

CFSound-III

**Compact FLASH
Digital Audio
System**

Table of Contents

Overview	4
Features	4
Connections.....	5
Main Connector	5
<i>Power Supply Connection</i>	5
<i>Built-in Contacts Connection</i>	5
<i>Speaker Connection</i>	6
Serial Connector	6
Remote Volume Connector.....	7
LINE OUT Connector	7
LINE IN Connector	7
PHONES Connector	7
Quick Start	8
Troubleshooting.....	10
No sound, no Green or Red LED(s) flashing.....	10
No sound, Red LED flashing	10
Low sound volume.....	10
Programming the Compact FLASH Card.....	11
Compact Flash Card Requirements.....	11
Installing and Removing the Compact FLASH Card.....	11
Audio Rates Supported	11
Formatting the CF Card	12
Modes of Operation	12
CFSound Mode	12
Filename Formats.....	13
<i>Sample Filenames</i>	14
<i>Compact FLASH Card Loading and Scanning</i>	15
<i>Background Audio Tracks</i>	15
<i>CFSOUND.INI File</i>	16
<i>Quiz / Kiosk Mode</i>	19
<i>Sequential Sound Play-out</i>	21
<i>RS-232 Serial Port Protocol</i>	22
DMX Operation	23
<i>DMX Controller (Master)</i>	23
<i>DMX Device (Slave)</i>	23
Basic Mode	26
Diagnostic LED Codes (Red & Green LEDs).....	27
Green LED.....	27
Red LED Error Flashes.....	27
Power Requirements	28
Digital Audio Recording	28
Recommended Recording Procedure	28

Optional Plug-in Modules	29
CFSound-III Contact Sense 8 Module	29
CFSound-III Contact I/O 8 Module	29
CFSound-III Contact Sense 24 Module	31
CFSound-III DMX I/O Module	32
Contact Wiring	33
Analog Input Wiring	34
DMX Wiring	34
Connecting a Motion Sensor	36
Normal Sized Motion Sensor	36
Small Sized Motion Sensor	37
Connecting Multiple Speakers	38
Frequently Asked Questions	39
Sample Messages	44
Sample Power Up Message, no CF card	44
Sample Power Up Message, CFSound Mode	44
Sample Power Up Message, Basic Mode	44
Mechanical	45
Firmware Revisions	46
Upgrading the Firmware	48

Overview

Thank you for purchasing the **Compact FLASH III Digital Audio System**; be assured that it will provide you with thousands of hours of trouble free, solid-state operation. You will also find that it is simple to change audio themes or tracks and is easy to make your own recordings or “program” the device.

End users can change the audio themes or tracks simply by inserting another, different Compact FLASH Card, as easily as the changing of a cassette tape. Multiple cards can be programmed with different audio themes or tracks allowing daily, hourly, weekly or monthly changes. It truly is as simple as removing the old card and plugging in the new one. Depending on the manufacturer, Compact FLASH Cards may be re-used up to 100,000 times.

Sound files are easily copied onto the card via your PC or laptop, using a Compact FLASH to PCMCIA, Compact FLASH to USB or parallel port adapter. As the files are copied to the Compact FLASH Card, they are renamed. This process instructs the **Compact FLASH III Digital Audio System** how and when to play the copied files.

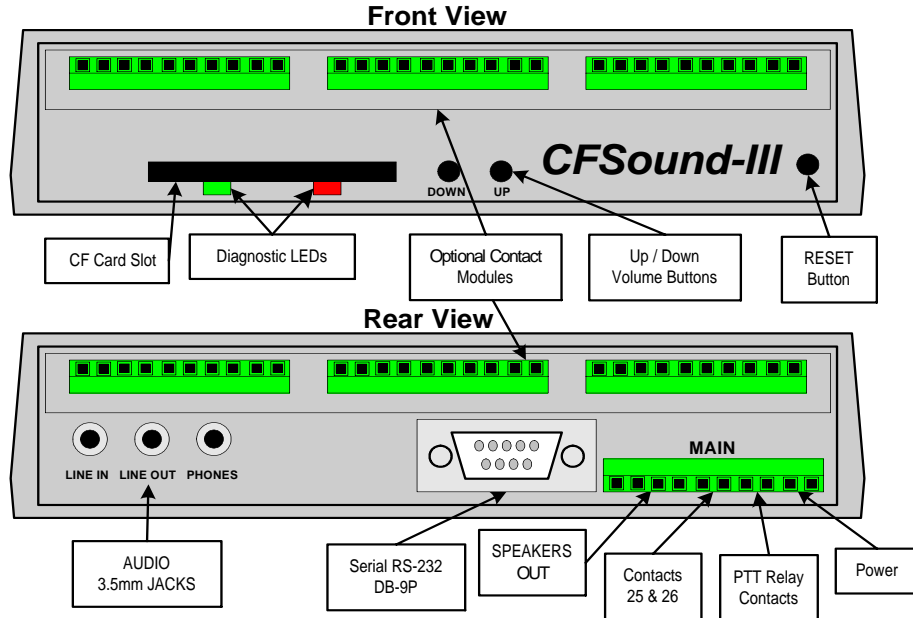
See the **Quick Start** section below to try out your CFSound-III immediately.

Features

The Compact FLASH III Digital Audio System incorporates the following features:

- Uses inexpensive, industry standard Compact FLASH (CF) Cards.
- RS-232 Serial Port for controlling audio play out via an attached computer or PLC.
- Diagnostic LED's to indicate operating status.
- Two built-in contact inputs to activate sounds.
- Push-To-Talk (PTT) dry relay contact output that can optionally close whenever a sound is played.
- Digital Up/Down volume control push buttons with remote connector.
- Built-in 50 Watt Class D Stereo (2 x 25W) Amplifier.
- Built-in 35mW @ 32 ohms Headphone Amplifier.
- Optional boards for contact inputs to activate sounds.
- Optional boards for contact outputs activated with sounds for other control.
- Optional board for control of or by USITT DMX-512 devices.
- Scriptable via built-in ACS Basic

Connections



Main Connector

Most of the connections to the CFSound-III are supplied to the unit with a ten pin, 2-piece pluggable terminal block style connector at **Main**.

Power Supply Connection

The CFSound-III requires a regulated or unregulated voltage of 10V to 18V DC. The unit has reset-able fusing internally to protect the Power input. Should the fuse trip, remove power, correct the fault, wait a minute for the thermal fuse to cool and reset, then, re-apply power. The non-OEM version of the CFSound-III is supplied with a wall mounted transformer rated at 12VDC @ 1.0A.

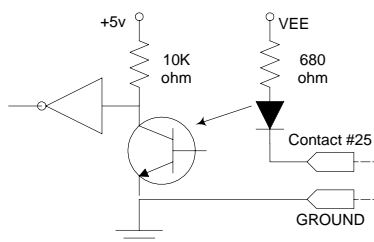
ACS supplies two different versions of the wall-mounted transformer power supply for the CFSound-III. The version in the black enclosure has a white stripe on the positive lead which should be connected to pin 9 of the **Main** connector with the other lead to pin 10. The version in the beige enclosure has a black stripe on the negative lead which should be connected to pin 10 of the **Main** connector with the other lead to pin 9.

Built-in Contacts Connection

The Push-To-Talk (PTT) relay dry contact output on the **Main** connector may be activated whenever a sound is playing. The contact output is implemented with a relay whose contacts are **rated at 1A @ 30VDC maximum**. The Common and Normally Open relay contacts are available on the **Main** connector.

The contact inputs on the **Main** connector appear logically to the CFSound-III as Contact #25 & #26, and may be activated by momentarily applying ground to the Input Contact #xx pin on the **Main** connector. The contact inputs are implemented with an optocoupler. The Cathodes of the LEDs in the optocoupler are connected to the Contact #25 and #26 Input pins. The Anodes of the LEDs in the optocoupler are connected to an internal 12VDC power supply, with a 680 ohm current limiting resistor in series. The output transistor of the optocouplers have 10K pullup resistors on their collectors, with the emitters connected to ground and

are buffered by an inverting gate. The following diagram is representative of the Contact #25 input and is similar for Contact #26:

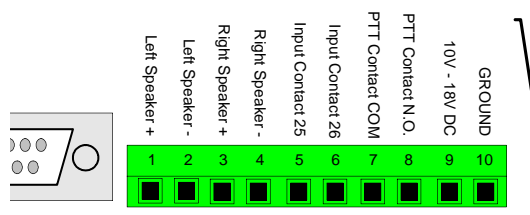


The input is activated by sinking current from the Contact input pin to ground. A Ground connection is supplied on pin 10 of the **Main** connector for this purpose. The input current sink requirement is approximately 10mA. The contacts are associated with sound files named 19x.WAV and 1Ax.WAV. The x denotes additional file control attribute characters. See the **Filename Formats** section below.

Speaker Connection

The speaker terminals on the **Main** connector provide connections for the two external left and right speakers. These may be either 4 or 8 ohm speakers, with 4 ohms providing higher output power. The speakers should be capable of handling up to 25 watts.

NOTE: THE SPEAKER OUTPUTS ARE NOT REFERENCED TO GROUND – EACH SPEAKER REQUIRES ITS OWN PAIR OF WIRES, AND NEITHER WIRE MAY BE CONNECTED TO GROUND.



Pin #	Signal	Filename
1	Left Speaker +	
2	Left Speaker -	
3	Right Speaker +	
4	Right Speaker -	
5	Input Contact 25	19x.WAV
6	Input Contact 26	1Ax.WAV
7	PTT Contact COM	
8	PTT Contact N.O.	
9	10VDC – 18VDC	
10	Ground	

Serial Connector

A standard RS-232 serial interface is provided on-board via a DB-9 style male connector. The CFSound-III provides diagnostic messages about CF card insertion and removal events and sound contents over the serial port. Additionally, the playing of sounds may be controlled by messages issued to the CFSound-III via the serial port. The format of the serial data is 2400 baud, 8 data bits, 1 stop bit and no flow control, and the baud rate may be changed using a configuration file entry or NVM setting. Only three of the nine pins are used. The configuration of jumper block JB2 on the CFSound-III controls whether the serial

port looks like a Modem (DCE) or a Terminal (DTE). As shipped, the CFSound-III is configured to be DCE so that a one-to-one cable from a PC serial port may be used. The Windows HyperTerminal accessory may be used to view the diagnostic messages and manually issue commands to start/stop/queue sounds:

Pin #	Signal Name JB2 = DCE	Signal Name JB2 = DTE
2	TX (from unit)	RX (to unit)
3	RX (to unit)	TX (from unit)
5	Ground(GND)	Ground(GND)

Remote Volume Connector

The sound volume level is controlled by two pushbuttons on the front of the CFSound-III: one for Up and one for Down. A momentary button press of the Up button raises the volume level, a button press of the Down button lowers the volume level. Pressing and holding the button for ¼ second starts an automatic volume increase/decrease until the button is released or the maximum/minimum volume is achieved. The volume is essentially db linear in sixty-four, 1db increments from 0db → -66db. The current volume level is 'remembered' in non-volatile memory on the CFSound-III and is restored to it's last setting upon power-up.

