8 TraXX

Eight Independent MP3 Players

User's Guide

**Alcorn
McBride
Inc.**

Every effort has been made to assure the accuracy of the information contained in this manual, and the reliability of the Alcorn McBride 8TraXX hardware and software. Errors can sometimes go undetected, however. If you find one, please bring it to our attention so that we can correct it for others. Alcorn McBride welcomes comments and suggestions on the content and layout of its documentation.

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Welcome!

Thanks for purchasing The Alcorn McBride 8TraXX™.   The 8TraXX replaces multi-track tape machines, CDs and solid state audio players in permanent audio playback installations, providing hours of high-quality, maintenance-free digital audio.

The 8Traxx lets you play eight independent stereo tracks from a single, economical rack-mount unit. It's perfect for dark rides, museums, and interactive displays. Each track is individually triggered by its own discrete input – contact closure or voltage – allowing direct connection to proximity sensors or switches. Or all tracks can be controlled from a single RS-232 serial or MIDI port.

8Traxx offers the latest in Digital Audio Repeater technology, combining MP3 audio with Compact Flash for a rugged, reliable, maintenance-free solution to your playback needs. Access time is nearly instantaneous! All eight tracks are completely independent, and offer superb audio quality. Standard play-back time is 20 minutes total. Larger Compact Flash media can provide several hours of playback!

Sounds are simply copied onto the media from your laptop computer or using an optional Compact Flash docking cradle.

Features

The 8TraXX offers a wide range of features including:

- 8 Independent Stereo Audio Channels
- High-quality MP3 Audio Format
- Encode audio on any PC
- Compact Flash Media Included
- Voltage or Contact Closure Control
- Start, Stop and Mute Each Track
- RS-232 and MIDI Control

Front Panel Controls and Indicators

The 8TraXX provides controls that can accommodate a wide variety of installations. The front panel incorporates eight test pushbuttons, a mute-all button, media status indicator, playing status indicators, mute status indicator, and a Compact Flash slot.   All front panel buttons can be disabled by a special serial command for systems requiring tamper-free remote control.

Test Channel Buttons

The numbers next to the test button match the channel and file numbers (i.e. Button number 1 plays file number 1 to channel 1, Button number 2 plays file number 2 to track 2, etc.

The front panel contains a row of eight pushbuttons. These buttons allow you to test play each of the unit's 8 channels. When a test channel button is pressed, the file with the same number as the button number will be activated and played out the corresponding channel. Pressing a button once plays the sound. Pressing it again while the sound is playing stops playback. Holding the button down causes the sound to loop from end to beginning.

Channel Status LEDs

While the 8TraXX is booting up, the channel status LEDs will illuminate one at a time from left to right, indicating channel initialization.

Next to each Channel Test button is a green LED. If a channel is currently playing, the corresponding LED will be illuminated. A channel LED flashes if an error occurs on the corresponding channel. Refer to the Error Indicators section below for details.

Mute All Button and LED

A pushbutton on the far right of the front panel causes all channels to mute. Pressing the button once causes all channels to mute. Pressing it again causes all channels to unmute.

The red LED next to the Mute-All pushbutton is activated whenever **any** of the 8TraXX channels are muted.

Using the Mute All Button to Format Media

The Mute All button is also used to format the Compact Flash media. To format the media, hold down the Mute All Button during the entire power-on cycle, when the Channel Status LEDs are flashing. THIS WILL ERASE ANY SOUNDS STORED IN THE MEDIA. After boot-up is complete, the Unit Status LED activates indicating that the media is being formatted. Formatting is complete when the Mute All LED illuminates.

Unit Status LED

This LED is primarily used to indicate media activity. It illuminates whenever the Compact Flash media is being accessed. The LED is also used for error indication (refer to error indication section below).

Error Indications

The Channel Status LEDs and Unit Status LED on the 8TraXX are used together to indicate various error conditions. The following table provides a key to the possible LED behavior combinations and the corresponding error or unit status that is indicated.

