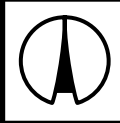
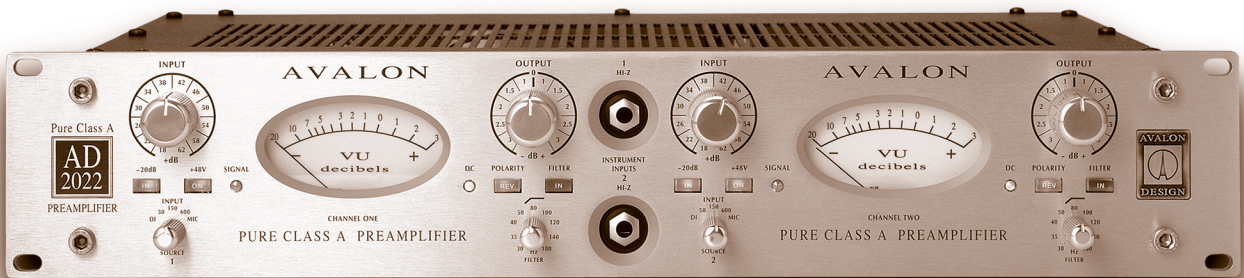


AVALON DESIGN



PURE CLASS A MUSIC RECORDING SYSTEMS

AD2022



**Pure Class A Dual Mono Discrete
Microphone & Instrument Preamp**

M5



**Pure Class A Mono Discrete
Microphone & Instrument Preamp**

Operation Manual

AD2022 & M5

Operation Manual

AVALON DESIGN

PURE CLASS A MUSIC RECORDING SYSTEMS

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1.0 Introduction

Welcome to Avalon and the world of high performance analog signal processing! The Avalon AD2022 and M5 pure Class A microphone and instrument preamplifiers have been designed for optimal signal integrity, ease of use and sonic excellence.

This operation manual incorporates instructions for the AD2022 and M5 preamplifiers. These preamplifiers share the same Pure Class A, synergistic design. The AD2022 and M5 include many professional features including high-voltage Class A regulated power supplies, HI-Z instrument inputs, variable-passive high pass filter and a low-ratio microphone input transformer. This unique design combination culminates into a dynamically neutral preamplifier capable of unmatched musicality.

Hand built in the U.S.A., the AD2022 (M5) uses only the finest active and passive components available. Many parts have been custom-manufactured exclusively to Avalon's specifications. A "no compromise" approach in every stage of design and production ensures that your AD2022 (M5) will give many years of dependable high-quality service.

Please take a moment to read this manual and enjoy your Avalon experience!

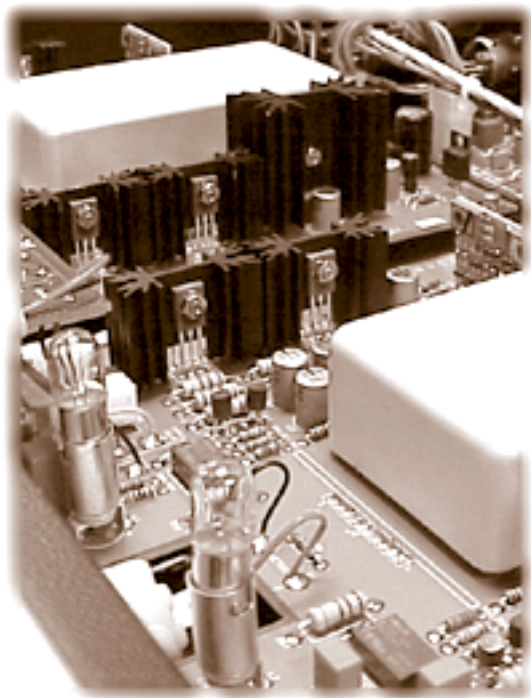
1.1 Overview

The AD2022 (M5) incorporates the most advanced high-performance microphone transformer available. Split low-ratio primary windings are carefully combined within a custom mu-metal core for an extended smooth frequency response and very low distortion. Sealed silver relays are used for all routing and have minimal signal invasion. The input selector, high pass filter, polarity-phase reverse, +48v power and the 20dB input attenuator (pad) all utilize these sealed silver relays. A variable passive high pass filter provides a minimum phase shift design while eliminating low frequency rumble, wind noise and mechanical vibration at subsonic levels.

Twin 100% discrete, high-voltage, Pure Class A amplifiers are utilized in each channel of the AD2022 and M5. The first amplifier operates in a cascaded-cascode FET configuration while the second stage amplifier is fully bipolar. The twin amplifiers share the total available gain requirement. This shared architecture increases the high level headroom capability, improves transient response and doubles the internal bandwidth of the ultra high performance Pure Class A amplifiers.

High-current DC coupled, Class A amplifiers are utilized for the output drive interface giving the AD2022 headroom of +36dB (M5 = +30dB) capability into all known loads. Two large, high-quality analog VU meters indicate accurate signal readings while bi-color LED's offer fast peak indication at 0dB and +20dB.

The AD2022 & M5 are world-class preamplifiers designed to deliver smooth detailed highs, delicate liquid midrange and extended low frequency control. All microphones, acoustic instruments and bass guitars will benefit from these preamplifiers and enable you to capture the full potential of your creative performance. They are the perfect partners for analog tape and digital audio workstations (DAW's).



Inside view of AD2022

1.2 Features

AD2022 & M5

- Deep, musical sound-stage
- Transparent amplification
- 100% Discrete pure Class A amplifiers
- Ultra high-quality custom input transformer
- Sealed silver relays for all signal routing
- Dual microphone and Hi-Z inputs
- Gain switched in 4dB steps
- Variable passive high pass filter
- Low noise -126dB EIN
- Large accurate analog VU meter(s)
- Fast acting bi-color peak LED's
- Regulated phantom power supply (+48V)
- Input polarity (phase) reverse
- Discrete Class A regulated power supplies
- Transformerless DC coupled outputs
- External power supply 100-240V AC
- Rugged stainless steel hardware

AD2022 Only

- Selectable input impedance matching
- Dual mono matched channels
- +/-3dB fine output trim
- Ultra high operating headroom +36dB
- Balanced and unbalanced outputs

1.3 Unpacking and Inspection

Your AD2022 (M5) was packed carefully at the factory and includes the following items:

1. AD2022 (M5) Preamplifier
2. B2T power supply
3. IEC AC power cable
4. 4-pin PC-1 power supply cable for B2T
5. Registration card
(must be returned to activate warranty)
6. Operation Manual

We suggest that you keep the packing materials should your unit ever require service.

Note: Please complete and mail your registration card to Avalon in order to activate the warranty and receive technical support.



AD2022 contents and packaging

2.0 Quick Start-up

The following chapter is designed to help you get started using your AD2022 (M5) without having to read the entire manual. Please take time to read the manual at a later date as there are many safety aspects and features that will not be discussed here.

Hook it up, turn it on and play:

1. Check that the voltage selector card on your B2T power supply is set for your local AC voltage. (120V in U.S.) Refer to Chapter 3.3 page 8 for details.



2. Connect the 4-pin cable from the B2T to your AD2022 (M5) then plug the AC power cable to your power source. **Note: there is NO power switch on the AD2022 (M5) or the B2T.** If you prefer a switched supply, plug your unit into a switched AC power strip.
3. Turn the Preamp Gain to the lowest setting (fully counter clockwise.) Press in the -20dB pad. (a safety option if you have a high output level microphone.)
4. Set the Output control to 0dB center position (AD2022 only).
5. Set the source input selector to MIC (1,500 ohms) (AD2022 only).

6. Plug your microphone into the Channel 1 XLR on the back of the unit and the Channel 1 balanced (or unbalanced) output to your monitoring system. (M5 - plug mic into XLR input on back of unit and the output to your monitoring system.)
7. If your microphone requires phantom power, press in +48V. (M5 phantom +48V switch is located on back of unit).
8. Talk into microphone. Disengage the -20dB pad, and adjust gain as needed.

2.1 Useful Tips

Unity Level - The AD2022 (M5) is calibrated for unity level where +4dBu output equals zero on the VU meter (+4dBu=0VU). The bi-color signal LED turns green (on peaks) at 0dBu and red at +20dBu (*clip at +36dBu on AD2022 and +30dBu on M5*).

INPUT - Use the input knob as the main gain control. Each position gives +4dB of gain.

OUTPUT (AD2022 only) - Use the output control as a fine trim control or for gain riding while recording.

BALANCED OUTPUT (AD2022 only) - The electronic balanced output is transformerless and DC-coupled, pin 2 hot and pin 3 cold.

UNBALANCED OUTPUT - The unbalanced output is DC-coupled and single ended, pin 2 hot and pin 3 ground.

SOURCE INPUT (AD2022 only) - Use input impedance settings for alternate sounds from your microphones. See chapter 4, page 15 for more details on input impedance.

3.0 Safety and Grounding

The following chapter describes how to safely install your AD2022 (M5).

3.1 Safety Instructions

This unit contains voltages that can cause serious injury or death. Do not operate with the covers removed. Improper connection of the equipment-grounding cable can result in a risk of electric shock.

Check with a qualified electrician or serviceman if you are in doubt about your electrical power or ground connection. The AD2022 (M5) is for use with an AC supply as selected by the AC voltage selector (located within the AC inlet on the front of the B2T power supply). Voltages are 100-120-220-240 VAC +/-5%, 50-60Hz (85 watts for the AD2022 and 28 watts for the M5.)

3.2 Grounding Instructions

Always connect the AD2022 (M5) to a grounded AC power circuit.

If the unit should malfunction or become "live", the chassis ground will provide the path of least resistance for electric current to reduce the risk of fatal shock.

The AC power cable must be plugged into an appropriate outlet that is correctly installed and grounded in accordance with all local electrical safety codes and ordinances.

Warning! No ground adapter should ever be used with this unit.

