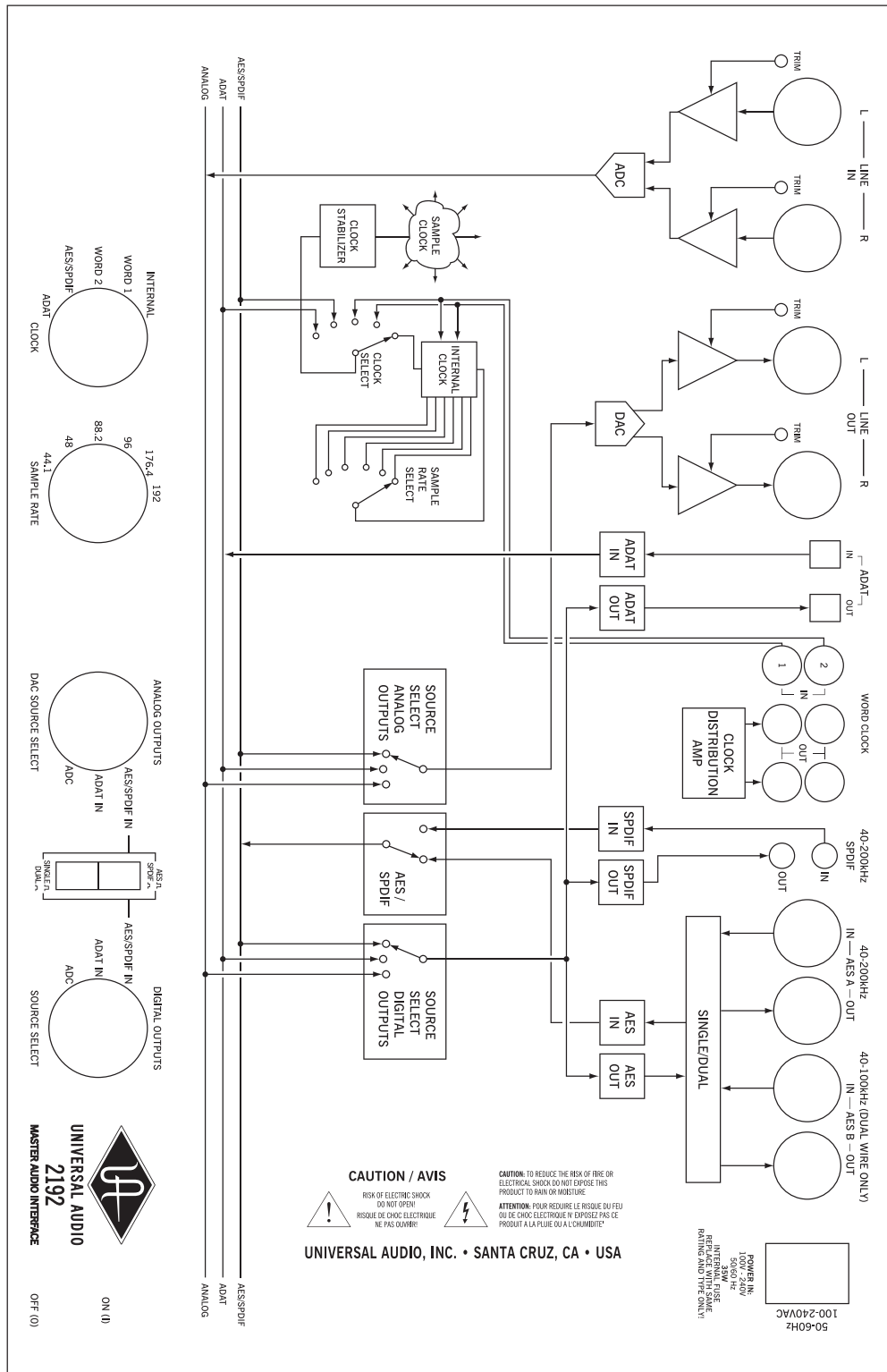


Figure 3: Block Diagram

Connections

All 2192 connectors are on the rear panel of the unit. The only adjustable controls on the rear panel are the analog level trims (page 19). Each connector and its function are detailed below.

AC Power Input

AC power is input to the 2192 via a standard, detachable IEC power cable such as the one supplied with the unit. The auto-sensing, multi-stage filtered, universal power supply accepts input power from 100VAC to 240VAC, at 50Hz to 60Hz. The third grounding pin is connected to the chassis internally.

AES/EBU Digital I/O

The AES/EBU digital interfaces of the 2192 use transformer coupled, balanced differential inputs and outputs for maximum digital signal integrity and jitter immunity. Only the highest-grade components are used throughout.

Each balanced AES/EBU connector can individually isolate pin 1 from ground if desired via an internal jumper block. See *Ground Isolation Jumpers* on page 22.

Both channels of a stereo pair at all supported sample rates can be transferred on a single cable between compatible hardware units. For compatibility with legacy equipment, dual wire mode is supported at sample rates of 176.4 and 192kHz.

AES/EBU "A" is used to transfer up to 192kHz stereo audio on single cables, or one channel of the stereo pair when in dual wire mode. AES/EBU input "B" is used only in dual wire mode. AES/EBU output "B" is used for one channel in dual wire mode, and replicates AES/EBU output "A" in single wire mode.

AES/EBU Dual Wire Mode

The 2192 can accommodate sample rates of 176.4kHz and 192kHz in AES/EBU dual wire mode, transferring one channel of the stereo pair on each of two separate AES/EBU digital I/O's. Dual wire mode is controlled by the Single/Dual front panel selector switch (page 27). When this switch is depressed, the 2192 is in dual wire mode.

AES/EBU Digital Input A

This female XLR jack receives incoming 24-bit stereo AES/EBU digital audio signals up to 192kHz from compatible hardware. When in dual wire mode, the left channel of audio is received here. Pin 2 is hot.

This input can be used for either digital audio with clock or for digital clock only. When the Clock knob (page 23) is set to AES/SPDIF and the Digital Outputs knob (page 27) is NOT set to AES/SPDIF, the audio portion of the signal is ignored.

AES/EBU Digital Output A

This male XLR plug transmits 24-bit stereo AES/EBU digital audio signals up to 192kHz to compatible hardware. When in dual wire mode, the left channel of audio is transmitted here. Pin 2 is hot.

AES/EBU Digital Input B

This female XLR jack receives the right channel of incoming 24 bit 176.4 or 192kHz AES/EBU digital audio signals at 88.2 or 96kHz when in dual wire mode. In single wire mode, this input is ignored. Pin 2 is hot.

AES/EBU Digital Output B

In dual wire mode, this male XLR plug transmits one channel of 24 bit 176.4 or 192kHz AES/EBU digital audio signals at 88.2 and 96kHz. In single wire mode, this output duplicates the signal on AES/EBU Digital Output A (but is electrically independent). Pin 2 is hot.

S/PDIF Digital I/O

S/PDIF Digital Input

This phono (RCA) connector accepts incoming 24-bit S/PDIF digital audio signals up to 192kHz from compatible hardware. The copy-protection, pre-emphasis, and consumer/professional bits are ignored.

This input can be used for either digital audio with clock or for digital clock only. When the Clock knob (page 23) is set to AES/SPDIF and the Digital Outputs knob (page 27) is NOT set to AES/SPDIF, the audio portion of the signal is ignored.

S/PDIF Digital Output

This phono (RCA) connector transmits 24-bit S/PDIF digital audio signals up to 192kHz to compatible hardware. The copy protection bit and pre-emphasis bits are cleared, and the professional bit is set.

Word Clock I/O

Two separate word clock inputs and four parallel word clock outputs are provided for synchronizing with external hardware. Connections are via standard 75-ohm BNC connectors. All input and output signal levels are TTL and CMOS compatible.

Word Clock Outputs 1-4

These outputs transmit independent high-quality word clock at the frequency specified by the Sample Rate Select (page 25). Four outputs are provided so you can use the 2192 as the master clock source for multiple devices simultaneously without cascading the clock through external devices, which can degrade the clock signal.

The word clock signal on each of the four outputs is identical, electrically independent, and phase aligned to the clock source to allow cascading multiple units without sample skew.

Word Clock Inputs

The Word Clock Inputs receive a standard digital word clock signal for synchronization (slaving) to external hardware devices. To sync to an external word clock, set the 2192 Clock knob (page 23) to Word 1 or Word 2.