Unit Status LED Behavior	Channel Status LED Behavior	LED Meaning
Off	Off	Idle
On	Off	Media activity (either reading to or writing from Compact Flash socket)
On	On	Channel playing
On	Flashing	Channel error - requested file not available or unsupported file type.
Flashing	N/A	Media error – can't read media, or unsupported media format.
Flashing	Flashing	Bootup

Rear Panel Controls and Connectors

The rear panel includes RCA jacks for 8 stereo channels of unbalanced stereo audio, parallel control inputs, configuration DIP switches, serial control connectors and the power input jack:
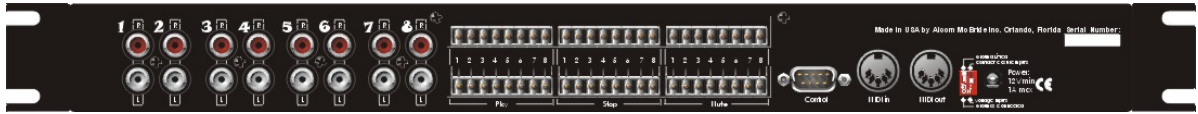
Audio Outputs

Eight sets of RCA jacks supply analog line-level stereo signals suitable for connection to a multi-channel amplifier or powered loudspeakers.

Parallel Control Inputs

There are three sets of parallel control inputs: 8 Play inputs, 8 Stop inputs, and 8 Mute inputs. These inputs can be configured to accept contact closures or voltage inputs using the configuration DIP switch (see below).

Play Inputs:

Sound numbers range from 1 – 511 for interruptible mode, and 1001 to 1511 for uninterruptible mode.

Each play input activates its corresponding channel. Play inputs 1 through 8 play sound numbers 1 through 8 respectively through channels 1 through 8 respectively. Repeatedly activating a play input while a channel is playing will restart the channel.

Sound numbers refer to the prefix of the sound file number. Please refer to the File Naming Convention section of this manual for details.

It is possible to prevent sounds from restarting during play by adding 1000 to the sound number (i.e. Sound number 1 is named 1001, etc.) *Sound numbers 1001 or higher are uninterruptible*, meaning that the sound will play to completion unless stopped by a parallel Stop input or serial Stop command. In this case, Play Input 1 plays Sound Number 1001, Play Input 2 plays sound Number 1002, and so on. These sounds will not restart if another Play Input for that channel is received during playback. Refer to the section *Interruptible versus Uninterruptible Operation* in this manual for more information.

In all cases, a Play input which is maintained at the point where the sound finishes causes the sound to loop back to the beginning and start over.

Stop Inputs:

Each Stop input stops playback of the corresponding channel.

Mute Inputs:

The front panel Mute LED illuminates if any of the parallel Mute inputs is active.

Activation of a channel's Mute input causes the corresponding channel to mute. The input must be maintained in order for the channel to remain muted.

RS-232C Serial Connector

This input is a standard DB-9 male RS-232C connector, intended to be connected to a PC or control system using a straight-through (not null-modem) 9-pin cable. The pinout appears below. Please refer to the Serial Protocol section for a list of control commands.

Pin	Function
2	TXD (data from 8TraXX)
3	RXD (data to 8TraXX)
5	GND

MIDI In and Thru

These 5-pin DIN connectors provide the MIDI control interface to the unit. The 8TraXX uses standard control change MIDI command protocol. Please refer to the Serial Protocol section of the manual for a list of commands.

Configuration DIP Switches

There are two small switches near the power connector.

Ground Lift

In the event of AC hum or noise, this switch may be set to the off position to isolate the 8TraXX circuit ground from the chassis.

Contacts/Voltage Inputs

Be sure to configure the 8TraXX's switches before connecting the parallel control interface.

This switch configures the parallel control inputs for either dry contact closure operation or voltage input operation. For voltage input operation, the input voltage should be at least 12VDC and not more than 24VDC.

Power

The power input is a 2.5x5.5x10mm barrel connector with center pin (+) and the outer rim (-). The 8TraXX requires a minimum of 9VDC at 1 Amp. It may be operated from a vehicle battery or other DC source, as long as the input voltage does not exceed 14VDC. An external 115 or 230 VAC power supply is provided with the unit.