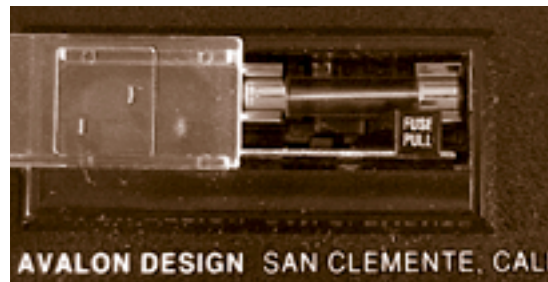
3.3 AC Voltage Selection

Before connecting the AD2022 to the AC supply, check the operating voltage located on the front of the B2T power supply in the AC inlet connector.

Voltages available are 100-120-220-240VAC +/-5%, 50-60Hz.

To change the AC voltage for your location:

1. Check that the AC power cable is **NOT** connected to the AC inlet on the B2T.



2. Slide the plastic cover to the left to expose the fuse and AC selector card.

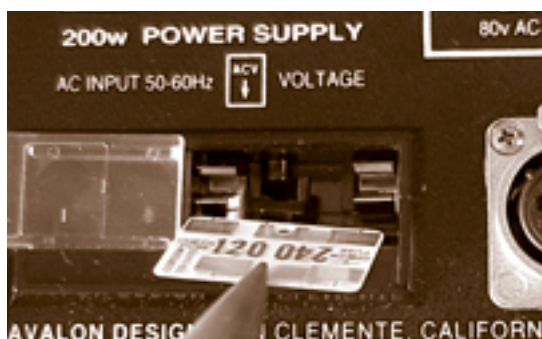


3. Carefully remove the fuse by pulling the lever labeled "FUSE PULL."

4. With a pair of needle nose pliers, *carefully* pull the AC selector card straight out.



5. Turn the voltage selector card so that you can read the correct voltage on top left. Then *carefully* slide the card back into the slot.



6. Connect your PC-1 (4 pin XLR) cable from the B2T to your AD2022 (M5) then connect the B2T to the IEC inlet connector via the grounded AC power cable.



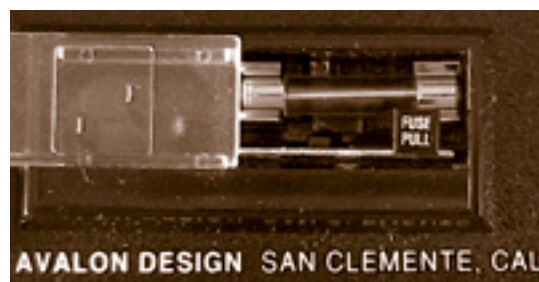
3.4 Fuse Replacement

The fuse on the AD2022 (M5) is located within the AC plug assembly on the front of the B2T. A fuse can blow if the AC selector card is incorrectly set or if your unit malfunctions.

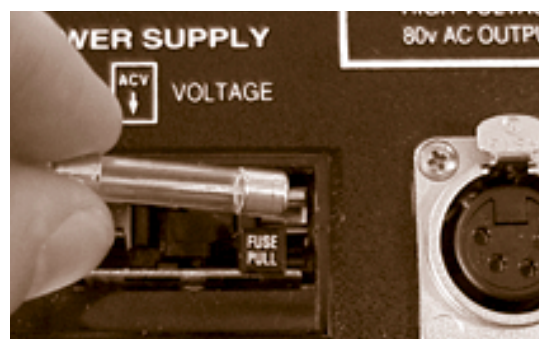
The B2T is supplied with a **250V, 1 amp** slow blow fuse.

To change the fuse:

1. Remove the AC power cable.
2. Slide the plastic cover on the AC inlet to the left to expose the fuse.



3. Pull the fuse lever to remove the fuse (labeled FUSE PULL).



4. Replace fuse into fuse holder. Slide fuse cover to the right. Connect grounded AC power cable.

3.5 Rack Mounting and Cooling

The AD2022 is designed to be mounted in a standard 19" equipment rack. You may purchase an RM-1 rack mounting kit for your M5 (RM-2 for racking two M5's). Because Class A circuitry generates heat, it is recommended that an additional rack space above and below the unit remain open for extra cooling. Avalon Design has a 1U ventilation panel (VP-1) to keep your rack mounted gear cool.



M5 with RM-1 rack mounting kit

Be sure that the ventilation slots (located on the top and bottom of the unit) are not obstructed and air is allowed to flow easily through the chassis. Never leave any obstruction on top of the unit (such as papers or books) blocking the ventilation slots. Also, be sure that the heat sink mounted on the rear panel of the AD2022 chassis has adequate clearance.

Excessive heat is the primary cause of component failures in electronic equipment!

Good ventilation can help avoid premature equipment breakdowns and assure a long and consistent life for your equipment!

Always use all four front panel-mounting holes when mounting the AD2022 (M5) in a rack enclosure.

The AD2022 (M5) is shielded against moderate electrical and magnetic fields, care should be taken to avoid areas that are in proximity to large motors or power transformers. Locations near sources of high radio frequency interference (RFI) such as computers or digital effects devices should be avoided.

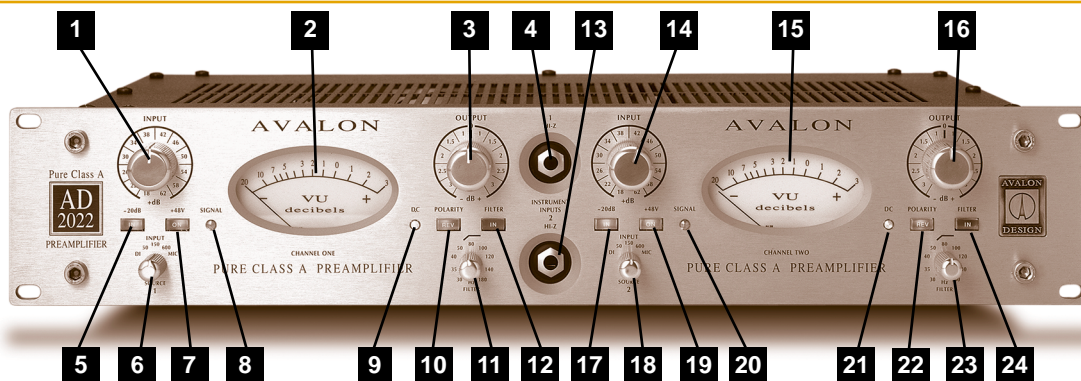


VP1- 1U ventilation panels

3.6 AC Power and Warm-up

There is no AC power (on/off) switch on the AD2022 (M5). This minimizes induced AC noise and eliminates intermodulation distortion created by stray magnetic fields. Should you require AC switching, plug the AC cord into a power strip or line conditioner.

For the best sonic performance, allow your AD2022 (M5) to warm-up for 30 minutes prior to recording. This warm-up gives the electronics time to stabilize and reach optimal operating level.



4.0 AD2022 Operation & Controls

The following chapter describes the front panel controls and functions for the AD2022.

The AD2022 is a dual mono (two channel) preamplifier. The functions on the left side control Channel 1 (1-12) while the functions on the right side control Channel 2 (13-24).

1 & 14 INPUT (Gain Control)

Discrete resistor-loaded rotary switch controls preamplifier gain (11 position). The gain range on the input is +20dB to +64dB in +4dB steps.

2 & 15 VU METER

The VU meter indicates the output level in dB. *Calibrated: +4dBu = 0 VU (balanced output).*



3 & 16 OUTPUT (Fine Adjustment)

Fine adjustment of the output level. Variable conductive plastic potentiometer +/-3dB range. The output control can also be used for gain riding while recording.

4 & 13 HI-Z INSTRUMENT INPUT

1/4" unbalanced jack. High impedance input selected when INPUT SOURCE is in DI position (also known as DI direct injection). Instruments such as electric/bass guitars, and keyboards can be plugged into this jack via a standard shielded instrument cable.

WARNING: DI maximum input +18dB.



5 & 17 -20dB (Pad)

Sealed silver relay selects a -20dB resistive attenuator pre the microphone input transformer (Pad only on microphone input.)

6 & 18 INPUT SOURCE (impedance)

Transformer balanced low-ratio, 50, 150, 600 and 1,500 ohm (MIC) input load selection. Use this for achieving alternate sounds from your microphones and cables. **As you lower the input impedance you place a load on the microphone and cable.** For more details see page 15 on impedance selection.

7 & 19 +48V (phantom power)

+48V phantom power is applied to the microphone input XLR on pins 2 and 3. Phantom power is necessary for condenser microphones that do not use their own external power supply.

Notes: Microphones that require phantom power will not work unless the +48V switch is engaged. Be careful, ribbon microphones can be damaged by using +48V phantom power.



8 & 20 SIGNAL (Output LED)

Bi-color LED flashes green at 0dBu and red at +20dBu. **Red signal LED does not indicate clipping, the AD2022 clips at +36dBu.**

9 & 21 DC (Power Indicator)

Blue LED indicates the DC power is operational.

10 & 22 POLARITY (Phase Reverse)

Reverses the input polarity of the **microphone input only**. Experiment with the phase switch to change the phase in multiple microphone and instrument applications. The AD2022 operates in "true phase" from the input source to the output. **A positive voltage on input pin 2 yields a positive voltage on output pin 2.**

11 & 23 FILTER (Variable Frequency)

Continuously variable rotary control adjusts the cut-off frequency measured in Hertz (Hz) of the passive high-pass filter. This sonically transparent filter rolls off the low-end frequencies at 6dB per octave (gentle slope) and works well for reducing room rumble, muddiness or microphone handling noise.



12 & 24 FILTER (In)

Engages the high pass filter. When the FILTER switch is out, the filter is hard wire bypassed.



4.1 Rear Panel Description

1 B2T POWER CONNECTION

PC-1 (XLR-4) cable connects to the power input connector on the external B2T power supply.



2 & 3 MICROPHONE INPUT

Female XLR-3. Balanced microphone input when INPUT SOURCE is set to 50, 100, 150 or MIC. Accepts microphone level signals to +30dB maximum (with -20dB pad engaged) and provides +48V when phantom power switch is engaged.