The 2192 supports subclock (1/2x or 1/4x) and overclock (2x and 4x) synchronization to allow converting signals at multiples or submultiples of the sample rate. For example, a 48kHz house sync can be used while converting at 96kHz or 192kHz.

Superclock (256x) is not supported. Vari-speed sync is supported.

The 2192 BNC word clock inputs each provide an internal 75-ohm terminator.

Word Clock Input 1

This word clock input is used for external synchronization when the Clock knob (page 23) set to Word 1.

Word Clock Input 2

This word clock input is used for external synchronization when the Clock knob (page 23) set to Word 2.

ADAT Optical Digital I/O

The 2192 provides standard ADAT digital I/O via this optical interface.

At sample rates of 44.1kHz and 48kHz, only channels 1 and 2 are used. At higher sample rates, industry standard S-MUX multiplexing is used to maintain high resolution transfers at higher sampling rates. At 88.2kHz and 96kHz, channels 1-4 are used to achieve the stereo transfer. At 176.4kHz and 192kHz, all 8 channels are used for high resolution stereo audio.

ADAT Optical Input

This optical connector receives digital ADAT optical data from external hardware devices.

ADAT input can be used for either digital audio with clock or for digital clock only. When the Clock knob (page 23) is set to ADAT and the Digital Outputs knob (page 27) is NOT set to ADAT, the audio portion of the signal is ignored.

ADAT Optical Output

This optical connector transmits digital ADAT optical data to external hardware devices.

Analog I/O

Each balanced analog connector can individually isolate pin 1 from ground if desired via an internal jumper block. See *Ground Isolation Jumpers* on page 22.

The analog inputs and outputs can be adjusted to calibrate signals for different levels as desired. See *Analog Line Trims* on page 19.

Analog Line Inputs

Analog signals are input to the left and right channels via these balanced line-level female XLR connectors. Pin 2 is hot. For unbalanced operation, Pin 3 can be grounded.

The analog inputs are calibrated at the factory so that an analog input level of +4dBu will output a -18dBFS digital signal, for 18dB of headroom before digital clipping occurs.

Analog Line Outputs

Analog signals are output from the left and right channels via these balanced line-level male XLR connectors. Pin 2 is hot. For unbalanced operation, Pin 3 can be grounded, and the output level will be attenuated by 6db.

The analog outputs are calibrated at the factory so that a digital signal level of -18dBFS will output an analog level of $+4\text{dBu}$, for 18dB of headroom. The line outputs can drive high or low (600ohm) impedance inputs with no changes in level.

Analog Line Trims

The analog line trims are used to calibrate analog I/O signal levels to match external analog hardware.

The analog I/O are calibrated at the factory so that analog levels of $+4\text{dBu}$ correspond to -18dBFS digital levels, for 18dB of headroom and maximum analog input and output levels of $+22\text{dB}$. The trims can be adjusted to accommodate maximum levels over a wide range using the rear panel 15-turn trim potentiometer.

Line Input Trims

These trims are used to calibrate the left and right analog line inputs. Differential shunt attenuation is used to maintain maximum signal and conversion integrity.

Line Output Trims

These trims are used to calibrate the left and right analog line outputs. Differential shunt attenuation is used to maintain maximum signal integrity.

Line Trim Procedure

To calibrate the analog inputs, a digital signal meter, and an accurate analog reference generator with low impedance outputs are required. To calibrate the analog outputs, a digital signal generator and an accurate analog dB level meter with balanced inputs are required.

Note: Before adjusting the factory calibration levels, make sure your equipment reads the current calibration values correctly! If your equipment does not match the factory settings, you will need to find out why before you proceed with recalibration.

To calibrate the analog line inputs:

1. Connect the analog reference generator to the analog input channel of the 2192.
2. Connect the digital output of the 2192 to the digital signal meter.
3. Set the reference generator to output a 1 kHz sine wave at the desired nominal signal level. The factory setting is +4dBu.
4. Adjust the input trim until the desired RMS digital level is obtained. The factory setting is -18dBFS.
5. Repeat these steps for the other channel.

To calibrate the analog line outputs:

1. Connect the digital tone generator to a digital input of the 2192.
2. Connect the analog output channel to the analog level meter.
3. Set the digital signal generator to output a 1 kHz sine wave at the desired nominal RMS signal level. The factory setting is -18dBFS.
4. Adjust the output trim until the desired analog output level is obtained. The factory setting is +4dBu.

Output Level Meter Calibration

If the rear panel output trims are changed from the factory defaults, the (+22dB equals 0dBFS) output meters will no longer be correctly calibrated. The input trims have no effect on the meters, and no calibration is needed after input trims are adjusted.

The clip indicator (top LED) is not part of metering circuit. It is controlled by the processor, and is illuminated when a digital clip occurs. It is hard wired in the unit and cannot be adjusted.



Important: Because there are potentially dangerous voltages present inside the unit, as well as sensitive electronic components, meter calibration should be performed by qualified service personnel only!

Output Meter Calibration Procedure

Having completed the input and out trim procedure (see top of this page), the output meters will need to be recalibrated. The factory default has the unit set so the a 0dBFS digital level equals an analog level of +22dB.

Required tools:

In addition to the gear listed for the analog output trim procedure, a small non-conductive plastic or nylon Phillips screwdriver is required.

To calibrate the Output Level Meters:

1. With the unit powered down, remove the AC line cord.
2. Place the unit on a flat, stable area and remove top cover.
3. Attach the AC line cord and power up the unit.



With the AC cord attached to the unit there are dangerous AC voltages present. Use extreme caution!

4. Connect the digital tone generator to the digital input of the 2192.
5. Set the digital generator to output a 1 kHz sine wave at -1 8dB.
6. Adjust the left channel output meter using Output Meter Trim A* (see Figure 4 below for location) so that the -1 8dB segment on the meter just lights up.
7. Adjust the right channel output meter using Output Meter Trim B* (see Figure 4 below) so that the -1 8dB segment for the right channel just lights up.

**Component reference designation numbers may vary from those shown below.*

The output meters are now calibrated.

Important: Do not adjust the Offset trim pots! These settings are optimized at the factory.