RS232C Serial Control

The 8TraXX may be controlled using serial RS-232 messages via the DB-9 Serial Connector. The data format is:

9600 Baud, **N**o Parity, **8** bits, **1** Stop bit

The protocol is ASCII-based. Upper or lower case characters can be used interchangeably.

Unlike with parallel control, RS232 and MIDI control allow you to play any sound to any channel.

Some commands (i.e. Play, Assign Sound) commands contain data fields specifying which sound number you want to play, and to which channel you want it to play to. Other commands (i.e. Mute, Stop) only specify which channel is to be affected by the particular command.

The details of these commands are listed below.

<CR> is a byte with the hexadecimal value 0D.

Throughout the following <CR> means carriage return.

Play File to Channel

Description:	This command causes the 8TraXX to play a specific sound file to a channel.
Command Bytes:	cPL <CR> or ncPL<CR> or nncPL<CR> or nnncPL<CR> or nnnncPL<CR> where n, nn, nnn, or nnnn is the sound number in ASCII and c is the channel number in ASCII
Message Response:	R<CR>
Comments:	If no sound number is specified, the number specified with the last Select File command (see below) will be used.
	Sound numbers 1 through 511 are interruptible, meaning that they will restart if commanded to play again while currently playing.
	Sound numbers 1001 through 1511 are uninterruptible, meaning that they will play through to completion (unless receiving a stop command) even if another play command is received while playing.
	Channel numbers range from 1 through 8, or "*" for All Channels

Examples:	Play file 215 to channel 4.	2154PL<CR>
	Play file 1 to channel 7.	17PL<CR>

Loop Play

Description:	This command causes the 8TraXX to select the specified sound file and play it to the specified channel, automatically looping it back to the start when the sound finishes.
Command Bytes:	cLP<CR> or ncLP<CR> or nncLP<CR> or nnncLP<CR> or nnnncLP<CR> where n, nn, nnn, or nnnn is the sound number in ASCII and c is the channel number in ASCII
Message Response:	R<CR>
Comments:	If no sound number is specified, the number specified with the last Select File command (see below) will be used.

Sound numbers 1 through 511 are interruptible, meaning that they will restart if commanded to play again while currently playing.

Sound numbers 1001 through 1511 are uninterruptible, meaning that they will play through to completion (unless receiving a stop command) even if another play command is received while playing.

Channel numbers range from 1 through 8, or "*" for All Channels

Examples:	Play and Loop file 215 to channel 4.	2154LP<CR>
	Play and Loop file 1 to channel 7.	17LP<CR>

Assign Sound

Description: This command causes the 8TraXX to assign a sound file to a specific channel. If the next play command is sent without a sound number specified, the sound number assigned to the particular channel in the Select File command is used. This is especially useful for All Channel play commands, where you can leave the sound number unspecified, and the channel number is specified as '*'. The 8Traxx will start playback of all channels at the same time, using the assigned sound numbers for each channel specified by a previous Select File command.

Command Bytes: ncSE<CR> or nncSE<CR> or nnncSE<CR> or nnnncSE<CR>
where n, nn, nnn, or nnnn is the sound number in ASCII
and c is the channel number in ASCII

Message Response: R<CR>

Comments: Sound numbers range from 1 to 511 for interruptible play, and from 1001 to 1511 for uninterruptible play.
Channel numbers range from 1 through 8, or "*" for All Channels

Examples:	Assign file 215 to channel 2.	2152SE<CR>
	Assign file 4 to channel 1.	41SE<CR>

Reset Channel

Description: This command causes the 8TraXX to stop playback of the specified channel.

Command Bytes: cRJ<CR>
where c is the channel number in ASCII

Comments: Channel numbers range from 1 through 8, or "*" for All Channels

Message Response: R<CR>

Mute/UnMute Channel

Description: This command causes the 8TraXX to mute or unmute the specified channel.