The Up and Down button inputs are also available on the VOL connector along the front edge of the printed circuit board inside the enclosure. Connecting a momentary button between the input and ground parallels the operation of the on-board volume controls:

Pin #	Signal
1	DOWN-
2	GND
3	UP-

LINE OUT Connector

The volume controlled sound is also available at an audio line level (1V RMS @ 0db volume, 47K ohms) at the 3.5mm Stereo LINE OUT jack on the rear of the CFSound-III.

Pin #	Signal
TIP	Left
RING	Right
SLEEVE	Ground

LINE IN Connector

Line level audio appearing at the 3.5mm Stereo LINE IN jack (1V RMS @ 0db volume, 47K ohms) on the rear of the CFSound-III may be enabled to be amplified at the current volume setting and presented to the Speakers/Line Outputs whenever another sound is not playing. See the **CFSOUND.INI** section below.

PHONES Connector

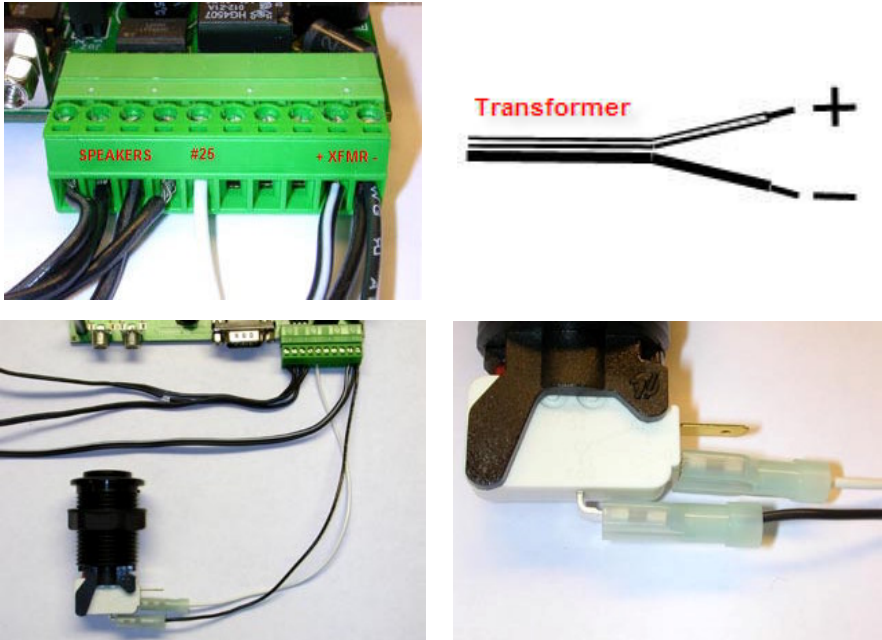
The volume controlled sound is also available for driving stereo headphones (35mW @ 0db volume, 32 ohms) at the 3.5mm Stereo PHONES jack on the rear of the CFSound-III.

NOTE: The common headphone output is not referenced to, and should not be connected to Ground.

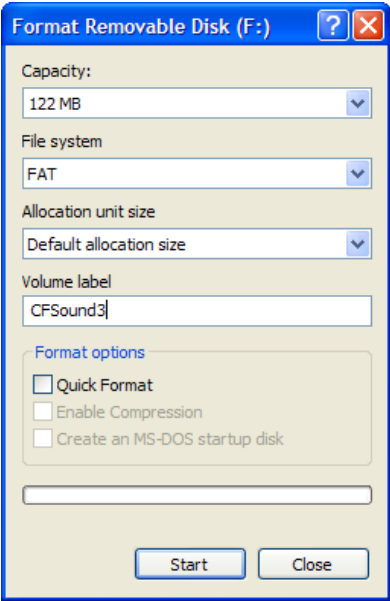
Pin #	Signal
TIP	Left
RING	Right
SLEEVE	Common

Quick Start

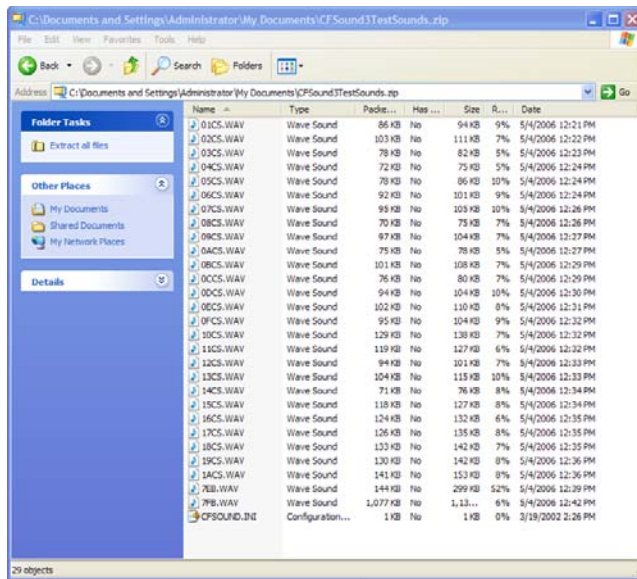
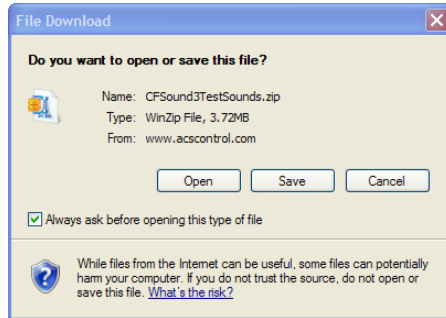
- 1. Connect the transformer, speakers and a normally open momentary pushbutton switch to the Main terminal block. See **Main Connector** section above for more information.



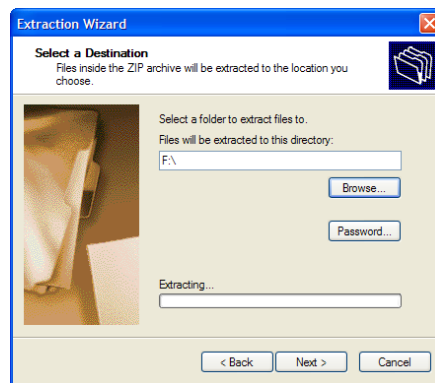
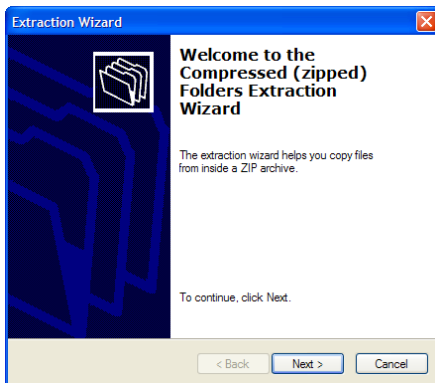
- 2. Apply power to the CFSound-III. With no CF card inserted, the Green LED should flash fast then slow. See **Diagnostic LED Codes** section below for more information.
- 3. Format a Compact Flash card using either FAT16 (FAT) or FAT32:



4. Download the some sample sounds



5. Extract the test sounds onto the formatted CF Card



Green LED should flash fast. Carefully insert the CF card into the CFSound playing then repeating.

Stop the background sound, play sound #25, then the background sound.

Troubleshooting

No sound, no Green or Red LED(s) flashing

The CFSound-III doesn't have correct power. Verify the power supplied to the MAIN connector for the correct polarity and level using a voltmeter if available. If this is correct, verify that none of the wiring to the unit is shorted causing the internal resettable fuse to be tripped.

No sound, Red LED flashing

The Red LED is flashing a pattern of one or more numbers to help identify the problem. Please see the **Diagnostic LED Codes** and **Frequently Asked Questions** sections below.

Low sound volume

Sound volume may be adjusted using the up / down pushbuttons on the front of the unit. Push and hold the up button to increase. If this doesn't adjust the volume, verify your speaker wiring and impedance.

Programming the Compact FLASH Card

Compact Flash Card Requirements

The **Compact FLASH III Digital Audio System** was designed to use only Compact FLASH Cards (CF Cards) that support the Common Memory ATA mode at 3.3 volt operation. Tested cards include SanDisk, Techworks, Dane-Elec, Memorex and Hitachi. The SanDisk card was tested, since they manufacture 90% of the retail cards on the market. Compact FLASH Cards are available in many local electronics or camera stores or can be ordered directly from ACS.

Note that not all Kingston Media Compact Flash cards are 100% compatible in Common Memory mode and as such may NOT BE COMPATIBLE with the Compact Flash III Digital Audio System.

The Compact FLASH Card is programmed by inserting it into the PCMCIA slot of a Compact FLASH to PCMCIA adapter or a Compact FLASH adapter connected to your parallel port. Sound files are copied to the Compact FLASH Card just as if it were a disk drive. The files used are the standard "*.WAV" files typically employed by Windows and DOS audio applications for years.

When a new Compact FLASH Card is first installed into your computer, Windows (95 or later) should recognize the device and install the software necessary to access the card. After the software installation is complete, the Compact FLASH Card appears as a disk drive icon under My Computer. You may then use Windows Explorer to drag and drop the sound files from your computer's hard disk directly to the Compact FLASH Card icon. It really is just that easy.