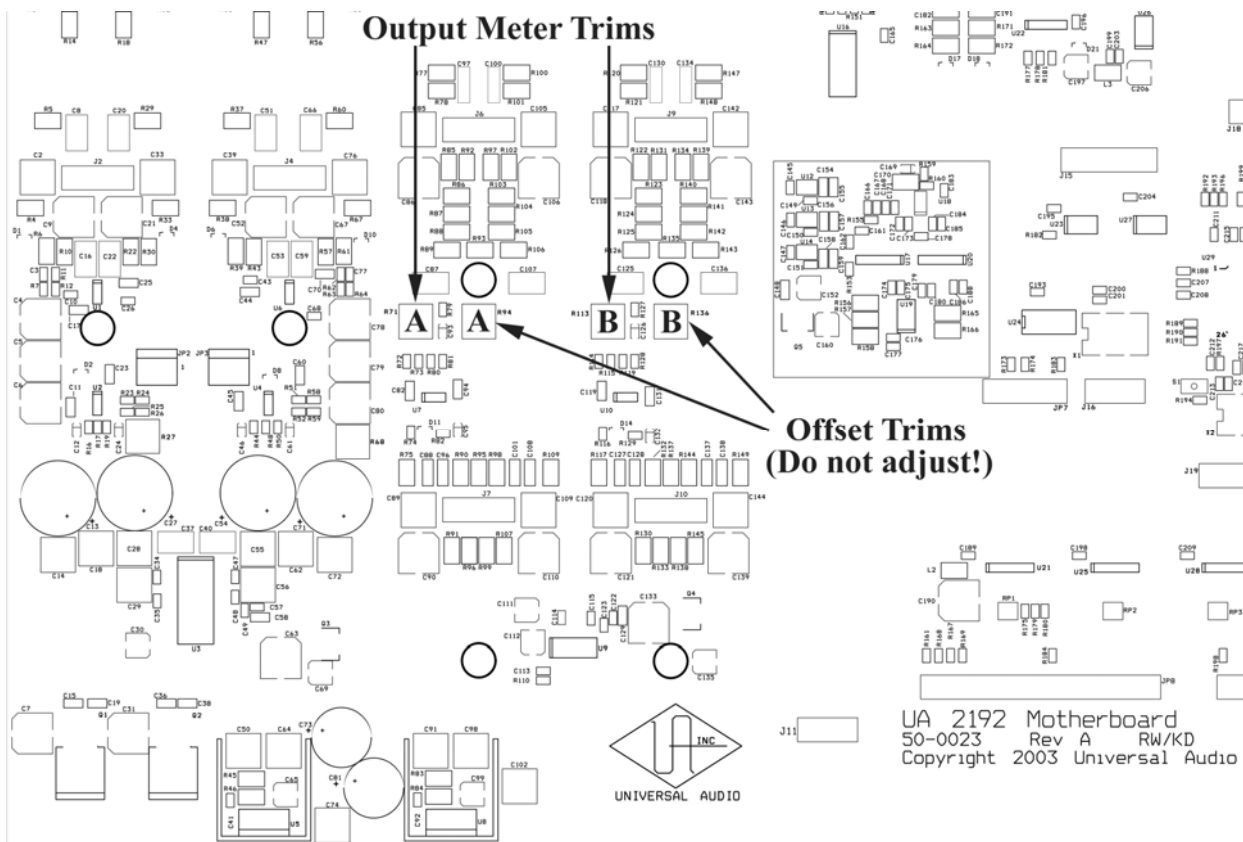


Figure 4: Output Level Meter Calibration Trimpots

Ground Isolation Jumpers

Each of the eight balanced connectors (the analog and AES/EBU digital I/O) can individually isolate pin 1 from ground if desired via an internal jumper block.

Table 3 below indicates which internal jumper is used for each balanced connector. Pin 1 is tied to ground for the connector when the indicated pair of pins is jumpered.

The 2192 is shipped from the factory with pin 1 connected to ground on all eight connectors.



Important: Changes to internal jumpers should only be made by qualified personnel. Disconnect AC Power before opening the unit!

Connector	Jumper	Connector	Jumper
Analog Input Left	JP1	AES/EBU Input A	JP9
Analog Input Right	JP4	AES/EBU Output A	JP10
Analog Output Left	JP5	AES/EBU Input B	JP11
Analog Output Right	JP6	AES/EBU Output B	JP12

Pin 1 is tied to ground when a jumper is across the pair of pins.

Table 3: Internal Ground Isolation Jumpers

Controls

The front panel contains most of the user adjustable controls and indicators for the 2192. The only controls located on the rear panel are the analog input and output line level trim controls (see *Analog Line Trims* on page 19).



Important: Do not change any front panel knob or switch settings while audio conversion or transcoding is in process. The signal is briefly interrupted when new settings are applied.

LED Level Meters

Level metering for each of the stereo input and output channels is provided by its own 10-segment LED display. Each channel has timed peak/hold digital clip/maximum output indicators.

All LED segments except CLIP are driven by the analog metering circuitry (the meters are tied to the converters, not the analog trims). The red CLIP indicators are driven by the digital circuitry.

Analog Metering

The nine analog LED segments are calibrated to reflect digital signal levels. A value of 0dB on the analog meter is equal to digital full scale code (0dBFS), which reflects an analog signal level of +22dB (adjustable using the rear panel Analog Line Trims for each channel).

An analog signal level of +4dBu at 1kHz will illuminate the -18dB segment on the 2192 meters. Please note that frequencies below 50Hz will flicker, and may not be reported correctly.

Digital Clip Indicators

When the red CLIP indicator illuminates, a full-scale digital signal has occurred.

CLIP uses a timed peak/hold-style indicator. When a signal at or over 0dBFS occurs, the CLIP indicator will remain illuminated momentarily before being auto reset once the signal drops below 0dBFS.

Input Level Meters

This pair of LED level meters indicates the signal strength at the stereo analog inputs relative to the calibrated 0dBFS level.

Output Level Meters

This pair of LED level meters indicates the signal strength at the stereo analog outputs relative to the calibrated 0dBFS level. See also *Output Level Meter Calibration* on page 20.

Clock Source

The Clock knob specifies the 2192 master clock source. Note that the clock source can be independent of the signal used for digital to analog conversions. For example, you could select AES/SPDIF as the clock source but perform D/A conversion on the incoming ADAT optical signal by setting the Digital Outputs Source (page 27) to ADAT.



The 2192 can be used for word clock distribution by connecting multiple clock sources to the rear panel, then using the Clock knob to switch between them.

The 2192 sample rate is determined by the Clock and Sample Rate knobs except when the clock source is set to AES/SPDIF, in which case the sample rate is automatically detected. See Table 4 below.

Clock Knob Setting:

	Internal	Word 1/2	AES/SPDIF	ADAT
Sample Rate Determined By:	Sample Rate knob	Sample Rate knob	Source signal (automatic)	Sample Rate knob

Table 4: Clock Source & Sample Rate Interaction



Important: If the clock won't lock when Clock knob is set to an external source, verify that the external device is connected to the proper digital input and that it is transmitting a clock signal. Please note that the 2192 cannot lock to an external device that is set to slave to the 2192!

Internal

When the Clock knob is set to Internal, the high-quality internal clock of the 2192 is used. At this setting clock inputs on the rear panel are ignored, and the internal sampling rate is determined by the Sample Rate knob.

Word 1

When the Clock knob is set to Word 1, the digital clock signal present at the Word 1 BNC clock input on the rear panel (page 17) is used as the master clock.

At this setting, the Sample Rate knob specifies the multiple or submultiple of the clock rate to be used internally. For example, if the BNC input is 48kHz, the 44.1 and 48kHz sample rates select 1x sampling, the 88.2 and 96kHz sample rates select 2x sampling, and the 176.4 and 192kHz sample rates select 4x sampling.

Word 2

When the Clock knob is set to Word 2, the digital clock signal present at the Word 2 BNC clock input on the rear panel (page 17) is used as the master clock.

At this setting, the Sample Rate knob performs as described above for Word 1.

AES/SPDIF

When the Clock knob is set to AES/SPDIF, the digital clock signal present at the AES/EBU digital input (page 16) or S/PDIF digital input (page 17) on the rear panel is used as the master clock.

At this setting, the internal sample rate is determined by the digital input alone and the Sample Rate select knob is ignored.



Important: The clock (AES/EBU or S/PDIF) to be used by the AES/SPDIF Clock knob setting is determined by the AES/SPDIF switch (page 27).

ADAT

When the Clock knob is set to ADAT, the digital clock signal present at the ADAT optical digital input (page 18) on the rear panel is used as the master clock.

At this setting, the Sample Rate knob now selects the multiple of the ADAT clock rate to be used internally. For example, if the ADAT input is 48kHz, the 44.1 and 48kHz sample rates select 1x sampling, the 88.2 and 96kHz sample rates select 2x sampling, and the 176.4 and 192kHz sample rates select 4x sampling.

Sample Rate Select

The Sample Rate knob selects the sample rate used for A/D and D/A conversions. The sample rates supported by the 2192 are listed in Table 5 below.

44.1kHz	88.2kHz	176.4kHz
48kHz	96kHz	192kHz

Table 5: Available Sample Rates

Note: The 2192 does not perform sample rate conversion.

Sample Rate with External Clock

If the 2192 is performing conversions while synchronized to an external clock, the Sample Rate is defined by a combination of the external clock rate and the Sample Rate knob.

When the Clock knob (page 23) is set to Internal, the Sample Rate knob determines the master clock frequency. However, when the Clock knob is set to Word 1, Word 2, or ADAT, the Sample Rate knob selects the multiple or submultiple of the clock rate to be used internally. When the Clock knob is set to AES/SPDIF, the Sample Rate knob has no effect.

Table 6 on page 26 summarizes the resulting sample rates when the 2192 is performing conversions while synchronized to an external clock.

		Sample Rate Knob Setting					
		44.1	48	88.2	96	176.4	192
Incoming Clock Rate	44.1	44.1	44.1	88.2	88.2	176.4	176.4
	48	48	48	96	96	192	192
	88.2	44.1	44.1	88.2	88.2	176.4	176.4
	96	48	48	96	96	192	192
	176.4	44.1	44.1	88.2	88.2	176.4	176.4
	192	48	48	96	96	192	192

Table 6: Sample Rates with External Clocking



Important: When AES/SPDIF is selected as the clock source, the Sample Rate knob is ignored and the internal sampling rate is determined by the AES/EBU or S/PDIF digital input (see Table 4 on page 24).

