LAVRY ENGINEERING

Model M•DA-824
Digital-to-Analog Converter

Quick-Start Guide
Version 2.0

OVERVIEW-

The M•DA-824 is a two-channel module that converts digital audio to analog audio with word-lengths of 16, 20 or 24 bits at sample rates of 44.1, 48, 88.2, or 96 kHz.

The M•DA-824 always clocks to the incoming digital audio signal (external clock). It can lock to standard sample rate frequencies (44.1, 48, 88.2 or 96 kHz) in CrystalLock™ or Narrow modes. When locked to an external source in Wide mode, the module can accommodate vari-speed frequencies in the ranges of 42-100 kHz.

The construction of the 4496 system is a modular design. Each module has a front panel and a rear panel that are directly in-line with each other from front to back in the 4496 chassis.

GETTING STARTED-

The power supply in the 4496 operates on an input voltage between 90-264 VAC at 47-63 Hz. The power supply automatically adjusts to an AC input in this range- there are no settings to change.

We recommend that you take the unit out of its box and plug in the power cable. It's easier to use these instructions while working with the unit in front of you.

1.) Connect the ANALOG OUTPUT CABLES to the M•DA-824.

Looking at the back of the 4496, each M•DA-824 module has a group of three XLR connectors. In each group, the LEFT OUTPUT is the **right** male XLR and the RIGHT OUTPUT is the **left** male XLR connector. The female XLR is the digital input.

This "mirror image" position of the analog outputs is due to the straight-through construction of the modules. Facing the front of the 4496, the Left channel is on the LEFT and the Right channel is on the RIGHT side of each module's PC board.

The 4496 is configured at the factory with the audio XLR outputs of the M•DA-824 set for electronically balanced line level operation (nominal +4dBm). **DO NOT CONNECT Pin 2 or Pin 3 to Pin 1 in the XLR for unbalanced operation without first setting the internal jumpers. Doing so will may cause distortion, although the amplifiers are protected against damage from short-circuit.**

For **unbalanced operation**, you will need to set the analog output mode by positioning the user-selectable jumpers J2, J3, J4 and J5 inside the 4496. After opening the top cover, they are visible near the back of the module's PC board next to each XLR output connector. Jumper positions (left or right) are viewed looking at the module's PC board with the front of the 4496 facing towards you. There are 3 pins on each jumper block. Choose the mode for each channel by selecting which position these jumpers will be in: if "Left" - jumper the left and center pins, if "Right" - jumper the right and center pins.

Analog Output Mode	**J2**	**J3**	**J4**	**J5**
Balanced output (as shipped from factory)	Left	Left	Left	Left
Unbalanced Output – Pin 2 active, Pin3 to ground	Left	Right	Left	Right
Unbalanced Output – Pin 3 active, Pin2 to ground	Right	Left	Right	Left

• *See the* M•DA-824 SETTINGS *section of the 4496 Operations manual for jumper location.*
• The Polarity of the output is set with the front panel switch (see #4 below).

•PLEASE NOTE: Pin 1 of each XLR is always grounded, to provide driver-side shield ground. It is highly recommended to **have only the cable shield connected to Pin 1 for proper cable shield connection**. Lavry Engineering does not recommend using Pin 1 as signal return for unbalanced configuration, thus all the jumpers J2-J5 should be on the board in their proper selected position and the shield should be connected on the XLR end of the cable.

2.) Connect the DIGITAL INPUT CABLE to the M•DA-824.

The Digital input of the M•DA-824 is AES digital format, which is a 110 ohm balanced 5V standard. The input is compatible with SPDIF format (75 ohm unbalanced), and can be "adapted" by using a simple adapter cable or "barrel" adapter from RCA to XLR. In some cases it may be necessary to use a transformer or simple electronic "level shifting" interface designed for this propose, but this usually not necessary. Because the AES input is transformer coupled, the signal MUST connect to pin 2 and pin 3 of the XLR connector. It is also OK to connect either Pin 3 or Pin 2 to Pin 1 (but not *both*) in the XLR connector that plugs into the AES input ONLY.

DO NOT connect Pin 1 to Pin 2 or Pin 3 of the **AUDIO** XLR's for unbalanced operation without setting the internal jumpers first! Please see Section 1 (above) for details.

Interface Standard/ Connector type	Signal +	Signal -	Shield
AES XLR	Pin 2*	Pin 3*	Pin 1
SPDIF RCA	Center Pin	Outer Contact	Outer Contact

*Please Note: Because the AES/SPDIF signal is "polarity independent," Pin 2 and Pin 3 can be interchanged in the wiring scheme.

3.) Choose the LOCK MODE.

Use the front panel switch to choose the lock mode that is best suited for your source. Both CrystalLock™ and Narrow modes have a fixed "propagation delay" and are recommended for multi channel operation.

• Because the M•DA-824 locks to the incoming AES/SPDIF signal, 4496 units with more than one M•DA-824 module can convert stereo pairs asynchronously at different sample rates. For example, you can compare a 44.1 kHz CD player output to a 96 kHz DAW output using two M•DA-824's and external analog monitor switching.

Choose **CrystalLock™** to activate specialized hardware to provide almost total jitter elimination from the incoming digital signal. This proprietary circuit utilizes a temporary buffer memory and a DSP controlled instrumentation digital-to-analog converter to effectively "re-clock" the incoming data to a vastly more stable internal crystal clock. The result is extremely low distortion and transparent imaging, even if the source is especially "jittery."

Choose **Narrow Lock** to reduce the sampling frequency input range to lock to signals within +/- 100ppm (parts per million) around a fixed rate (44.1, 48, 88.2 or 96 kHz). Narrow lock operation provides improved jitter rejection over Wide Lock when operating with a known fixed frequency.

