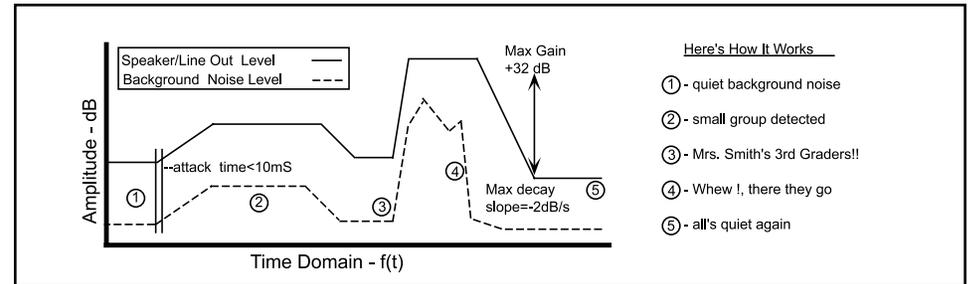# The SMART AMP<sub>v2</sub>

## INSTALLATION and SETUP INSTRUCTIONS

Prior to connecting your SMART AMP from Stop and Listen we strongly recommended you read through these instructions from beginning to end to familiarize yourself with the installation and operation of the device.

# OVERVIEW

As you go through this booklet we hope that we'll answer any questions you may have about the installation and operation of the device. If, on completing this booklet you still have questions, please don't hesitate to call. Our technical support staff will be able to provide you with the answers you need.



Here's How It Works

① - quiet background noise

② - small group detected

③ - Mrs. Smith's 3rd Graders!!

④ - Whew !, there they go

⑤ - all's quiet again

The SmartAmp is a high-fidelity monaural 6 watt utility amplifier that provides automatic attenuation (volume) control. Using the supplied audio sensor, it listens to background noise levels in your exhibit area (1), then automatically adjusts the output volume to compensate. If the exhibit area is relatively quiet (2), the sensor instructs the amplifier to turn the volume down (staff really like this feature). When large groups enter the area, such as Mrs. Smith's 3rd-graders (3), the sensor measures how much the speaker volume should be raised to compensate, then sends the instructions to the amplifier. When things quiet down again, the SmartAmp reacts by turning the output volume down (4).The overall effect is that audio can be heard clearly at all times, while 'spillover' during quiet times (5) is kept to a minimum.
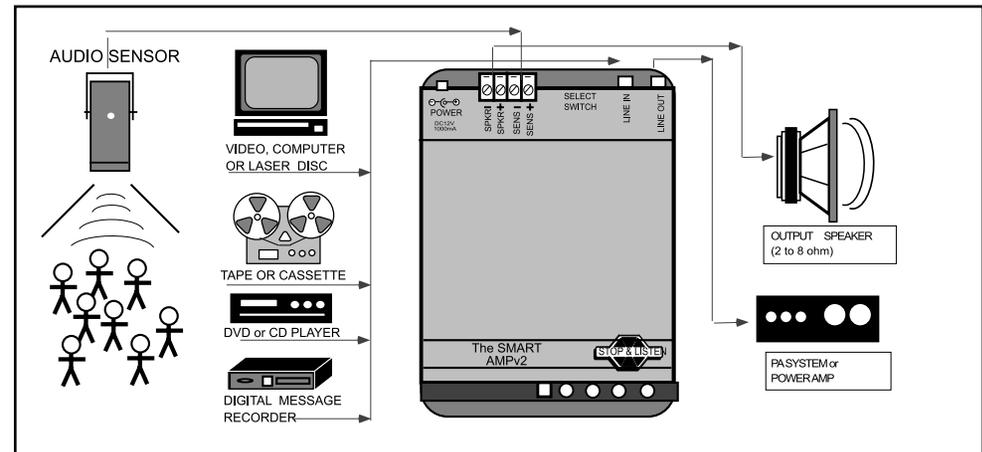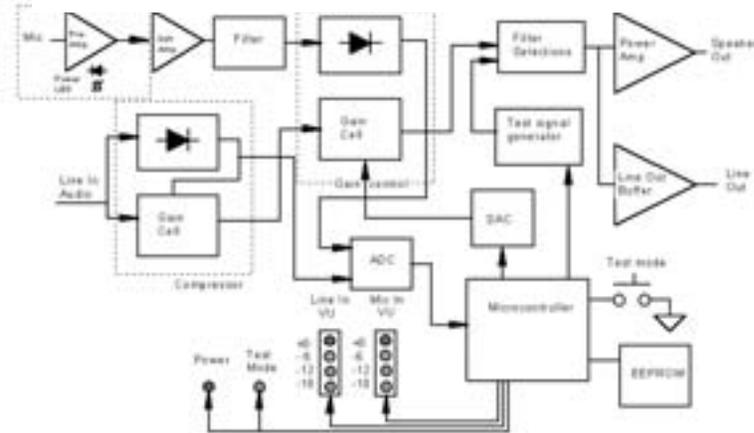
# HOW IT WORKS



