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## VME Audio

### Digital Audio/Signal Processors

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#### FEATURES

- Quad Channel
- CD/DAT Quality Audio
- Real-Time Digital Mixing
- Software-Selectable Sampling Rates & Encoding
- On-Board Multi-Ported RAM, Private DSP Static Memory
- Programmable Voice Signal Detection
- Analog Matrix Mixer

VisiCom's Digital Audio Boards serve as high-performance audio signal processing platforms for simulators, multi-media workstations, trainers, sonar, industrial control systems, voice synthesis and recognition, sound analysis, and communications systems of all types.

On-board digital signal processors (DSPs) provide a variety of encoding and data compression methods ranging from highly compressed 16 Kbits/second on up. Firmware provides a variety of easy-to-use, yet sophisticated digital recording and playback modes.

#### CLEAR, DISTINCT AUDIO

VisiCom's audio boards are designed to produce the highest quality sound within the limits of the digital encoding method. Frequency response is from 20 Hz to 45.5% of the sample rate for all audio boards, with a dynamic range up to 80 dB using Sigma-Delta conversion technology. Sigma-Delta A/D conversion is employed to assure the most accurate sound reproduction - for applications using narrow telephone-line bandwidths up to full-fidelity sound.

#### MMI-4311

- Four Stereo Channels
- Four Motorola DSPs
- Four Channel Mixing
- Sample Rate Programmable from 1500Hz-50,000Hz Continuous

The MMI-4311 provides four stereo line inputs and outputs, and four stereo microphone inputs. A unique 4-channel, fully programmable matrix mixer allows any signal from any channel to be mixed with any other channel or combination of channels.

#### MMI-4310

- Four Mono Channels
- Four Motorola DSPs
- Four Channel Mixing
- Sample Rate Programmable from 1500Hz-50,000Hz Continuous

The MMI-4310 provides four monophonic line inputs and outputs. Inputs and outputs can be set-up for balanced and unbalanced transformer-coupling, AC-coupling, or DC coupling via DIP switch settings. A unique 4-channel, fully programmable matrix mixer allows any signal from any channel to be mixed with any other channel or combination of channels.

#### VERSATILE DSP

Motorola DSPs control the audio encoding process as well as the recording and playback to and from onboard memory. Acting on commands from the host processor over the VMEbus, the DSP organizes buffers in the RAM to receive encoded audio input (the record process) and reads buffers in the RAM for playback through the audio outputs. The amount of RAM needed depends upon the sample rate as well as the encoding method.

### ONBOARD MEMORY

Both the MMI-4310 and MMI-4311 include 4MB of onboard dual-port RAM.

### RAM Storage Requirements

Recording time per 1 Megabyte of Memory

(time in seconds)

Encoding Type	Sampling Rate (kHz)			
	<u>8</u>	<u>16</u>	<u>44.1</u>	<u>48</u>
Linear PCM	<b>64</b>	<b>32</b>	<b>11.6</b>	<b>10.7</b>
μ-Law, A-Law	<b>128</b>	<b>64</b>	<b>23.2</b>	<b>21.3</b>
ADPCM	<b>256</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>
VQ	<b>512</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>

Downloadable firmware provides a number of audio processing functions (see DiSPATCH).

### DISPATCH FIRMWARE/SOFTWARE

DiSPATCH™ is a powerful firmware/software package that gives the host system a high-level interface to the flow and processing of audio data. DiSPATCH frees the host processor from the demanding real-time performance requirements of audio data control and offers an extensive collection of ready-to-use features which are accessed with a unified interface.