4 & 6 UNBALANCED LINE OUTPUT

Male XLR-3. Unbalanced DC coupled, +30dB maximum output into 600 ohms.

- Pin 1 ground
- Pin 2 hot (+)
- Pin 3 ground

Note: When using unbalanced equipment, always use the dedicated unbalanced XLR output. This output can also be used with balanced input devices.

5 & 7 BALANCED LINE OUTPUT

Male XLR-3. Balanced DC coupled, +36dB maximum into 600 ohms.

- Pin 1 ground
- Pin 2 hot (+)
- Pin 3 cold (-)

Note: Do not use this balanced output with unbalanced inputs as the circuit design is optimized for balanced lines only.

8 HEATSINK

Solid aluminum heatsink. Allow adequate air flow for cooling.

4.2 Using the AD2022

The AD2022 is simple to operate and can be used with a variety of microphones including dynamics, condensers and ribbons.

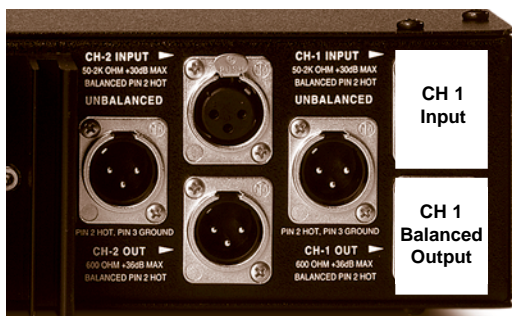
4.3 Basic Operation

IMPORTANT!
ALWAYS CHECK YOUR CABLES FIRST!

1. Connect the PC-1 (XLR 4 pin) cable from the B2T to your AD2022 then plug the AC power cable to your power source.
2. Turn INPUT fully counter clockwise
3. Select INPUT SOURCE to MIC
4. Plug microphone into Channel 1 input (microphone XLR) on rear of unit.

WARNING: Turn down your monitors when changing microphones, cables and activating +48V.

5. Connect Channel 1 balanced (or unbalanced) output into desired channel on recording device (or monitoring system for testing).
6. If your mic requires phantom power, press in +48V. **Never use +48V on ribbon microphones.**



8. Talk into mic and adjust INPUT level.
9. Set OUTPUT at 0dB position and adjust fine trim as required.
10. Engage High Pass Filter switch and select low frequency roll-off to reduce rumble and sub-harmonic noise (if required).

4.4 Instrument Input (DI)

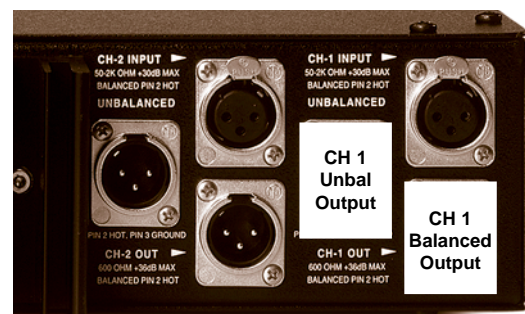
You can use the AD2022 as an instrument preamplifier for guitars, bass, synths or keyboards. The AD2022 DI input can also be used as an unbalanced line level input signal conditioner.

WARNING: DI maximum input +18dB.

Plug the instrument into the 1/4" jack on the front and select the INPUT SOURCE to DI. **The -20dB pad and phase reverse do not affect the DI instrument input.**

4.5 Balanced & Unbalanced Output

The AD2022 provides balanced and unbalanced outputs to optimize the absolute minimum signal path design. The balanced output is +6dB higher than the unbalanced output. (Both outputs can be used simultaneously.)



The balanced output is transformerless and DC coupled. The unbalanced output is "single-ended" and is the most direct signal path. **For optimum performance in an unbalanced system, use the unbalanced output.**

Having balanced and unbalanced outputs is a feature that enables you to choose between two high performance output stages!

4.6 Input Source (Impedance)

The AD2022 includes a rotary switch that enables you to change the preamplifier's input impedance. The switch labeled INPUT SOURCE selects between four different input impedance values: 50, 150, 600, and 1,500 ohms (MIC).



Most professional microphone preamplifiers have an input impedance between 600 ohms and 2K (2,000) ohms. With a higher input impedance, the signal is hotter and often the frequency range is more extended. As you lower the INPUT SOURCE impedance, a “load” is placed across the microphone. This causes the sound characteristics of the microphone to change while some mics may change dramatically. Lowering the input impedance can reduce the output level of the microphone. The input gain can be increased to make up for any loss in level.

Cable capacitance is also a factor when the impedance changes. Lowering the input impedance can in some cases “tune” your cable. Some lower quality cables and long cables have higher amounts of capacitance and helps balance the high to low frequency filtering effects caused by high-capacitance cables. The input load selector enables you to “swamp” or “dampen” the non-musical effects of poor cables.

Impedance Matching

Most microphone specifications do not list an optimal source impedance. Typically microphone specifications list their “nominal output impedance” (usually 50 ohms) in which the microphone will meet its specified performance.

4.7 Microphone Tests

To help you better understand the effects of the **input impedance selector**, Avalon conducted a range of tests with over twenty microphones including condensers, dynamics, tube, and ribbons.

The following microphones were used in the tests:

AKG C414EB / C12VR / 451EB / 451W / D112, Audio Technica ATM25, DPA (B&K), Brawner Velvet, Neumann TLM 103 / TLM 147 / U67 / U87 / KM84, Royer SF-1/ 121, RCA 77, Sennheiser 441 / 421, Shure SM57 / SM58 and Sound Deluxe Gold.



Typical microphone and equalized speaker placement used in impedance tests.



A selection of the microphones used in the “input impedance” evaluation tests.

Microphone Tests

Our test results showed that changing the input impedance alters the sound of some microphones. There are three main audible elements that effect the sound of a microphone when the input impedance is changed: (i) **frequency response**, (ii) **distortion**, and (iii) **cable capacitance** (filtering effects). These sonic differences can be explained technically with mathematical formulas. However, for simplicity we have taken a musical approach to show the results of changing the transformer balanced input impedance on the AD2022 microphone preamp.

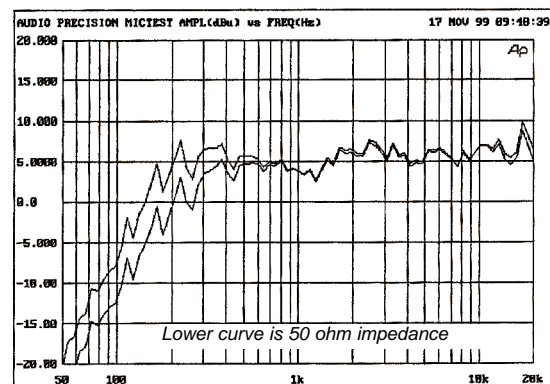
Test Procedure

Each microphone was tested by sending a 20Hz to 20kHz swept tone through a reference monitor. The microphone output was connected to the input of the AD2022. The AD2022 output was the connected to an FFT frequency analyzing device. For this summary, each microphone was tested with an input impedance of (1) 1,500 ohms (highest setting) and (2) 50 ohms (lowest setting).

Frequency Response

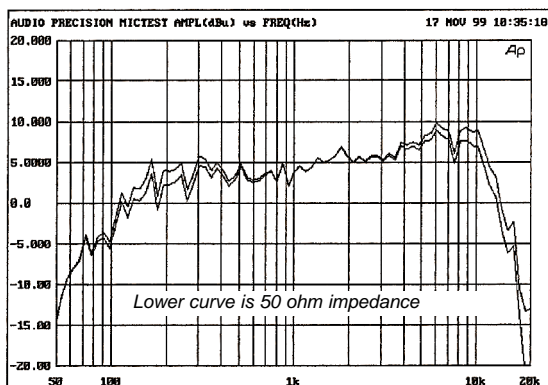
The frequency response or overall bandwidth of a microphone can change when the input impedance is lowered (or raised).

The following graph shows the Amplitude (dBu vertical axis) vs. Frequency (Hz horizontal axis) for a popular **large**



diaphragm condenser microphone.

The top curve is the plot of the input impedance set to “MIC” (1,500) ohms (nominal response is flat). While the lower curve is the input impedance set to 50 ohms. As you can see, there is a low frequency (-3dB at 400Hz) roll off to -20dB at 50Hz. This indicates a 10dB reduction below 400Hz with consistent tracking to 50Hz. In this case the lower impedance setting may sound clearer and more detailed on a muddy or boomy acoustic guitar. This reduced low frequency output could be caused by the microphone’s coupling devices which are acting as a high pass filter when driving a lower impedance input. **Not all microphones follow the same patterns when the input impedance is lowered.**

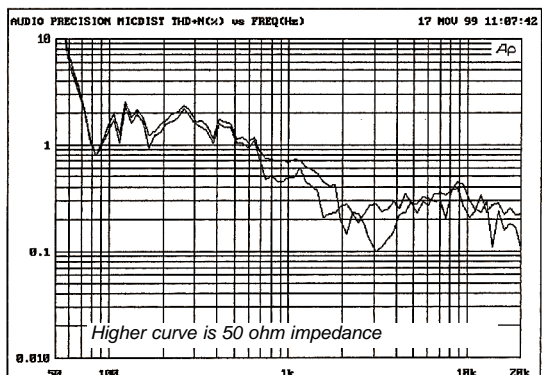


The next example is a plot from a **dynamic microphone**. As the input impedance is lowered, there is a roll-off in the high frequencies beginning around 5kHz and rolling off approximately 3dB above 12kHz. The bass frequencies are also affected. A lower impedance setting in the above example may achieve a slightly “softer” tone. However the higher impedance setting will make the source more “open” and have greater presence.

Distortion(THD)

Distortion is a measurable and audible factor on some microphones when the input impedance on the AD2022 is changed.

The following graph plots total harmonic distortion (THD) vs. Frequency (Hz) for a popular **small diaphragm condenser microphone**.



