

WA-2A

OPTICAL TUBE COMPRESSOR

Revision 1.1



WARMTM
AUDIO

THANK YOU!

REGISTER YOUR WA-2A

Before we begin, please take the time to visit www.warmaudio.com to register your product. To ensure you receive proper and uninterrupted warranty support for your product, please register your unit within 14 days from purchase.

Thank you for purchasing the Warm Audio WA-2A Leveling Amplifier. We feel this product offers the best in terms of the sound, function, and vibe from the classic era of analog recording. We don't cut corners when it comes to what goes into our products, and the WA-2A is no exception. The WA-2A uses the highest quality custom input and output transformers made by Cinemag Transformers USA. The WA-2A also uses premium grade tubes, and a T4B optical module made by Kenetek USA, which is considered by many to be the world's finest. We are confident you will love recording with the WA-2A.

Welcome Back To the World Of Analog

Though digital technology and software have made great strides in their performance in recent years; we still feel that nothing compares to the level of articulation, depth, realism, and responsiveness of a well-built piece of analog gear. When you hear the bottom end presence and top end detail of quality analog gear, the difference can be astounding. The cost of most boutique analog equipment is financially out of reach for many recording artists. Our mission is to change this, and introduce as many people as we can to recording and mixing with real, dedicated hardware. Whether this is the first piece of outboard gear you've ever purchased outside of a recording interface, or merely the first in a long time; we thank you, and welcome you back to the world of analog.

Bryce Young

President

Warm Audio

Liberty Hill, Texas USA

WARRANTY STATEMENT

Warm Audio warranties this product to be free from defect in materials and workmanship for one year from the date of purchase, for the original purchaser to whom this equipment is registered. This warranty is non-transferrable.

This warranty is void in the event of damage incurred from unauthorized service to this unit, or from electrical or mechanical modification to this unit. This warranty does not cover damage resulting from abuse, accidental damage, misuse, improper electrical conditions such as mis-wiring, incorrect voltage or frequency, unstable power, disconnection from earth ground (for products requiring a 3 pin, grounded power cable), or from exposure to hostile environmental conditions such as moisture, humidity, smoke, fire, sand or other debris, and extreme temperatures.

Warm Audio will, at its sole discretion, repair or replace this product in a timely manner. This limited warranty extends only to products determined to be defective and does not cover incidental costs such as equipment rental, loss of revenue, etc. Please visit us at **www.warmaudio.com** for more information on your warranty, or to request warranty service.

This warranty applies to products sold in the United States of America. For warranty information in any other country, please refer to your local Warm Audio distributor. This warranty provides specific legal rights, which may vary from state to state. Depending on the state in which you live, you may have rights in addition to those covered in this statement. Please refer to your state laws or see your local Warm Audio retailer for more information.

NON-WARRANTY SERVICE

If you have a defective unit that is outside of our warranty period or conditions; we are still here for you and can get your unit working again for a modest service fee. Please visit us at **www.warmaudio.com** to contact us about setting up a repair or for more information.

With the proper care, your Warm Audio gear should last a lifetime and provide a lifetime of enjoyment. We believe the best advertisement we can have is a properly working unit being put to great use. Let's work together to make it happen.

CHAPTER 1: NOW LET'S GET STARTED!

HARDWARE CONTROLS — FRONT PANEL



Power Switch

This switch powers the WA-2A on and off

Limit/Compress Switch

In Compress mode, the WA-2A operates as a signal compressor with a compression ratio that is fixed but also somewhat source-dependent. In Limit mode, the ratio of the copressor is raised much closer to infinity, allowing the WA-2A to behave more like a hard limiter. The difference between these settings can be subtle with lower amounts of gain reduction; but become more audible with heavier amounts of compression.

Output Gain

This control adjusts the amount of makeup gain applied to the output. The WA-2A has approximately 40 dB of available gain. In practical use, this is generally much more gain than required; and care should be taken to start off at a safe recording level, adjusting as needed.

