

AmpConnectTM

Microphone & Loudspeaker Test Interface Instruction Manual

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Transforming Sound into Knowledge

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Introduction

AmpConnect makes loudspeaker and microphone testing simpler AND more cost-effective. It replaces an impedance box, amplifier, microphone power supply and digital I/O card with one simple USB controlled piece of hardware. AmpConnect provides all the necessary calibration, voltage, & current signals to perform acoustic and electronic tests



such as frequency response, sensitivity, distortion, and impedance. It can also drive sound sources (e.g. mouth simulators) for testing microphones. This reduces operator error as multiple hardware items are replaced by a single rugged, rack mountable unit with fully labelled connections. AmpConnect is fully controllable via SoundCheck which means that adjustments of parameters such as gain can be included in test sequences. AmpConnect will self-calibrate with SoundCheck and is more immune to ground loops than off-the-shelf components. AmpConnect can route/select all test signals, and contains an integral power amplifier to drive the device under test (or mouth simulator). Two selectable internal reference resistances to measure device impedance offer much simpler impedance measurements than conventional methods. No additional external equipment is required to realize a complete acoustic test platform for a wide range of devices – simply connect your device to AmpConnect and SoundCheck, and start testing.

Control

AmpConnect can be controlled either using the switches on the front-panel, or remotely via a USB connected PC. This makes it equally suitable for use as a standalone device (e.g., in a lab or during production line setup), or with a PC on a production line. An eight-bit digital I/O port provides digital control and/or status monitoring of external devices for operator feedback, test fixture control, etc.

Connection

Connection to SoundCheck (or any other test system) is simple via balanced (XLR) or single-ended (BNC) connections. Two simultaneous user-selectable inputs enable 2 measurements to be made simultaneously. In the case of a loudspeaker test, this may be an acoustic signal and an electrical signal such as impedance, and in the case of a microphone test a reference microphone may be measured at the same time as the microphone under test for comparison purposes. Two sets of output connections for the devices under test, either of which can be selected as the active output, permit one test to be performed while simultaneously setting up a test on the other output, thereby increasing production line testing throughput. A reference input connection allows the output from an external electrical test signal (typically the output of a measurement microphone) to be routed through and selected by AmpConnect and communicated to SoundCheck, freeing the operator from having to handle any external signal switching during testing. This reference input also provides voltage and IEPE bias, supporting transducers requiring either type of powering. The bias can be removed to allow direct connection to a microphone power supply or preamplifier. The amplitude of signals can be adjusted for optimal levels without the need for external amplifiers or attenuators. Both the reference input signal and the signal from the device under test, can be attenuated by 10 or 20 dB, or amplified by 0, 10, 20, 30, or 40 dB before being output to SoundCheck. Simplicity and ease of use has been carried through to the user display, with three-color indicators on the front panel (as well as a signal to the computer via the USB) to provide a clear visual signal to the user that the reference, device-under-test, and power amplifier levels are operating within range.

Key Features

Combines the functionality of:

- Microphone power supply
- Impedance Sense Resistor Interface
- Power Amplifier
- Signal Router
- Digital I/O

All in a 2 rack space package.

Simplicity

- Consolidates test equipment and eliminates excess cabling, greatly simplifying setup and reducing connectivity errors
- Much simpler calibration without having to change any cables

Integration

- Can be controlled directly from SoundCheck® via USB or through front panel controls

Protection & Durability

- Protects sound card from overload and damage
- Built to stand up to demanding production environments

Speed

- Dual amplifier outputs allows the operator to test one speaker while loading another