Command Bytes: ncAD<CR>
where n is "0" for mute, "1" for unmute
and c is the channel number in ASCII

Comments: Channel numbers range from 1 through 8, or "*" for All Channels

Message Response: R<CR>

Keylock Control

Description: This command is used to disable the front panel pushbuttons of the 8TraXX.
Command Bytes: nKL<CR>
                              where n is "0" for disable front panel pushbuttons, "1" for enable pushbuttons
Message Response: R<CR>

Version Request

Description: This command is used request the operating system version.
Command Bytes: ?V<CR>

Message Response: Alcorn McBride 8TraXX Vxx.xx<CR>
                              Where xx.xx is the current version of the installed firmware.

Note: The firmware version can also be obtained by holding down the 8th front panel channel button as power is applied to the 8TraXX. The channel LEDs on the front panel will indicate the version as XXXX.XXXX, where the first four LEDs indicate the binary whole number and the last four LEDs indicate the binary decimal number part of the version.

For example ('X' is LED on, 'O' is LED off)

OOOXOXOX indicates firmware version 1.5

After this operation, the 8TraXX must be power-cycled to reboot.

Completion Acknowledge Mode

Description: This command is used to select the method by which the 8TraXX issues a completion acknowledge message. There are 5 completion acknowledge modes possible, each of which is selected by issuing a separate serial command. The completion acknowledge mode remains as long as the 8TraXX is powered. In all cases the Message Response is R<CR>. *Note*: The unit defaults to no completion acknowledge whenever the unit first powers up.

Command Bytes: RAK<CR>   Selects simple channel response mode.

                                                CH<CR> is sent upon a channel stopping, where CH = ASCII representation of the channel number, from 0 through 7.

                        The remaining modes are designed specifically for interfacing to Alcorn McBride Show Controllers. The 8TraXX protocol file implements these commands. Please refer to the *Alcorn McBride Show Control User's Manual* for details.

                        *<flag offset>*FAK<CR>   Selects *Flag Offset* Mode.

                                                An Alcorn 8-bit *Set Flag* message is sent, where each channel completion sets a corresponding flag in the show controller starting at the flag number designated by the *flag offset* parameter. This parameter is in HEX, and has a range of 0x40 to 0x77.

                        *<variable offset>*WAK<CR>   Selects *Variable Offset* Mode.

                                                An Alcorn 8-bit *Set Variable* message is sent, where each channel completion sets a corresponding variable in the show controller to a 1 starting at the variable number designated by the *variable offset* parameter. This parameter is in HEX, and has a range of 0x00 to 0x17.

                        *<variable>*VAK<CR>   Selects *Set Variable* Mode.

                                                An Alcorn 8-bit *Set Variable* message is sent, where each channel completion sets the show controller variable designated by the *variable* parameter to the completed channel, starting at one (i.e. The *variable* is set to a '3'. when channel 3 completes.) This parameter is in HEX, and has a range of 0x00 to 0x1f .

                        *<sequence offset>*SAK<CR>   Selects *Start Sequence* Mode.

                                                An Alcorn 8-bit *Start Sequence* message is sent, where each channel completion starts a corresponding sequence in the show controller beginning at the offset designated by the *sequence offset* parameter. This parameter is in HEX, and has a range of 0x00 to 0xff .

Error codes

Error Code	Description	What to Do:
E00	Communication Error	Check your serial connections
E04	Feature Not Available Yet	Have you entered the correct command? Check for avail.
E11	Media Not Present	Is the Compact Flash inserted? Formatted? A recommended brand?
E12	Search Error	Selecting the correct file? Is the file on the card? Is it named correctly?
E20	Format Error	Has the Compact Flash been properly formatted?

Making MP3 Files

Encoding

Making MP3 files involves using an encoder, and you can find them readily available from the web. A couple that we have seen work well are **Audio Catalyst,** which is available from **Xing Technology Corporation** (www.xintech.com), and **Music Match JukeBox** available from **MusicMatch** (www.musicmatch.com)**.** Fraunhofer IIS Institute in partnership with Thomson Multimedia own patents on tools that make MP3-compliant bitstreams. Due to the fact that Fraunhofer charges a royalty from each encoder distributor, it is difficult to find a freeware MP3 encoder. But at the time of this printing, MusicMatch (mentioned above) does have a free encoding utility in their Jukebox. Audio Catalyst is a lot more flexible than MusicMatch Jukebox, but you'll need to purchase it.