Peak Reduction

This control adjusts the amount of compression applied by the WA-2A, by raising or lowering the compression threshold. The WA-2A can apply as much as nearly 40 dB of gain reduction. In practical use, 40 dB of gain reduction would be more than what may be considered musical or transparent; however, this much compression can be useful as a creative effect or used in parallel with an uncompressed or differently compressed track (more on this will be discussed later in the manual). As a general rule, we suggest to start with a moderate amount of peak reduction and adjust further by ear to achieve the desired amount of compression.

Though the WA-2A does not have a true bypass; a soft-bypass can be achieved by turning Peak Reduction fully counterclockwise. The audio signal will pass through the unit's transformers and tube stages, providing a subtle amount of sheen and warmth.

Meter Select

This control selects what information is conveyed by the VU meter; gain reduction, output measured at +10dB above meter, or output measured at +4dB above meter. +4dB is an industry-standard measurement; however a +10dB scale can help the VU meter to convey more dynamic information within louder signals by providing the VU meter additional 'headroom' to operate in.

HARDWARE CONTROLS — BACK PANEL



AC Power Input

Connect the included IEC grounded power cord to your unit here.

Voltage Selector

The WA-2A can operate at 115vAC (60hz) or 230vAC (50hz), depending on the position of the Voltage Selector switch. Before connecting power or powering on your unit, use this switch to select the correct voltage for your location.

Grounding Lug

This provides a chassis ground connection for the WA-2A, a common feature on many pieces of vintage recording equipment. This type of ground terminal is rarely used in a modern studio setting due to earth-grounded (three pin) AC being the norm in most parts of the world. We include this feature mostly for legacy compliance; for normal and safe operation, your WA-2A should receive earth ground via the ground pin of your IEC power cable.

Meter Adjust

This control allows you to calibrate your VU meter. To calibrate the VU, be sure that your unit is powered on, that no audio input or output or stereo link cable is connected, and that both gain and peak reduction are turned down. Set Meter Select switch to Gain Reduction, and adjust the meter until the needle rests at 0 dB.

Pre-Emphasis

This control adjusts the sidechain audio that directs the optical module to compress. Set to 'Standard', the sidechain audio is set 'flat' and the opto module responds to peaks across the full bandwidth of the audio source in a normal manner. As you move the control counterclockwise, the WA-2A will become less responsive to high frequency transients. This control does not change the tone or the bandwidth of the actual audio output; but merely the sidechain audio that the opto module responds to. This control is not exactly like the type of low pass filter sidechain one may find on other compressors, though the effect can be somewhat similar. Sidechain Pre-Emphasis actually has its origins in the world of FM radio broadcast, and in how audio signals are processed to be prepared for transmission. We've maintained the legacy feature because it can still serve a creative purpose in the world of modern recording.

For example, it can be useful, depending on the program material, in preventing the compressor from 'over-reacting' to low frequency information, for dialing in the right amount of compression for voice, for reducing sibilance, and other applications.

Stereo Link

This control allows two units to operate in stereo mode, with a shared threshold response. This is done by blending the sidechain signal (sometimes referred to as control voltage) of both units via a standard TRS ¼ patch cable. A sidechain is a signal which, while not directly in the audio path, informs the gain reduction circuitry of a compressor on how to process audio. Stereo link is useful for accurate tracking of a stereo instrument such as keyboard, sampler, or drum machine, or accurate processing of a stereo bus in a mix. Stereo link operation does not disable any front panel control, and care should be taken to keep the units set the same as well as level matched via the Output Gain control, in order to have a good stereo image. To that end, care should also be taken that the stereo signal sent into two WA-2A's is as even in volume and dynamic character as can be made. When not operating in stereo mode, the control should be set to 'Stand-Alone'.

A word on stereo image and stereo image shift.

