

TetraMic™/VVMic™ Users Guide

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1 Introduction

Welcome to the latest in surround sound recording, TetraMic! Whether you need 5.1 location sound for your new independent film or the most flexible point source stereo mic possible, TetraMic can do the job.

This document provides a basic, but complete description of how to use TetraMic and VVMic to record and listen to surround sound. Much of the information here applies specifically to either Core Sound's TetraMic microphone or VVAudio's VVMic software. Where other products are mentioned, it is only by way of example.

You do not need an extensive background in audio engineering or any prior knowledge of surround sound to understand this manual or to record with TetraMic. However, you should already be familiar with the operation of any other equipment or software used and a basic understanding of recording process is assumed.

2 Ambisonics & Other Terms

Ambisonics is a method of recording and reproducing surround sound that was originally developed in the 1970s, mostly by Michael Gerzon. For more information about ambisonics in general ambisonic.net is a good place to start. Below are a few key terms that will be used throughout this document.

A-Format – a recording where each channel corresponds directly to one capsule in the microphone array. For TetraMic these signals are Left Front Up, Right Front Down, Left Back Down and Right Back Up.

B-Format – a general purpose representation of the soundfield based on spherical harmonics. For 1st order, as used here, this consists of one omni and three figure eight pattern signals called W, X, Y and Z.

AMB File – a specific file format for B-Format material, based on Microsoft's WaveFormatExtensible. For a definition go to <http://www.ambisonia.com/Members/etienne/Members/mleese/file-format-for-b-format>

Speaker Feeds – signals that correspond directly to the speakers in the targeted layout, e.g. stereo, hexagon, or 5.1. Speaker signals are required for some distribution media like CD's and DVD's, as well as being used to listen to.

Interleaved vs. Multi-Mono – an interleaved file combines multiple channels into a single file. If not interleaved, surround sound will usually be represented by several

‘.wav’ files, each a mono, or single channel file. A combination, where a pair of stereo files are used to carry four channels can also be read by VVMic.

3 Recording

3.1 Cabling

TetraMic has a 6-pin mini-XLR-M jack in its base. The six pins carry four microphone signals, power and ground. A variety of 6-pin cables are available, including 6-pin-Male-to-6-pin-Female cables in lengths of 6-, 10- and 20-feet. The 6-pin male plug on a cable can plug directly into [4Mic](#). Cables can be chained for lengths beyond 20-feet, electrical noise conditions allowing.

Also available is a breakout cable to convert from TetraMic's single 6-pin connector to four 3-pin mini-XLR-F (P3) plugs. The P3 plugs connect to most common lavalier microphone power supplies including our Phantom Power Adapter (PPA), Audio Technica's AT8531 Power Module and many others.

(Note: some low cost phantom power adapters do not provide the correct voltage, do not create a correctly balanced signal and add significant noise of their own. If you want to use an adapter that is not explicitly mentioned here, please call us to discuss it.)

3.2 Powering TetraMic

TetraMic runs on 4.5 to 6 VDC. Core Sound's 4Mic will provide the correct power for TetraMic with the use of the supplied "Four 3-pin mini-XLR-F Breakout Cable". When used with other microphone pre-amps that provide standard 48 Volt phantom power, you'll need the breakout cable and four phantom power adapters (PPAs). (If you're using 4Mic and want to position TetraMic more than 20-feet away, we recommend using 4Mic's 48 Volt phantom power, a breakout cable and the PPAs. This allows you to use balanced cables for the long distance runs, reducing noise pickup.)

The PPA has a standard XLR-M jack through which a balanced microphone signal is sent, and through which 48V phantom power is applied. (TetraMic receives phantom power only through the PPA used for microphone capsule #1/LFU. The other PPAs use 48 phantom power for their power needs but don't pass it on to TetraMic.)

The PPA also has a 3-pin mini-XLR jack (P3) that accepts one of TetraMic's unbalanced microphone signals and through which 4.5 to 6 VDC is supplied to TetraMic.

3.3 Mounting & Location

TetraMic is supplied with a shock mounted microphone clip. The clip mounts to any standard 5/8-27 threaded microphone stand or fixture. Where to put the stand is a more subtle question, involving more art than science. Finding ‘the best seat in the house’ and putting the mic there is a good starting point. Any place an XY or Blumlein array would

work, TetraMic will work also with the added advantage that you can choose one of these patterns or anything in between in post-processing.