Quality

Below is a useful comparison of bitrates, quality, and file size. All you will need to do is choose the bitrate at which you want the file encoded, which best fits in with your storage space requirements. The most common bitrate is bolded.

Bitrate (Kbps)	Quality	File Size/min
Original WAV	Best quality achievable is whatever the source is.	10.47Mbytes
80	FM radio quality.	.594Mbytes
96	Near CD quality	.712Mbytes
128	**Close enough to CD Quality most listeners can't tell a difference**	**0.950Mbytes**
160	Better than CD quality – good for high end stereos	1.19Mbytes
320	Best quality, good for archiving, but takes up lots of memory	2.38Mbytes

Bandwidth Limitations

Due to varying response times on compact flash media and bandwidth limitations in the unit, follow this table in encoding your clips according to the number of channels you are using. If you plan to use more channels later, then you may prefer using a smaller bitrate to keep from re-encoding. You may need to follow these recommendations if healthy channels drop out during playback of new channels.

This table is based on a SanDisk 64MB card. Performace can vary by brand and size.

Number of Channels	Recommended Highest Bitrate
1-2	320Kbps or less
3	256Kbps or less
4-6	160Kbps or less
6-7	128Kbps or less
8	112Kbps or less

MIDI Control

The 8TraXX may also be controlled using MIDI control change messages via the 5-pin DIN Connector. The data format is:

 31250 Baud, **N**o Parity, **8** bits, **1** Stop bit

Unlike with parallel control, MIDI and RS232 control allow you to play any sound to any channel.

The protocol is in accordance with MIDI Control Change protocol. As shown in the following table, the Status Byte (`76) is always followed by two data bytes that determine the channel to be addressed and the activity to be triggered (i.e. Play, Stop, Mute, etc.) All number in the table are decimal.

Message Format: (Status Byte)(Control Number)(Control Value)

Function	Status Byte (control change)	Control Number Range	Control Value Range
Play Channel	176	64 – 71 select channels 1 - 8	1 – 122 selects sound number 1 - 122
Play & Loop Channel	176	72 – 79 select channels 1 – 8	1 – 122 selects sound number 1 - 122
Stop Channel	176	80 – 87 select channels 1 – 8	0
Mute /Unmute Channel	176	88 – 95 select channels 1 – 8	0 = Mute channel 127 = Unmute channel
Disable/Enable Front Button	176	122	0 = Disable buttons 127 = Enable buttons
Stop All Channels	176	123	0

Examples:

Play sound 1 to channel 2	176,73,0
Play and loop sound 4 to channel 5	176,76,3
Stop channel 4	176,83,0
Unmute channel 6	176,93,127
Stop all channels	176,123,0

File Names

The 8TraXX uses the number part of the file name to identify the sound number.

The media must be formatted in the 8TraXX, but files may be copied using a PC with a Compact Flash adapter. Care should be taken to avoid long filenames, or other features not supported by the FAT16 file system.

Do not delete files and then copy additional ones. This will fragment the media. To delete files, copy all of the required files to the PC's hard drive, format the Compact Flash card in the 8TraXX, and then recopy the desired files.

File names are represented in simple DOS 8.3 format – in other words, an eight character name, a period, and then a three character extension. The following is an example of valid file names for the 8TraXX:

SND00001.MP3   (sound number one - interruptible)

SND00020.MP3   (sound number twenty - interruptible)

SND01005.MP3   (sound number five – uninterruptible)

The name is made up of eight characters beginning with SND followed by the number of the file (5 digits from 00001 to 00511, or 01001 to 01511), and then followed by the .MP3 extension.