Before we move on to calibrating the unit for stereo use, it's important to define, for the sake of this discussion, what stereo image shift is, and why it should usually be prevented. Contrary to popular belief, stereo image shift is not the result of improper panning or the result of some transient peak activity being unique to only one side of stereo signal. Those are separate issues which may or may not require attention at an earlier stage of production. Stereo image shift, in the context of this discussion, is the result of one channel of a dynamics processor behaving differently on one side of a stereo field than on the opposing side. This can have the effect of collapsing a stereo image; proper stereo image requires both channels of a stereo compressor to act in concert with one another, regardless of what the source material is doing.

The WA-2A has the capability to allow you to do essentially three different things with a pair of units.

- 1.** Two units can operate as autonomous, stand-alone units.
- 2.** Two units can operate as a stereo pair, sharing a summed or intentionally re-calibrated sidechain signal.
- 3.** Two units can operate as a stereo unit that compresses two audio signals based entirely on the sidechain signal of one unit (ducking).

To calibrate for stereo use, follow these steps

- 1.** Calibrate the meter of both units. Make sure there is no audio input, set Meter Select switch to Gain Reduction, and calibrate meter to Odb via the Meter Adjust control on the rear.
- 2.** Connect a balanced (tip, ring, sleeve) ¼ inch patch cable between both units, via the Stereo Link Input Jack on both units. The cable should be short, ideally no more than 2ft.
- 3.** Start with both Stereo Link controls set to Stand-Alone. The units will share a common sidechain voltage merely by connecting the TRS patch cable, and the Stereo Link adjust will act as a means to fine-tune for any minor differences between the response of two units. As the knob is turned clockwise, the control will subtract sidechain level from the unit being adjusted, and add sidechain level to the opposing unit. If there stereo signal going into both units is extremely close

in nature already, it is common for little or no adjustment to be needed. It is good to reference the WA-2A's gain reduction in Stereo Mode to the amount of gain reduction it performs on the same input material in Stand Alone mode (link cable removed). If the amount of gain reduction in Stereo Mode is heavier than when in Stand Alone mode (link cable removed), the Stereo Link Adjust can be used to reduce the sidechain level. Sidechain signal is generated by raising the Peak Reduction control of a given unit. Normally, on a stereo source, you will want both units to have the same level of Peak Reduction applied, in order to create a sidechain signal that is summed of equal parts left and right; however, by setting peak reduction only on one unit, a type of 'ducking' effect can be produced where the two compressors only respond to the sidechain signal of the unit in which Peak Reduction is applied. In this scenario, one unit would be considered a 'master' unit, with the second unit following its direction. In other words, both units would only respond to a transient peak received by the master unit. In a normal stereo situation, there would be no master unit; as the sidechain signal of both units would be equally summed. In other words, both units would respond evenly to a transient peak that occurred on either the left or the right channel. Typically, this is ideal for stereo bus use.

4. With a test signal or music running into both units, begin to turn up Peak Reduction on both units until you see gain reduction being displayed on the VU meters. Both meters should normally track very close to one another, if the meters are calibrated and if Peak Reduction is set identically on both units. If there is a visible difference in gain reduction, the Stereo Link Adjust control can be used to compensate for this.

The two units will now operate as a stereo-linked pair. To return units to normal operation, simply remove the Stereo Link cable and check that the Stereo Link controls for both units have been returned to the Stand Alone position.

Stereo Link Input Jack

Connect 2 WA-2A units together using this jack, with one shielded TRS (balanced, 3 pin) ¼ inch patch cable, of no more than two feet in length.

Balanced Output

This connection provides a transformer-coupled, balanced, line level output for the WA-2A via both XLR and ¼ inch TRS. The outputs are wired in parallel, and it is not recommended to use both outputs at the same time. For unbalanced operation, short XLR pin 3 to pin 1 on your XLR cable via a jumper (requires soldering), or simply use an unbalanced (mono) ¼ inch TS patch cable, which effectively creates the same configuration.

Balanced Input

This connection provides a transformer-coupled, balanced line level input for the WA-2A via both XLR and ¼ inch TRS. The inputs are wired in parallel, and may not be used simultaneously. For unbalanced operation, short XLR pin 3 to pin 1 on your XLR cable via a jumper (requires soldering), or simply use an unbalanced (mono) ¼ inch TS patch cable, which effectively creates the same configuration.