As seen in the graph the lower the input impedance the higher the harmonic distortion in the upper midrange between 3kHz and 4kHz. This may give the microphone a “harder” and more “electric” sound at these frequencies. The graph also indicates this microphone’s active electronics and output drive capability are directly limited by the lower input impedance.

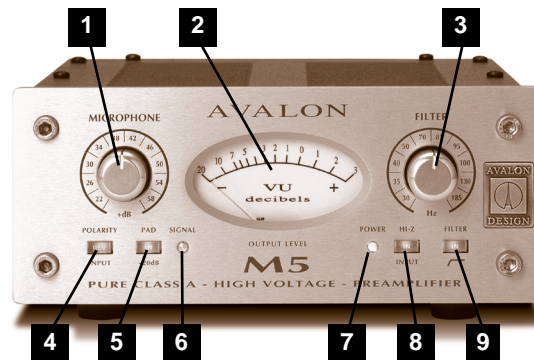
Cable Capacitance

All cables have a fixed resistance and capacitance. When these two elements are included in a circuit, a low pass (high cut) filter is created. The frequency of where the low pass filter begins is a function of the resistance and capacitance. As the input impedance is lowered (in most cases) the capacitance effect is also reduced. The net result is that the frequency where the low pass filter begins is raised thus delivering more of the high frequencies than the higher input impedance. This is sometimes inaudible but can be a factor when using microphones with longer lengths or low quality cables. **Take time to compare your cables.** They can often provide the final “sonic solution” for a particular recording application.

Conclusion

Our test results concluded that every microphone reacts differently when the impedance is changed. We found no patterns in microphone types (ie. dynamics, condensers, ribbons.) There is not always a “best setting” for a particular microphone, but rather a multitude of hidden “voices” within each microphone-cable combination.

Trust your ears and use the input impedance control as a “creative tone shaper” to enhance the sonic signature from your microphones and cables!



5.0 M5 Operation and Controls

The following chapter describes the front panel controls and functions for the M5.

1 MICROPHONE (Gain Control)

Discrete resistor-loaded rotary switch controls the preamplifier gain (11 position). The gain range is +20dB to +64dB in +4dB steps.

2 VU METER

The VU meter indicates the output level in dB. Calibrated: +4dBu = 0 VU.

3 FILTER (Variable Frequency High-pass)

Continuously variable rotary control adjusts the cut-off frequency measured in Hertz (Hz) of the passive high-pass filter. This sonically transparent filter rolls off low-end frequencies at 6dB per octave (gentle slope) and works well for reducing room rumble, muddiness or microphone handling noise.

4 POLARITY (Phase Reverse)

Reverses the input polarity of the **microphone input only**. Experiment with the phase switch to defeat phase cancellation and create musical effects.

The M5 operates in "true phase" from the input source to the output. A positive voltage on **input** pin 2 yields a positive voltage on **output** pin 2.

5 -20dB (pad)

Sealed silver relay selects a -20dB pre-transformer resistive attenuator (pad). **Microphone input only!**

6 SIGNAL-LED

Bi-color LED flashes green at 0dBu and red at +20dBu. **Red signal LED does not indicate clipping, the M5 clips at +30dBu.**

7 DC-LED

Blue LED indicates the DC power is operational.

8 HI-Z INPUT (Instrument)

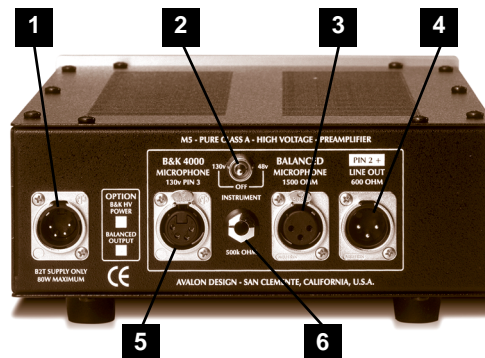
Selects 1/4" unbalanced jack on the rear of the chassis. Instruments, acoustic guitars, electric/bass guitars, synths and keyboards can be plugged into this jack via a standard shielded instrument cable.

WARNING: DI maximum input +18dB.



9 FILTER (In)

Engages the high pass 6dB per octave variable filter. When the FILTER switch is not engaged, the filter is hard wire bypassed with a sealed silver relay.



5.1 Rear Panel Description

1 B2T POWER CONNECTION

PC-1 (XLR-4) cable connects to the power input connector on the external B2T power supply.



2 +48V / 130V (phantom power)

Three position toggle switch.

Left: 130 Volt DPA (B&K) power (optional)

Middle: Off - Use when using instrument jack or dynamic/ribbon microphones.

Right: +48V phantom power for condenser microphones.

Note: Phantom power is applied to the microphone input XLR. Both pins 2 and 3 carry the phantom power. **Microphones that require phantom power will not work unless the +48V switch on rear of M5 is selected.**

3 MICROPHONE INPUT

Female XLR-3 for microphone level signal. (+30dB maximum with -20dB pad engaged). Also provides +48V phantom power when +48V switch on rear is selected to right position.

4 UNBALANCED LINE OUTPUT

Male XLR-3 unbalanced DC coupled, +30dB maximum into 600 ohms.

Pin 1 ground

Pin 2 hot (+)

Pin 3 ground

Note: The M5 output is supplied as unbalanced. The optional JT-1 Jensen output transformer can be factory fitted for balanced output operation. The JT-1 option does not alter or improve the sonic performance of the M5. If you are using cables in excess of 100 feet (30 meters) the JT-1 may be a worthwhile consideration.

5 DPA (B&K) MICROPHONE INPUT

Female XLR-4 for DPA (B&K) microphones that require +130V power. (Optional BK-1 power card available, but not included in standard M5.)

6 HIGH Z INSTRUMENT INPUT

1/4" unbalanced jack. High impedance input selected when HIGH-Z push button is engaged on front panel. Also known as DI (direct injection). Instruments, electric/bass guitars and keyboards can be directly plugged into this jack via a standard shielded instrument cable.

WARNING: DI maximum input +18dB.

5.2 Using the M5

The M5 is simple to operate and can be used with a variety of microphones including dynamics, condensers and ribbons.

5.3 Basic Operation

IMPORTANT!
ALWAYS CHECK YOUR CABLES FIRST!

1. Connect the PC-1 (XLR 4) pin cable from the B2T to your M5 then plug the AC power cable to your power source.
2. Turn MICROPHONE input fully counter clockwise.

WARNING: Turn down your monitors when changing microphones, cables and activating +48V.

3. Plug your microphone into the XLR input connector on the rear of the unit.
4. Connect output into desired channel on your recording device (or monitoring system for testing).
5. If your mic requires phantom power, select +48V on rear. **Never use +48V on ribbon microphones.**
6. Talk into mic and adjust MICROPHONE input level.
8. Press in High Pass Filter and select low frequency roll-off to reduce rumble and sub-harmonic noise (if required).

5.4 Instrument Input (DI)

You can use the M5 as an instrument preamplifier for guitars, bass, synths or keyboards. The M5 DI input can also be used as an unbalanced line level input signal conditioner.

WARNING: DI maximum input +18dB.

Plug your instrument into the 1/4" jack on the rear of the chassis and engage the HI-Z switch on the front panel. **The -20dB pad is not available for the DI instrument input.**

5.5 Unbalanced Output

The M5 output is single-ended and DC coupled. This simple design minimizes the signal path and provides the most natural sound possible with the lowest noise.

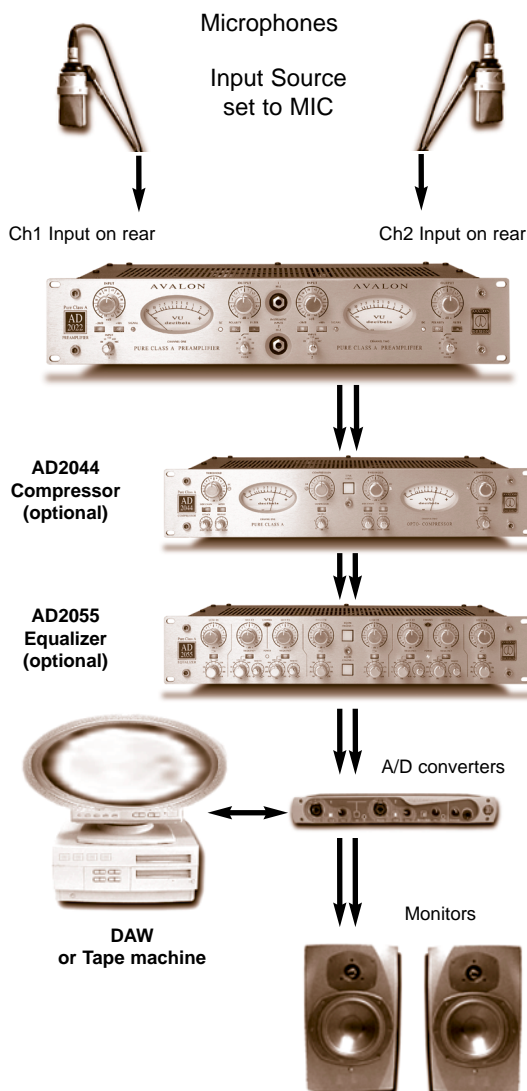
Note: Always connect pin 3 to ground to ensure correct loading on balanced line inputs following the M5 in the signal chain.

6.0 Recording Applications

The following diagrams show you how to use your AD2022 in a recording session.