Traditional Test Setup

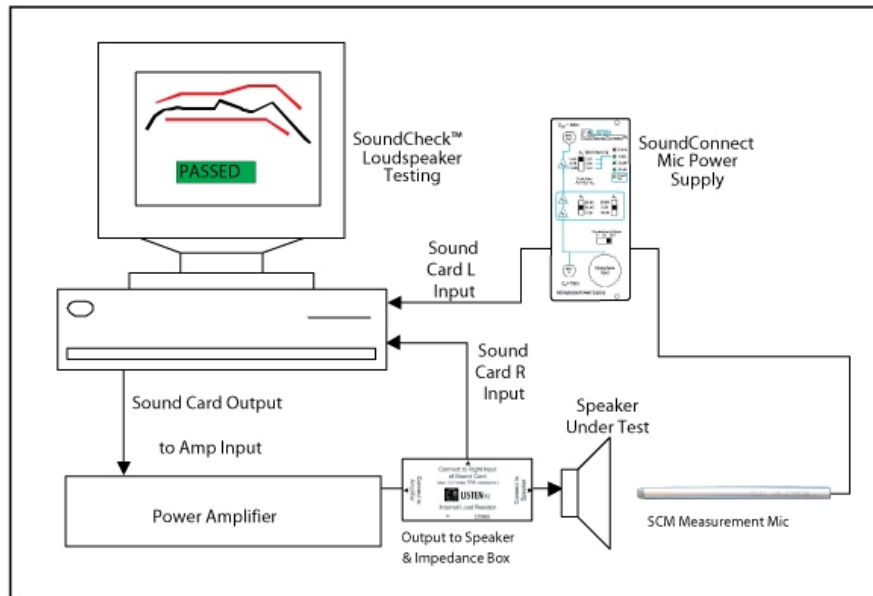


Figure 1-1: Conventional loudspeaker test setup

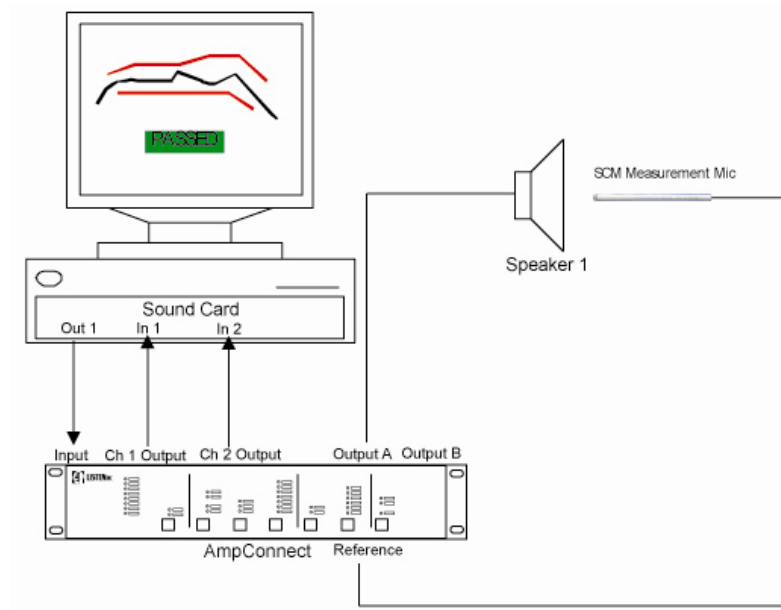


Figure 1-2: AmpConnect simplifies the setup

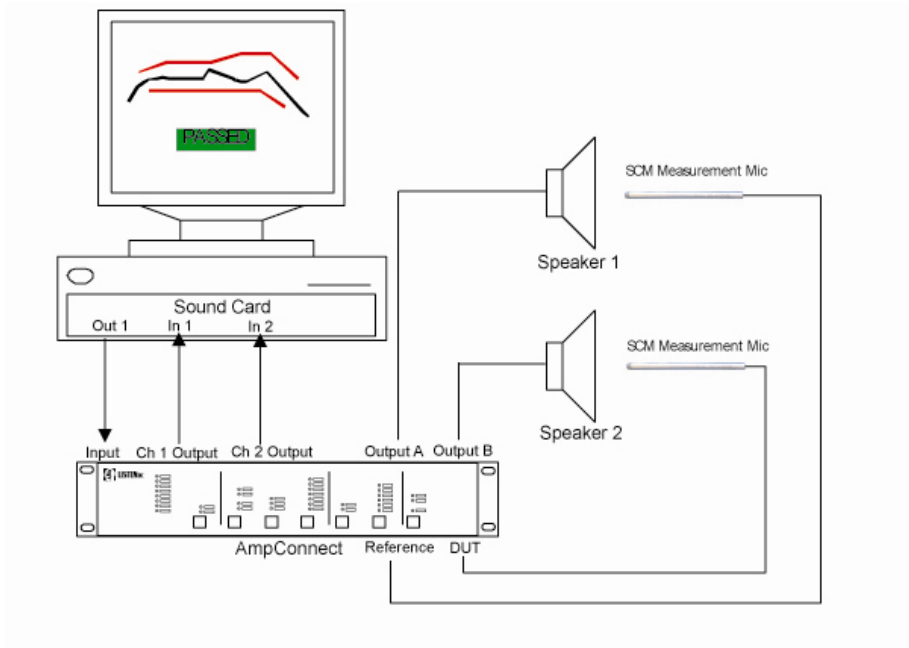


Figure 1-3: Example of two speaker test setup

Installation

Requirements

- SoundCheck 8.11 (or SoundCheck ONE) is required in order to control AmpConnect via USB
- The SoundCheck computer must have an available USB 2.0 connection
- The following Custom VI files must be copied to the C:\SoundCheck 8.1\System\Custom VIs folder:
 - AmpConnect.vi
 - AmpConnect Editor.vi
 - AmpConnect.llb

Software Installation

Before connecting AmpConnect to a USB port of your SoundCheck System, you must run the AmpConnect software installation.

AmpConnect requires Microsoft .NET Framework 2.0 sp1 (or later). The installation process will check to see if .NET Framework is installed. If not, the following screen will appear prompting you to install the required application.

Note: An internet connect is required in order to download the Microsoft application. If the SoundCheck system does not have internet access, the NET framework installer can be download on a different PC and then copied to the system manually.



Once the installation has finished, you can connect AmpConnect to your SoundCheck system using the USB cable provided.

Windows will indicate that new hardware has been found, which shows that the driver has been successfully installed. This may be displayed as "AmpConnect" or as "New HID Device".



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Front Panel Functions

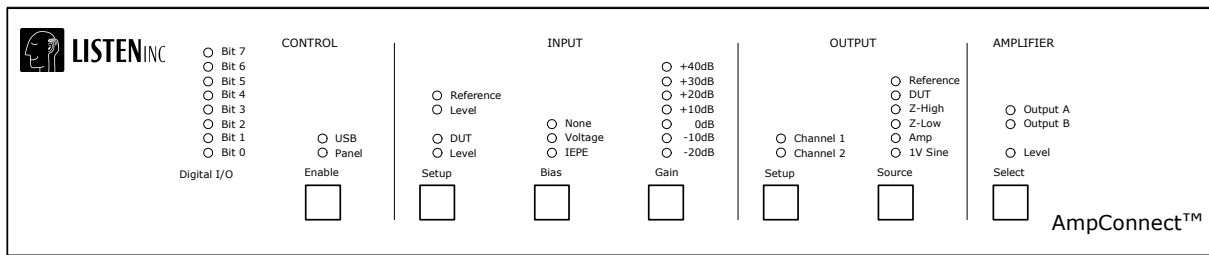


Figure 3-1: Front Panel

AmpConnect can be used as a stand-alone test and measurement interface. It can also be controlled by SoundCheck using Custom Steps in a test sequence. The front panel LEDs show the settings for input and output channels as well as signal level and signal state.

Control

Enable

The Enable button toggles between USB and Front Panel control. The USB and Panel LEDs indicate which is selected.

- **USB** allows SoundCheck to control the operation of AmpConnect
 - AmpConnect will automatically enable **USB** control as soon as it is connected to the SoundCheck computer via USB
 - AmpConnect will return to Panel control if the SoundCheck computer shuts down
- **Panel** allows AmpConnect to function as a standalone interface (This is disabled when USB is selected in a SoundCheck sequence step.)
 - When **Panel** is disabled, the front panel is locked out, protecting the unit from accidental changes during testing. This feature may be activated from a step, however, it is not a requirement.
- **USB** and **Panel** control can be simultaneously enabled if desired

Panel Control

The power up default settings are those most commonly used for loudspeaker testing:

- Digital I/O - all bits are Low (LEDs off). (Digital I/O is not available when used as a stand-alone interface)
- Input - Reference Mic Bias set to Voltage with +20dB of gain
- Output Channel 1 - Reference Mic routed to Channel 1 output
- Input - DUT Mic is not used
- Output Channel 2 - Z-Low routed to Channel 2 output
- Amplifier routed to Output A

USB Control

- USB control of front panel functions through a SoundCheck sequence step
- When USB is selected in a SoundCheck sequence step, the Front Panel controls are disabled to prevent accidental changes

Digital I/O

- 8 bits of digital I/O that can be written and read directly in SoundCheck
- Used to control relay boards and switches, e.g. footswitch for Start and Stop
- Communicate with PLCs in automated production lines
- Receive TTL signals from other test equipment

Digital I/O States

- Bits can be used as either input or output. The state of the Bit is indicated by the LEDs:
 - LED off - Bit is low
 - LED on - Bit is high

Note: The Digital I/O function can only be used when AmpConnect controlled by SoundCheck through USB.

Input

The Setup button toggles between Reference input and DUT input. Separate settings and signal routing can be made for each. The settings for Reference and DUT are independent of each other.

When the Reference or DUT microphone inputs are routed to Output 1 or 2, the level indicators show the signal state of the OUTPUTS that these microphones are assigned to. This is to insure that the input of the SoundCheck sound card is not overloaded or underloaded (low signal level that is too close to the noise floor of the system). Refer to your sound card manual to see what overload level is appropriate.

Reference

Level - Monitors the signal level and state of the **Output Channel** that the **Reference Mic** has been routed to, after applying gain.

- Green indicates level is $\geq -40\text{dBV}$
- Yellow indicates level is $\geq +4\text{dBu}$
- Red indicates level is $\geq +13\text{dBu}$
- If an input channel is not assigned to an output channel, the LED is off

DUT (Device under test)

Level - Monitors the signal level and state of the **Output Channel** that the **DUT Mic** has been routed to, after applying gain.

- Green indicates level is $\geq -40\text{dBV}$
- Yellow indicates level is $\geq +4\text{dBu}$
- Red indicates level is $\geq +13\text{dBu}$
- If an input channel is not assigned to an output channel, the LED is off

Bias

Bias can be set for ONLY the Reference Microphone.

- None: for microphones or electronics that do not require power
- Voltage: provides bias to SCM microphones and electret condensers
- IEPE: provides constant current bias for pre-polarized reference microphones

Note: Testing microphones that need 48V phantom power requires an external phantom power supply.

Gain

- Gain is variable in steps from -20dB to +40 dB
- Input gains are independently variable

Output

AmpConnect™ features two configurable outputs to the sound card. You can choose which signals are routed to each from the Front Panel or via USB control. Settings for Channels 1 and 2 are independent of each other.