Clock Status Lamp

When the 2192 is locked (synchronized) to a clock source, the Clock Status lamp glows green. The lamp glows red when the clock is not locked. The clock must be locked for proper A/D and D/A conversions and transcoding.

The clock is always locked when the Clock knob (page 23) is set to Internal. For the clock to be locked when the clock source is external, a clock signal must be present at the input selected by the Clock knob.

Note: After the Power Switch is turned on, the Clock Status lamp stays off for about 12 seconds while the 2192 power conditioner and analog conversion circuits perform their initial calibrations.



Important: If the clock won't lock when Clock is set to an external source, verify that the external device is connected to the proper digital input and that it is transmitting a clock signal.

Analog Outputs DAC Source Select

The Analog Outputs knob specifies the digital source for the D/A converters and the analog outputs.

AES/SPDIF In

When the Analog Outputs knob is set to AES/SPDIF In, either the AES/EBU or the S/PDIF digital input signal is routed to the D/A converters and analog outputs, depending on the position of the AES/SPDIF switch (page 27).



Important: At this setting, the digital signal (AES or S/PDIF) routed to the analog outputs is determined by the AES/SPDIF switch.

ADAT In

When the Analog Outputs knob is set to ADAT In, the digital signal from the ADAT optical input (page 18) is routed to the D/A converters and analog outputs. The S-MUX mode is determined by the Sample Rate knob.

ADC

When the Analog Outputs knob is set to ADC, the digitally converted signal at the analog inputs (see page 18) is routed to the D/A converters and analog outputs.

The incoming analog signal is routed through the A/D and D/A converters for “true confidence” monitoring via the analog outputs.

AES/SPDIF Controls

These two pushbutton switches are used in conjunction with the Clock knob (page 24), Digital Outputs (page 27), and Analog Outputs (page 26) when these controls are set to AES/SPDIF.



These switches have no effect when none of the dependent controls (Clock Select, Digital Outputs Source Select, and Analog Outputs Source Select) are set to AES/SPDIF.

AES/SPDIF Switch

The AES/SPDIF switch specifies whether the AES/EBU or S/PDIF digital inputs are used when Clock, Analog Outputs Source Select, or Digital Outputs Source Select is set to AES/SPDIF.

When the button is depressed, the S/PDIF input signal is used. When the button is out, the AES/EBU input signal is used.

The AES/EBU and S/PDIF digital outputs are always active.

Single/Dual Switch

The Single/Dual switch specifies whether AES/EBU single wire or dual wire mode is used.

When the button is depressed, AES/EBU dual wire mode is used. When the button is out, AES/EBU single wire mode is used.

Note: This switch has no effect on the S/PDIF input. However, the S/PDIF output will transmit the same signal as the AES/EBU “A” output.

Digital Outputs Source Select

The Digital Outputs knob specifies the signal that is routed to the digital outputs. The signal source selected here will be routed to all digital outputs (AES/EBU, S/PDIF, and ADAT optical) simultaneously.

This knob is normally set to ADC during all operations except transcoding (see page 37).

AES/SPDIF In

When the Digital Outputs knob is set to AES/SPDIF In, the digital signal from the AES/EBU or S/PDIF digital inputs is routed to all digital outputs.



Important: At this setting, the digital signal (AES or S/PDIF) routed to the digital outputs is determined by the AES/SPDIF switch.

ADAT In

When the Digital Outputs knob is set to ADAT In, the digital signal from the ADAT optical digital input (page 18) is routed to all digital outputs.

ADC

When the Digital Outputs knob is set to ADC, the signals at the analog inputs (page 18) are converted and delivered to the digital outputs.

Power Lamp

The Power Lamp glows blue when the proper AC voltage is connected and the power switch is in the up (I) position.

Note: After the Power Switch is turned on, the Power Lamp stays off for about 2 seconds while the 2192 power conditioner circuits perform their initial calibrations.



Important: If the Power Lamp does not come on after the initial 2 second delay, please check that the AC line is plugged into a 100-240VAC 50-60Hz AC power source. If the power still does not come on, it is possible that the internal protection fuse has blown, and the 2192 needs to be serviced by a qualified service technician.

Power Switch

The Power Switch activates the 2192. Power is on when the switch is in the up (I) position. When the switch is down (O), AC power is completely disconnected from the internal power supply, and only the safety ground remains connected to the chassis.



Important: Do not apply power to the 2192 unless the audio monitoring system volume is reduced to minimum.



Important: Like all quality audio equipment, please allow the 2192 to warm up for 20 minutes after powering on for optimum performance.

Clocking

The internal digital clock of the 2192 was designed for extreme stability and jitter-free operation. The internal clock conditioner removes jitter from external sources, so conversion quality is unaffected by clock source.

Flexibility

Combined with its extensive digital I/O, flexible front-panel routing controls, and phase aligned clock conditioner, the 2192 provides high-quality master clock source and clock distribution for your entire studio.

Two separate word clock inputs as well as AES/EBU, S/PDIF, and ADAT S-MUX can be used as external clock sources in addition to the internal clock. Four word clock outputs are provided so the 2192 can be used as a master clock source without cascading the clock through external devices, which can degrade the clock signal. A prominent lamp indicates when the 2192 is successfully synchronized to an external clock source.

A/D and D/A conversion is accomplished at any available 2192 sample rate, even if the 2192 is synchronized (slaved) to an external clock source that is running at a multiple (subclock) or submultiple (overclock) of the 2192 sample rate.

Subclocking/Overclocking

Subclocking occurs if the 2192 is synchronized to an external clock that is running at 2x or 4x the 2192 sample rate. Overclocking occurs if the 2192 is synchronized to an external clock that is running at 1/2 or 1/4 of the 2192 sample rate.

The 2192 clock source can be set to internal, and the digital source device set to synchronize to the 2192 (recommended), or the clock source can be set to an external source that is generated either by the digital source device, or an external clock master. When an external clock master is used, both the digital source device and the 2192 must be set to synchronize to the external clock master.

Reclocking

When an external clock master is used that provides a multiple or submultiple of the digital source sample rate (e.g. a 48kHz clock master with 96kHz audio), the 2192 can slave to the clock master, and generate the required word clock output for the digital source device at the higher or lower sample rate.

Because the 2192 performs clock conditioning and jitter removal on all external clock sources, there is no degradation in sound quality caused by inferior clock sources. All BNC clock and digital output signals are generated from the conditioned internal clock, so the 2192 can be used for reclocking poor quality external source clocks.

Synchronizing to unrelated clock rates (e.g. 44.1kHz clock with 48kHz digital audio) and sample rate conversion are not supported.

The 2192 does not perform sample rate conversion.

Analog to Digital Conversion

Analog signals can be converted to digital at sampling rates of 44.1, 48, 88.2, 96, 176.4, and 192kHz. The digital output signal is in 24-bit format.

The digitized signal is sent to all digital outputs (AES/EBU, S/PDIF, and ADAT S-MUX) simultaneously.

Audio digitized at rates above 48kHz is transmitted over AES/EBU in single or dual-wire mode, as specified by the Single/Dual switch (page 27).

Audio digitized at rates above 48kHz is transmitted over ADAT optical with S-MUX interleaving. At 88.2kHz and 96kHz, channels 1-4 are used to achieve the stereo transfer. At 176.4kHz and 192kHz, all 8 channels are used for stereo audio. At 44.1kHz and 48kHz, only channels 1 and 2 are used.

The S/PDIF interface transmits 24-bit audio at rates up to 192kHz.

When the Analog Outputs knob (page 26) is set to ADC, the signals at the analog outs are the analog input signals after they have passed through both the A/D and D/A converters, enabling “true confidence” analog monitoring of the digitized signal.



Important: Do not change any front panel knob or switch settings while A/D conversion is in process. The signal is briefly interrupted when new settings are applied.

Important: Set the Digital Outputs knob to ADC when performing A/D conversion.

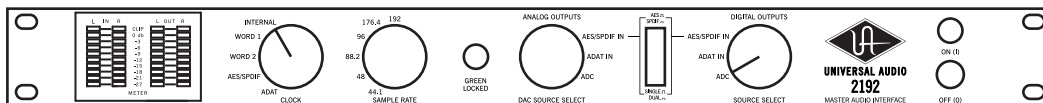
A/D conversion can be performed in either of two configurations: using the internal clock, or when the 2192 is slaved to an external clock. Each operation is detailed below.