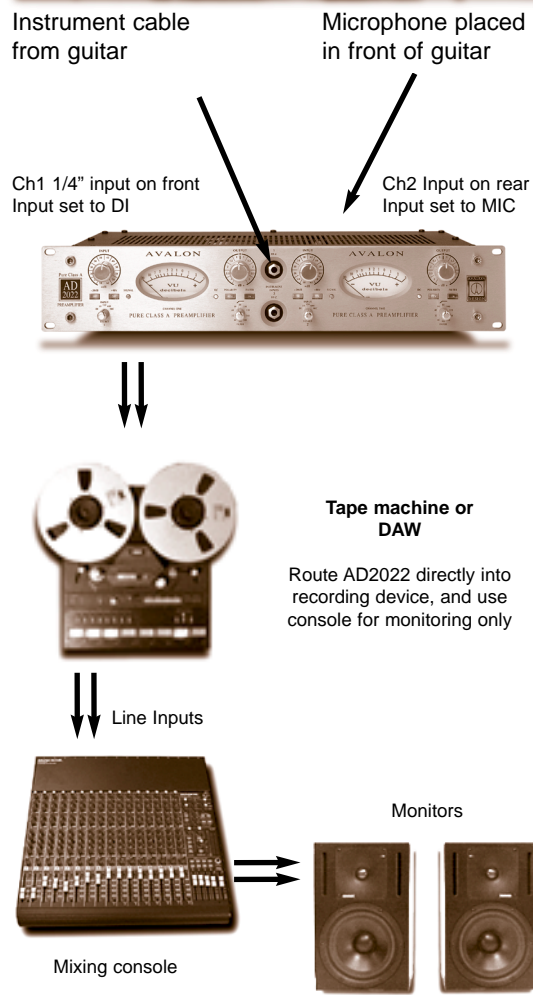
6.1 Using Microphones

Microphones direct to Digital Audio Workstation (DAW) or tape machine. Use this set up for vocals (typically one microphone), simultaneous two channel recording such as kick and snare drum, or capturing the stereo image of an acoustic instrument, eg. piano or drum overheads.



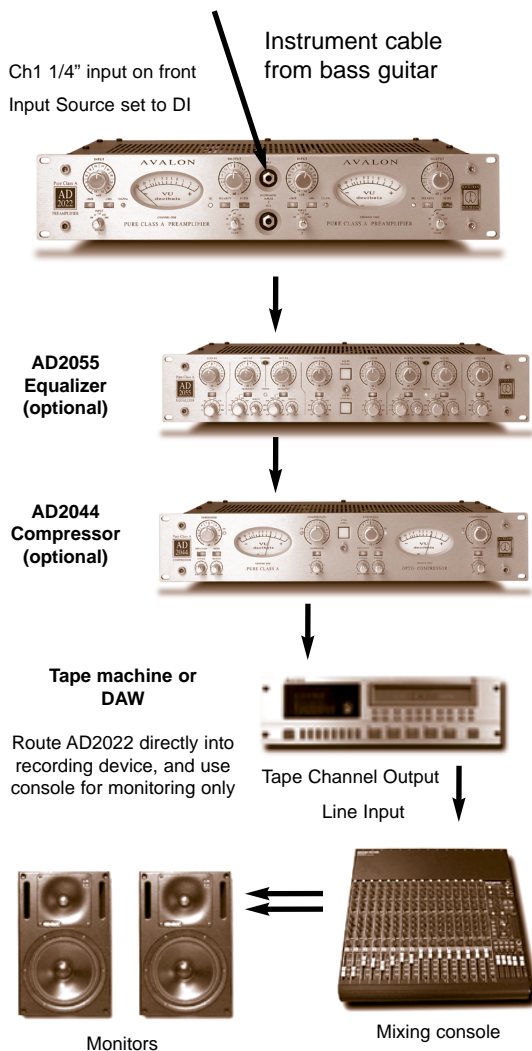
6.2 Acoustic Guitar/Upright Bass

Two channel recording - Direct signal from pick-up **and** microphone to capture both direct signal and room ambience.



6.3 Direct Bass Guitar

Direct signal from bass to recording device.

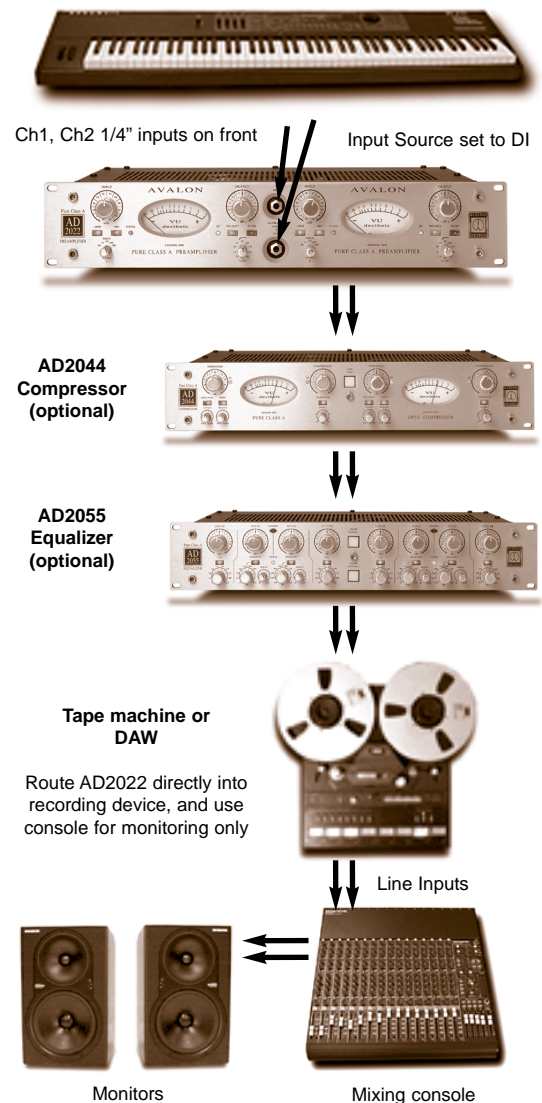


6.4 Keyboards & Synths

Keyboard preamplifier for low output keyboards and synths.

WARNING: DI maximum input +18dB.

Note: many newer keyboards deliver line-level outputs and do not require the AD2022 preamp for boosting to line level. To use your AD2022 for line level signal conditioning, connect line-level source to XLR microphone input on rear of AD2022 and **press in -20dB pad** (maximum input +36dB).



7.0 FAQs

The following are answers to **Frequently Asked Questions about the AD2022 & M5:**

Q: Is the AD2022 (M5) durable enough for the road?

A: Yes. *the AD2022 (M5) and all Avalon equipment is literally “built like a tank.” Steel chassis, 1/4” thick metal faceplate, metal knobs, all circuit boards are mounted to chassis with stainless steel hardware.*

Q: Will the AD2022 (M5) continue to work when I travel to different countries?

A: Yes. *The B2T power supply for the AD2022 (M5) has selectable voltages: 100V, 120V, 220V, and 240V. It is easy to change the voltage. See chapter 3.3 (page 8).*

Q: Will the AD2022 (M5) work with my unbalanced inputs on my recording device?

A: Yes. *The AD2022 features both balanced and unbalanced outputs. Make sure that your cables are wired the same (pin 2 hot). You can use a cable with an XLR on one end and an RCA or 1/4” on the other. This will work fine for the unbalanced system, as long as the cables are not more than 20 ft (6 meters) in length. The M5 output is unbalanced only and works well with both balanced and unbalanced input devices.*

Q: Will the AD2022 (M5) work with a recording device designed for -10dB operation?

A: Yes. *However the signal coming from the AD2022 (M5) may be too hot. You may need to press the -20dB pad so the signal more closely matches the -10dB machine. If you have a choice, always run at +4dB.*

Q: What kind of microphones work best with the AD2022 (M5)?

A: *The AD2022 (M5) was designed to work with all types of microphones. (ie. condensers, dynamics, ribbons, etc.) It works great with FET condensers as well as tube condensers. Microphone choice and selection is a matter of taste.*

Q: Can I use the AD2022 (M5) live as a microphone preamp and as a DI box?

A: Yes. *Many touring artists are currently using the AD2022 (M5) as the primary vocal mic preamp as well as a preamp for bass and guitars.*

Q: Will the AD2022 (M5) “enhance” the signal going to a digital recorder?

A: Yes. *The AD2022 (M5) will give the signal a rich and deep sound. The low frequencies will be more extended and your recording will sound bigger. It will bring your digital recordings to life!*

Q: What are the main differences between the microphone preamplifiers in the Vt-737sp and the AD2022 (M5)?

A: *The Vt-737sp is a vacuum tube preamp (uses four dual triode tubes) and includes an opto-compressor and equalizer. The AD2022 (dual channel) and M5 (mono), are Avalon’s “top of the line” ultra-high performance solid state microphone preamps. The AD2022 (M5) preamp features 100% discrete electronics and no tubes. All Avalon Design preamps run in Class A mode and have enormous headroom and wonderful musicality. Sonically, the Vt-737sp has a more “close-up” sound whereas the AD2022 (M5) has a larger and more extended sound stage giving a deeper and more detailed three dimensional image (you hear more of “the room”).*

8.0 Trouble Shooting

If you experience any problems with your AD2022 (M5) always make sure you isolate the cause to your preamp. In many cases a bad cable or another piece of equipment in the signal path can produce less than excellent results.

To isolate the problem, remove as many pieces of extraneous gear in the signal path as possible. If you believe that your AD2022 (M5) has a problem, set up the following test system:

ALWAYS CHECK YOUR CABLES FIRST!

1. Plug your input source (microphone or instrument) into the AD2022 (M5).

2. Connect the output of the AD2022 (M5) directly to your powered speakers or monitor system. Use the INPUT gain control to adjust the volume.

If you have isolated the problem to the AD2022 (M5) please check the table below for suggested solutions.

Other problems

If you have any technical questions or are experiencing problems not listed in our Trouble Shooting Table, please call your nearest dealer or the Avalon factory at 949-492-2000 or fax to 949-492-4284. You can also email Avalon at avalon@avalondesign.com.

