VME Audio
Digital Audio/Signal Processors

Titan Corporation Advanced Products & Design (AP&D) Division'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 — Titan'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 DSP
- Four-Channel Mixing
- Sample Rate Programmable from 1500Hz-50,000Hz Continuous

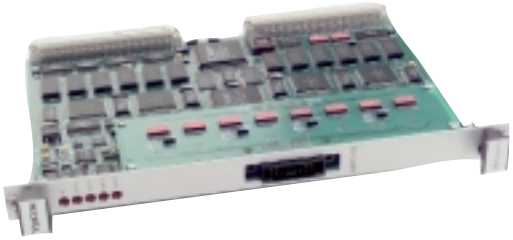
The MMI-4311 provides four stereo line inputs and outputs, and four stereo microphone inputs. A unique 4-channel, fully programmable matrix mixer allows any signal from any channel to be mixed with any other channel or combination of channels.

MMI-4310

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

Features

- **Quad Channel**
- **CD/DAT Quality Audio**
- **Real-Time Digital Mixing**
- **Software-Selectable Sampling Rates and Encoding Methods**
- **On-Board Dual-Ported RAM**
- **Programmable Voice Signal Detection**
- **Analog Matrix Mixer**



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MMI-4310's unique 4-channel, fully programmable matrix mixer allows any signal from any channel to be mixed with any other channel or combination of channels.

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.

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 on-board 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.

On-board Memory — Both the MMI-4310 and MMI-4311 include 4MB of on-board dual-port RAM.

RAM Storage Requirements

Recording time per 1 Megabyte of Memory (time in seconds)

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

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. Features 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 audio quality
- High-speed interrupt-driven command interface

"The 4300 family incorporates the features, performance, and powerful firmware/software to control and process audio data for a variety of applications."

- "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 Solaris™, HP-UX™, 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

THE DiSPATCH SOFTWARE DEVELOPMENT 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.

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Technical Specifications

Audio	Audio Bandwidth	20Hz to 45.5% of sample rate
	Programmable Output Level	0 to -72DB
	Audio Data Coding	VQ, ADPCM, µ-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 µ-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 jacks

For additional information, visit our website a www.titan.com. Or contact us via email at boardproducts@titan.com, via phone at (800) 621-8474 or +1 (858) 527-6100.

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