Any of the following signals can be routed to Output Channel 1 or 2:

- Z-High – 1 ohm sense resistor load for testing loudspeaker impedance
 - output signal is 1 Volt/Amp
- Z-Low – 0.1 ohm sense resistor load for testing loudspeaker impedance
 - output signal is 100 mVolt/Amp
 - fixed value - cannot be changed
- Amp – the output of the power amp can be routed to a signal out when calibrating the amp
 - Output impedance is always 0 ohms, even when sense resistors are active
- Reference – signal from the Reference microphone input
- DUT – signal from the DUT microphone input
- 1V Sine – a reference 1 Volt sine wave can be sent to either output in order to test sound card connections and settings.
 - constant signal generated by AmpConnect
 - cannot be routed to amplifier output
- Quiet - output channel is shunted to ground (All source LEDs are off)
 - If AmpConnect is accidentally disconnected from USB or if the computer is shut off, AmpConnect will automatically shunt both output channels to ground. The power amplifier outputs are also set to off. This is to minimize transients. Re-enable the channel outputs and power amp outputs by re-selecting them.
 - All source LEDs are off

Amplifier

- Single input amplifier with a fixed gain of 26 dB
- Amplifier output can be routed to Output A, Output B or both simultaneously
- Output impedance is always 0 ohms, even when sense resistors are active
- Should the power amp output current exceed 5.7A peak, the outputs will be disabled until reset by the user. The power amp level indicator will flash red.
- The amplifier output signal is attenuated by 20dB when it is routed to the Channel 1/2 Outputs for use in amplifier calibration

Level

- Monitors the signal level and state of the amplifier output
 - Green indicates level is $\geq -14\text{dBV}_{\text{out}}$ (corresponds to $-40\text{dBV}_{\text{in}}$)
 - Yellow indicates level is $\geq 12\text{V}_{\text{peak}}$ (about 6dB before clipping)
 - Red indicates level is $\geq 17\text{V}_{\text{peak}}$ (about 3dB before clipping)

Rear Panel Connections

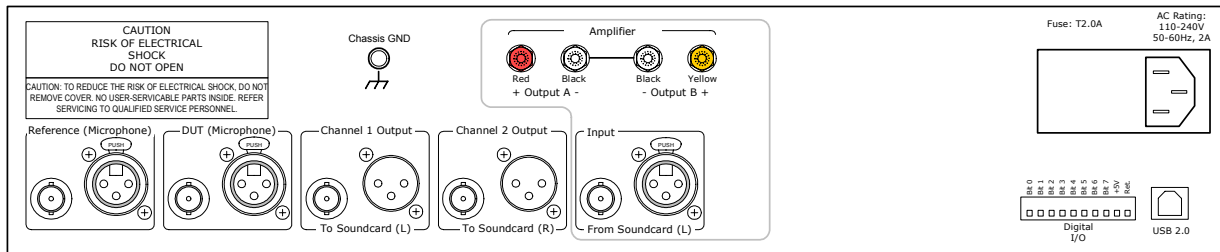


Figure 4-1: Rear Panel

Important! XLR and BNC connections on an **input** should not be used simultaneously. For more information on the internal connection between XLR and BNC connectors, please refer to [Internal Jumper Settings on page 24](#). The output stages of the XLR and BNC outputs are independent of each other and can be used simultaneously.

Reference - Microphone

This is typically used for connecting a Reference Microphone.

- Balanced XLR female and Single Ended BNC connectors, wired in parallel
- Bias voltage is across Pin 2 & 3 of XLR connector, and the center pin & shell of the BNC connector
 - When Voltage or IEPE Bias is selected, the BNC shell and XLR Pin 3 are internally connected to signal ground. This is independent of internal jumper settings. This makes the input Single Ended.
- Voltage = 10 V
- IEPE = 10mA
- Input impedance - 100k ohm

BNC vs. XLR internal wiring

- XLR & BNC inputs are differential
- XLR pin 1 is chassis ground
- XLR pin 2 is signal high (+), BNC center is signal high (+)
- XLR pin 3 is signal low (-), BNC case is signal low (-)
- By default, the BNC shell is not connected to signal or chassis ground (providing Bias is off, as noted above)

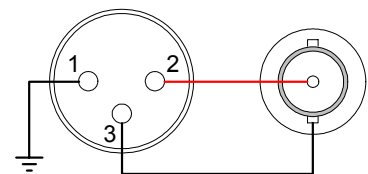


Figure 4-2: XLR / BNC Inputs

Refer to [Internal Jumper Settings on page 24](#) for more information on grounding options and single ended operation.

DUT - Microphone

This connection can be used for connecting a “Device Under Test” Microphone. This connection is used typically for microphone testing.

- Balanced XLR female and Single Ended BNC connectors
- -3dB low frequency roll off point is 20Hz
- Bias is not available for DUT microphone

Channel 1 Output

This is connected to the appropriate sound card input of the SoundCheck system.

- Balanced XLR male and single ended BNC connectors

Channel 2 Output

This is connected to Input 2 of the SoundCheck system sound card.

- Balanced XLR male and single ended BNC connectors

Amplifier Input

This is connected to the appropriate sound card output of the SoundCheck system.

- Balanced XLR female and single ended BNC connectors
- Direct input to Amplifier. Amplifier output can be routed to two outputs

Amplifier Output A

Connects to a transducer via the binding post connectors.

Note: There is only one power amp channel in AmpConnect. This amp channel can be switched to either Output A, Output B or A + B.

Amplifier Output B

Connects to a second transducer via the binding post connectors.

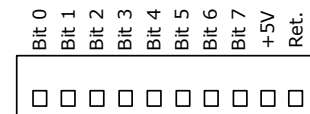
Digital I/O

Phoenix style connector

- Requires a Phoenix plug, part number: 1803659, in order to wire to external devices.

Pin out:

- Bit 0 thru 7 - Lines can be used as outputs to control external devices, or as inputs to receive switching signals from external devices.
 - Input Bit max voltage is 5.5V DC
- +5V - Provides a +5V DC voltage as reference or power for Bits
 - Self resetting fuse set at 80 mA
- Ret. - Digital I/O signal ground (at same potential as chassis ground)



Digital
I/O

See [Digital I/O Connections on page 21](#) for wiring suggestions.

USB

Connect to SoundCheck computer for USB control.

The settings in AmpConnect can be changed through a Custom Step in a SoundCheck test sequence.

See [Custom Step on page 15](#) for more information.

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USB Control Via SoundCheck

Custom Step

Open the SoundCheck sequence editor and select the Custom Step category on the left hand menu.

Under **Step** select **New**.

Enter "**AmpConnect**" for the custom step name and click **OK**.

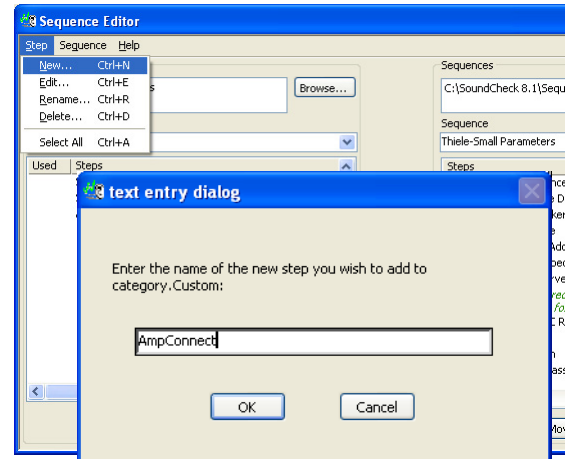


Figure 5-1: Create Custom Step

Note: In SoundCheck ONE, the user does not have access to creating a new custom step. Only the settings in the existing step can be changed.