Problem	Cause	Solution
No Power	Power cable on B2T not securely attached into connector	Check PC-1 power cable, AC source and IEC power cable
No Power	Fuse blown due to power surge or improper AC voltage setting	Replace fuse and check AC voltage setting on B2T power supply (p. 8)
Lights dim / no sound	Improper AC voltage setting	Check AC voltage setting on B2T power supply (p. 8)
No sound	Incorrect input selector position	Make sure input source selector switch is set to the correct position (DI for HI-Z input) (M5 check HI-Z)
No sound	Bad cable or connectors	Check cables on input and output
No sound	+48v not selected for a microphone that requires phantom power	Turn on +48V to supply microphone with phantom power
Hum or buzzing noise	bad cables, ground loop or wire missing from connector link	check all cables and grounding. Isolate chassis of preamp from equipment rack.
Distorted sound	Microphone or input source overloading	Change microphone or input source; lower input gain, press -20dB pad
Distorted sound	AD2022 (M5) may be overheating	Make sure AD2022 (M5) has good ventilation (p. 10)
Overloading recording device	Recording device is -10dB device, AD2022 (M5) is +4dB device	Press in -20dB pad to attenuate to a usable level.

Trouble Shooting Continued

Problem	Cause	Solution
Drop in level / Low output	Pin 2 or 3 not connected on XLR mic cable	Check / change XLR mic cables
No bass or Low Frequencies	Pin 2 or 3 not connected on XLR mic cable	Check / change XLR mic cables
Hiss or HF noise	Bad cable, dirty XLR connector pins bad microphone	Check / change XLR mic cables Check / change microphone
Clip LED Red, VU small movement	High content of peak transients and low average signal level	Make sure device following AD2022 (M5) can handle the high output

9.0 Service and Contact Information

Your AD2022 (M5) is built to withstand many years of high performance music making. If you experience any malfunctions or problems, please contact the dealer where your unit was purchased. If your AD2022 (M5) has outlasted your dealer, please contact Avalon directly.

External Cleaning

The AD2022 (M5) can be cleaned using a mild cleaner such as 409 or Windex. Do not use abrasive cleaners or petroleum-based solvents.

Contact Information

Avalon Design
 PO Box 5976
 San Clemente, CA 92673
 United States of America

Tel: 949-492-2000
 Fax: 949-492-4284

Email: avalon@avalondesign.com
 Website: www.avalondesign.com

10.0 AD2022 Technical Information

Specifications

Circuit topology: Twin Cascode FET and bipolar low level signal amplifiers, high-voltage, 100% discrete, symmetrical Pure Class A

Input type and load: Transformer balanced low-ratio, 50, 150, 600 and 1k5 ohm input load selection

Maximum mic level: +36dB balanced XLR pin 2 hot (with -20dB passive attenuator)

Maximum instrument level: +18dB at 100k ohms instrument input level, standard mono 1/4 inch jack.

Input attenuator: -20dB resistive pre-transformer primary, sealed silver relay

Phantom power: +48v regulated 50mA capability, sealed silver relay

High pass filter: Passive, variable from 30Hz to 185Hz @ 6dB per octave, sealed silver relay by-pass

Polarity reverse: sealed silver relay on microphone input only

Gain range input: +20dB to +64dB in 4dB steps

Gain range output: +/-3dB variable conductive plastic potentiometer

Maximum output level: +36dB balanced 600 ohms, (+30dB unbalanced) DC coupled, discrete symmetrical Pure Class A

Output type: XLR connector, pin 2 hot

Noise EIN unweighted: -126dB 150 ohm

Noise 20-20kHz unweighted: -102dBu

Distortion (THD, IMD) @ 1kHz: 0.05%

Frequency Response -3dB: 1 to 120kHz

Bandwidth (-3dB): DC to 1MHz

Output meter: Illuminated analog VU meter 0dB=+4dBu (balanced output)

Peak meter: Bi-color LED's 0dB and +20dB peak detection circuit

AC power supply B2T: External toroidal 100v to 240v, 50-60Hz selectable, 85 watts maximum. Internal DC regulation on AD2022.

Cables: 1 x 8 ft 4-pin AC cable (PC-1), 1 x 8 ft AC standard IEC cable included

AD2022 Dimensions: 19 x 12 x 3.5 inches
482 x 305 x 89 mm

AD2022 Weight: 15 lbs (6.8kg)

B2T Dimensions: 5 x 7 x 3.25 in
127 x 177 x 83mm

B2T Weight: 7lbs (3.2kg)


Dimensions - shipping carton:

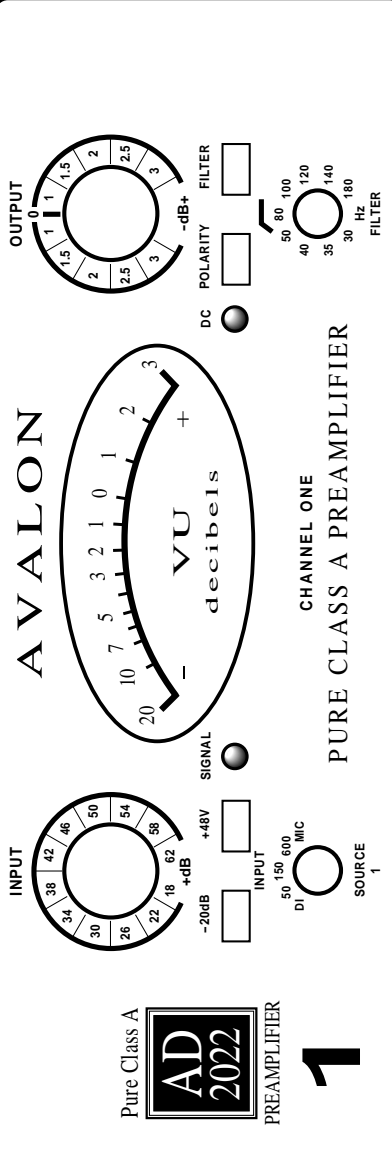
24 x 21.5 x 7.5 inches
610 x 546 x 190 mm

Weight packed: 25 lbs. (11.4 kg)

10.1 AD2022 Recall Sheet

AVALON AD2022 PREAMPLIFIER RECALL SHEET

Pure Class A  **1**



AVALON

INPUT: -20dB, +48V, +dB (26, 30, 34, 38, 42, 46, 50, 54, 58)


SIGNAL: VU decibels (20, 10, 7, 5, 3, 2, 1, 0, 1, 2, 3)

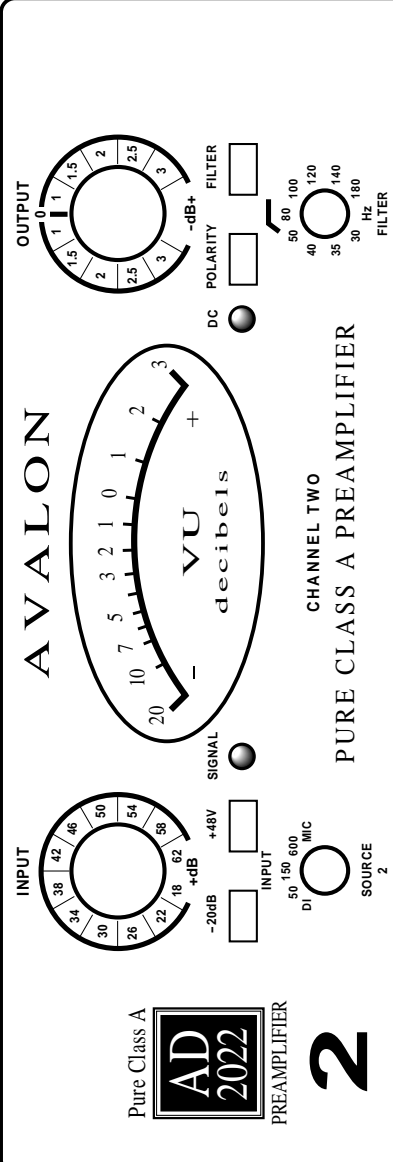
CHANNEL ONE
PURE CLASS A PREAMPLIFIER

DC POLARITY:

OUTPUT: -dB+ (0, 1.5, 2, 2.5, 3)

FILTER: 50, 80, 100, 120, 140, 180 Hz

Pure Class A  **2**



AVALON

INPUT: -20dB, +48V, +dB (26, 30, 34, 38, 42, 46, 50, 54, 58)

SIGNAL: VU decibels (20, 10, 7, 5, 3, 2, 1, 0, 1, 2, 3)

CHANNEL TWO
PURE CLASS A PREAMPLIFIER

DC POLARITY:

OUTPUT: -dB+ (0, 1.5, 2, 2.5, 3)