Please take care not to use audio tracks that are copyrighted. If you wish to avoid this issue, you will find that many computer software outlets have CD's with non-copyrighted music and audio sound effects that you may use without limitation. They are commonly found in the multimedia section. **Please be advised that you as the user are solely responsible for audio that you record and play from the Compact FLASH III Digital Audio System.**

Installing and Removing the Compact FLASH Card

Care should be taken when installing or removing the Compact FLASH Card. Please be certain to insert the card with a straight and level motion. Please do not force the card to insert. Otherwise, some of the 50 pins in the socket may become damaged and the card and/or **Compact FLASH III Digital Audio System** may become unusable.

Before REMOVING the Compact FLASH Card under Windows 95 or later, Microsoft recommends that you double click on the PCMCIA icon at the bottom of your computer screen. This will bring up the pc card [PCMCIA] properties window. Click on socket status tab, and select the card you wish to remove by clicking on it. Finally, click on the stop button. Windows will then tell you that the card socket services have been stopped. Under Windows XP you may also right-click on the folder and select Eject. **Failure to stop the card reader and/or eject the CF card may result in incorrect or incomplete data on the card.**

On the **Compact FLASH III Digital Audio System** this will all happen automatically simply by removing the card.

Audio Rates Supported

The Compact FLASH III Digital Audio System supports 16-bit mono or stereo Windows PCM format (.WAV) sound files at a sampling rate of 44.1KHz (44,100Hz) only. The **Compact FLASH III Digital Audio System** reads the sampling rates and formats encoded in the .WAV sound files whenever a card is first inserted or a sound play-out is triggered. The unit will not play any file that does not meet these

requirements. Further, this error condition should be identified by the red led flashing twice every six seconds. See the Diagnostic LED Codes section below for more information.

Formatting the CF Card

Compact FLASH cards must only be formatted using the FAT12 (floppy) FAT16 or FAT32 file systems. **NTFS, Linux EXT3 or other file system formats are not supported.** The maximum supported partition size is 4G. The CFSound-III will attempt to locate a valid, active partition on the formatted card in order to be able to access the files. CF cards that have been previously used in some digital cameras may not be correctly formatted, or may not have valid partitions defined.

By default, Windows XP will format any Compact Flash card of 64MB or more with FAT32 format. The ACS Compact FLASH III Digital Audio System uses the FAT (FAT16 or FAT32) format and can not operate with a NTFS formatted card. You must select FAT or FAT32 file system to format your Compact Flash card in a Windows XP PC.

Modes of Operation

The CFSound-III can operate in one of two different modes:

1. Conventional CFSound where the sound play-out is controlled by the association of contact numbers and sound filenames. This is referred to as the **CFSound Mode**.
2. Scriptable CFSound where the sound play-out is controlled by the execution of ACS Basic programs. This is referred to as the **Basic Mode**.

Upon power-up, reset or whenever a Compact Flash card is inserted or removed, the unit determines its operating mode as follows. As the CFSound-III scans for a CF card, and then files on the card, the Green LED flashes 3 times per second:

If a **CF card is not present**, the unit runs in Basic Mode by starting the ACS Basic interpreter and accepting/executing a subset of Basic commands that don't require file I/O via the serial port. The Green LED flashes once per second.

If a **CF card is present**, the unit looks for a file named **CFSOUND.BAS** and, if **found**, starts the ACS Basic interpreter, loading the file and executing the Basic program within in Basic Mode. The Green LED flashes once per second.

If a **CF card is present**, and the file **CFSOUND.BAS** **is not found**, the unit scans the card looking for sound files that follow the conventional CFSound Mode Filename Format. If at least one correctly named, valid sound file is found, the unit runs in CFSound Mode. If no valid sound files named in the conventional CFSound Mode Filename Format are found, the unit starts the ACS Basic interpreter and accepts/executes the complete set of Basic commands via the serial port in Basic Mode.

These two modes of operation are detailed in the following sections. Any errors encountered while scanning the CF card produce error code flashes on the Red LED. See the Diagnostic LED Codes section below for more information about LED error codes.

CFSound Mode

In CFSound Mode, the operation of the CFSound-III is controlled by the names of the sound files on the CF card. Sounds are associated with contacts by the leading numeric portion of the filename, and the controlling state of the contact is specified by additional trailing non-numeric character attributes. Sounds may be played when a contact closes, opens, or only while a contact is closed or open. Sounds may be flagged as non-interruptible, or to only play when no other contact controlled sounds are playing. In

addition, a small configuration text file may be placed onto the CF card along with the sound files to further control how the unit plays sounds (see the CFSOUND.INI section below).

Filename Formats

The filenames of the individual Sound files on the Compact FLASH Card control how and when the sounds are played out by the **Compact FLASH III Digital Audio System**. **The filenames must start with the optional input number they are associated with expressed as a two digit HEX number.**

The HEX numbering system has a base of 16 as compared to the decimal system which has a base of ten. A HEX numeric digit is 0 through F, 0 being equal to decimal 0, and F being equal to 15. The first digit (MSB) of the two digit hex number is multiplied by 16. The second digit (LSB) is added to the adjusted value derived from the first digit. The number 10 in HEX is thus equal to 16 decimal. The number 20 in HEX is 32 decimal, 21 in HEX is 33 decimal, and 7F in HEX is 127 decimal. For your convenience, a decimal to hex conversion table is provided below:

LSB → MSB↓	_0	_1	_2	_3	_4	_5	_6	_7	_8	_9	_A	_B	_C	_D	_E	_F
0_	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1_	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2_	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3_	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
4_	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
5_	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
6_	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
7_	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
8_	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
9_	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159
A_	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
B_	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191
C_	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207
D_	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223
E_	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239
F_	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255

For example, a sound file associated with optional contact input #1 would be named "01.WAV," a sound file for input #10 would be named "0A.WAV," a file for input #16 would be "10.WAV" and a file for input #36 would be "24.WAV". There is no input #0 and so "00.WAV" is reserved and should not be used. There is a maximum of 254 sounds and so "FF.WAV" is reserved and should not be used.

The two digit hex input number must be the first two characters in the filename.

Additional letter tokens are appended to the input # in the filename to determine *when* and *how* the audio sound is played. The **Compact FLASH III Digital Audio System** provides one input in its standard configuration and, by adding optional boards, can be expanded to either 10, 18, 26 or 50 total inputs. The inputs can be wired to switches or other such devices, either normally opened or normally closed.

You can also connect the RS-232 port of the **Compact FLASH III Digital Audio System** to the RS-232 port of your computer or PLC to control up to 254 sounds using serial commands.

The filename letter tokens are described as follows:

If a “**C**” appears after the hex number in the filename, the sound file will be played on a *closure* of the corresponding optional contact input module input or serial command. The sound will start playing when the associated contact input goes from an open to closed state.

If a “**O**” appears after the hex number in the filename, the file is played on a *opening* of the corresponding optional contact input module input or serial command. The sound will start when the associated contact input goes from a closed to an open state.

If a “**P**” after the hex number in the filename, the file will play only while the “**C**” or “**O**” state is true. If “**C**,” it will play while the associated contact input is closed and it will stop playing the sound when the input is opened. If “**O**,” it will play while the associated contact input is open and it will stop playing the sound when the input is closed.

If an “**R**” appears in the filename after the hex number, the sound is *repeated*, that is to say that the same sound file plays over and over. If used in conjunction with the “**P**” command, the sound file will repeat the entire time the “**C**” or “**O**” input condition is true. If “**C**,” the entire time the input is closed, if “**O**,” the entire time the input is open. If triggered without a “**P**” attribute, the file will play indefinitely or until another sound is played.

If an “**S**” is used in the filename after the hex number, the on-board Push-To-Talk (PTT) relay and contact closure corresponding to the input number on an optional plug-in board will be activated when the file is played.

If a “**B**” is used in the filename after the hex number, the sound is considered to be a *background* sound. Background sounds play when no other sound is playing, and multiple background sounds are played in the numerical sequence of the two digit input number. Sounds that are marked as Background may not be marked for contact closure or open, play while or repeat. Such markings will be ignored.

If an “**N**” is used in the filename after the hex number, the sound is considered to be a *non-interruptible* sound. Sounds that are marked as non-interruptible will play to completion before any other sounds are played. Contact events that occur while non-interruptible sounds are playing are discarded unless the SaveNIContacts entry in the optional CFSOUND.INI file [Contacts] section is set to TRUE. Sounds that are marked as non-interruptible may not be marked for Repeat or as a Background sound. Such markings will be ignored.

If an “**F**” is used in the filename after the hex number, the sound is considered to be associated with a DMX channel Fade. Sounds that are marked for fade will ramp up the associated DMX channel value between the **BeginFadeValue** and **EndFadeValue** entries at the **FadeDuration** rate in the CFSOUND.INI file [DMX] section when the sound plays and ramp down when the sound ends or another sound is started.

If a “**D**” is used in the filename after the hex number, the sound is considered to be associated with one or more DMX channels defined by an associated scene ##.DMX file.

Sample Filenames

- “01C.WAV” This file would play once, when triggered by optional contact input #1 closing.
- “02O.WAV” This file would play once, when triggered by optional contact input #2 opening.

- “04CP.WAV” This file would play once, when triggered by optional contact input #4 closing and play only while input #4 was closed without repeating.
- “07CPR.WAV” This file would play and repeat, the entire time optional contact input #7 was closed.
- “01OPR.WAV” This file would play and repeat, the entire time optional contact input #1 was open.
- “08CNS.WAV” This file would play once, without being interrupted when triggered by optional contact input #8 closing. The on-board PTT relay would be activated for the duration of the sound as well as optional contact output #8.
- “7EB.WAV” This file would play as a background sound whenever any other sound was not playing.
- “7FB.WAV” This file would also play as a background sound after the preceding file 7EB.WAV had played.
- “19C.WAV” This file would play once, when triggered by contact input #25 on the MAIN connector on the back of the CFSound-III closing.
- “01CD.WAV” This file would play once, when triggered by optional contact input #1 closing. When the sound starts, the first 16 DMX channels would be set to values in the 01.DMX [SoundStart] section, when the sound stops, the first 16 channels would be set to values in then [SoundStop] section of the same file.
- “19CF.WAV” This file would play once, when triggered by contact input #25 on the MAIN connector on the back of the CFSound-III closing. When the sound starts, DMX channel #25 would fade-up to values at a rate determined by entries in the CFSOUND.INI file. When the sound stops DMX channel #25 would fade-down.