Choose **Wide Lock** for applications requiring non-standard sample rates, including most normal varispeed operations. It allows the sampling rate to run automatically between 42-50 kHz or 84-100 kHz. The indicators for 44.1 **AND** 48 kHz light to indicate non-standard frequencies in the 42-50 kHz range, and the 88.2 **AND** 96 kHz indicators light to indicate non-standard frequencies in the 84-100 kHz range.

About Sample Rate and Lock Indicators -

The converter automatically detects the incoming sample rate and displays it via one of the 4 LED indicators marked as 44.1, 48, 88.2 or 96 kHz in CrystalLock™ and Narrow modes or two LED's in Wide mode (See "Choose the Lock Mode " above for details). The LOCK LED indicates that the module is locked to a digital input. The LOCK indicator **flashing** indicates that a **signal is not present or an unlocked condition exists** (such as no signal or a missing cable at the digital input, or out-of-range sample frequency).

4.) Set the POLARITY SWITCH.

This front panel switch, with positions marked as "Pin 2 +" and "Pin 3 +", provides the ability to invert the signal polarity**.** When set to "Pin 2 +", a increasing value (positive slope) of the digital input's waveform causes the voltage on Pin 2 of the XLR analog output to increase, and the voltage on Pin 3 to decrease. The opposite is true with the "Pin 3 +" switch setting.

The setting for this switch that matches the way the **M•AD-824 Analog to Digital** converter is configured at the factory using its internal DIP switch is: "**PIN 2 +**".

• **Please don't confuse the function of the polarity switch with the Balanced or Unbalanced configuration of the Analog Outputs.** It is switched electronically before the output stage; so it does not physically change the connections to the XLR pins, and functions the same regardless of the Balanced or Unbalanced configuration.

• For more information on this subject, see the document entitled "Polarity, Balanced and Unbalanced Operation" under the SUPPORT tab at www.lavryengineering.com.

5.) Adjust the OUTPUT GAIN.

Individual front-panel **volume controls** (20 turn potentiometers for each channel) provide 24dB's of adjustment range for the analog outputs. These are located in the lower left and right corners of the front panel and are marked "L" and "R." For balanced outputs, this means a full scale digital signal "0dBFS"can be set for analog output levels in the range from 0dBu to +24dBu, and for unbalanced operation "0dBFS"can be set for analog output levels in the range from –6dBu to +18dBu. The factory setting is "0dBFS" digital level equals +24dBu.

Typically you would set the M•DA-824 reference levels for "Unity Gain" so all the levels used during recording and playback are matched. This means with no gain adjustment in the digital domain, the same analog reference level that was used to set up the A-to-D converter would be reproduced by the analog outputs of the M•DA-824.

• FOR EXAMPLE: **If you used a "0dB VU" tone* to align the A-to-D:** plug the AES output of the A-to-D into the AES input of the M•DA-824**.** Adjust the analog output of the M•DA-824 so that the same analog level tone reads "0dBVU" on an external meter (for example the 2-track return on a mixer). Or you can use a digital 1kHz tone source at "-14dBFS" (or whatever your reference level is) to feed the M•DA-824. The important point is that the same analog and digital reference levels are used to calibrate the A-to-D and the D-to-A.

* "0dBVU" on a VU meter corresponds to +4dBu. The A-to-D converters' analog input is typically set for this to correspond to "–14dBFS" digital level or 14dB's below "peak" or clipping level in the digital domain. Individual digital "Reference Levels" will vary from studio to studio. Please see the 4496 manual for information on the "Reference Meter" setting of the **M•AD-824.**

• An alternative method is to use a "0dBFS" full-scale digital tone to establish clipping level when feeding inputs that have "clipping" indicators or simple LED meters. Use caution and be sure the monitor volume is low before raising the volume of your tone or music source to "0dBFS" or in other words "digital clipping level."
1.) Using a digital tone, set the level of the tone to "0dB."If you are using a mono music source, raise the level of the output fader so the music peaks cause digital "clip" indications in your recording software mixer output section.
2.) Adjust the analog output level using the M•DA-824 trimmers until the "clipping" indicators on the analog inputs they are feeding illuminate.
3.) Reduce the output level of the M•DA-824 by turning the trimmers down at least one-half turn below the point where the clipping indicators no longer illuminate.
4.) Using a level control that affects both outputs equally from the music software (for example the master output fader or the level setting for a tone) reduce the level until the top segment of the analog input's meters just turn "off." Check to make sure that this happens at the same level on both channels by raising and lowering the digital source level a small amount. If it does not, adjust one of the trimmers on the M•DA-824 so that both channels turn the top segment of the meter "On and Off" at the same time when you raise and lower the level the digital source. This will help insure that the left and right output level of the M•DA-824 is balanced.
5.) It is a good idea to re-check the clipping level (steps 1-3 above) to be sure the balance adjustment did not change the gain enough to cause clipping.

YOU NEED TO KNOW . . .

The flexibility of the LavryBlue 4496 chassis allows up to 4 single width modules to be in different slots within the frame with some restrictions:
If the unit has an M•AD-824 A-to-D module, it must be in the leftmost slot, and an M•SYNC module is required. The M•SYNC panel replaces the logo panel in the leftmost position on the front of the 4496. Users can install additional M•AD-824's in the adjacent slot(s) to the immediate right of the first M•AD-824 module. Other converter modules can then be added to the right of the last M•AD-824, including one or more M•DA-824's. In systems with one or two converter modules, a MicPre can be added to the right of the converter modules.
MicPre's are doublewide modules, and take up two "slots."

Lavry Engineering is required to install the first M•AD-824 module and MSYNC in the 4496 chassis. There are a number of critical calibrations that are part of this procedure. Your dealer can provide assistance or contact Lavry Tech Support: techsupport@lavryengineering.com