FILTER: 50, 80, 100, 120, 140, 180 Hz

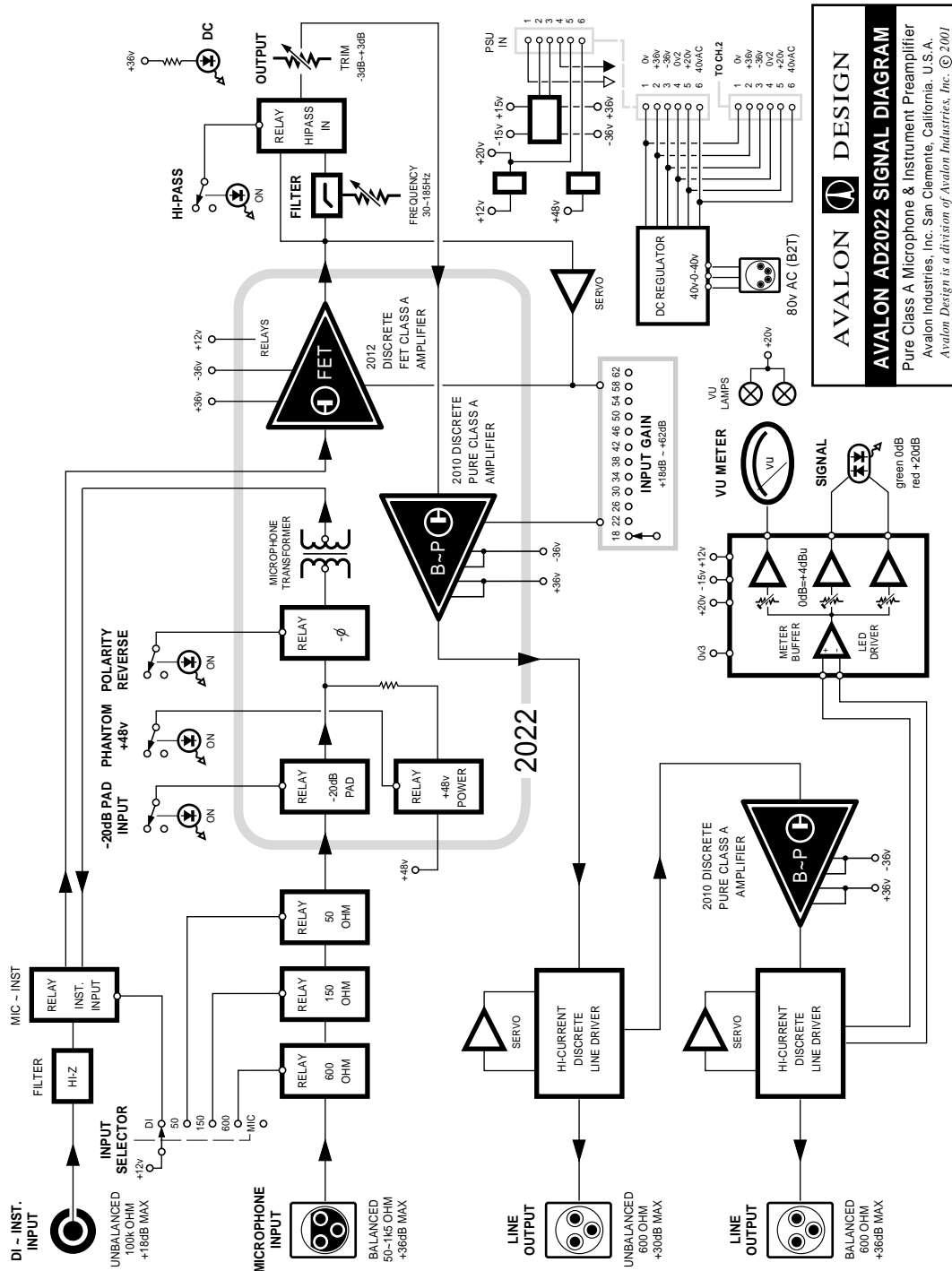
Pure Class A

MICROPHONE PREAMPLIFIER

AD2022

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10.2 AD2022 Block Diagram



AVALON DESIGN
AVALON AD2022 SIGNAL DIAGRAM
 Pure Class A Microphone & Instrument Preamplifier
 Avalon Industries, Inc. San Clemente, California, U.S.A.
 Avalon Design is a division of Avalon Industries, Inc. © 2001

11.0 M5 Technical Information

Specifications

Circuit topology: Twin Cascode FET and bipolar low level signal amplifiers, high-voltage, 100% discrete, symmetrical Pure Class A

Input type and load: Transformer balanced low-ratio 1k5 ohm input load selection

Maximum mic level: +36dB balanced XLR pin 2 hot (with -20dB passive attenuator)

Maximum instrument level: +18dB at 100k ohms instrument input level, standard mono 1/4 inch jack.

Input attenuator: -20dB resistive pre-transformer primary, sealed silver relay

Phantom power: +48v regulated 50mA capability, sealed silver relay. (BK-1 +130V DPA (B&K) option available.)

High pass filter: Passive, variable from 30Hz to 185Hz @ 6dB per octave, sealed silver relay by-pass

Polarity reverse: sealed silver relay on microphone input

Gain range input: +20dB to +64dB in 4dB steps

Maximum output level: +30dB unbalanced 600 ohms, DC coupled, discrete symmetrical pure Class A

Output type: XLR connector, pin 2 hot (optional balanced JT-1 Jensen transformer)

Noise EIN unweighted: -126dB 150 ohm

Noise 20-20kHz unweighted: -102dBu

Distortion (THD, IMD) @ 1kHz 0.05%

Frequency Response -3dB: 1 to 120kHz

Bandwidth (-3dB): DC to 1MHz

Output meter: Illuminated analog VU meter 0dB=+4dBu

Peak meter: Bi-color LED's 0dB and +20dB peak detection circuit

AC power supply B2T: External toroidal 100v to 240v, 50-60Hz selectable, 28 watts maximum. Internal DC regulation on M5.

Cables: 1 x 8 ft 4-pin AC cable (PC-1), 1 x 8 ft AC standard IEC cable included

M5 Dimensions: 8.5 x 3.5 x 12 inches
216 x 88 x 305 mm

M5 Weight: 15 lbs (6.8kg)

B2T Dimensions: 5 x 7 x 3.25 in
127 x 177 x 83mm

B2T Weight: 7lbs (3.2kg)

Dimensions - shipping carton:

24 x 21.5 x 7.5 inches
610 x 546 x 190 mm

Weight packed: 25 lbs. (11.4 kg)

11.1 M5 Recall Sheet

AVALON M5 MONO PREAMPLIFIER RECALL SHEET

1

AVALON

MICROPHONE PAD SIGNAL -20dB INPUT

VU decibels


OUTPUT LEVEL **M5**

PURE CLASS A - HIGH VOLTAGE - PREAMPLIFIER

FILTER HI-Z INPUT FILTER

Hz

AVALON DESIGN



2

AVALON

MICROPHONE PAD SIGNAL -20dB INPUT

VU decibels


OUTPUT LEVEL **M5**

PURE CLASS A - HIGH VOLTAGE - PREAMPLIFIER

FILTER HI-Z INPUT FILTER

Hz

AVALON DESIGN



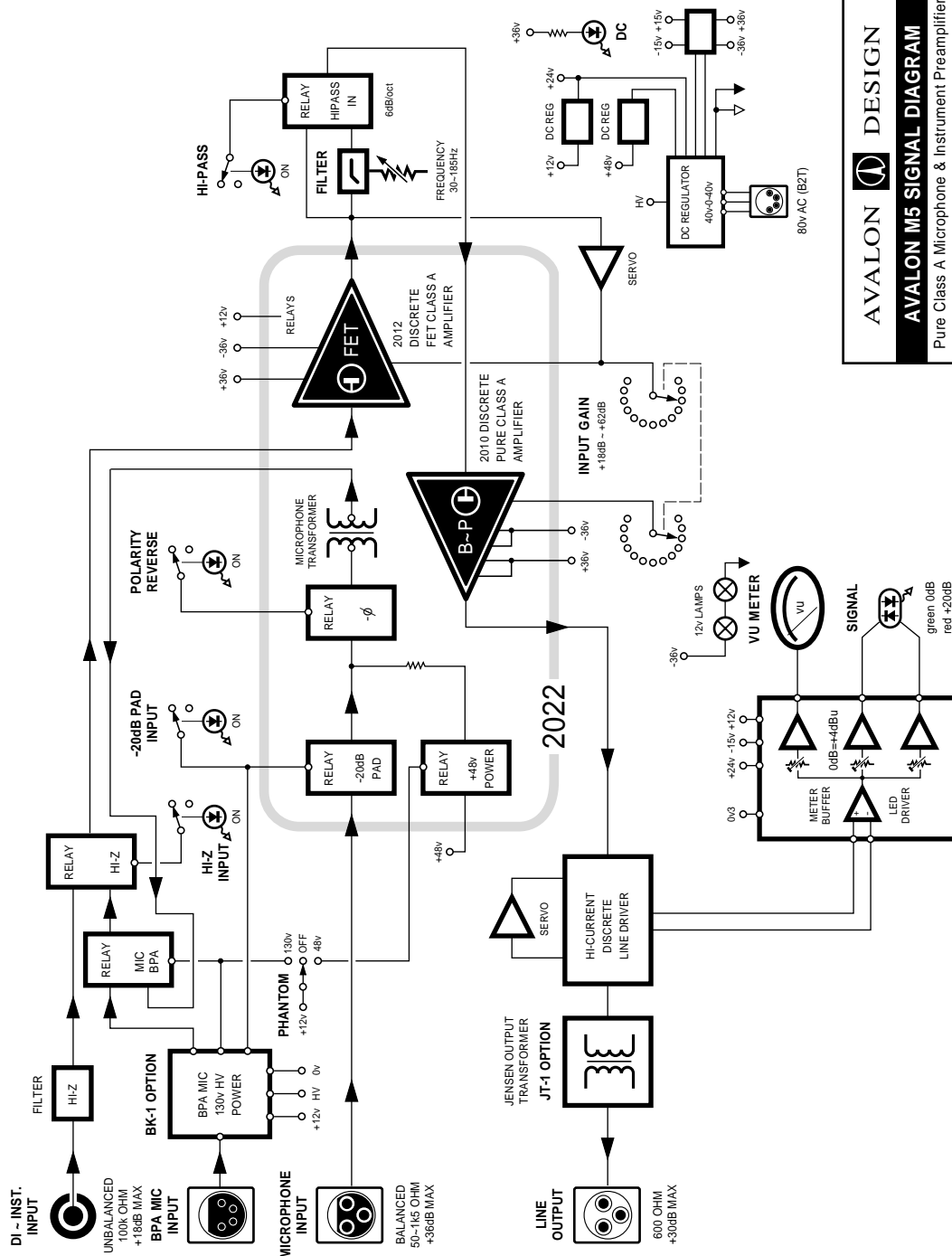
Pure Class A

MICROPHONE PREAMPLIFIER

M5

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11.2 M5 Block Diagram



AVALON DESIGN
AVALON M5 SIGNAL DIAGRAM
 Pure Class A Microphone & Instrument Preamplifier
 Avalon Industries, Inc. San Clemente, California, U.S.A.
 Avalon Design is a division of Avalon Industries, Inc. © 2001

12.0 Warranty

Avalon Industries, Inc. warrants this product against defects in material or workmanship as follows:

1. For a period of one (1) year from the date of purchase Avalon will pay the labor charges to repair the defective product. After this one (1) year period, all labor charges will be paid by the customer.
2. Avalon will supply at no charge, new or rebuilt replacements for any defective mechanical switches, potentiometers or moving parts for a period of one (1) year from original date of purchase.
3. This warranty is void if the product has been found to be subjected to misuse, abuse or unauthorized service.
4. This warranty does not cover cosmetic damage, and damage due to acts of God, accident or transit damage.
5. Proof of purchase in the form of a bill of sale or invoice to provide evidence that the unit is within the warranty period must be presented to obtain warranty service.
6. This warranty is only valid if the serial number appears on the product.