Interruptible versus Uninterruptible Operation

The number part of the file name identifies the sound number. Sound numbers can range from 1 to 511, and 1001 to 1511. The two ranges provide a way for the 8TraXX to determine whether or not a sound is allowed to be interrupted while playing and start over, or if it should keep playing through to completion and ignore incoming play requests.

Sound numbers 1001 to 1511 are uninterruptible, meaning that repeated play requests will not cause the sound to start over from the beginning while playing. An example of where this might be used is in a museum kiosk, where a guest trips a break-beam sensor to start an audio presentation. The audio will continue playing through, even though the guest might continually trip the sensor while listening to the presentation.

Sound numbers 1 to 511 are interruptible, meaning that repeated play requests during playback will cause the sound to start over. An example of where this might be used is in a shooting gallery, where you want the sound to be heard every time a gun's trigger is pulled.

The parallel play inputs 1 through 8 will either play sound numbers 1 through 8, or sound numbers 1001 through 1008, whichever it finds first. If the sound number is 1001 through 1008, the sound will play in uninterruptible mode. If the sound number is 1 through 8, the sound will play in interruptible mode.

> **Important Note:** When using a PC to copy your audio files to the media, **avoid copying files after performing delete operations**. This will cause the media to become **fragmented** and the 8TraXX will malfunction during playback. Always format the media in the 8TraXX first, and then copy files to it all at once.

Using More Than 511 sounds

You can access up to 9,999 sounds on the 8TraXX. In order to do this, create a subdirectory on the Compact Flash media named "sounds" and copy your MP3 files to that directory. Sounds can be numbered as shown below:

SND00001.MP3   up to   SND09999.MP3

Interruptible versus Uninterruptible Operation

With files in the "sounds" subdirectory, any sound number greater than 10000 will be uninterruptible (see previous section for description of uninterruptible operation). In this case, sounds can be numbered as shown below:

SND10001.MP3   up to   SND19999.MP3

Important Note: There cannot be any sound files with duplicate sound numbers in the lower 4 digits. For example, you can't have

SND10020.MP3   and   SND00020.MP3

File Compatibility

The following provides a detailed outline of the various parameters and specifications for the types of audio files that the 8TraXX is capable of playing. In general, the 8TraXX can play MP3 files at any of the popular bitrates or resolutions.

All features specified for Layer III in ISO/IEC 11172-3 (MPEG 1 Audio)

All features specified for Layer III in ISO/IEC 13838-3.2 (MPEG 2 Audio)

Lower sampling frequency extension, (not specified by ISO) called MPEG 2.5

Decodes Layer III Stereo Channels, Dual Channel, Single Channel (Mono)

Supports all the MPEG 1 and 2 sampling frequencies and the extension to MPEG 2.5 including: 48, 44.1, 32, 24, 22.05, 16, 12, 11.025, 8 KHz.

Accepts MPEG 2.5 Layer III (MP3) elementary compressed bitstreams with data rate from 8Kbits/s up to 320 kbit/s, and also variable bitrate files up to 320kbits/s.

Note: A few software encoders generate large MP3 data packet sizes, where many bytes of data appear between sequence headers. For best results and quick file seaming (skipping between files on one track), make sure that your encoder places sequence headers at least every 512 bytes. Otherwise there may be an unacceptable playback response when skipping between files on a single track.

GPS Operation

You can use an Alcorn McBride AM4 Audio Machine or DVM7400 Digital Video Machine to send play commands to the 8TraXX based on geographic position and direction of travel.

The 8TraXX connects to the AM4 or DVM7400 using a GPS Cable Harness. This harness connects both the power and serial inputs of the 8TraXX to the AM4 or DVM7400, and also connects the GPS receiver. A main power input is provided for a vehicle power connection.

A windows program, GPS Builder is used to capture geographical points and make a playlist which resides on the Compact Flash card installed in the AM4 or DVM7400.

You can download GPS Builder from www.alcorn.com.

When a programmed geographic location is arrived at, the AM4 or DVM7400 sends a serial message to the 8TraXX to play a file from its Compact Flash to a particular channel. Multiple files/channels can be played simultaneously for multilingual applications, for example.