A/D Using Internal Clock

This is the simplest use of the 2192. In this configuration, the 2192 is the master system clock.

Four word clock outputs are provided so the 2192 can be used as the master system clock without cascading the clock through external devices, which can degrade the clock signal.

To perform A/D conversion using the internal clock:



1. Connect the analog source signals to the 2192 line inputs.
2. Connect the 2192 digital output(s) to the external device digital input(s) that will receive the digitized audio signal using an appropriate digital cable(s).
3. Set the 2192 Clock knob to Internal.
4. Set the 2192 Sample Rate knob to the desired frequency.
5. Set the 2192 Digital Outputs knob to ADC.
6. Set the external digital device to synchronize to the 2192 and receive the digitized audio signal.

A/D conversion is continuous in internal clock mode.

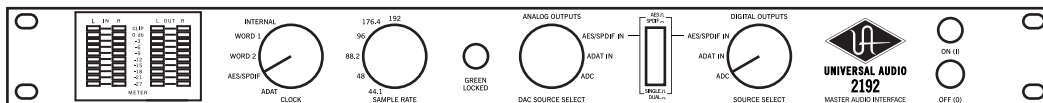
A/D Using External Clock

In this configuration, the 2192 is synchronized (slaved) to an external master digital source clock.

Two separate word clock inputs as well as AES/EBU, S/PDIF, and ADAT S-MUX can be used as clock sources for external synchronization.

In this mode, A/D conversion is accomplished at any available 2192 sample rate even if the external clock is running at a multiple or submultiple of the 2192 sample rate.

To perform A/D conversion using external clock:



1. Connect the analog source signals to the 2192 line inputs.
2. Connect the 2192 digital output(s) to the external device digital input(s) that will receive the digitized audio signal using an appropriate digital cable(s).
3. Connect the master clock source from the external device to the 2192 digital audio or BNC clock input that will receive the clock signal using an appropriate digital cable.
4. Set the 2192 Clock knob to specify the digital input that the external clock is connected to. If the Clock knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
5. Set the 2192 Sample Rate knob to the desired frequency. See page 25 for important information on sample rate selection.
6. Set the 2192 Digital Outputs knob to ADC.
7. Set the external digital device that is the destination for the digitized audio to receive the digital audio input signal.
8. Set the external master clock device to transmit digital clock.

A/D conversion is performed only when the 2192 is locked (the external clock must be running). The Locked lamp glows green when the 2192 is successfully synchronized to an external clock source.

Digital to Analog Conversion

Digital signals can be converted to analog at sampling rates between 44.1 and 192kHz. All 24-bits of the digital input signal are converted. If the digital source has less than 24-bit resolution, it's recommended that high quality dither be applied before conversion.

Any of the digital audio input sources (AES/EBU, S/PDIF, or ADAT S-MUX), or the digitized analog inputs can be converted to analog audio.

When performing D/A conversion, the 2192 sample rate must match the sample rate of the digital audio source signal.



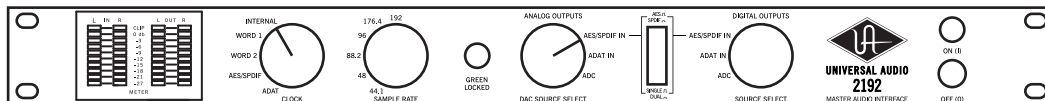
Important: Do not change any front panel knob or switch settings while D/A conversion is in process. The signal is briefly interrupted when new settings are applied.

D/A Using Internal Clock

This is the simplest use of the 2192. In this configuration, the 2192 is the master system clock.

Four word clock outputs are provided so the 2192 can be used as a master system clock source without cascading the clock through external devices, which can degrade the clock signal.

To perform D/A conversion using the internal clock:



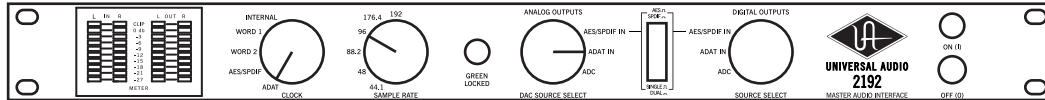
1. Connect the 2192 analog outputs to the analog inputs of the destination device (mixer, recorder, etc).
2. Connect the digital output of the external digital audio source device to the desired 2192 digital input using an appropriate digital cable.
3. Set the 2192 Clock knob to Internal.
4. Set the 2192 Sample Rate knob to match the sample rate of the digital audio source signal.
5. Set the 2192 Analog Outputs knob to select the digital audio source (AES/SPDIF or ADAT). If the source is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
6. Set the digital audio source device to synchronize to the 2192 and transmit the digital audio signal.

D/A conversion is continuous in internal clock mode.

D/A Using Digital Audio Source Clock

In this configuration, the 2192 is synchronized to the clock signal that is imbedded within the digital audio signal that is being converted to analog.

To perform D/A conversion using the digital audio source clock:



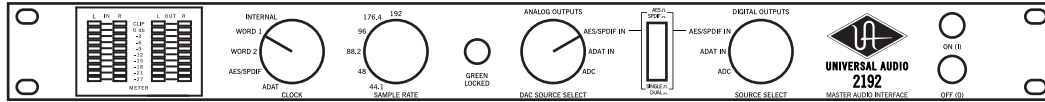
1. Connect the 2192 analog outputs to the analog inputs of the destination device (mixer, recorder, etc).
2. Connect the digital output of the external digital audio source device to the desired 2192 digital input using an appropriate digital cable.
3. Set the 2192 Clock knob to specify the digital input that the digital audio source signal is connected to (AES/SPDIF or ADAT). If the Clock knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
4. If the digital source is ADAT, use the Sample Rate Select knob to select the appropriate S-MUX format: 44.1 and 48 select standard 1x mode, 88.2 and 96 select 2x mode, and 176.4 and 192 select 4x mode. If the digital source is AES/SPDIF, the Sample Rate Select knob has no effect.
5. Set the 2192 Analog Outputs knob to the same digital setting as in step 3.
6. Set the digital audio source device to transmit digital audio. The source device must be set to use its internal clock, or set to synchronize to an external clock master.

D/A conversion is performed only when the 2192 is locked (the external clock must be running). The Locked lamp glows green when the 2192 is successfully synchronized to an external clock source.

D/A Using External BNC Word Clock

In this configuration, D/A conversion is accomplished while the 2192 is synchronized to one of the two independent BNC Word Clock inputs.

To perform D/A conversion while synchronized to Word Clock:



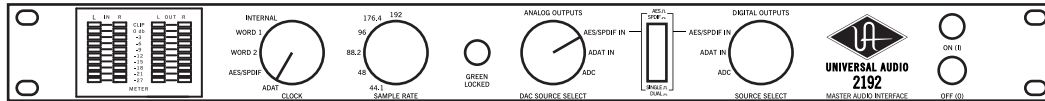
1. Connect the 2192 analog outputs to the analog inputs of the destination device (mixer, recorder, etc).
2. Connect the digital output of the external digital audio source device to the desired 2192 digital input using an appropriate digital cable.
3. Connect the Word Clock output of the external master clock source to the 2192 Word Clock input 1 (or Word Clock input 2) using an appropriate digital BNC cable.
4. Set the 2192 Clock knob to Word 1 (or Word 2).
5. Set the 2192 Sample Rate knob to the appropriate range to match the digital audio source sample rate. The selected clock rate is now available on the BNC Word Clock outputs for synchronizing external devices.
6. Set the 2192 Analog Outputs knob to specify the digital input that the digital audio source signal is connected to (AES/SPDIF or ADAT). If the Analog Outputs Source Select knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
7. Set the external word clock device to transmit word clock. It can be set to transmit a multiple or submultiple of the sample rate if necessary. For example, a 48kHz clock can be used with 96kHz digital audio and vice versa.
8. Set the digital audio source device to transmit digital audio.
9. Set the digital audio source device to synchronize to either the external clock master, or to the clock output of the 2192. If the digital audio sample rate is a multiple/submultiple of the external clock rate, use the clock outputs from 2192 for the digital audio source device.