Outside of the USA

Please check www.avalondesign.com for your nearest authorized service center.

12.1 Returns

If your AD2022 (M5) has become defective within the one (1) year period as specified above, please contact the place of purchase to arrange for warranty repair. If you would rather work directly with Avalon, please call the factory at 949-492-2000, send a fax to 949-492-4284 or email at avalon@avalondesign.com.

To return a unit to Avalon for repair or exchange, you will need to obtain a Return Authorization Number (RA) from Avalon. Do not send your unit to Avalon without an RA number.

13.0 Safety Standards



Avalon Industries, Inc. declares that the AD2022 (M5) conforms to standards EN55013 (Emissions), EN55020 (Immunity), and EN60065 (Product Safety).

Appendix A - Glossary

amplification – The process by which a signal level is increased.

amplitude – The distance above or below the centerline of a signal's waveform. The greater the distance from the centerline, the larger the pressure variation or electrical signal.

attack – The initial transient or first part of the envelope of a signal. The beginning of a note.

attenuate – To reduce the signal level.

balanced – In a classic balanced audio circuit, the two legs of the circuit (+ and -) are isolated from the circuit ground by exactly the same impedance. Additionally, each leg carries the signal at exactly the same level but with opposite polarity. Balanced input circuits can offer excellent rejection of noise and grounding loops.

balanced line – A cable having two conductors and a ground connection and often surrounded by a shield. With respect to ground, the conductors are at equal potential but opposite polarity. These lines are often used in professional setting to reduce or eliminate induced noise and interference from external electromagnetic sources.

bandwidth – The band of frequencies that pass through a device with a loss of less than 3dB, expressed in hertz or in musical octaves.

capacitance – Capacitance is the ability of an object to store an electrical charge.

channel – A single functional path in an audio circuit.

clipping – A cause of audio distortion that is the result of excessive gain requiring the peaks of the audio signal to rise above the capabilities of the circuit.

compressor – In effect, an automatic fader. When the input signal exceeds a predetermined level (called the threshold), the gain is reduced by the compressor and the signal is attenuated.

compression ratio – The ratio of signal dynamic range between the compressor input and the output above the device's set threshold point (such as 2:1, 4:1, 20:1).

console – A term for a sound mixer, usually a large desk-type mixing board used to mix together multiple track musical material.

crosstalk – The unwanted leakage of a signal from one channel or track onto another.

decibel (dB) – A unit of audio measurement of sound pressure level (SPL), signal level, and changes of difference in signal level. The decibel is a logarithmic (log) mathematical function that reduces large numeric values into smaller, more manageable numbers. Decibel is calculated as 10 times the log of the ratio of two powers, and 20 times the log of the ratio of two voltages.

dBm: Decibels referenced to 1 milliwatt.

dBu or dBv: Decibels referenced to 0.775 volt.

dBV: Decibels referenced to 1 volt.

de-ess – Using a frequency-dependent function in a compressor to reduce excessive sibilance ("sss", "sh," and "ch") sounds.

detent – A point of slight physical resistance (a click stop) in the travel of a knob or slide control.

dynamic range – The range between the maximum and minimum sound levels of an audio system. It is usually expressed in decibels as the difference between the level at peak clipping and the level of the noise floor.

equalizer – A frequency-dependent amplifier that controls the relative amplitude of various frequencies in the audible bandwidth. The equalizer lets you exercise tonal control over the harmonic content or timbre of a sound.

EQ curve – A graph of the response of an equalizer, with frequency on the x (horizontal) axis and amplitude (level) on the y (vertical) axis. Equalizer types and effects are often named after the shape of the graphed response curve, such as peak, dip, shelf, notch, knee and so on.

fade – A slow change in volume.

fader – A linear attenuation device or linear volume control.

feedback – The returning of a loudspeaker signal back into a microphone feeding the loudspeaker. Excessive feedback results in unpleasant, screaming sounds usually at particular high frequencies.

filter – A simple equalizer designed to remove certain ranges of frequencies. A high-pass filter (also called a low-cut filter) reduces or eliminates frequencies below the cutoff frequency. There are also high-cut (low-pass) filters, bandpass filters, which cut both high and low frequencies but leave a band of frequencies in the middle untouched, and notch filters, which remove a narrow band but leave the high and low frequencies alone.

flanging – A process whereby a delayed signal is combined with itself undelayed. The delay is varied to create continual changes in sound.

frequency – The rate at which a sound wave repeats a cycle. The number of cycles that occurs over the period of one second is called hertz (Hz). Often , the perceived range of hearing is from 20Hz to 18,000Hz.

gain – The measure of how much a circuit amplifies a signal. Gain may be stated as a ratio of input to output values, such as decibels from line amplifier.

gain riding – Adjusting the preamp gain while recording.

gain stage – An amplification point in a signal path, either within a system or a single device. Overall system gain is distributed between the various gain stages.

graphic EQ – A type of equalizer where the frequency bands for cut/boost and bandwidths are fixed. Graphic EQs are usually controlled by faders instead of knobs.

ground – The point of zero voltage in a circuit or electrical system.

ground loop – Exists in an improper grounding situation, whereby a DC current differential exists between one signal path and another, resulting in a 50Hz or 60Hz hum.

headroom – The difference between nominal operating level and peak clipping in an audio system.

hertz – The unit of measure for frequency of oscillation, equal to 1 cycle per second. Abbreviated Hz. kHz is an abbreviation for kilohertz, or 1000 Hertz.

impedance – The opposition of current flow in a circuit.

knee – A sharp bend in an EQ response curve. Also used in describing dynamic processors.

LED – Acronym for light emitting diode.

line level – A signal level that is referenced to either +4dB (professional) or -10dB (semi-pro/consumer).

mastering – The processing and transfer of a final, sequenced or mixed audio tape to a medium for duplication.

mixdown – The process in which the separate audio tracks of a multiple track recording are combined, balanced, and routed through the recording console. During mixdown, volume, tone, special effects and spatial positioning can be artistically set by the engineer to create a stereo or surround sound mix that is then recorded to a master recording device, such as a DAT recorder.

monaural – Confined to a single channel. One microphone is a mono pickup; many microphones mixed to one channel is a mono mix. Several mono sources, however, can be panned into a stereo (or two-channel) mix.

mono – short for monaural.

noise – Unwanted sounds. Hum, buzz or hiss; could be crosstalk or digital hiss.

noise floor – The residual level of noise in any system. The lower the noise floor and the higher the headroom, the more usable dynamic range a system has.

overload – The distortion that occurs when an applied signal exceeds a system's maximum input level.

pad – A switch circuit that attenuates the level by a specified amount (such as -20dB).

parametric EQ – A parametric EQ allows continuous control of each of the three primary EQ parameters (frequency, gain and bandwidth) independently.

passive EQ - A filter topology similar to early equalizer designs (such as pultec) where passive components (capacitors) are only used to filter the signal. In a passive EQ, amplifiers are only used as make-up gain devices. The capacitors used to filter the signal are not incorporated in the active feedback stage of the circuit. Passive EQ's have a distinctively smooth and musical sound.

peak amplitude – The maximum instantaneous amplitude of a signal.

peak LED – A light that flashes when a maximum signal level is reached.

phantom power – Polarizing supply voltage for condenser microphones supplied directly through the microphone cable (usually +48V).

phase – The degree of progression in the cycle of a wave, where one complete cycle is 360 degrees. Phase is measured in degrees of a cycle and will result in audible variations of a combined signal's amplitude and overall frequency response.

phase shift – The difference in degrees of phase angle between corresponding points on two waves.

polarity – See phase.

potentiometer (pot) – A rotary gain, pan, or other type of continuously variable signal control.

preamplifier - A piece of equipment that boosts the signal level so that the signal operates at a higher and more desired level enabling greater frequency and dynamic range.

PSU - Power supply unit

release time – Once compression has begun, the time taken for the attenuated signal to return to 63% of its original (unprocessed) level.

resistance – The opposition to the flow of DC current in a wire or circuit.

ribbon microphone – A microphone that uses a diaphragm of extremely thin, aluminum ribbon suspended in a strong field

of magnetic flux. As sound-pressure variations displace the metal diaphragm in accordance with air-particle velocity, the ribbon cuts across the magnetic lines of flux. This induces a current in the ribbon of proportional amplitude and frequency to the acoustic waveform.

shelving filter – A rise or drop in frequency response at a selected frequency that tapers off to a preset level and continues at the level to the end of the audio spectrum.

side chain - A function on a compressor where a specified frequency range is compressed more than the overall musical program. Many compressors have a jack for an equalizer to be inserted into the compressor drive electronics.

signal LED - Light flashed when signal of a specified level occurs. On AD2022 (M5) green light flashes at 0dB, then flashes red at +20dB.

spectral control - The use of a side chain in a compressor to compress selected frequencies of a musical program. One example of spectral control is removing the "sss" sounds of a vocal (de-essing).

sweep EQ – An equalizer that allows you to "sweep" or continuously vary the frequency of one or more sections.

unbalanced – An electrical circuit in which the two legs of the circuit are not balanced with respect to ground. Unbalanced circuit connections require only two conductors (signal "hot" and ground). Unbalanced audio circuitry is less expensive to build, but under certain circumstances is more susceptible to

noise. An unbalanced audio cable has only one conductor plus a surrounding shield, in which the shield is at ground potential. The conductor and the shield carry the signal.

VU meter - Volume unit meter. A meter that reads audio voltage levels in or out of a piece of equipment and is designed to match the ear's response to sudden changes in level.

volume – Electrical or sound level in an audio system.

waveform – A graph of a signal's sound pressure or voltage level versus time.