The flow diagram above outlines some of the features that are built in to the SmartAmp circuitry and are key to how it is so effective in maintaining audio at suitable levels. Starting at the upper left are the pre-amp and filter circuit blocks for the Sensor unit. These ensure that the sensor will operate effectively, even if it's mounted hundreds of feet away from the SmartAmp itself.
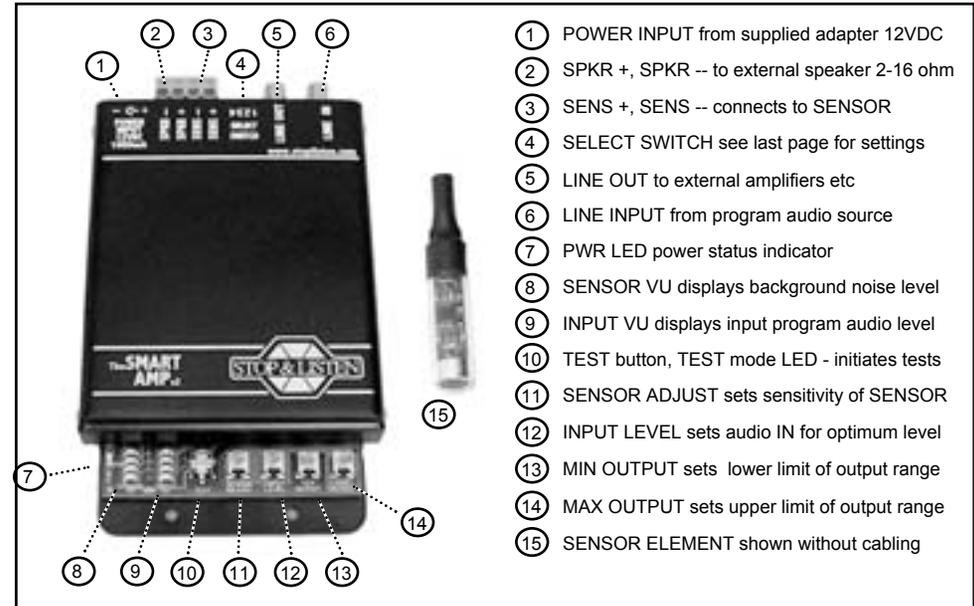
After the filter section the sensor signal is fed to an analog to digital converter (ADC) and then sent to the microcontroller. At the same time, program audio at Line In is brought through the (optional) input compressor, and then sampled by the ADC for comparison to the sensor signal in the microcontroller. On comparing the two signals, the microcontroller is able to subtract the program audio signal from the Sensor signal, resulting in a truly accurate measurement of background noise. It checks these values thousands of times each second. The microcontroller then sends a signal to the gain cell in the gain control section, telling it how much to increase or decrease the audio level to the amplifier section.