Compact FLASH Card Loading and Scanning

Once programmed with the desired sounds and correct filenames, the card is inserted into the slot on the front of the **Compact FLASH III Digital Audio System**. The green LED indicator should begin to flash indicating that the unit is scanning and loading the files from the card. When the card is correctly loaded and scanned, the green LED should glow steadily. Any problems encountered while reading the CF card are indicated by a repeating sequence of flashes on the red LED indicator (see the Diagnostic LED Codes section below for more information).

The card may be removed at any time. In that case, both the green and red LED indicators should turn off.

The optional contact inputs are ‘debounced’ by sampling them using a periodic interrupt. The sample rate is 50 Hertz (20 milliseconds). Valid input closures are detected by reading a 0 - 0 - 1 (open, open, closed) sample sequence. Valid input opens are detected by reading a 1 - 1 - 0 (closed, closed, open) sample sequence.

The status of the unit while loading and scanning is also displayed via messages sent out the serial port. Using a PC with “HyperTerminal” or other terminal emulator software connected to the **Compact FLASH III Digital Audio System** serial port the card loading and scanning messages may be viewed. The serial data format is 2400 baud, 8 data bits, 1 stop bit and no flow control. Samples of these messages are shown in the Appendix.

Background Audio Tracks

Sounds labeled with the “**B**” token in their filename after the hex number are played in numerical sequence as background sounds when no other audio tracks are being played, continuously repeating the sequence. A background audio track will cease playing when any other sound file is triggered to play by contact closure or serial command. Once that sound file is finished playing, the background audio file that was playing will resume playing from the point where it was interrupted and continue to play until again interrupted.

CFSOUND.INI File

Support is provided to control various operating parameters by the inclusion of a CFSOUND.INI file on the CF card. This file is a text file that is created using Notepad or other text editor and then is placed onto the CF card along with the sound files.

When a card is inserted and after all sound files have been loaded, the CFSound-III unit looks for a file with this name, and reads initialization parameter entries from it. Parameter entries are organized into sections with a section name in brackets followed by one or more PARAMETER=VALUE lines. The Section Names and Parameter entries are case sensitive. A section or parameter may be commented out by placing a '#' character as the first character on the line. **The last line in the file should be a blank line.**

NOTE: THE CFSOUND.INI FILE IS NOT REQUIRED IF YOU ARE NOT ALTERING A PARAMETER FROM THE DEFAULT VALUE SHOWN IN THE TABLE.

SECTIONS AND PARAMETERS THAT ARE NOT BEING CHANGED FROM THEIR DEFAULT VALUES IN THE TABLE ARE ALSO NOT REQUIRED.

Here is a list of currently supported Sections and Parameter entries:

<u>[Section] / Parameter</u>	<u>Description</u>
[Comm]	Communications Port Section
BaudRate=dddd	Sets the serial port baudrate to the decimal value dddd. Default=2400.
[DEBUG]	Debug Section
ShowStartStop=TRUE/FALSE	Enables RS-232 message display of sound start/stop events. Default=FALSE.
[Background]	Background Section
BackgroundDelay=dddd	Sets the delay in seconds between background sound play-outs to the decimal value dddd. The delay starts when a background sound is started in order to maintain the delay interval regardless of the sound(s) length. Default=0.
BackgroundRestart=TRUE/FALSE	Enables interrupted background sound to restart from the beginning instead of where it was interrupted. Default=FALSE.
[Quiz]	Quiz Section
QuizMode=TRUE/FALSE	Enables Quiz/Kiosk mode of operation. Default=FALSE.
QuestionContacts=dd	Sets the number of question contacts to the decimal value dd. Default=4.
AnswerContacts=dd	Sets the number of answer contacts to the decimal value dd. Default=4.
NoAnswerTimeout=dd	Sets the delay in seconds between the end of the question sound and the timeout answer sound to the decimal value dd. Default=5.
AwaitAnswerSound=xx	Sets the hexadecimal sound number xx to play after the question sound before the timeout answer sound. Default=0 (no sound).
AnswerWithoutQuestionSound=xx	Sets the hexadecimal sound number xx to play if an answer contact is activated before a question contact. Default=0 (no sound).

<u>[Section] / Parameter</u>	<u>Description</u>
[Contacts]	Contacts Section
Force=TRUE/FALSE	Setting this value to TRUE restores the original CFSound contact behavior wherein the contact's active status is 'forced' upon reset, power-up or card-insertion. This will cause associated sound activation if the contact was active. Setting this value to FALSE (the default) causes the new behavior wherein the contact's current status is sampled upon reset, power-up or card-insertion. This will cause no associated sound activation until the contact is re-activated. Default=FALSE.
SequenceContactNumber=dd	Sets the number of the contact that will play sounds in sequence to the decimal value dd. Default=0 (no sequencing)
FirstSoundNumber=dd	Sets the first sound number that will be played in sequence to the decimal value dd. Default=1 (sound #1)
LastSoundNumber=dd	Sets the last sound number that will be played in sequence to the decimal value dd. Default=127 (sound #127)
SaveNIContacts=TRUE/FALSE	Setting this value to TRUE will remember any contact events that occur while a non-interruptible sound is playing. Note that this can cause a non-interruptible sound to play again if its contact is re-activated while it is playing. Default=FALSE
OutputContactModulus=dd	Setting this value to non-zero will cause the output contacts associated with sounds to repeat on the modulo value if QuizMode=FALSE . Example: OutputContactModulus=4 activates contact outputs 1 through 4 for sounds 1 through 4, contact outputs 1 through 4 for sounds 5 through 8, etc. Default=0
RandomSequence=TRUE/FALSE	Setting this value to TRUE will cause each activation of the SequenceContactNumber to play a random sound from the range FirstSoundNumber to LastSoundNumber. Default=FALSE
OffsetContactNumber=dd	Sets the number of the contact that will offset the sounds associated with the other contacts by ContactOffsetAmount to the decimal value dd. Does not affect Sequence or Quiz mode. Default=0 (no offset)
ContactOffsetAmount=dd	Sets the value that will be added the the input contact number when the OffsetContactNumber input is active, to offset the actual sound number that will play to the decimal value dd. Does not affect Sequence or Quiz mode. Default=0 (no offset amount)
AutoplayEntireSequence=TRUE/FALSE	Setting AutoplayEntireSequence to TRUE causes the entire sequence of sounds to be played once whenever the SequenceContactNumber activates one time. Default=FALSE (no autoplay)
LineInputEnableContactNumber=dd	Sets the number of the contact that will

<u>[Section] / Parameter</u>	<u>Description</u>
	stop any sound currently playing and enable the Line level Input to the decimal value dd. Audio on the Line level Input is amplified to the current volume setting and appears on the speaker and Line level Output. Default=0 (no Line In control contact)
PttOutputWithLineInputEnableContact=TRUE/FALSE	Setting this value to TRUE will cause the PTT relay to follow the non-zero LineInputEnableContactNumber state, otherwise the PTT relay activation is controlled by sounds with the Relay attribute in their filename. Default=FALSE (PTT for sounds w/Relay attr)
[LineIn]	LineIn Section
LineInputAlwaysEnabled=TRUE/FALSE	Setting this value to TRUE enables the Line level Input always when no sound is playing. When this is FALSE, the Line level Input is controlled by the LineInputEnableContactNumber. Default=FALSE (Line level Input disabled)
[DMX]	DMX Section
IsMaster=TRUE/FALSE	Setting this value to TRUE enables the CFSound as a DMX controller. When this is FALSE, the CFSound is a DMX device. Default=FALSE (DMX device)
SlaveBaseChannel=ddd	Sets the base channel number for the group of channels that the CFSound monitors when configured as a DMX device (IsMaster=FALSE). Default=1
FrameDelay=dd	Sets the delay times 20mSEC between transmitted DMX frames. Default=0 (no delay)
NumberOfChannels=ddd	Sets the number of transmitted channels per DMX frame, always a multiple of 2. Default=512
BeginFadeValue=ddd	Sets the DMX channel value for the start of the Fade Up when the associated sound plays, and the value for the end of the Fade Down when the sound ends. Default=0
EndFadeValue=ddd	Sets the DMX channel value for the end of the Fade Up when the associated sound plays, and the value for the start of the Fade Down when the associated sound ends. Default=255
FadeDuration=dd	Sets the length of the DMX channel Fade Up / Fade Down when the associated sound plays, 0 = full on/off. Default=1

Sample CFSOUND.INI file

These three lines typed into a text file with a text editor and saved on the CF card as CFSOUND.INI along with sounds named with the Background filename attribute provides a 5 minute (300 second) delay between played background sounds:

```
[Background]
BackgroundDelay=300
```

Quiz / Kiosk Mode

The CFSound-III may be configured to operate in a Quiz or Kiosk mode. This mode is enabled by including the requisite [Quiz] section entries in a CFSOUND.INI file on the card with the **QuizMode=TRUE** parameter.

In Quiz mode, Question contacts trigger the Question sounds, then Answer contacts trigger the Answer sounds related to the question that was activated. The Question contacts start at contact 1 and are contiguous through the number of **QuestionContacts=dd** parameter. The Question sounds would be named 01C.WAV, 02C.WAV, ... , xxC.WAV where xx is the hexadecimal equivalent of the **QuestionContacts=dd** parameter.

The Answer contacts immediately follow the Question contacts and are contiguous through the number of **AnswerContacts=dd** parameter. Each Answer contact is associated with an array of Answer sounds, with the offset into the array controlled by the Question contact that was activated. There is also an additional timeout Answer sound that will be played if an Answer contact is not activated within the **NoAnswerTimeout=dd** seconds interval.