CHAPTER 2: TECHNICAL SPECIFICATIONS

line level, transformer balanced input	600 ohms impedance pin 2/tip=positive, pin 3/ring=negative, pin 1/sleeve=ground
line level, transformer balanced output	600 ohms impedance pin 2/tip=positive, pin 3/ring=negative, pin 1/sleeve=ground
frequency response	+/- 1 DB, 15 HZ TO 20KHZ
maximum gain	+40 dB \pm 1dB
maximum peak reduction	-40 dB \pm 3dB
input level	+16 dB maximum
output level	+10 dB nominal, +16 dB maximum
distortion	Less than 0.1% THD at \pm 10 dBm
noise	-74dB
attack time	10 milliseconds
release time	0.06 seconds for 50% release; 0.5 to 5 seconds for complete release
tube compliment	2x 12AX7, 1x 12BH7, 1x 6P1 (compatible with 6aQ5, 6005, and 6N1N)
optical attenuator	Kenetek T4B module (socketed) (compatible with T4A, T4B, and T4C modules per standard wiring configuration to standard octal header
power	115/230 volts (switchable), 50/60 Hz, standard IEC 3 conductor cord
fuse compliment	1x 250v, 1amp fast-blow type fuse
dimensions	19" Rackmount chassis, 2U. 19" x 7" x 3.5"
weight	12 lbs

CHAPTER 3: A BIT OF HISTORY

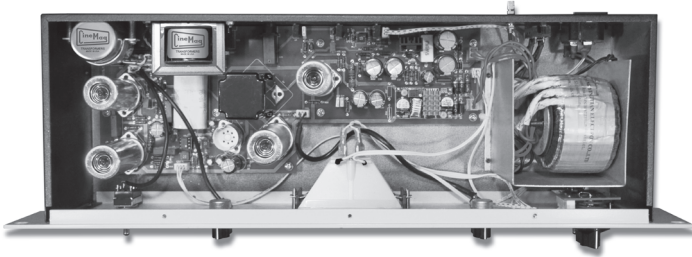
In the beginning...

The classic opto-compressor designs date back to at least the late 1950's; and, like many pieces of beloved audio gear, has its humble beginnings in the world of broadcast radio. From there, it was discovered by artists who performed on radio, and soon made its way into the studio to be used in making records. The optical compressor represented a step forward in terms of sound quality over the types of broadcast limiters commercially available at the time; achieving new levels of perceived transparency and musicality due to its improved THD and noise specs, and its almost intuitive and program-dependent response. The earliest versions of this type of compressor had a slower attack time and therefore were more limited in the types of program material they could handle; however as the design was perfected throughout the 1960's, a familiar sonic response was refined that is still in use today in professional studios around the world. The optical modules went through several known variations and several different manufacturers, and include the T4A, T4B, and T4C modules, with many sub-variations existing within those. Over time, the T4B module became the standard-bearer, and is the version that continues to be perfected by various makers today.

The optical modules went through several known variations and several different manufacturers, and include the T4A, T4B, and T4C modules, with many sub-variations existing within those. Over time, the T4B module became the standard-bearer, and is the version that continues to be perfected by various makers today. The modules operate by coupling pairs of photo-resistors (resistors which increase in resistance as they are exposed to light) to an electro-luminescent panel (ELP), with the luminescent panel being driven by the audio sidechain. The louder the audio's transient peak, the brighter the panel becomes, and the amount of resistance generated by the photo-resistors increases, attenuating the output further. With an all-tube signal path driving the input, output, and audio sidechain, through large high quality CineMag transformers - you have the legendary sound of a classic optical compressor.

CHAPTER 4: A LOOK INSIDE

A quick look inside and you will find the WA-2A sports an all discrete, class-A, all tube circuit, using only through-hole components on a hand-populated board. The WA-2A has a robust power supply to deliver current to its four vacuum tubes, a socketed Kenetek T4B module (optical attenuator), and large custom transformers by CineMag.