Insert the new AmpConnect step at the top of the sequence. When the sequence runs, this step will set the AmpConnect options for its first use in the sequence.

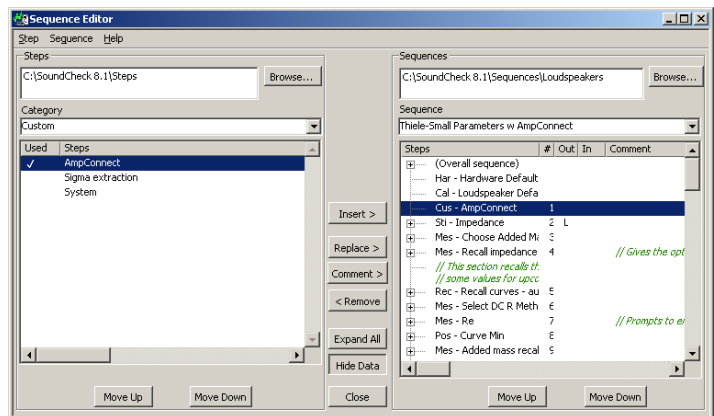


Figure 5-2: Custom Step in Sequence

Important! AmpConnect settings can be changed during the run of a test sequence, to perform different functions. This will require individual AmpConnect steps at various points in the SoundCheck sequence. All settings in the AmpConnect Custom Step are Blue Fields (Sequence Specific), so that multiple instances of a step can be used in a sequence. Each step can have different settings. Please refer to the SoundCheck Instruction Manual for more information on sequence operation.

AmpConnect Software Control

Open the AmpConnect custom step from the Active Sequence in the right hand section of the editor.

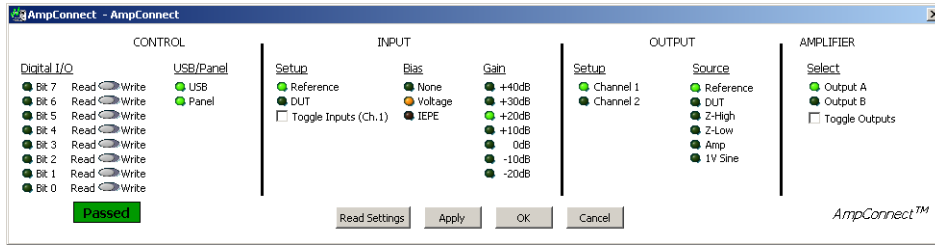


Figure 5-3: Channel 1 Settings

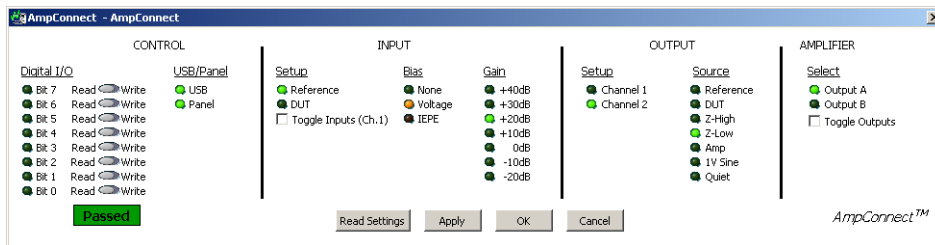


Figure 5-4: Channel 2 Settings

The Loudspeaker Impedance Test Sequence will require the settings as shown in [Figure 5-3](#). (Refer to [Single Loudspeaker Test on page 17](#) for wiring suggestions.)

- Control is set to USB. This disables the front panel controls.
- Input Section - Reference Mic is set to use Voltage and a Gain of +20dB.
- Output Section - The Reference Mic is routed to Output Channel 1.
- Amplifier output is set to Output A

In addition, [Figure 5-4](#) shows the settings for Output Channel 2:

- The signal from the Z-Low sense resistor is set to Output Channel 2. This is used for the Impedance measurement input in the SoundCheck sequence.

Click **Apply** in the editor to test that the AmpConnect settings change on its front panel.

When the sequence runs, AmpConnect will automatically change to these settings.

Connection Procedures

Single Loudspeaker Test

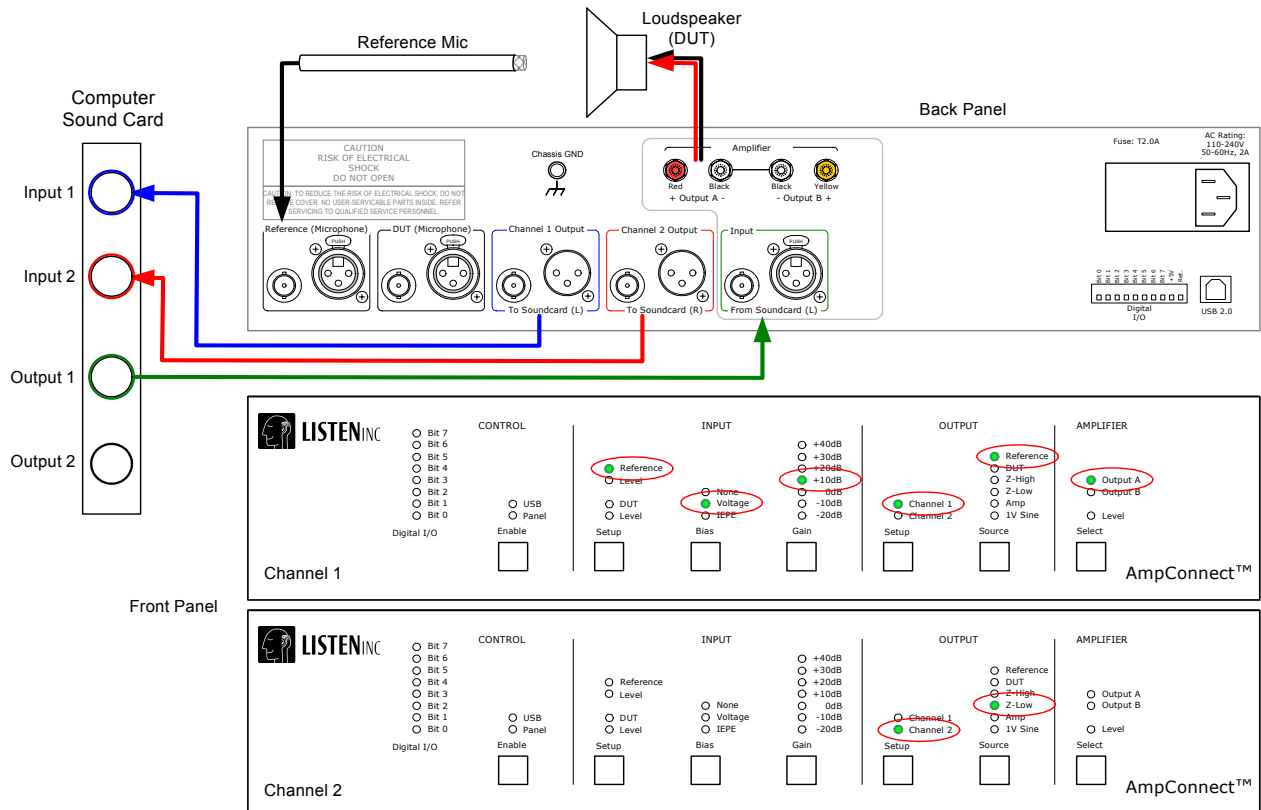


Figure 6-1: Single Loudspeaker Test Layout

The Single Loudspeaker test as shown in [Figure 6-1](#) shows AmpConnect with the following settings:

- Reference Mic output set to Channel 1
- Bias set to Voltage
- Gain set to +10dB
- Amplifier output set to Output A
- Z-High sense resistor output set to Channel 2

Two Loudspeaker Test

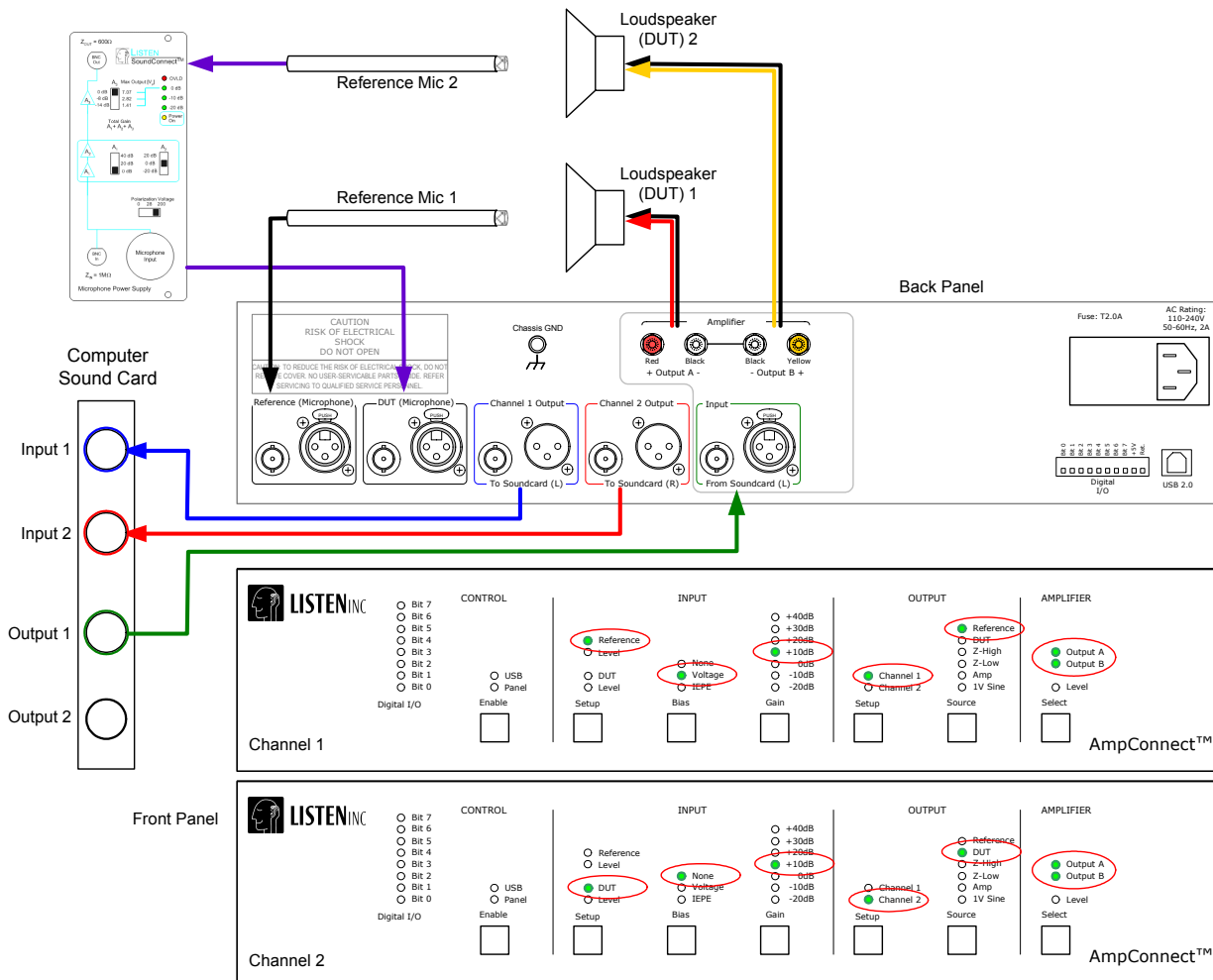


Figure 6-2: Two Loudspeaker Test Layout

Figure 6-2 shows AmpConnect setup to test two loudspeaker simultaneously. (This does not include impedance measurement.)

- Reference Mic 1 output set to Channel 1
- Bias set to Voltage
- Gain set to +10dB
- Reference Mic 2 is connected to an external microphone power supply. In this case, a SoundConnect.
 - SoundConnect set to 0dB of gain and connected to the DUT Microphone input
- DUT Mic (Reference Mic 2) output set to Channel 2
- Gain set to +10dB (Bias not available on DUT Mic input)
- Amplifier output set to Output A and B

Important! Connecting two loudspeakers in parallel to one amplifier output reduces the impedance of the load, e.g., 8 Ohms + 8 Ohms = 4 Ohms. Testing low impedance loads is not recommended.