Due to the maximum number of sounds being limited to 255 including the optional BACKGRND.WAV sound the following limitation must be observed:

$$\text{QuestionContacts} \times (\text{AnswerContacts} + 1) \leq 254$$

The next table shows a sample of Quiz mode sound file names and their contact associations given the following values for the [Quiz] section parameters: **QuestionContacts=4**, **AnswerContacts=4**, **AnswerWithoutQuestionSound=7E** and **AwaitAnswerSound=7F** in the CFSOUND.INI file. Notice how the Answer contacts play different sounds depending upon what Question contact was activated:

Sound Filename	Contact #	Description
01CS.WAV	1	Question #1 sound
02CS.WAV	2	Question #2 sound
03CS.WAV	3	Question #3 sound
04CS.WAV	4	Question #4 sound
05CS.WAV	5	Question #1 Answer #1 sound
06CS.WAV	6	Question #1 Answer #2 sound
07CS.WAV	7	Question #1 Answer #3 sound
08CS.WAV	8	Question #1 Answer #4 sound
09.WAV	-	Question #1 no Answer Timeout sound
0ACS.WAV	5	Question #2 Answer #1 sound
0BCS.WAV	6	Question #2 Answer #2 sound
0CCS.WAV	7	Question #2 Answer #3 sound
0DCS.WAV	8	Question #2 Answer #4 sound
0E.WAV	-	Question #2 no Answer Timeout sound
0FCS.WAV	5	Question #3 Answer #1 sound
10CS.WAV	6	Question #3 Answer #2 sound
11CS.WAV	7	Question #3 Answer #3 sound
12CS.WAV	8	Question #3 Answer #4 sound
13.WAV	-	Question #3 no Answer Timeout sound
14CS.WAV	5	Question #4 Answer #1 sound
15CS.WAV	6	Question #4 Answer #2 sound
16CS.WAV	7	Question #4 Answer #3 sound
17CS.WAV	8	Question #4 Answer #4 sound
18.WAV	-	Question #4 no Answer Timeout sound
7EC.WAV	5,6,7,8	Answer Without Question Sound
7F.WAV	-	Awaiting Answer Sound

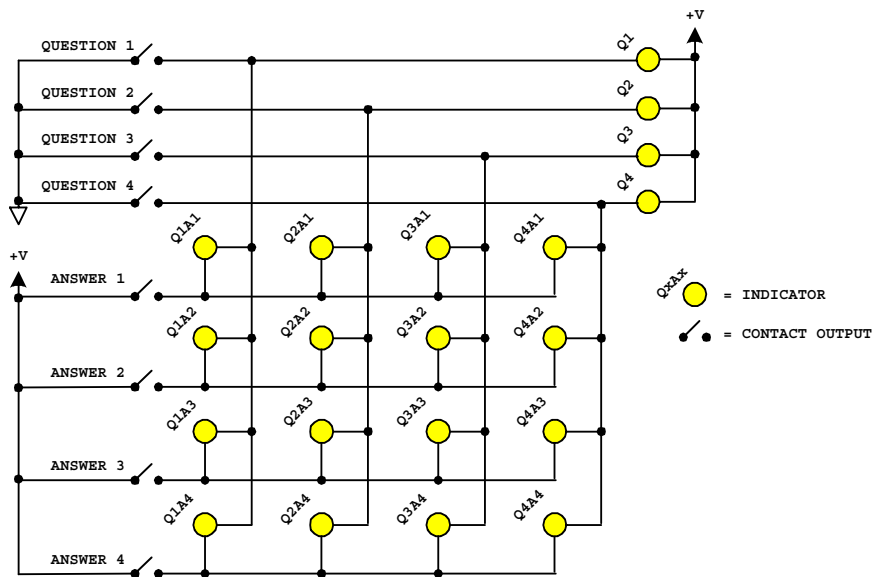
Note that while these sample files all have the 'C' contact closure token in the filename, the 'O' contact open token may be used as well. Sound files that are played without a direct contact closure do not require these tokens.

There are two additional, optional sounds that may be played in Quiz mode. The **AwaitAnswerSound=xx** parameter, if xx is non-zero, causes sound file xx.WAV to be played after the question sound while awaiting an Answer contact activation. In the preceding example, this would play sound file 7F.WAV. The duration of this optional sound or the **NoAnswerTimeout=dd** seconds parameter, whichever is greater, determines the interval before the associated no answer timeout sound file is played. The **AwaitAnswerSound** should not be marked as non-interruptible.

The **AnswerWithoutQuestionSound=xx** parameter if xx is non-zero causes sound file xx.WAV to be played if an Answer contact is activated before a Question contact to prompt user to select question first. In the preceding example, this would play sound file 7EC.WAV when any Answer contact is activated before a Question contact.

A Kiosk mode of operation may be obtained by setting the **NoAnswerTimeout=dd** parameter to zero. This effectively disables the **AwaitAnswerSound** and all of the **No Answer Timeout sounds** simply allowing the Question contact to select different sets of Answer contacts sounds such as various languages or features. After a Question contact is activated, it remains active selecting a given set of Answer contact sounds until another Question contact is activated.

Contact outputs may also be activated for Question and Answer sounds by using the 'S' token in the filename. In Quiz mode, Question contact outputs remain active for the duration of the Question/Answer cycle. In Kiosk mode, the last Question (answer selection) contact output remains active until another Question input is activated. Note that the Answer contact outputs associated with the Answer contact inputs are used for each set of answers, independent of which Question contact is activated. Unique Answer contact outputs may be achieved by constructing a matrix using the Question contact outputs as Rows and the repeating Answer contact outputs as Columns (or vice versa). This is shown in the following diagram:



Matrix Wiring of Question/Answer Contact Outputs

The **BackgroundDelay=ddddd** parameter can be used in conjunction with one or more background sounds to provide a delay between sounds, so that they can be used as an attention getting attract mode.

Sequential Sound Play-out

The CFSound-III may be configured to allow a single contact closure (or opening) to play several sounds in sequence; one each time it is closed (or opened). This mode is enabled by including the requisite **[Contacts]** section entries in a CFSOUND.INI file on the card with the **SequenceContactNumber=dd** parameter set to a non-zero, valid contact number from 1 to 8 (1 to 24 with Contact Sense 24 module) or 25 and 26 (rear of unit contact inputs).

The range of sounds that may be played in sequence may be constrained by the addition of two other parameter entries in the **[Contacts]** section. The **FirstSoundNumber=dd** parameter controls the starting sound number of the sequence, and the **LastSoundNumber=dd** parameter controls the ending sound number in the sequence. Setting the **FirstSoundNumber** parameter to a higher number than the **LastSoundNumber** will cause the sounds to be played in reverse sequence, higher number to lower number. The sequence wraps around to the beginning or end.

For example to play normal sounds on the first 8 contacts, and sequence through 16 different sounds for the 25th contact, a card would be prepared with the 24 sound files named 01C.WAV – 18C.WAV. Then a CFSOUND.INI file would be added to the card with the entries:

```
[Contacts]
SequenceContactNumber=25
FirstSoundNumber=9
LastSoundNumber=24
```

The first eight contacts would each play their associated sound. Each closure of contact 25 would play a sound from 09C.WAV – 18C.WAV then repeat from 09C.WAV – 18C.WAV in sequence. To reverse the order of the sound play-out set the **FirstSoundNumber=24** and the **LastSoundNumber=9**.

To cause the entire sequence of sounds to be played once whenever the **SequenceContactNumber** is activated, set the **AutoplayEntireSequence** parameter to TRUE. For example a museum exhibit needs to play a sequence of 8 sounds when triggered with each sound activating a relay output while it is playing. A CF card would be prepared with the 8 sound files in the sequence named 01CNS.WAV – 08CNS.WAV. Then a CFSOUND.INI file would be added to the card with the entries:

```
[Contacts]
SequenceContactNumber=25
FirstSoundNumber=1
LastSoundNumber=8
AutoplayEntireSequence=TRUE
```

Whenever contact 25 is closed, the eight sounds 01CNS.WAV – 08CNS.WAV would play in sequence, each sound activating its output relay. This feature only works for non-random sequences. The addition of the non-interruptible attribute to the file names prevents multiple contact 1 closures from prematurely advancing the sequence.

RS-232 Serial Port Protocol

Sound play-out may also be controlled via commands received via the serial port. The data format is the current baud rate (default is 2400 baud), 8 data bits, 1 stop bit and no flow control. Sounds may be started, queued and stopped using a simple ASCII protocol:

<SOH> p {+/-/&/~/!} XX <ETX>

where:

<SOH> = ASCII Start of Header character 01₁₆ (Ctrl-A)
p = ASCII lower case letter 'p'
{+/-} = ASCII plus character '+' to start a sound, minus character '-' to stop a sound
{&/~/!} = ASCII ampersand character '&' to queue a sound, tilde character '~' to flush the queued sounds, exclamation character '!' to stop the current playing sound and flush the queued sounds
XX = ASCII two digit hexadecimal number XX₁₆ of the sound (01, 02, . . . , 7E, 7F, . . . , FE (maximum))
<ETX> = ASCII End of Text character 03₁₆ (Ctrl-C)

Up to 128 sounds may be queued. Sounds that are queued are played in succession in the order that they were queued only when no other sound is playing until the queue is exhausted or flushed. Note that this can occur at the end of the current background sound file before it repeats. A background or other sound that is playing may be stopped by issuing a "<SOH>p-00<ETX>" serial command sequence to allow queued sounds to be heard. The background sound will be resumed when the queue has emptied.

Sound volume may also be controlled via commands received via the serial port. The volume is essentially db linear in sixty-four, 1db increments from -66db (value of 0) → 0db (value of 63). The current volume level is 'remembered' in non-volatile memory on the CFSound-III and is restored to the last setting upon power-up. Sound volume may be set, increased or decreased using a simple ASCII protocol:

<SOH> v {=/+/-/<} XX <ETX>

where:

<SOH> = ASCII Start of Header character 01₁₆ (Ctrl-A)
v = ASCII lower case letter 'v'
{=} = ASCII equals character '=' to set the volume to the absolute value XX
{+/-} = ASCII plus character '+' to increase the volume by XX, minus character '-' to decrease the volume by XX
{<} = ASCII less than '<' to fade the volume to 0 over XX seconds
XX = ASCII two digit hexadecimal value XX₁₆ of the volume modification (00, 01, . . . , 3E, 3F) = (0 → 63)
<ETX> = ASCII End of Text character 03₁₆ (Ctrl-C)

The speaker amplifier may also be muted via commands received via the serial port. Muting does not affect the current volume setting and is automatically turned off whenever the CFSound is Reset. The speaker amplifier may be muted / un-muted using a simple ASCII protocol:

<SOH> a {+/-} <ETX>

where:

<SOH> = ASCII Start of Header character 01₁₆ (Ctrl-A)
a = ASCII lower case letter 'a'
{+/-} = ASCII plus character '+' to un-mute the speaker amplifier, minus character '-' to mute the speaker amplifier
<ETX> = ASCII End of Text character 03₁₆ (Ctrl-C)

DMX Operation

The CFSound-III can be configured to be a DMX controller (Master) or DMX device (Slave). Upon power-up, reset or CF card insertion, the CFSound-III looks for the presence of an installed DMX I/O module. If found, the mode of DMX operation is controlled by the CFSOUND.INI file **IsMaster** parameter as well as the presence of the DMX Scene or Fade filename attributes.