A Few Words On Tubes

The WA-2A operates on four tubes: two 12AX7's, one 12BH7, and one 6P1 miniature power tube. The classic units of the past used a 6aQ5 valve in place of our 6P1; unfortunately the 6aQ5 has not been manufactured new since the 1980's. Though still available in smaller quantities as NOS tubes; we determined there were not enough reliable 6aQ5's left in the world to go into production with. One of our early challenges was to find an available tube that had the exact same specifications and characteristics as the vintage 6aQ5; because we did not want to deviate from the classic design at all. We finally came upon the 6P1, a tube once used in hi-fi, which is essentially the same tube in a slightly larger housing with a different pin configuration (in fact, the 6P1 valve has slightly better specs than the original 6aQ5). To stay true to the classic in every sense, we have placed an original 6aQ5 socket wired directly in parallel next to the 6P1's socket; so you may in fact replace the 6P1 with an original 6aQ5 if you can obtain an original one in good working order. This will not by any means improve the performance of the WA-2A and should not be considered an upgrade; but we have left this option available for the sake of nostalgia and as a testament to the fact that the original circuit has not been changed.

Known tube substitution list

The two 12AX7 sockets may be populated with any 12AX7 (ECC83), ECC803S (hi-fidelity 12AX7), or 12AX7A/7025 (low-noise 12AX7). The 12BH7 socket may be populated with any current or NOS brand of 12BH7. The 6P1 socket may be populated with any 6P1 (Asian) valve or 6N1N (Russian equivalent). The 6aQ5 socket may be populated with any working NOS 6aQ5 valve or 6005 (high performance military grade 6aQ5). **DO NOT POPULATE BOTH THE 6P1 AND 6aQ5 SOCKETS AT THE SAME TIME!** The 6aQ5 and 6P1 sockets are wired in parallel, and only one socket must be populated at a time to avoid serious damage to the equipment!

A word on the T4B module

We feel that there is no T4B module finer than those made by Kenetek, and we are especially proud to offer this high end module in our WA-2A. However, for those who wish to experiment; we have built our unit in accordance with the standard octal socket and wiring configuration used for optical compressors for the past half-century. If you have an old stock T4A, T4B, or T4C module that is in good working order, or a new one made by another manufacturer; you may install it in the WA-2A to experiment with different types of modules. Though they all have the same general traits, each have their own slightly distinct characteristics as far as attack, release, knee, and threshold.

Service Disclaimer

As with all high voltage electronics, all service or modification should be referred to qualified service personnel only. The WA-2A should be disconnected from mains power and given time to fully discharge before attempting service or modification. Aside from vacuum tubes and the T4B module, there are no other aspects of the WA-2A which are subject to modification; and service should be referred to a qualified service technician.

CHAPTER 5: WAXING PHILOSOPHICAL

Probably no area in the technical side of music production is more hotly debated than the subject of dynamics control (compression). The so called 'loudness wars', which began far back in the era of vinyl, reached a fever-pitch by the turn of the century at the height of the Compact Disc; and both engineers and developers sought more ways to restrict dynamics at every stage of production, from tracking to mixing to mastering. Experts have called compression the enemy of music, while others have claimed dynamic range itself to be the enemy. In the end, both answers are right; for both dynamic restriction and the lack thereof can be quite detrimental to a finished production. Whatever side of the fence one may be on; it can be generally agreed that having quality tools for dynamic control when needed, as well as having the skill to use these tools with good judgment, is vitally important. There are certain styles of music production, such as jazz and classical, where the use of EQ and compression are extraordinarily sparse, if used at all. For almost everything else, however, the art of music production is by and large the creation of something that is a highly enhanced version of reality. Most especially so with pop and rock music, an engineer's goal is to create a finished work that is in most ways 'larger than life'; creative production decisions are often made that help lead to a cohesive and consistent finished product, and that help to captivate and connect the listener to the music on an emotional level.