D/A conversion is performed only when the 2192 is locked (the word clock must be running) and digital audio is present at the digital input. The Locked lamp glows green when the 2192 is successfully synchronized to an external clock source.

D/A Using ADAT Clock with AES/SPDIF Audio

In this configuration, D/A conversion is accomplished on an AES/EBU or S/PDIF digital audio signal while the 2192 is synchronized to the clock at the ADAT input. The audio portion (if any) of the ADAT signal used as the clock source is ignored.

To perform AES or SPDIF D/A while synchronized to ADAT clock:



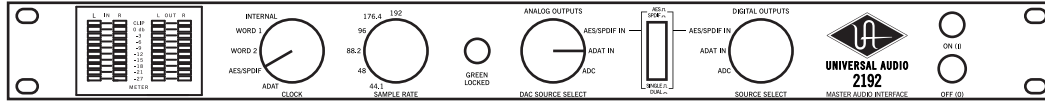
1. Connect the 2192 analog outputs to the analog inputs of the destination device (mixer, recorder, etc).
2. Connect the digital output of the external digital audio source device to the desired 2192 digital input using an appropriate digital cable.
3. Connect the digital output of the external ADAT device that contains the digital clock signal to the 2192 ADAT input using an appropriate optical cable.
4. Set the 2192 Clock knob to ADAT.
5. Set the Sample Rate Select knob to the appropriate rate to match the AES/SPDIF digital audio sample rate. The selected clock rate is now available on the BNC Word Clock outputs for synchronizing external devices.
6. Set the 2192 Analog Outputs knob to AES/SPDIF. Use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
7. Set the external ADAT device to transmit digital clock.
8. Set the AES/SPDIF source device to transmit digital audio.
9. Set the AES/SPDIF audio source device to synchronize to either the external ADAT clock master, or to the clock output of the 2192. If the digital audio sample rate is a multiple/submultiple of the external clock rate, use the clock outputs from 2192 for the digital audio source device.

D/A conversion is performed only when the 2192 is locked (the external clock must be running) and digital audio is present at the digital input. The Locked lamp glows green when the 2192 is successfully synchronized to an external clock source.

D/A Using AES/SPDIF Clock with ADAT Audio

In this configuration, D/A conversion is accomplished on an ADAT digital audio signal while the 2192 is synchronized to the clock of an AES/EBU or S/PDIF signal. The audio portion (if any) of the external AES/SPDIF signal used as the clock source is ignored.

To perform ADAT D/A while synchronized to AES or SPDIF clock:



1. Connect the 2192 analog outputs to the analog inputs of the destination device (mixer, recorder, etc).
2. Connect the optical output of the external ADAT digital audio source device to the 2192 ADAT input using an appropriate optical cable.
3. Connect the digital output of the external AES/SPDIF device that contains the digital clock signal to the desired 2192 digital input using an appropriate digital cable.
4. Set the 2192 Clock knob to AES/SPDIF. Use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
5. The 2192 Sample Rate is defined by the AES/SPDIF digital input (the Sample Rate knob is ignored). This rate is now available on the BNC Word Clock outputs for synchronizing external devices.
6. Set the 2192 Analog Outputs knob to ADAT.
7. Set the external AES/SPDIF device to transmit digital clock.
8. Set the ADAT digital audio source device to transmit digital audio.
9. Set the ADAT audio source device to synchronize to either the external clock master, or to the clock output of the 2192.

D/A conversion is performed only when the 2192 is locked (the external clock must be running) and digital audio is present at the digital input. The Locked lamp glows green when the 2192 is successfully synchronized to an external clock source.

Transcoding

The 2192 can transcode (convert) digital audio data between AES/EBU, S/PDIF, and ADAT S-MUX formats in realtime. The transcoded digital audio input signal is output to all of the other digital audio outputs simultaneously.

Transcoding can be performed using any of the available clock sources. The 2192 does not perform sample rate conversion.

Note: You cannot clock to S/PDIF while listening to AES/EBU or vice versa.

To hear analog audio during transcoding, set the Analog Outputs knob to the digital audio source.

Transcoding can be performed using either the internal clock, the digital audio source clock, or an external clock master. Each operation is detailed below.

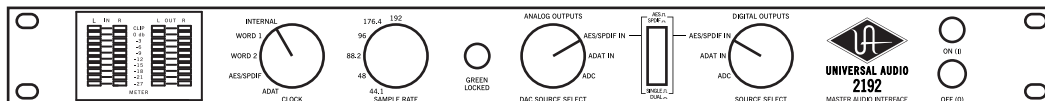


Important: Do not change any front panel knob or switch settings while transcoding is in process. The signal is briefly interrupted when new settings are applied.

Transcoding Using Internal Clock

In this configuration, the 2192 is the master system clock.

To perform transcoding using the internal clock:



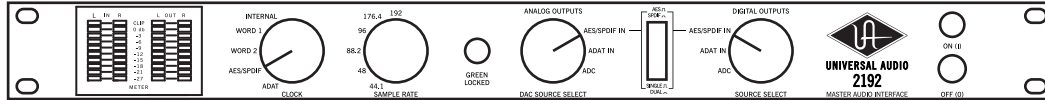
1. Connect the digital output from the external digital audio source device to the desired 2192 digital input using the appropriate digital cable.
2. Connect the 2192 digital output(s) to the digital input(s) on any external device(s) that will receive the transcoded digital audio signal using the appropriate digital cable(s).
3. Set the 2192 Clock knob to Internal.
4. Set the 2192 Sample Rate knob to match the sample rate of the digital audio source signal.
5. Set the 2192 Digital Outputs knob to the digital audio source input (AES/SPDIF or ADAT). If the Digital Outputs knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
6. Set the digital audio source device to transmit digital audio and to synchronize to either the external master clock or to the 2192.

Transcoding is continuous as long as the digital audio source is transmitting.

Transcoding Using Digital Audio Clock

In this configuration, the 2192 is synchronized to the clock signal that is imbedded within the digital audio source signal that is being transcoded.

To perform transcoding using the digital audio source clock:



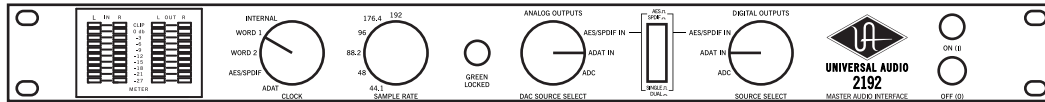
1. Connect the digital output from the external digital audio source device to the desired 2192 digital input using the appropriate digital cable.
2. Connect the 2192 digital output(s) to the digital input(s) on any external device(s) that will receive the transcoded digital audio signal using the appropriate digital cable(s).
3. Set the 2192 Clock knob to specify the digital audio source input (AES/SPDIF or ADAT). If the Clock knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
4. Set the 2192 Digital Outputs knob to the same digital source selected in step 3.
5. Set the digital audio source device to transmit digital audio. The source device must be set to use its internal clock, or set to synchronize to an external clock master.

Transcoding is continuous as long as the digital audio source is transmitting.

Transcoding Using Alternate Clock

In this configuration, the 2192 is synchronized to an external clock master. The digital audio source device can be synchronized to the same clock, or to the 2192.

To perform transcoding while using an alternate source clock:



1. Connect the digital output from the external digital audio source device to the desired 2192 digital input using the appropriate digital cable.
2. Connect the 2192 digital output(s) to the digital input(s) on any external device(s) that will receive the transcoded digital audio signal using the appropriate digital cable(s).
3. Connect the digital output from the external device that is generating the digital clock signal to the desired 2192 digital input using the appropriate digital cable.
4. Set the 2192 Clock knob to specify the digital input connected to the digital clock source (Word 1, Word 2, AES/SPDIF or ADAT). If the Clock knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF.
5. Set the 2192 Digital Outputs knob to control to specify the digital input that the digital audio source signal is connected to (AES/SPDIF or ADAT). If the Digital Outputs knob is set to AES/SPDIF, use the AES/SPDIF switch to specify AES/EBU or S/PDIF. *Note: You cannot clock to S/PDIF while listening to AES/EBU or vice versa.*
6. Set the external master clock device to transmit digital clock.
7. Set the digital audio source device to transmit digital audio and to synchronize to either the external master clock or to the 2192.

Transcoding is performed only when the 2192 is locked (the external clock must be running) and digital audio is present at the digital input. The Locked lamp glows green when the 2192 is successfully synchronized to an external clock source.