3.4 Levels & Test Signals

It is critical to the surround sound recording process that the gain settings of all four channels be identical. Recording systems that allow gain to be set to exact values are best. If levels must be set with uncalibrated knobs, then it is important to use some sort of test tones or other means to guarantee accurate levels during playback.

In addition to tones for setting levels, you may want to record a short walk around test in order to verify the connections and calibration of the TetraMic. Use a simple, broad band source, such as finger snaps. Then with your recording system running, walk around the mic, announcing and snapping at each of 0, 45, 90 degrees and so on. Ambisonic convention measures angles counter clockwise looking down starting at the front. The front of TetraMic is the direction the Core Sound logo points on the handle.

4 Processing

4.1 File Formats

The following table shows the file formats that VVMic will read directly:

Bits per Sample	16 & 24 bit fixed, 32 bit float
Samples per Second	44100, 48000, 96000
Channels per File	4 mono files 2 stereo files 1 three channel file (no height) 1 four channel file (WAV, WXYZ, AMA or AMB)

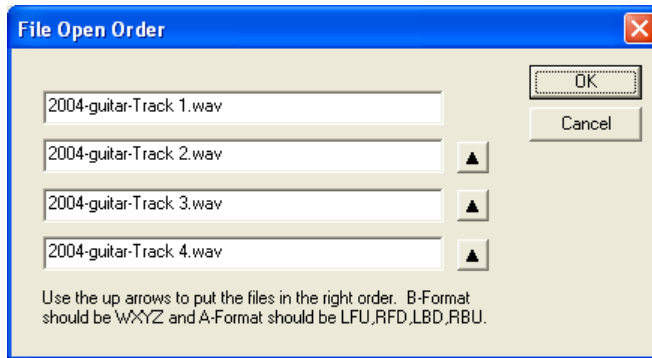
All of these formats are based on WAV files. If your recording application creates, for example, SDII files, you will have to convert them to WAV files before opening them with VVMic.

4.2 Starting VVMic & Opening Files

The VVMic application can be started by double clicking on a mapped file type, usually AMA and AMB. If VVMic is started using the icon installed on the desktop or the programs menu, then you can press the 'Input File' button to select your files. If the names of your files follow one of the naming conventions shown below, then you can just select the first file in the group. For example if your files are named 'test_wx.wav' and 'test_yz.wav' then you can just open the first one and VVMic will find the second.

A-Format	.ama _a1.wav, _a2.wav, _a2.wav, _a4.wav _lfu.wav, _rfd.wav, _lbd.wav, _rbu.wav
B-Format	.wav .wxyz .amb _w.wav, _x.wav, _y.wav, _z.wav _wx.wav, _yz.wav _wy.wav, _xz.wav

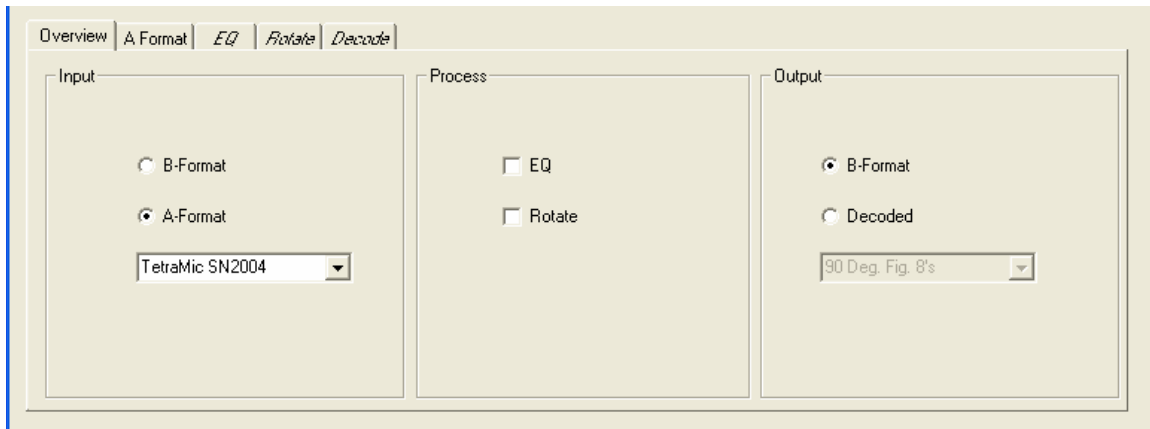
If your files are named differently, then select all of the files at once and you will be prompted to determine the proper order like this:



Use the up arrow buttons to rearrange the files so that they are in the order given in the definition of A-Format or B-Format [above](#).