Microphone Test

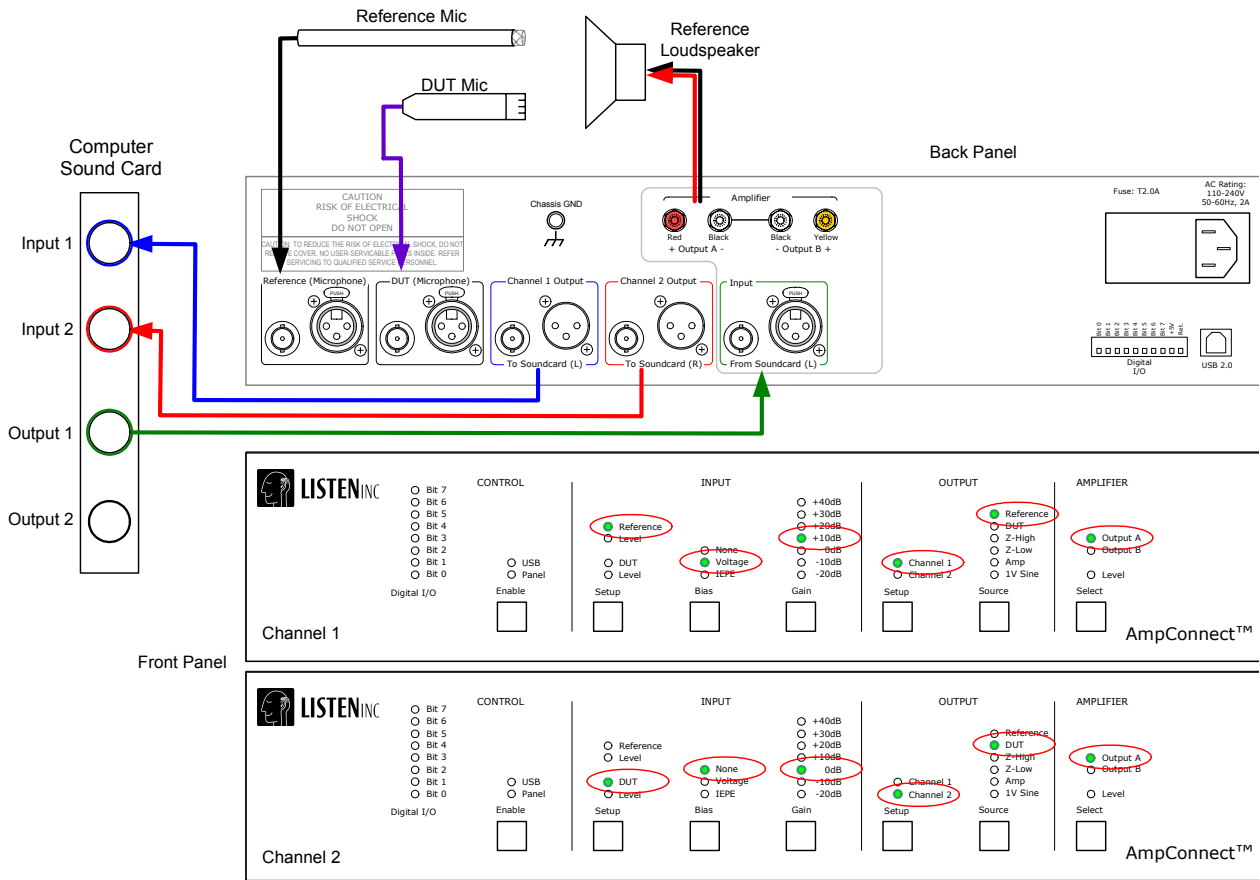


Figure 6-3: Microphone Test Layout

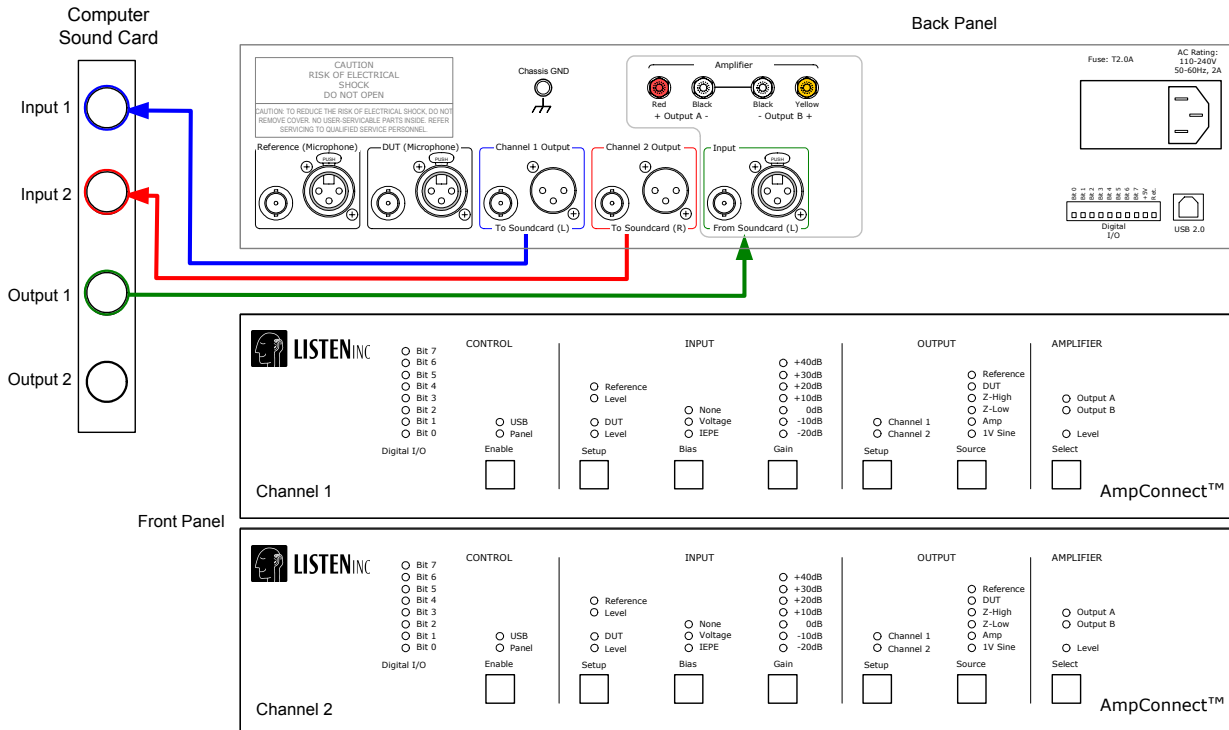
The Microphone test setup in [Figure 6-3](#) shows how AmpConnect is setup with a DUT Mic that does not require an external power supply.

- Reference Mic output set to Channel 1
 - Bias set to Voltage
 - Gain set to +10dB
- DUT Mic output set to Channel 2
 - Bias is not available on the DUT Mic input (see notes below)
 - Gain set to 0dB
- Amplifier output set to Output A

Note: To test microphones that require Bias (Voltage or Current), an external supply such as the SoundConnect can be used.

Note: To test microphones that require 48 Volt, an external Phantom Power Supply can be used.

User Setup Notes



Digital I/O Connections

Digital I/O settings are made in a AmpConnect Custom Step, used in a SoundCheck test sequence. When the Bit Light is **On**, the Bit is set **High**. When **Off**, the Bit is set **Low**.

Note: Access to Digital I/O control is not available in SoundCheck ONE.

General rules

- Bits are at ground when set Low
- Bits are at +5V when set High
- This corresponds to the Front Panel LEDs and software control settings
- Lines for Bits 0 thru 7 have an internal 470 Ohm resistor in series with each
- When configured as an input, the bit is pulled high through an internal 100K resistor

Output Bits

When using the Digital I/O Bits as outputs the example in [Figure 6-4](#) shows two possible wiring configurations.

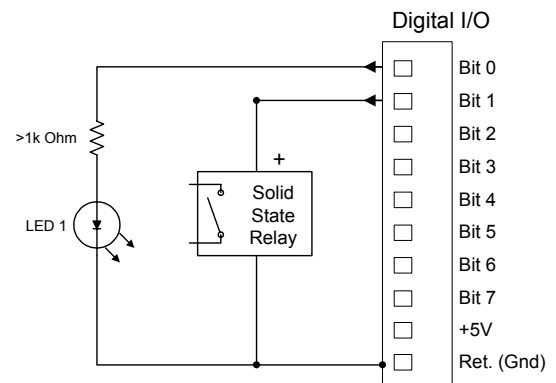
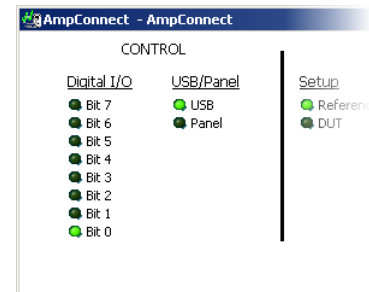


Figure 6-4: Bits 0 & 1 used as outputs

Bit 0 Example

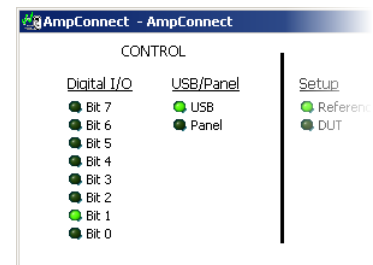
This turns on an external LED when Bit 0 is set to High (On) in the software control panel. A resistor of at least 1k Ohm should be put in series with the LED, wired as indicated. When the step is executed in the sequence, Bit 0 is set High and 5VDC is applied to the LED.

Note: Individual AmpConnect Custom Steps are required in a SoundCheck sequence to perform various Digital I/O operations.



Bit 1 Example

This activates an external Solid State Relay as shown in [Figure 6-4](#). When Bit 1 is set High by the AmpConnect Custom Step, 5VDC is applied to the relay input.



Input Bits

When configured as an input, the bit is pulled high through an internal 100K resistor. Users may want to use external pull-up resistors to increase noise immunity or pull-down resistors to force the input low, as shown in [Figure 6-6](#).

Bit 4 Example - High when switch is depressed

A Normally Closed Footswitch can be used to start a SoundCheck test sequence.