A unique feature of the SmartAmp is it's ability to measure room acoustics during the Auto-Calibration routine and to use the information to help determine how much the volume should be increased or decreased. The SmartAmp is further complimented by a complete series of self-check routines that are implemented every time the unit is powered up.

At Stop and Listen we have gone to great lengths to ensure that your new SmartAmp represents the ultimate in durability and ease of use. As you become more familiar with the unit you will find that the on-board features can add a whole new dimension to your application. Thank you for purchasing the SmartAmp from Stop and Listen.

# INSTALLATION AND SETUP

Before commencing the permanent installation of the SmartAmp it is helpful to 'bench-test' the system under controlled conditions to become familiar with the various controls and how they relate to one another. Final adjustments should be made under 'real' conditions. For these instructions, minimum and maximum background noise levels are assumed to be 'typical', or 'within expected norms'.



① POWER INPUT from supplied adapter 12VDC
② SPKR +, SPKR -- to external speaker 2-16 ohm
③ SENS +, SENS -- connects to SENSOR
④ SELECT SWITCH see last page for settings
⑤ LINE OUT to external amplifiers etc
⑥ LINE INPUT from program audio source
⑦ PWR LED power status indicator
⑧ SENSOR VU displays background noise level
⑨ INPUT VU displays input program audio level
⑩ TEST button, TEST mode LED - initiates tests
⑪ SENSOR ADJUST sets sensitivity of SENSOR
⑫ INPUT LEVEL sets audio IN for optimum level
⑬ MIN OUTPUT sets lower limit of output range
⑭ MAX OUTPUT sets upper limit of output range
⑮ SENSOR ELEMENT shown without cabling

**Installation**
**1)Mounting the Sensor Element** - the Sensor element should be mounted in the general area where the program audio is to be heard and pointing roughly to where it will pick up a reasonable sample of ambient noise. It can be suspended in mid-air using the attached wiring, mounted on any flat surface using the supplied black nylon tubing clamp, or mounted and concealed directly in exhibit cabinetry. A simple method of mounting is to drill an inconspicuous ½" dia. hole in one of the exhibit or wall panels, push the sensor barrel into the hole from behind, then glue or clamp it in place. Sensor cabling can be extended where needed (up to 1000 ft using standard 2 conductor speaker wiring, MIC cable is not required). Don't mount the sensor too close to an output speaker or where excessive mechanical noise or vibration are present. In extreme cases where the Sensor is very closely coupled to an output speaker it may be necessary to wait for a break in the program audio before the output level will subside. In these cases, the Sensor should be relocated and the set-up routine should be re-run as outlined.

**2) Mounting the SmartAmp Case** - The SmartAmp can be mounted virtually anywhere, provided it is not exposed directly to the elements. Make allowance for access to controls on the front and connections on the rear. Mounting holes on the end flanges can be used to secure the unit to any reasonably flat surface if needed. Proximity to magnetic or other electrical sources is normally not an issue. The orange SPKR/SENS terminal block is removable to facilitate installation - pull firmly straight back.

**3) Making Connections** - Connect the sensor wires to the orange connector block terminals on the rear of the SmartAmp labeled SENS+ and SENS-- respectively. A small screwdriver has been supplied for these connections. Connect the program audio source to the LINE IN jack using the supplied patch cords. Connect the output speaker(s) to the terminals labeled SPKR+ and SPKR-- respectively. If the SmartAmp is to be used with external amplifiers, PA systems, etc., connect the SmartAmp LINE OUT jack to the appropriate input on the external equipment.