4.3 A-Format to B-Format

It is recommended that you quickly convert your A-Format recordings into B-Format for archiving. A-Format requires knowledge of the specific microphone to process properly while B-Format is a more universally useful format. With the files open, just set the input to A-Format, choose the right preset and set the output to B-Format as show below. If the Multi-Mono option is off, then the result will be an interleaved file with the proper headers to be called an '.amb' file.



You should have been provided with customized calibration files for your microphone. This will show up as a preset whose name is the serial number of your mic and will always be your best choice. If the original settings are unavailable, or you are processing files from a different TetraMic then you can use the uncalibrated setting.

It is highly recommended that you do not change the provided A-Format presets.

Real time output should be turned off while writing to B-Format files. For archive purposes, dither should be off. If you intend to distribute the B-Format files directly, then you might want to use dither at this stage.

4.4 B-Format to Speaker Feeds

Whether listening to a TetraMic recording or a publicly available ambisonic file, the B-Format must be converted into the proper signals to feed the target listening system. The target system can be stereo, 5.1 or a custom rig.

Stereo

To decode to stereo, start with one of the two stereo presets in the VVMic output section: *180 Deg. Cardioids* or *90 Deg. Figure 8's*. From one of these starting points, you can go to the decode tab and modify the settings to best suit the particular recording. The most useful parameters to change will be width and directivity.

Surround

If you are decoding for more than two speakers, then start with the preset that matches your speaker array, if possible. There are settings for *Square*, *Hexagon* and *5.1*, or if your array is different, you will need to start with the *User Defined* setting. The channel order for the presets is as follows, where each preset uses a subset of these positions:

- Front Left, Front Right
- Center, Low Frequency
- Back Left, Back Right
- Side Left, Side Right