Diagrams

Frequency Response

Universal Audio, Inc.

2192 Analog to A/D to D/A to Analog,
Fs=192kHz, +4dBu, Frequency Response

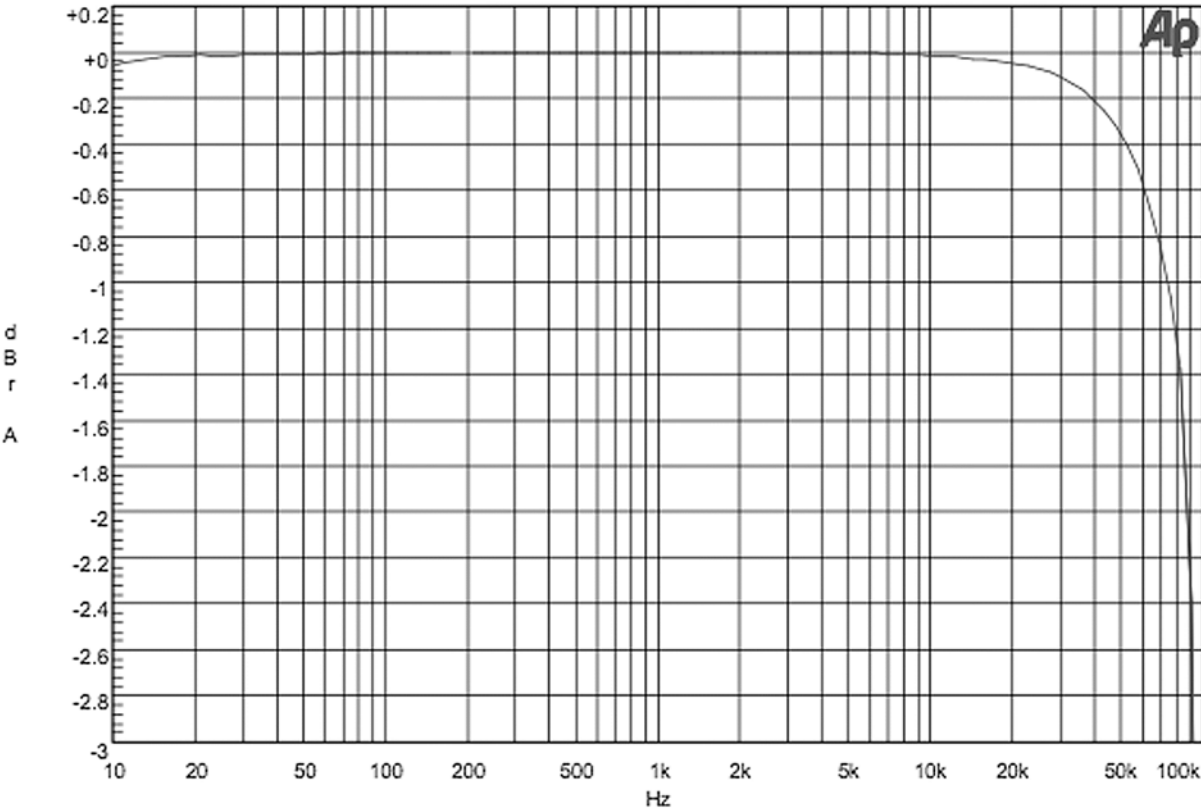


Figure 5: Frequency Response

Dynamic Range: A/D

Universal Audio, Inc. 2192 A/D Converter Spectrum, 1kHz, -38dBu (-60dBFS) Input
Fs=96kHz

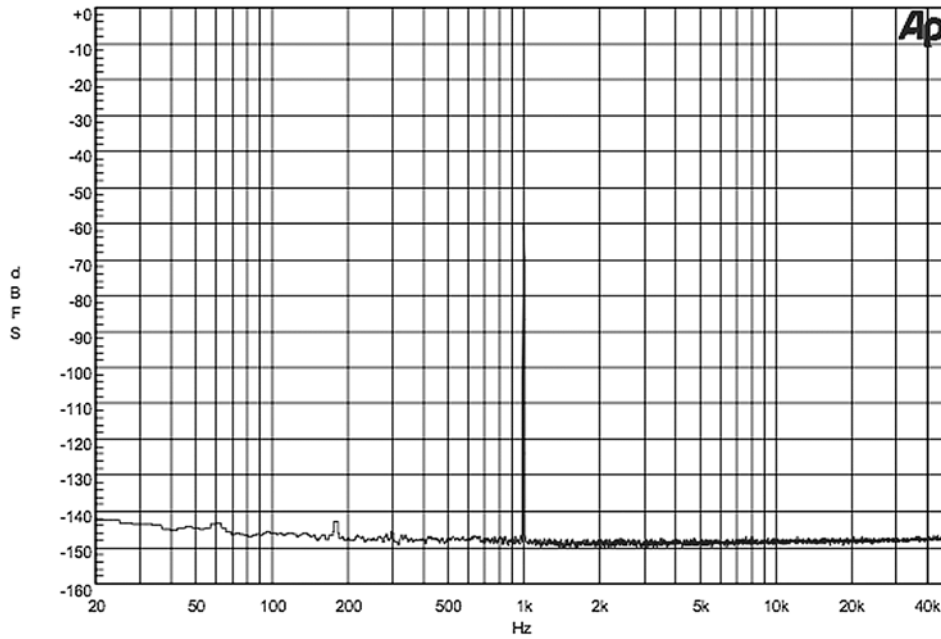


Figure 6: A/D Dynamic Range

Dynamic Range: D/A

Universal Audio, Inc. 2192 D/A Converter Spectrum, 1kHz, -60dBFS (-38dBu) Output
Fs=96kHz