[Figure 6-5](#) shows a Normally Closed switch wired across Bit 4 and Ret.

In this configuration, when the switch is open, the AmpConnect custom step will indicate that the bit is **Low**. When the switch is closed, the custom step will change to High.

This “State Change” can be used to prompt the start of the sequence run.

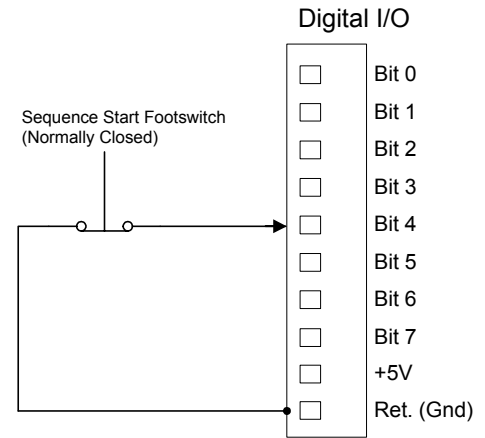


Figure 6-5: Bit 4 - Normally High

Bit 4 Example - High when switch is depressed

A Normally Open Footswitch can also be used.

In [Figure 6-6](#) a Normally Open switch is wired across Bit 4 and +5V.

A 2.2k Ohm resistor is also wired across Bit 4 and Ret.

In this configuration, when the switch is open, the AmpConnect custom step will indicate that the bit is **Low**. When the switch is closed, the custom step will change to High.

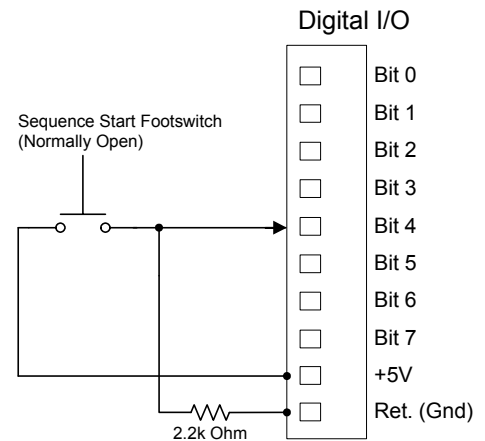


Figure 6-6: Bit 4 - Set Low

Bit 5 Example - TTL Input

SoundCheck may also need to receive a TTL signal from an external device such as a Production Line Controller.

[Figure 6-7](#) shows the output of such a device connected across Bit 5 and Ret. When the TTL signal goes High, Bit 5 will also be set to High in the AmpConnect Custom Step.

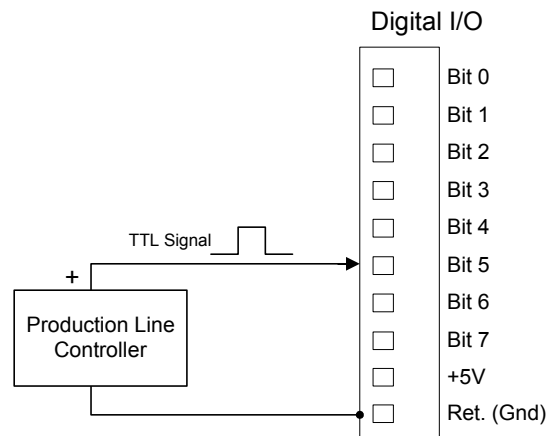


Figure 6-7: Bit 5 - Normal Logic Input

AmpConnect Internal Connections

Block Diagram

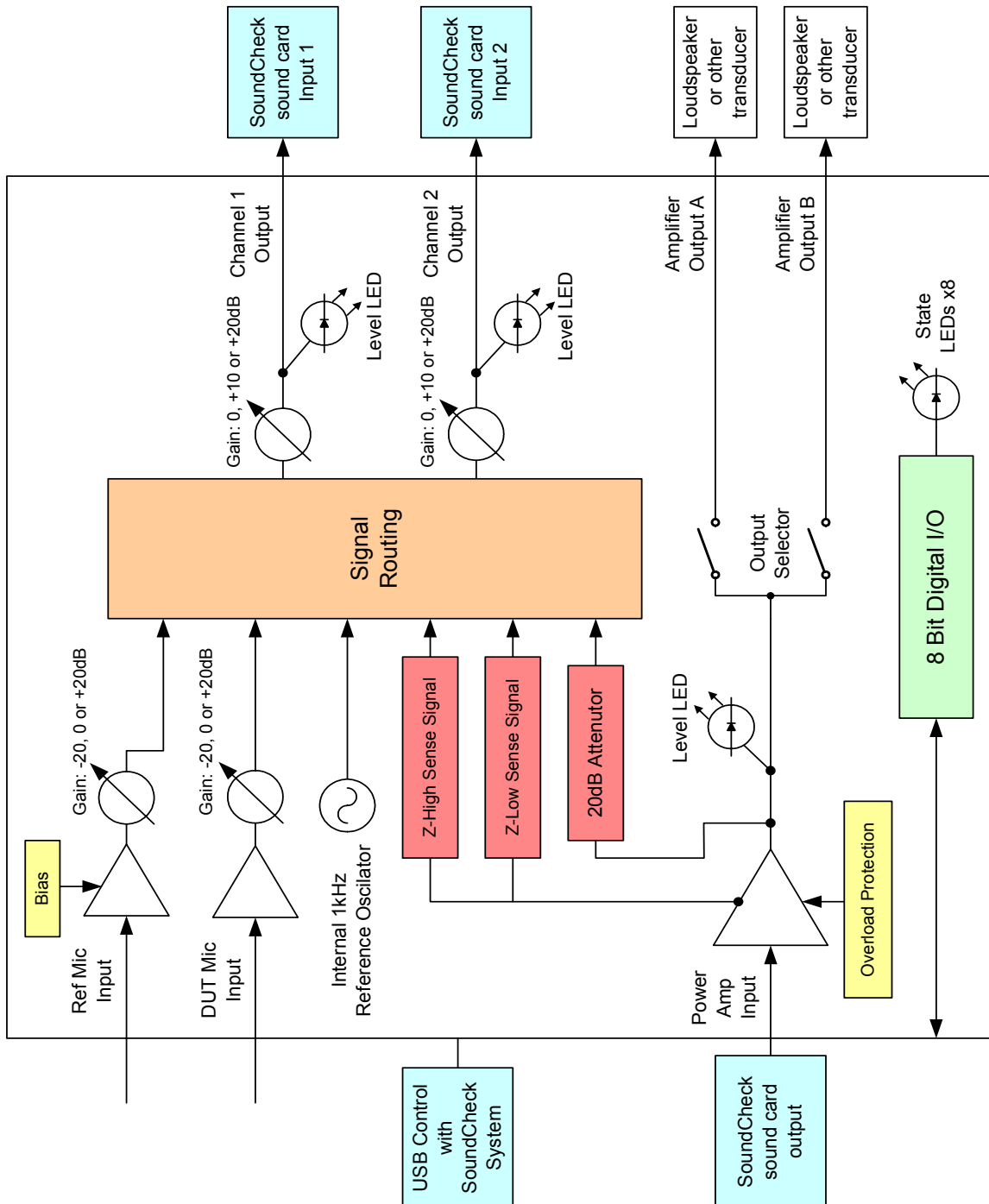


Figure 7-1: AmpConnect Block Diagram

Internal Jumper Settings

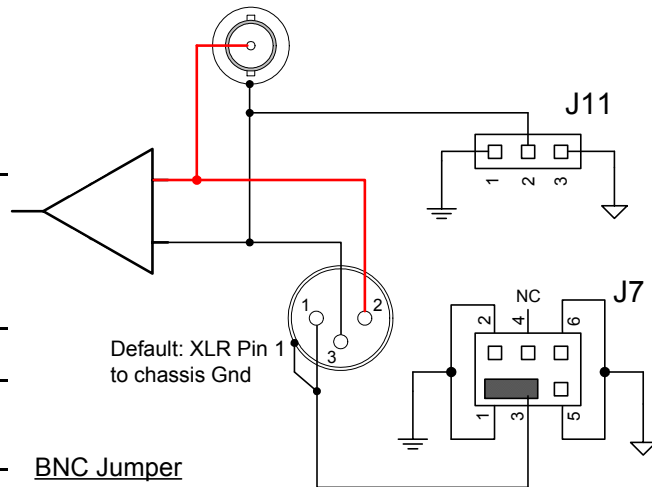
Grounding jumpers allow for greater flexibility in using AmpConnect in various environments. Default jumper settings can be changed by the user by simply removing the cover and changing the two pin jumpers on the desired input or output. The available options should allow the user to compensate for issues such as “Ground Loops”.