THEORY OF OPERATION

The WA-2A, as with any classic optical compressor, appears deceptively simple at first, with so few controls on the front panel. The attack, release, knee, and ratio controls found on many other types of 'fully comprehensive' compressors are absent; leaving the user only with a control for compression threshold (Peak Reduction), makeup gain (Output Gain), and a selection of compress or limit, which changes the ratio from a starting position of about 4:1 to something closer to 100:1. The WA-2A's attack and release characteristics, as well as its ratio and knee, are determined by a very complex relationship between the optical attenuator and the audio signal being fed into it. Generally, the WA-2A's attack will be very fast, with its release character being a rather complex, multi-stage event that, to an extent, is determined by the audio input and the immediate history of the audio passed through the module (known as its 'memory effect'). Generally, the initial release will be very fast, with a second, more subtle stage of release taking one or more seconds, and a tiny third stage of release taking even longer. Due to its extended and smooth time constant, this type of compressor became famous for taming bass guitar, upright bass, and vocals; however, it has the attack speed and transparency to actually handle many other types of instruments. As with all things audio, let your ear determine what the music needs and how much compression is enough to achieve your desired goals. Due to the amount of compression that can be achieved; this type of compressor is often a first choice for instruments that require a fairly strong amount of gain reduction, such as bass; and also often a first choice for more advanced studio techniques such as series and parallel compression.

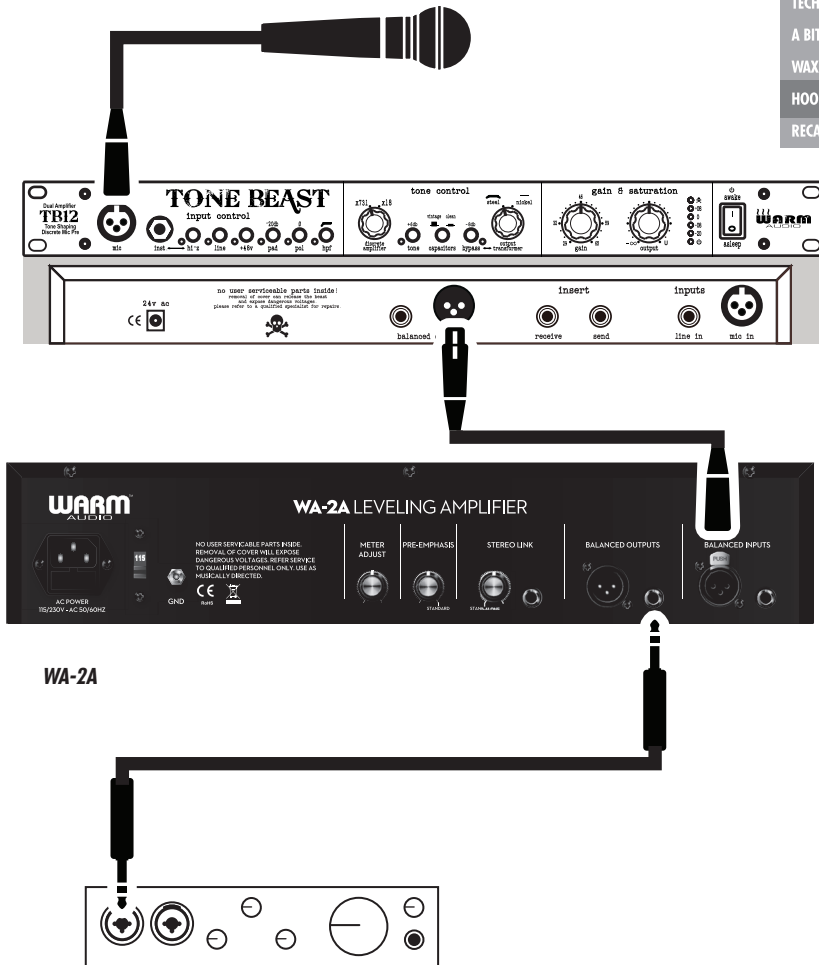
Series compression is simply following one compressor/limiter with another one; they do not have to be the same make or model, but they can be. This is done sometimes when one compressor is doing much of the heavy lifting of dynamic control, while a second compressor is added because the engineer favors its particular tonal qualities or 'glue'. In the case of classic optical compressors, some engineers have been known to set one unit to a heavier amount of Peak Reduction in Compress mode, and follow it by a second unit with a much more modest amount of Peak Reduction, set to Limit mode. This is done to level off any residual transient peaks not caught by the first unit.