Feature highlights of DISPATCH are:

- Real-time digital mixing of up to 24 asynchronous audio streams for each DSP
- Directly supports many audio data formats, including PCM-8, PCM-16, ADPCM, μ-Law and A-Law
- Performs real-time Vector Quantizing audio compression/decompression for very low bit-rate (16kbps) audio
- Tight buffering for low latency
- Programmable voice signal detection
- Extensive hardware diagnostics
- 144 dB (24-bit) digital dynamic range for uncompromised quality
- High-speed interrupt-driven command interface
- "RAM-to-RAM" audio processing features for in-place format conversion
- Real-time, user definable FIR Filters for playback and recording

### DISPATCH PACKAGE

The DiSPATCH software development package is required with MMI-4310 and MMI-4311 VME audio signal processors. The package includes the DiSPATCH Programming Library, Device Driver, DSP Firmware and Tone Generator, plus sample applications that can be used as starting points for application development.

### DiSPATCH Programming Library

This C-language programming library provides the interface to the DiSPATCH DSP firmware. The library simplifies many common tasks, such as initializing the DSP, playing audio from a file, and recording to a file. All DiSPATCH commands are supported by the programming library.

The library is written in standard K&R C and is compliant with ANSI standards. Complete source code is provided, allowing the programmer to study the library as an example or extract useful parts of the code for an application. Complete support packages are available for SunOS™, Solaris™, IRIX™, HP-UX™ and HP-RT™, OS/9™, and VxWorks™. For platforms that require a kernel device driver, one is provided.

### **DiSPATCH DSP Firmware**

The DiSPATCH firmware is compiled into the programming library, and is automatically sent to the DSP during initialization. Files containing the raw firmware binary images for use in applications that do not use the library are also included. The firmware is identical for all host platforms.

### **MMI-Test**

This interactive program allows the user to directly access most features of DiSPATCH from script files or its command-line prompt. This direct interface to DiSPATCH allows rapid testing and prototyping.

### **DiSPATCH Tone Generator Module**

This firmware module allows the DSP to serve as a powerful real-time tone synthesizer. The host has complete and immediate control over all tone parameters, even while the tone is playing.

The Tone Generator module features:

- Real-time digital mixing of up to 12 independent tones for each DSP
- Tones can be mixed with other audio tracks
- All tone parameters can be modified "on the fly" while a tone is playing
- Programmable amplitude envelope (attack, sustain, release).
- FM and AM modulation synthesis
- Sine, triangle, square, sawtooth waveforms built in; arbitrary waveforms can be dynamically supplied by the host
- Supports variable-rate sweeps and two-tone sounds
- 144 dB (24-bit) digital dynamic range
- Interactive ToneShop development program included

## **TECHNICAL SPECIFICATIONS**

### **Audio**

Audio Bandwith: 20Hz to 45.5% of sample rate  
Programmable Output Level: 0 to -72DB  
Audio Data Coding: VQ, ADPCM,  $\mu$ -law, A-law, linear PCM, Software selectable

### **Digital Signal Processor**

DSP Type: Motorola DSP56002

### **Memory**

Onboard Memory: 4MB dual-port RAM  
Audio Storage Capacity: Memory = Playback time x Sample frequency/ $n$ where:  
 $n = 4$  for VQ;  
 $n = 2$  for ADPCM,  
 $n = 1$  for  $\mu$ -law or A-law  
 $n = 0.5$  for linear PCM

### **Bus Interface**

VMEbus Interface: Slave, 32-16- and 8-bit Extended and standard address.

### **Physical Attributes**

Power Consumption	+5VDC 2.25A (max. (11.25W) +12VDC 67mA (max. (804mW) -12VDC 67mA (max. (804mW)
Operating Temperature:	0° to 70°C
Storage Temperature:	-20°C to +125°C
Humidity:	0-95% non-condensing
Connectors:	
MM1-4310	20 Pin IDC (AMP P/N: 87813-7)
MM1-4311	3.5mm stereo audio jack

### **FOR MORE INFORMATION**

For additional information on this product, or any other VisiCom product or service, contact VisiCom's sales department via email at [sales@visicom.com](mailto:sales@visicom.com) or by telephone at 858-457-2111.

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