DMX Controller (Master)

The CFSound-III becomes a DMX controller (Master) when it finds files on the CF card with the DMX Scene or Fade filename attributes, OR, when it reads the CFSOUND.INI file and finds a **[DMX]** section with the **IsMaster** parameter set to TRUE (see the Filename Formats and CFSOUND.INI sections above). As a DMX controller the CFSound produces the serial data stream that commands the daisy-chain connected DMX devices to brighten/dim, move, pan or otherwise respond to their DMX channel values.

When a sound is played with the filename **Fade** attribute, the CFSound begins a fade-up of the channel value with the same number as the sound. When the sound stops playing a fade-down of the channel value occurs. The beginning and ending channel fade values as well as the fade duration can be controlled by entries in the CFSOUND.INI file.

When a sound is played with the filename **Dmx** scene attribute, the CFSound sets the first 16 channels to values obtained from an associated **##.DMX** file – the **##** must match the two character sound number of the associated **##CDx.WAV** or **##ODx.WAV** file. The content of the **.DMX** text files follow a similar format as the CFSOUND.INI file:

[Section] / Parameter	Description
[SoundStart]	Sound Start section
1=ddd	Sets the value of channel 1 to ddd (0 to 255) when this sound starts. Default=0
2=ddd	Sets the value of channel 2 to ddd (0 to 255) when this sound starts. Default=0
...	...
16=ddd	Sets the value of channel 16 to ddd (0 to 255) when this sound starts. Default=0
[SoundStop]	Sound Stop section
1=ddd	Sets the value of channel 1 to ddd (0 to 255) when this sound stops. Default=0
2=ddd	Sets the value of channel 2 to ddd (0 to 255) when this sound stops. Default=0
...	...
16=ddd	Sets the value of channel 16 to ddd (0 to 255) when this sound stops. Default=0

DMX Device (Slave)

The CFSound-III becomes a DMX device (Slave) when it finds no files on the CF card with the DMX Scene or Fade filename attributes, OR, when it reads the CFSOUND.INI file and finds a **[DMX]** section with the **IsMaster** parameter set to FALSE (this is the default, see the Filename Formats and CFSOUND.INI

sections above). As a DMX device the CFSound monitors the serial data stream that commands all daisy-chain connected DMX device's channel values.

The CFSound-III monitors a group of three channels, starting at the channel selected by the **SlaveBaseChannel** parameter of the CFSOUND.INI file for changes in value. Sounds may be stopped, started and queued by setting the DMX Sound Number channel value to the desired sound number and toggling the DMX Command channel value between 0 (no operation) and one of the other command values:

DMX Channel Number	Register	Description
SlaveBaseChannel + 0	Command	0 = No operation 1 = Play Sound Number 2 = Stop playing Sound Number 3 = Queue Sound Number 4 = Clear queue 5 = Stop playing and clear queue 6 = Mute amplifier 7 = Un-mute amplifier
SlaveBaseChannel + 1	Sound Number	0 to 254 When stopping 0 = all sounds
SlaveBaseChannel + 2	Volume	0 to 255

Up to 128 sounds may be queued. Sounds that are queued are played in succession in the order that they were queued only when no other sound is playing until the queue is exhausted or cleared. Note that this can occur at the end of the current background sound file before it repeats. A background or other sound that is playing may be stopped by issuing a 'stop playing all sounds' command sequence to allow queued sounds to be heard. The background sound will be resumed when the queue has emptied.

Sound volume may also be controlled by changing the value of the DMX Volume channel. The 256 channel values are mapped to the 64 volume values by dividing the channel value by 4. The resulting volume is essentially db linear in sixty-four, 1db increments from -66db (value of 0) → 0db (value of 63). The current volume setting is not 'remembered' by the CFSound between power-up, reset, or CF card insertions. Note that the volume push buttons on the front of the unit will appear to not work since their 'settings' are constantly being over-ridden by received DMX frames containing a received volume setting.

Here's an example - CFSOUND.INI file contains:

```
[DMX]
SlaveBaseChannel=50
```

Initially DMX channels SlaveBaseChannel+0 through SlaveBaseChannel+2 should be set to zero. This is the no operation command, with the volume set to minimum:

DMX Channel	Value	Description
50	0	No Operation Command
51	0	Sound Number
52	0	Volume

To start a sound playing, set the SlaveBaseChannel+1 to the sound number, set the SlaveBaseChannel+2 to the desired volume, then set the SlaveBaseChannel+0 to 1. To play sound number 10 at full volume:

DMX Channel	Value	Description
50	0	No Operation Command
51	10	Sound Number
52	255	Volume

Then issue the Play Sound command by changing the Command channel's value from No Operation to Play Sound– the transition from No Operation to a command value causes the command to take effect:

DMX Channel	Value	Description
50	1	Play Sound Command
51	10	Sound Number
52	255	Volume

After the DMX frame has been sent, the SlaveBaseChannel+0 can be set back to zero – no operation – in preparation for the next command:

DMX Channel	Value	Description
50	0	No Operation Command
51	10	Sound Number
52	255	Volume

The SlaveBaseChannel+2 continually updates the CFSound-III volume as DMX frames are received – this channel's value can be tied to a potentiometer or slider on the DMX master's console to adjust the volume.

To stop all sounds that have been queued and are playing:

DMX Channel	Value	Description
50	5	Stop Playing Clear Queue Command
51	n/a	Sound Number (don't care)
52	255	Volume

After the DMX frame has been sent, the SlaveBaseChannel+0 can be set back to zero – no operation – in preparation for the next command:

DMX Channel	Value	Description
50	0	No Operation Command
51	n/a	Sound Number (don't care)
52	255	Volume

Basic Mode

In Basic Mode, the operation of the CFSound-III is controlled by the interpreted execution of a user written program that is written in the ACS Basic language. **BASIC** is the acronym for **B**eginners' **A**ll-purpose **S**ymbolic **I**nstruction **C**ode – a easy to learn programming language developed by Kemeny & Kurtz at Dartmouth in 1964. Programs consist of numbered lines with one or more English keywords describing the operations that the user wants to have performed.

The BASIC interpreter built-in to the CFSound-III implements most of the language elements for working with integers, strings and files as well as providing access to the CFSound-III hardware features such as contacts, timers, clock and playing sounds. The language elements are outlined in the separate document “**ACS Basic User’s Manual**” available for download on the website.

Programs may be developed two different ways:

1. Interactively using a terminal emulator such as Windows HyperTerminal connected to the CFSound-III’s serial port. Program statements comprised of language elements are interactively keyed-in, developing and debugging programs that may be saved on the CF card. See the “Upgrading the Firmware” section at the end of this manual for a description of the required cabling and HyperTerminal settings. This is the preferred development methodology.
2. Offline using a text editor such as Windows Notepad. The files are then saved onto the CF card for debugging when inserted into the CFSound.

Once a program has been developed and tested, it may then be placed onto the CF card named as CFSOUND.BAS along with any other required files. The CFSound will then load and execute this file upon power-up, reset or CF card insertion, effectively customizing the unit’s function.

Diagnostic LED Codes (Red & Green LEDs)

Green LED

- Flashes three times a second while scanning or loading CF Card files.
- Steady on when loaded, ready or playing in CFSound mode.
- Flashes once a second while running ACS Basic mode

Red LED Error Flashes

The Red LED can indicate up to 4 error conditions by flashing 1 to 4 unique numeric code patterns from the following table in a continuously repeating sequence. The Red LED flashes at three times a second for the value of the pattern, followed by a half second gap, then the next pattern.

Flash Count	Error Condition	CFSound Stops
One	Problem w/ATA interface, non-compatible CF card, bad CF card, execution stops.	•
Two	Error opening .WAV file for that input, incorrect filename, file does not exist.	•
Three	Error when reading file, file corrupted, unsupported file type, the sound doesn't start or stops playing.	•
Four	No valid "*.WAV" files of a CFSound Mode Filename Format found on the CF Card – starting ACS Basic. This code will continue until a Basic RUN command is issued.	
Five	No valid FAT or FAT32 file system found on the CF Card, execution stops.	•
Six	Error seeking within file when starting or resuming sound, the sound doesn't start or resume.	•
Seven	Error initializing CODEC, execution stops.	•
Eight	Invalid .WAV file internal structure, file is ignored.	•
Nine	Unsupported .WAV format (not Windows PCM), file is ignored.	•
Ten	Unsupported .WAV sample rate (not 44.1KHz), file is ignored.	•
Eleven	Unsupported .WAV sample size (not 16-bit), file is ignored.	•
Twelve	Contact closure without matching sound file, a contact closure with matching sound file stops this code from flashing.	
Thirteen	Speaker is muted by RS-232 command or ACS Basic command.	
Fourteen	Problem with CFSOUND.INI file entries.	•
Fifteen	CFSOUND.INI [DMX] section with no DMX I/O module detected.	

Power Requirements

The idle current of a CFSound-III unit, no expansion modules with a 4GB SanDisk CF card installed is ~100mA @ 12VDC input.

With a background sound playing at a moderate level, the current consumption averages ~200mA @ 12VDC.

Digital Audio Recording

Initially make all recordings (either music or voice) with a sample rate of at least 44.1KHz and 16-bit mono or stereo. This high quality, first-generation recording will later provide the greatest bandwidth and produce the best sounding final audio.

Recommended Recording Procedure

1. Record any audio clip of your choosing @ 44KHz, 16-bit, Mono or Stereo. Make sure that your samples do not clip (go above or below the sample window). The peaks of your audio clip, should, however, fill vertically at least 95% of the sample window. If they do not, you will need to boost your input signal by using a pre-amp or by some other means.
2. Edit the clip until satisfied. You can use a sound editor or filter program, such as Syntrillium's Cool Edit to normalize the amplitude of the sample. Use this command cautiously though, since it also tends to amplify noise levels. It is always preferable to re-record your sound clip at a higher level to achieve better fidelity.