Input Grounding Options

There are two sets of jumpers for the inputs; BNC and XLR.

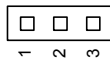
Note: XLR Pin 1 is set to chassis ground by default. XLR Pin 1 is also physically connected to the XLR case as shown in [Figure 7-2](#).

Note: Using BNC Option 2 or 3 will set the input to single ended.



BNC Jumper

Option 1 - Default



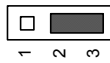
BNC case floating -
Input is differential

Option 2



BNC case to chassis Gnd -
Sets input to single ended

Option 3



BNC case to signal Gnd -
Sets input to single ended

Figure 7-2: Input Grounding Jumpers

Jumper List

Amp Input

- BNC - J11
- XLR - J7

Reference Microphone

- BNC - J33
- XLR - J27

DUT Microphone

- BNC - J25
- XLR - J19

Important! When Voltage or IEPE Bias is selected, the BNC shell and XLR Pin 3 are internally connected to signal ground. This is independent of internal jumper settings. This makes the input Single Ended.

Important! XLR and BNC connections on an **input** should not be used simultaneously. For more information on the internal connection between XLR and BNC connectors, please refer to [Internal Jumper Settings on page 24](#). The output stages of the XLR and BNC outputs are independent of each other and can be used simultaneously.

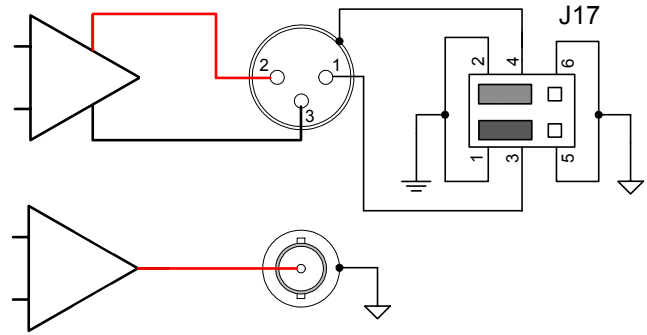
Output Grounding Options

There is only one jumper for each output.

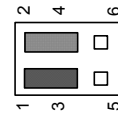
Channel 1 Output - J17

Channel 2 Output - J13

- Pins 2 and 4 of the jumper block are always connected. Set by default.
- There is no way to internally configure the XLR outputs for single ended operation.
- Users may accomplish this by externally connecting pin 2 or 3 to ground.
- 50 Ohms is in series internally with each XLR signal pins. (100 Ohms total)
- The output impedance of the BNC less than 5 Ohms.

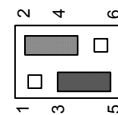


Option 1 - Default



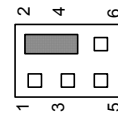
XLR Pin 1 to chassis Gnd

Option 2



XLR Pin 1 to signal Gnd

Option 3



XLR Pin 1 floating

(2 & 4 are always jumpered)

Figure 7-3: Output Grounding Jumpers

Jumper Location

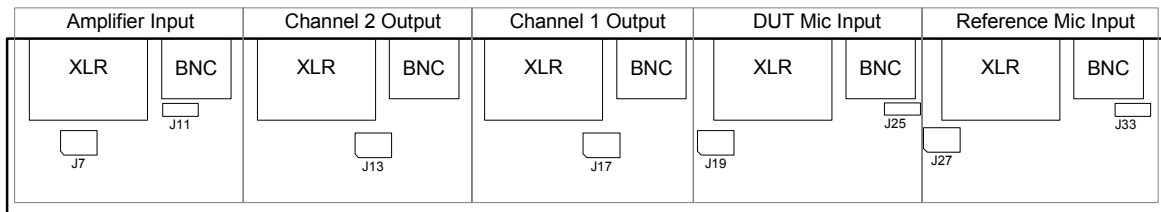


Figure 7-4: Grounding Jumper Location

Jumpers are located on the AmpConnect PC board as indicated in [Figure 7-4](#). Remove the cover to adjust jumper positions and then replace the cover.

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Specifications

Power Amplifier

- Continuous Output Power: 60W RMS into 4 Ohms, 47W RMS into 8 Ohms
- Frequency Response: -3dB at 4Hz & 90KHz
- THD at 60W, 4 Ohms: 0.019%
- Voltage Gain: +26.4dB, +/-0.1dB

Loudspeaker Current Measurement

- Z-High = 1V/A +/-1%
- Z-Low = 100mV/A +/-1%

Amplifier Output Impedance

- 0 Ohms

Reference & DUT Inputs

- Gain: -20dB to +40dB in 10dB steps
- Maximum input at -20dB: 100V RMS
- Maximum input at +40dB: 100mV RMS
- Frequency Response: -3dB at 20Hz & 100KHz;
- IEPE Bias: 10mA, 20VDC (max)
- ECM / Electret Bias: 10 VDC through 2.2K Ohms

Channel 1 and 2 Outputs (To Soundcard Inputs)

- Maximum Output: 10V RMS into 600 Ohms (Balanced and Unbalanced)
- Unbalanced Output Impedance: Less than 5 Ohms
- Unbalanced Output Tolerances: +/- 0.1dB for gains -20dB, 0dB, +20dB, +/-0.2dB for gains -10dB, +10dB, +30dB, +40dB
- Balanced Output Impedance: 100 Ohms

Digital I/O

- 8 Bit; any bit may be configured for input or output
- Outputs: +5V/GND 10mA (max) each
- Note: USB required for Digital I/O operation

Internal Sine Generator

- Output Level: 1V RMS +/-TBD dB
- Output Frequency: 1KHz +/- TBD Hz

USB 2.0 Interface

- All front panel functions USB controllable
- Front panel can be locked out via USB
- Outputs automatically disabled upon USB disconnect or PC shutdown

Physical

- Without rack mounting flanges: 17 in. wide, 2-Unit (3-1/2 in.) high, 11 in. deep
- Weight: 7 lbs (3.2kgm) approx.
- Power: 85 - 264VAC 50/60 Hz, 150 Watts (max)

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Contact Information

Contact the Listen office at 617-556-4104, Monday thru Friday, between 9 AM and 5 PM EST.

or email:

Sales - sales@listeninc.com

Technical Support - support@listeninc.com

Useful links

Listen Website: www.listeninc.com/

User's Forum: www.listeninc.com/community/

FAQ page can be found at: www.listeninc.com/community/

Download the latest versions of manuals, drivers and sequences from:

www.listeninc.com/site/download_main.html

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