Please contact Alcorn McBride for ordering information.

Troubleshooting Guide

Q: I've copied several files from my PC onto a Compact Flash, but they do not play.

A: The Compact Flash may have been pre-formatted in a way that is incompatible with the 8TRAXX operating system. Refer to the Formatting section of the manual to find out how to format the media.

Q: When playing back files, the audio seems to jump from one file to the next, interrupting the currently playing file in the middle.

A: The media has become fragmented. Format the media in the 8TRAXX and then re-copy all the files to it.

Q: It seems that the 8TraXX is not responding to a Stop command very quickly. It sometimes takes seconds for the sound to stop after issuing the command or pressing the front panel button.

A: The sound file has a corrupted or missing sequence header. Try re-encoding the file.

Q: When skipping between files on a single track I hear pops and squeaks in the audio.

A: Make sure that all sound files played to a track have identical encoding parameters (i.e. bitrate, sample frequency, encoding format, etc.).

Q: When skipping between files on a single track, there is a long delay between when I issue the play command and the sound actually starts playing.

A: The MP3 data files you are playing might contain larger than normal data packet sizes. The 8TraXX waits until a sequence header (at the beginning of a data packet) comes along when playing a file before "seaming" to another file. If the data packets are too long, the 8TraXX has to play a lot of data before finding a header. Try re-encoding the file using a different encoder to reduce the packet size.

Q: Why can't I get more than a few channels to play at once? When I start the fifth channel, channels 3 and 4 stop playing.

A: Your bandwidth may be too high. See the section labeled "Bandwidth Limitations" in the "Making MP3's" section for details.

For the answers to other questions, check out the Alcorn McBride Knowledge Base at http://www.alcorn.com/kb

If you don't find it there, please email our technical support staff at support@alcorn.com

Specifications

Audio: Tracks: 8 Stereo (16 channels)
DAC Resolution: 16 Bits
Deviation from Linear phase: +/-0.5 dB
Total Harmonic Distortion: 0.008%
Dynamic Range (A-weighted): 94dB
Inter-Channel Isolation: 90dB
Inter-Channel Gain Mismatch: 0.1 dB
Frequency Response: 10 to 20 Khz +/-0.1 dB
Maximum Phase Non-Linearity: 5 degrees
Line Output Level: Unbalanced, 4.07V P-P max (3.70 typical) into 20K
Line Output Load: 10K Ohm Minimum, 100pF Maximum

Playback Time: 1 MByte/minute with excellent audio quality
Over 20 minutes of audio from included Compact Flash card
Hours of audio from optional larger Compact Flash card
Response Time less than 33 msec.

Response Time: Less than 33 msec.

Power: 9 VDC to 14 VDC at 1 Amp max
Adapter for 115 or 230 volts provided
115/230 volts, 50/60 Hz, 30 W max

Physical: 5.5" x 1.75" x 11"
4 lbs.
0°C (32°F) to 38°C (100°F), free air circulation
0-90% relative humidity, non-condensing
20 g max Vibration (with removable Compact Flash Card)

Controls: Test Button for each track
Mute All button
Playing LED for each track
Mute All LED

Connectors: Side mounted switch for ground lift
Side mounted switch for input type: contact/voltage
Phoenix type screw terminals for discrete controls (mating connectors included)
RCA type Phono connectors for left and right line level outputs for each track
Barrel connector (2.5 mm x 5.5 mm x 10 mm) for power
DB-9M serial RS-232 connector
2 x 5-pin DIN Female (MIDI In, MIDI Thru)

Part Numbers

8TraXX with 110 VAC Power Supply	8TraXX-110
8TraXX with 220 VAC Power Supply	8TraXX-220
Spare 110 VAC Power Supply	PS9V110
Spare 220 VAC Power Supply	PS9V220
Compact Flash Docking Station for USB port	CFUSB-1
Compact Flash to PC-Card Adapter	CFPC-1
Compact Flash Media	Contact factory for sizes and part numbers
AM4/DVM7400 GPS Cable Harness	