It is imperative that all initial editing and filtering be done to the audio clip while it is formatted at 16-bit stereo and 44.1KHz. Please be certain that your recording environment is absolutely quiet.

Also remember that digital play-out devices do not introduce any static of their own other than quantization noise. They only play back exactly what was recorded. If there is excessive static in the audio clip or sample, then there was probably static in it originally.

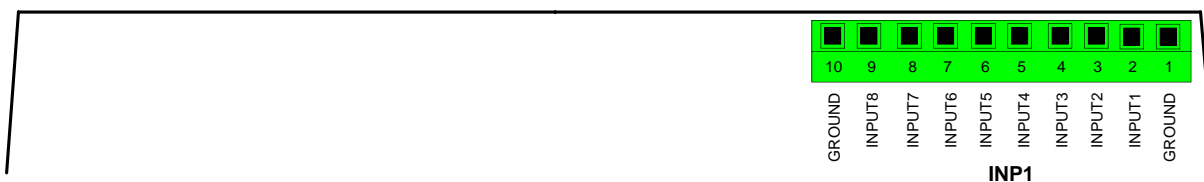
Optional Plug-in Modules

The **Compact FLASH III Digital Audio System** supports optional plug-in modules to provide Contact I/O and audio power amplifier capability. Up to two modules may be installed along the front and back of the unit.

CFSound-III Contact Sense 8 Module

This module provides eight contact inputs. The contacts on the rear module are numbered 1 through 8 and are associated with sound files named 01x.WAV through 08x.WAV. The contacts on the front module are numbered 33 through 40 and are associated with sound files named 21x.WAV through 28x.WAV. The x denotes additional file control attribute characters. See the **Filename Formats** section above.

The Input connector INP1 consists of a 10 pin, 2 piece terminal block style connector. See the Contact Wiring section below for a discussion of the electrical input structure and connections. The pinout is shown in the following rear diagram and table:

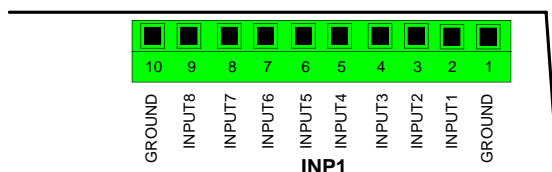


INP1 Pin #	Rear Signal	Rear Filename	Front Signal	Front Filename
1	GROUND		GROUND	
2	INPUT 1	01x.WAV	INPUT 33	21x.WAV
3	INPUT 2	02x.WAV	INPUT 34	22x.WAV
4	INPUT 3	03x.WAV	INPUT 35	23x.WAV
5	INPUT 4	04x.WAV	INPUT 36	24x.WAV
6	INPUT 5	05x.WAV	INPUT 37	25x.WAV
7	INPUT 6	06x.WAV	INPUT 38	26x.WAV
8	INPUT 7	07x.WAV	INPUT 39	27x.WAV
9	INPUT 8	08x.WAV	INPUT 40	28x.WAV
10	GROUND		GROUND	

CFSound-III Contact I/O 8 Module

This module provides eight contact inputs and eight contact outputs. The contacts on the rear module are numbered 1 through 8 and are associated with sound files named 01x.WAV through 08x.WAV. The contacts on the front module are numbered 33 through 40 and are associated with sound files named 21x.WAV through 28x.WAV. The x denotes additional file control attribute characters. See the **Filename Formats** section above. If an 'S' token is present in the sound filename, the associated output contact and on-board PTT relay will be activated whenever the sound is played.

The Inputs connector INP1 is a 10 pin, 2 piece terminal block style. See the Contact Wiring section below for a discussion of the electrical input structure and connections. The pinout is shown in the following rear diagram and table:

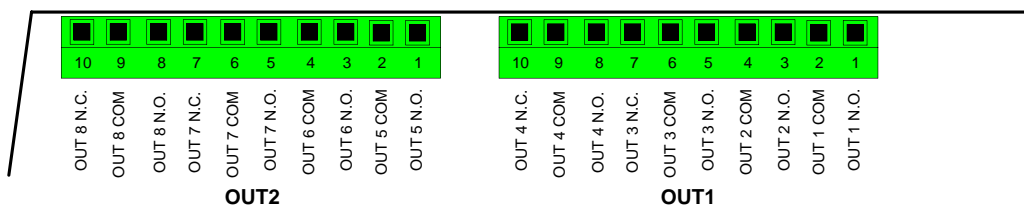


INP1 Pin #	Rear Signal	Rear Filename	Front Signal	Front Filename
1	GROUND		GROUND	
2	INPUT 1	01x.WAV	INPUT 33	21x.WAV
3	INPUT 2	02x.WAV	INPUT 34	22x.WAV
4	INPUT 3	03x.WAV	INPUT 35	23x.WAV
5	INPUT 4	04x.WAV	INPUT 36	24x.WAV
6	INPUT 5	05x.WAV	INPUT 37	25x.WAV
7	INPUT 6	06x.WAV	INPUT 38	26x.WAV
8	INPUT 7	07x.WAV	INPUT 39	27x.WAV
9	INPUT 8	08x.WAV	INPUT 40	28x.WAV
10	GROUND		GROUND	

The CFSound-III Contact I/O 8 Module provides eight normally open (N.O.) relay contact outputs. Outputs 3, 4, 7 and 8 also provide the normally closed (N.C.) relay contact outputs.

Each relay contact is rated at 1A @ 30VDC or 0.5A @ 125VAC.

The Output connectors OUT1 and OUT2 consist of two 10 pin, 2 piece terminal block style mounted adjacently. The pinout is shown in the following rear diagram and table:

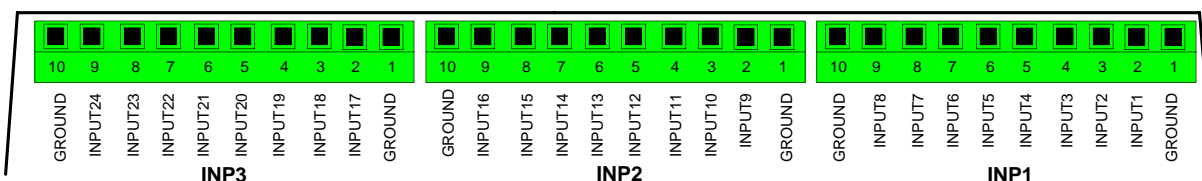


OUT2 Pin #	Rear Signal	Front Signal	OUT1 Pin #	Rear Signal	Front Signal
1	OUT 5 N.O.	OUT 37 N.O.	1	OUT 1 N.O.	OUT 33 N.O.
2	OUT 5 COM	OUT 37 COM	2	OUT 1 COM	OUT 33 COM
3	OUT 6 N.O.	OUT 38 N.O.	3	OUT 2 N.O.	OUT 34 N.O.
4	OUT 6 COM	OUT 38 COM	4	OUT 2 COM	OUT 34 COM
5	OUT 7 N.O.	OUT 39 N.O.	5	OUT 3 N.O.	OUT 35 N.O.
6	OUT 7 COM	OUT 39 COM	6	OUT 3 COM	OUT 35 COM
7	OUT 7 N.C.	OUT 39 N.C.	7	OUT 3 N.C.	OUT 35 N.C.
8	OUT 8 N.O.	OUT 40 N.O.	8	OUT 4 N.O.	OUT 36 N.O.
9	OUT 8 COM	OUT 40 COM	9	OUT 4 COM	OUT 36 COM
10	OUT 8 N.C.	OUT 40 N.C.	10	OUT 4 N.C.	OUT 36 N.C.

CFSound-III Contact Sense 24 Module

This module provides twenty four contact inputs. The contacts on the rear module are numbered 1 through 24 and are associated with sound files named 01x.WAV through 18x.WAV. The contacts on the front module are numbered 33 through 56 and are associated with sound files named 21x.WAV through 38x.WAV. The x denotes additional file control attribute characters. See the **Filename Formats** section above.

The Input connectors INP1, INP2 and INP3 consist of three 10 pin, 2 piece terminal block style connectors mounted adjacently. See the Contact Wiring section below for a discussion of the electrical input structure and connections. The pinout is shown in the following rear diagram and table:



INP3 Pin #	Rear Signal	Front Signal	INP2 Pin #	Rear Signal	Front Signal	INP1 Pin #	Rear Signal	Front Signal
1	GROUND	GROUND	1	GROUND	GROUND	1	GROUND	GROUND
2	INPUT17	INPUT49	2	INPUT9	INPUT41	2	INPUT1	INPUT33
3	INPUT18	INPUT50	3	INPUT10	INPUT42	3	INPUT2	INPUT34
4	INPUT19	INPUT51	4	INPUT11	INPUT43	4	INPUT3	INPUT35
5	INPUT20	INPUT52	5	INPUT12	INPUT44	5	INPUT4	INPUT36
6	INPUT21	INPUT53	6	INPUT13	INPUT45	6	INPUT5	INPUT37
7	INPUT22	INPUT54	7	INPUT14	INPUT46	7	INPUT6	INPUT38
8	INPUT23	INPUT55	8	INPUT15	INPUT47	8	INPUT7	INPUT39
9	INPUT24	INPUT56	9	INPUT16	INPUT48	9	INPUT8	INPUT40
10	GROUND	GROUND	10	GROUND	GROUND	10	GROUND	GROUND

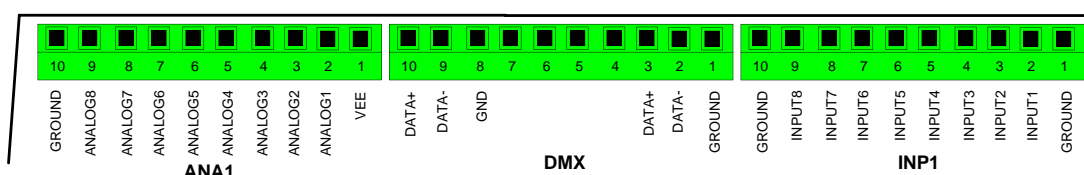
INP3 Pin #	Rear Filename	Front Filename	INP2 Pin #	Rear Filename	Front Filename	INP1 Pin #	Rear Filename	Front Filename
2	11x.WAV	31x.WAV	2	09x.WAV	29x.WAV	2	01x.WAV	21x.WAV
3	12x.WAV	32x.WAV	3	0Ax.WAV	2Ax.WAV	3	02x.WAV	22x.WAV
4	13x.WAV	33x.WAV	4	0Bx.WAV	2Bx.WAV	4	03x.WAV	23x.WAV
5	14x.WAV	34x.WAV	5	0Cx.WAV	2Cx.WAV	5	04x.WAV	24x.WAV
6	15x.WAV	35x.WAV	6	0Dx.WAV	2Dx.WAV	6	05x.WAV	25x.WAV
7	16x.WAV	36x.WAV	7	0Ex.WAV	2Ex.WAV	7	06x.WAV	26x.WAV
8	17x.WAV	37x.WAV	8	0Fx.WAV	2Fx.WAV	8	07x.WAV	27x.WAV
9	18x.WAV	38x.WAV	9	10x.WAV	30x.WAV	9	08x.WAV	28x.WAV

CFSound-III DMX I/O Module

This module provides eight contact inputs, eight analog inputs and up to 512 DMX output channels. The contacts on the rear module are numbered 1 through 8 and are associated with sound files named 01x.WAV through 08x.WAV. The contacts on the front module are numbered 33 through 40 and are associated with sound files named 21x.WAV through 28x.WAV. The x denotes additional file control attribute characters. See the **Filename Formats** section above. Only a single DMX I/O module should be installed.