**SET UP**

**1) Initial settings** - Using the supplied screwdriver, set the INPUT LEVEL, MIN OUTPUT, and MAX OUTPUT controls to approximately 1/2 scale (12 o'clock position). Connect the power supply (supplied) to the PWR INPUT jack to power up the system. The SmartAmp will start a series of internal self-tests during which: the LED's on the front panel, at the POWER INPUT jack, and on the Sensor will turn solid ON; the TEST mode LED will flash quickly; and both the SENSOR and INPUT VU meters sequence from bottom to top. If all self-tests pass, all LED's will return to their normal operating modes - PWR LED's solid ON, TEST mode LED off, and VU meters indicating levels. Errors: flashing PWR LED indicates probable wiring faults, a flashing SENSOR VU indicates reversed SENSOR polarity.

**2) Setting INPUT LEVEL** - start the program audio source and adjust the INPUT LEVEL control on the SmartAmp so the program audio level on the INPUT VU reads in the -10dB (green/yellow) range with only occasional peaks into the 0dB (red) range. You should be hearing the program audio on the output speakers.

**3) Setting MAX OUTPUT** - press and release the TEST button: the red TEST mode LED will turn ON and the output volume will go to maximum. Adjust the MAX OUTPUT control for the appropriate maximum listening level. This is the level that will be heard in the listening area when background noises are at a maximum. (Output levels must be reduced if clipping distortion is evident.)

**4) Setting MIN OUTPUT** - press and release the TEST button again so the red TEST mode LED is OFF. Set the SENSOR ADJUST control to the ...

minimum level (fully CCW), and adjust the MIN OUTPUT control for the appropriate level for when background noise is at a minimum. (The TEST button can be used to toggle between the minimum and maximum output levels as needed: allow a few seconds for the audio level to adjust each time the test button is pressed.) The SmartAmp has been designed with a broader attenuation range than is required in most situations. It is a common error during set-up to over-compensate for background noise by using too much range between the MAX and MIN levels.

**5) Setting SENSOR ADJUST** (sensitivity) - temporarily disconnect or shut off the program audio source. Adjust the SENSOR ADJUST control until the SENSOR VU is reading in the -20 or -30dB (green) range in a relatively quiet environment. This should result in a 0dB (red) reading when background noise is high.

**6) Running Auto-Calibration** - as a final step, press and hold down the TEST button for 2 seconds until the TEST mode LED starts flashing: the SmartAmp initiates an auto-calibration routine to complete the set-up. During this routine a full level tone sweep is fed to the speaker while the microcontroller records feedback constants plus speaker and environmental parameters. These are used to reference gain levels during normal operation. Once completed, the unit returns to the normal operating mode (TEST mode LED off). The auto-calibration routine should be re-run any time the MAX or MIN output levels are adjusted significantly.

If possible, run through the set-up procedure 2 or 3 times under different operating conditions to achieve the best results.

**NORMAL OPERATION** - *That's it!* The SmartAmp is ready to go to work and you shouldn't have to bother with it again unless other parts of the system are changed. Under normal operation the TEST mode LED should be off, program audio should be visible on the INPUT VU display, and increases and decreases in background noise levels should be visible on the SENSOR VU display. Output levels should increase rapidly when background noise increases yet subside over 10 to 20 seconds when background noise decreases. Short duration noise such as a single handclap will have little or no effect. Listening levels should be clear when background noise levels are high but still appropriate when levels are low.

DIFFICULTIES?? - if you experience any problems at all,or if you just want to let someone know what a great job you've done, CALL OUR **TECHNICAL SUPPORT** TOLL FREE  1-800-387-2365 or e-mail us: support@stoplisten.com

STOP & LISTEN

STOP & LISTEN

# The SELECT SWITCH - Setting LINE IN Parameters

On the back of the SmartAmp is a series of 4 dip switches that can be set by the user to affect the LINE IN audio as it comes into the unit itself.

| Switch | DESCRIPTION | DEFAULT |
|---|---|---|
| DIP#1 | UP for differential LINE IN, DOWN to reference LINE IN to GND | default=UP |
| DIP#2 | 500 Hz Low Cut filter - UP to disable, DOWN to enable | default=UP |
| DIP#3 | UP to disable input compressor, DOWN to enable - must be opposite to #4 | default=DOWN |
| DIP#4 | DOWN to disable input compressor, UP to enable - must be opposite to #3 | default=UP |

**Dip Switch #1** is used to switch between a differential input mode versus a ground-referenced input mode. Most users should leave it in the (default) differential mode to reduce spurious noise that can be picked up on the input cabling. The ground referenced mode is suitable for use with mixers or in complicated installations where ground loops cause problems with background hum. This switch should normally be in the UP(differential) position.