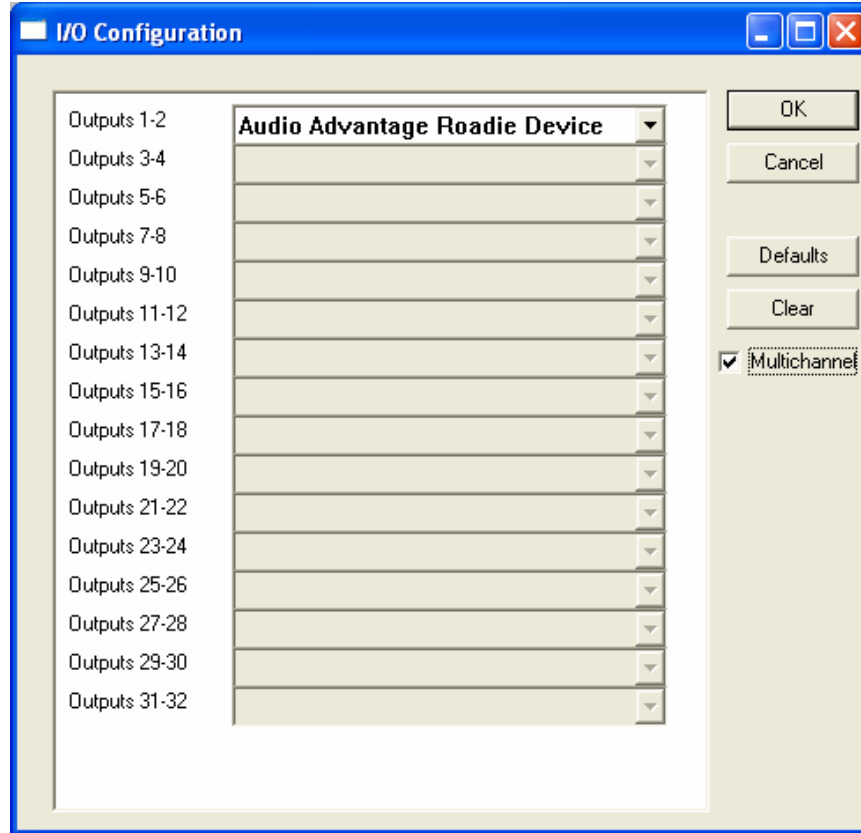
5 Reproduction

5.1 Listening

You can listen to your A-Format or B-Format files directly if the outputs are configured correctly and the 'Real Time Output' option is checked. Depending on your audio hardware and driver, you may need to dither 24 bit files to 16 bit as shown.



To select which device to use, press the 'Output Config' button to bring up this dialog:



You can either select multiple stereo devices or, if the 'Multichannel' option is selected, all output channels are sent to the first device.

It is important that all output channels have the same latency. When multiple stereo devices are used, especially if they correspond to different hardware paths, the latency should be verified.

5.2 Distribution

To produce stereo output, set VVMic's output to decoded and choose one of the stereo presets described above. For most applications, which expect interleaved stereo '.wav' files, set Multi-Mono off.

Ambisonia.com is website where you can upload your recordings for others to hear, as well as find many, freely downloadable files. The primary file format there is the '.amb' file. VVMic will produce an '.amb' file when the output is set to B-Format and Multi-Mono is off. You have to type the extension yourself.

The easiest way for most people to listen to surround sound is on standard DVD's. For these, the audio must be encoded in either DTS or AC3, each of which requires commercial encoder software. The encoders are built into the more expensive DVD mastering programs. These encoders will usually require separate mono '.wav' files.

VVMic will produce appropriate files with output set to decoded, the right preset, e.g. 5.1, and Multi-Mono off. Dither should be on unless you are sure that your encoder can accept 24 bit files directly.

The DTS-CD format offers a cheaper, easier way to produce distribution media that will play in most home theater systems. A simple utility, Minnetonka's SureCode CD, converts the speaker feeds files into a single '.wav' file that can be burned to a standard audio CD, but when played digitally into a home theater system that supports DTS, will get decoded into surround. The required input files are the same as described for DVD's above; multiple mono speaker feed files.

For higher quality, uncompressed distribution of surround sound, Minnetonka also offers DiscWelder Bronze for create DVD-A disks. The process is much the same as for creating a DTS-CD, but the result is a DVD-Audio disk. Support for this format is less common than for plain DVD-V's, but it one of the only ways to distribute uncompressed surround sound without requiring the end user to have a computer to play it.

6 Calibration and Settings Files

Each new TetraMic should come with a set of calibration files, created specifically for that microphone. Normally this will be in the form of a '.zip' file containing a text file with the settings and a set of filter definitions in a subdirectory. Simply extract all of these file into the 'calibrations' subdirectory where VVMic was installed, by default

```
C:\Program Files\VVAudio\VVMic\calibrations
```

Each calibration file placed in this directory will show up as an A-Format preset whose name matches the name of the text file, usually the mic's serial number. These settings cannot be changed.

Once you have VVMic configured with decode parameters and output devices set to match your listening rig, you may want to save these settings. Just press the 'Save' button and choose a file name and location. By default, VVMic will create a file with the extension '.vvm'. You can use the 'Load' button to read one of these files back in, or double click on the file and start VVMic with those settings. To load a given configuration at startup, save those settings as 'vvmic.ini' in VVMic's startup directory.

7 Conclusion

While a few pages cannot begin to adequately cover the world of surround sound recording, we hope this manual has at least helped you get started with your new TetraMic. Should you have questions, please contact Core Sound for hardware related issues and VVAudio for software trouble. Contact information is provided in an appendix.

We wish you many happy recordings,
The TetraMic Team

Appendix A – Contact Information

Core Sound

Phone	(888) 937-6832 or (201) 801-0812
Fax	(201) 801-0912
Email	moskowit@core-sound.com
Web	http://www.core-sound.com/
U.S. Postal Service	Core Sound LLC 300 Ogden Avenue Teaneck NJ 07666 USA

VVAudio

Email	info@vvaudio.com
Web	http://vvaudio.com/