Parallel Compression involves using two compressors side by side working on the same input signal. They do not have to be the same make or model compressor; but they can be. The advent of digital audio workstation (DAW) recording actually lends itself quite well to this technique. It is now very easy to duplicate a track in the DAW and send each copy out to individual hardware channels simultaneously, with no real signal loss. As with series compression, one unit will generally be set much more aggressively than the other, and the two compressed tracks can be blended back together in the DAW to achieve a desired effect. When performed properly, one can give a source both the intensity and presence of a hyper-compressed track, while still retaining the openness, apparent dynamics, and detail of an uncompressed track. The WA-2A is an ideal choice for this type of compression, due to the very high levels of gain reduction it can achieve.

CHAPTER 5: HOOKUP DIAGRAMS

ENGLISH

WARRANTY
NOW LET'S GET STARTED
TECHNICAL SPECS
A BIT OF HISTORY
WAXING PHILOSOPHICAL
HOOKUP DIAGRAMS
RECALL SHEETS



Recording interface

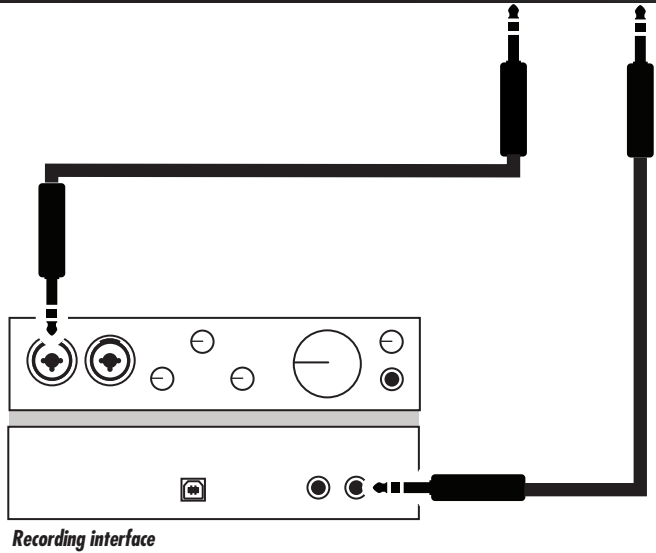
In this example, a microphone is feeding into a preamp, which feeds in to the WA-2A via a balanced XLR patch cable, which feeds in the LINE LEVEL input of your recording interface/recorder.

Note: it is important to use a line level input on your recording device as opposed to a microphone or instrument level input.

CHAPTER 5: HOOKUP DIAGRAMS



WA-2A



In this example, the WA-2A is being routed as an insert into a recording device. This is useful for using the WA-2A as an “analog plug-in” or insert for mix-down. The recording device is feeding the WA-2A with a balanced 1/4” cable via a line output. Then, the recording device is capturing the WA-2A via a LINE LEVEL input.

CHAPTER 6: RECALL SHEETS

ENGLISH

- WARRANTY
- NOW LET'S GET STARTED
- TECHNICAL SPECS
- A BIT OF HISTORY
- WAXING PHILOSOPHICAL
- HOOKUP DIAGRAMS
- RECALL SHEETS



Session: _____ Track: _____ Notes: _____

Date: _____ Instrument: _____ Notes: _____



Session: _____ Track: _____ Notes: _____

Date: _____ Instrument: _____ Notes: _____

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