**Dip Switch #2** is used only for specialized speaker installations where low frequency acoustics can cause problems. It implements a low frequency cutoff filter at 500 Hz on the input program audio. This switch should normally be in the UP(disable) position.

**Dip Switches #3 and #4** enable and disable a specialized circuit called an audio compressor. When enabled, the compressor circuit will reduce the loudness of loud passages in the program audio, and increase the loudness of quiet passages. The overall effect is more even loudness levels. This is helpful for spoken passages because it makes them much more intelligible. On the other hand, music applications often depend on changes in loudness to give dramatic effect, in which case the compressor feature should be disabled. In order to work effectively, Dip Switches 3 and 4 must always be in opposite positions to each other, as outlined in the table

## OTHER FEATURES

**INTERNAL FUSING** The SmartAmp is internally fused using a 1Amp Type 2AG fuse. The most common reason why the fuse trips is because either the power polarity is incorrect or the there is a short-circuit in the external wiring. Replace only with same type fuse.

**EJECTABLE CONNECTOR BLOCKS** The orange connector block on the back of SmartAmp is EJECTABLE for easy changing of the unit or for pre-wiring. Use a small screwdriver to gently pry the connector away towards the back of the unit. Push on to reconnect.

## Specifications: The SMART Amp
Monaural 6 watt Hi-Fi Audio Amplifier with auto output attenuation

| | |
|---|---|
| Frequency Response | 20Hz-20kHz +1/-5 dB |
| S/N Ratio | 75dB (compressor bypassed) |
| Dynamic Range | 82dB (compressor enabled) |
| Audio Input (Line In) | -13dBm to +8dBm(170mV to 2.0V RMS), single ended or differential |
| User Controls | Input vol., master vol., minimum vol., RUN/TEST mode, sensor sensitivity, switchable input compressor, plus AUTO SETUP mode |
| Indicators | Input and Sensor VU's, RUN/TEST status, main and sensor POWER status |
| Audio Sensor | Condenser type, includes line drive amplifier and feedback suppression filters |
| Acoustic Mapping | full scale sweep response performed during AUTO SETUP routine, 8 bit microprocessor with flash lookup storage, plus self test routines |
| Audio Output | 6 watts @4 ohms, 2 to 8 ohm nominal, overload protected, includes line out |
| Output Attenuation | -32dB max,adjustable, at both speaker and line outputs |
| Connections | Line in, line out, speaker out, power and ext. sensor (via 4 pin ejection header) |
| Output Tracking | 10ms attack resp., linear tracking, max 32dB attenuation |
| Power Consumption | 500 mA @12 VDC (typical, average) |
| Construction Standard | Industrial/Commercial, carbon steel enclosure |
| Operating Temp | -20°F to +130°F (-30°C to +55°C) |
| Dimensions, Weight | 3.5"w x6.0"d x0.9h, 1.5lb (8.9w x15.2d x2.3h cm, 0.7kg) |
| Warranty | 5 year Gold Seal Warranty |

*Includes*
*12VDC power supply, Audio Sensor w/ mounting hardware,*
*audio patch cords and connectors*

**CARE AND CLEANING**

The SmartAmp audio amplifier is designed and constructed for the utmost in quality and durability. Because of it's 100% solid-state design, the only thing you should ever have to do is dust it with a dry cloth.

**www.stoplisten.com**

**The SELECT SWITCH**

STOP & LISTEN

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