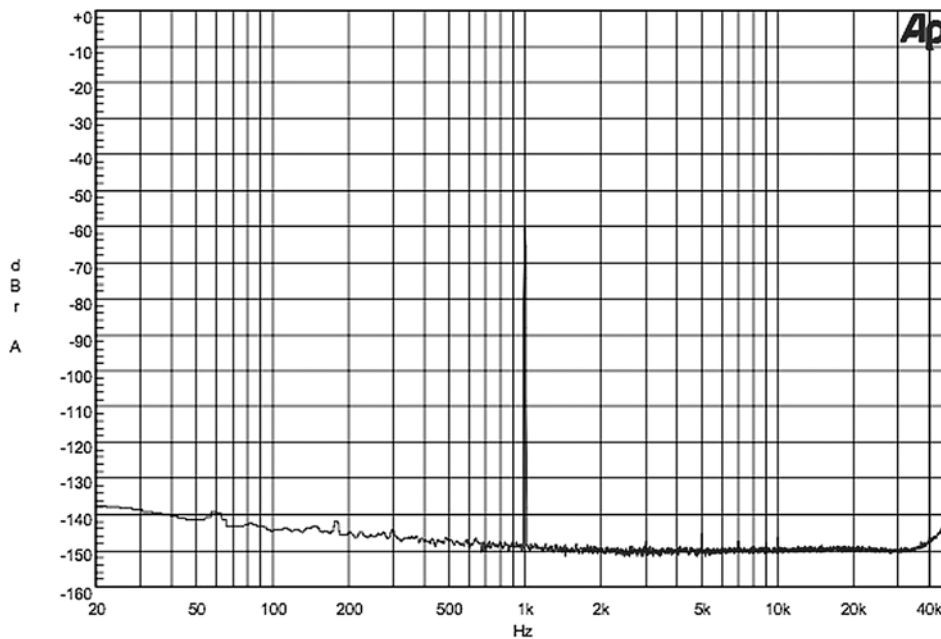


Figure 7: D/A Dynamic Range

Mastering Setup

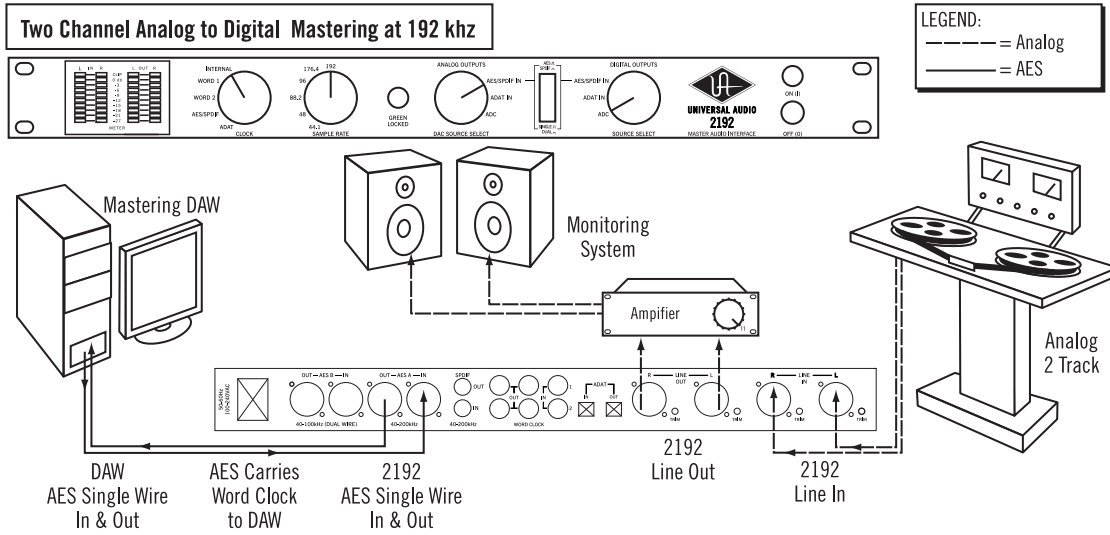


Figure 8: Typical Mastering Setup

Digital Audio Workstation Setup

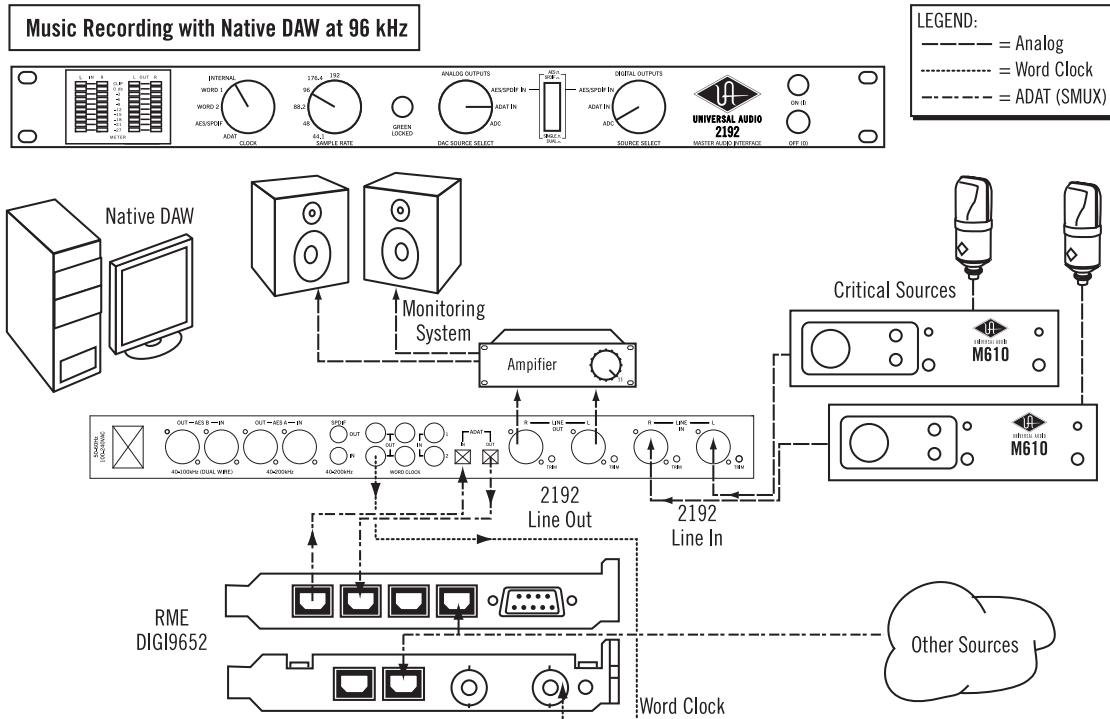


Figure 9: Typical DAW Setup

8-Channel Pro Tools Setup

Eight Channel Analog to Digital Transfer at 96 kHz Using Pro Tools | HD

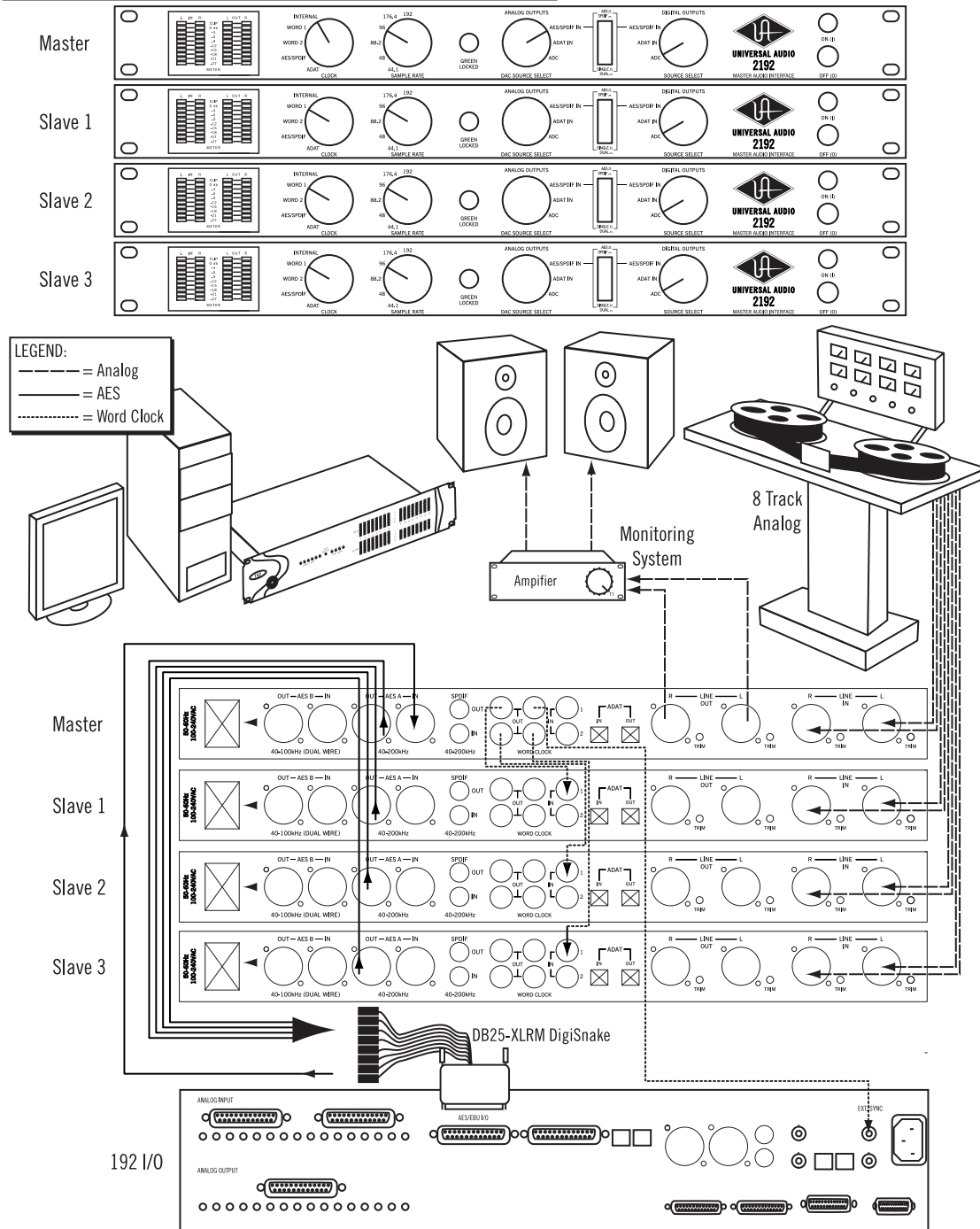


Figure 10: Typical Pro Tools HD Setup

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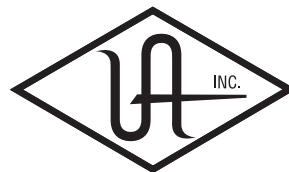
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