The DMX I/O module implements the USITT DMX-512 standard which allows control of up to 512 dimmers or other DMX devices in a daisy chain fashion.

The Input connectors ANA1, INP1 & DMX consist of 10 pin, 2 piece terminal block style connectors. See the Contact and DMX Wiring sections below for a discussion of the electrical input structure and connections. The pinout is shown in the following diagram and table:



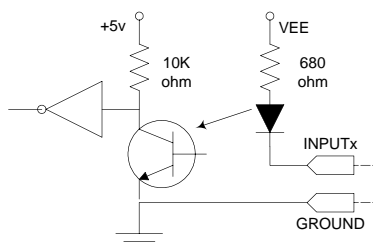
ANA1 Pin #	Rear Signal	Front Signal
1	VEE	VEE
2	ANALOG1	ANALOG1
3	ANALOG2	ANALOG2
4	ANALOG3	ANALOG3
5	ANALOG4	ANALOG4
6	ANALOG5	ANALOG5
7	ANALOG6	ANALOG6
8	ANALOG7	ANALOG7
9	ANALOG8	ANALOG8
10	GROUND	GROUND

DMX Pin #	Rear Signal	Front Signal
1	GROUND	GROUND
2	DATA-	DATA-
3	DATA+	DATA+
4		
5		
6		
7		
8	GROUND	GROUND
9	DATA-	DATA-
10	DATA+	DATA+

INP1 Pin #	Rear Signal	Rear Filename	Front Signal	Front Filename
1	GROUND		GROUND	
2	INPUT 1	01x.WAV	INPUT 33	21x.WAV
3	INPUT 2	02x.WAV	INPUT 34	22x.WAV
4	INPUT 3	03x.WAV	INPUT 35	23x.WAV
5	INPUT 4	04x.WAV	INPUT 36	24x.WAV
6	INPUT 5	05x.WAV	INPUT 37	25x.WAV
7	INPUT 6	06x.WAV	INPUT 38	26x.WAV
8	INPUT 7	07x.WAV	INPUT 39	27x.WAV
9	INPUT 8	08x.WAV	INPUT 40	28x.WAV
10	GROUND		GROUND	

Contact Wiring

On the optional Contact Modules, switch contacts are wired between the Input pin number and a ground located on either end of the connector. The inputs are optically isolated using optocouplers. The cathodes of the LEDs in the optocouplers are connected to the Input connector port pins. The Anodes of the LEDs in the optocouplers are connected to an internal 12VDC power supply, with a 680 ohm current limiting resistor in series. The output transistor of each optocoupler has a 10K pullup resistor on its collector, with the emitter connected to ground and is buffered by an inverting gate. The following diagram is representative of one input:

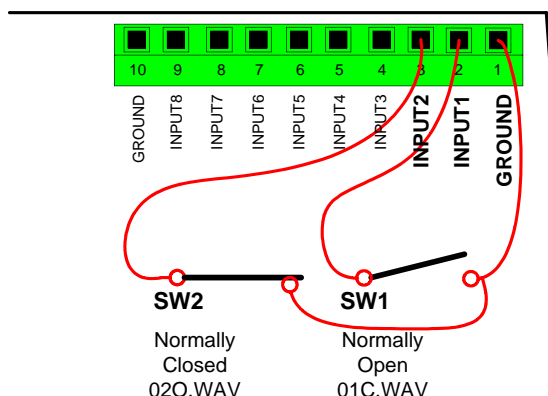


An input is activated by sinking current from the corresponding input pin to ground. A Ground connection is supplied on pins 1 and 10 of each Input connector for this purpose. The input current sink requirement is approximately 15 mA.

Switches may be one of two forms: Normally Open (N.O.) or Normally Closed (N.C.). Switches that are Normally Open have no electrical connection between the switch terminals unless the switch is activated closed. Switches that are Normally Closed have an electrical connection between the switch terminals unless the switch is activated open.

The CFSound-III Contact Modules can work with either form of switch by using the appropriate filename letter token in the filename. A sound can be played when a Normally Open switch *closes* by placing the 'C' letter token after the sound number in the sound filename. In a similar fashion, a sound can be played when a Normally Closed switch *opens* by placing the 'O' letter token after the sound number in the sound filename.

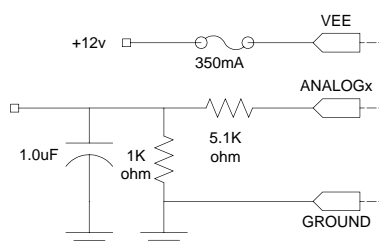
In the following diagram, Input1 is wired to a Normally Open switch SW1, and Input2 is wired to a Normally Closed switch SW2. If this contact module is installed on the rear expansion connector, the sound file to be played when SW1 closes would be named 01C.WAV. The sound file to be played when SW2 opens would be named 02O.WAV.



Analog Input Wiring

On the optional DMX Module, analog signals with a voltage range of 0 → 12VDC may be connected. The input impedance is approximately 6000 ohms. Linear potentiometers with a 1K @ 250mW value may be connected across the VEE and GROUND terminals with the wipers connected to the analog inputs. The analog conversions are ratio-metric to the scaled VEE value – not absolute. The conversion result is 12 volts divided by 8 bits or about 0.047 volts per step.

The following diagram is representative of one analog input:

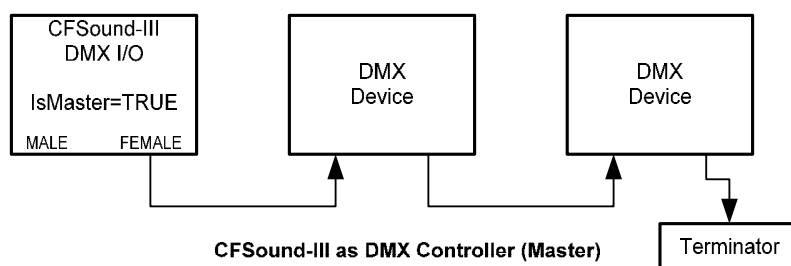


DMX Wiring

The CFSound-III may be wired into the DMX network in one of two ways. As a DMX controller, the CFSound-III is connected at the beginning of the network's daisy chain of devices. As a DMX device, the CFSound-III may be connected anywhere along the network's daisy chain.

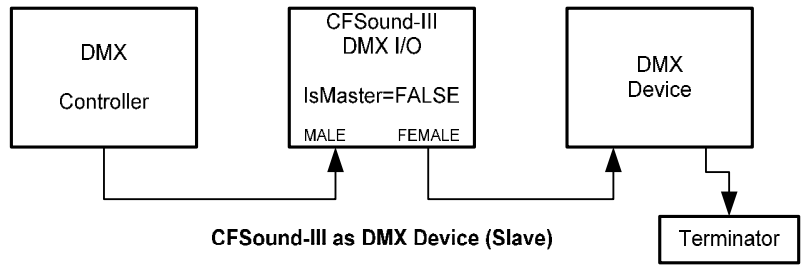
DMX devices such as lights are connected in a daisy-chain fashion: from the controller to light #1, to light #2, to light #3 and so forth. According to the standard, a DMX-512 controller can only drive up to 32 loads (e.g., one light controller = one load). But improvements in technology have reduced the load a single light puts on the circuit, so you may be able to drive as many as 128 lights (each one being 1/4 load) from a single controller such as the CFSound-III DMX I/O module. To control additional loads (lights), a DMX splitter is required.

Here's a block diagram showing how the CFSound would be connected as a DMX Controller (Master):



The final device in the daisy-chain must be terminated. Terminating plugs contain a 120 ohm resistor soldered across pins 2 and 3. The terminator functions by absorbing signal power which would otherwise be reflected back into the cable and degrade the data.

Here's a block diagram showing how the CFSound would be connected as a DMX Device (Slave):

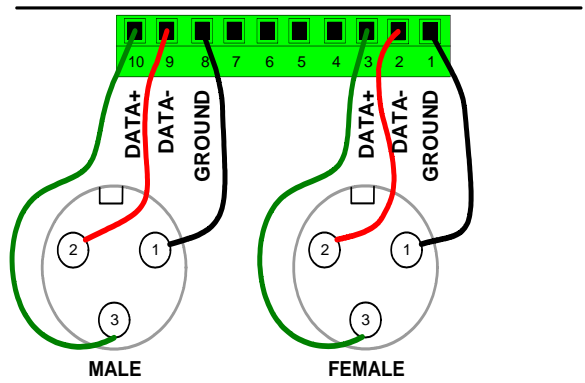


The DMX connector is wired to one or two 3 or 5 pin XLR style connectors. Both connectors are required if the CFSound-III is implementing a DMX device, only a single connector is required if it is being used as a DMX controller. A female connector is used to connect to downstream devices (or the terminator if the last device), a male connector is used to connect to upstream devices.

The use of a shielded, twisted-pair, 120 ohm, low-capacitance data cable designed for EIA RS-485 such as Belden 9841, Belden 7200A or Belden 3105A is recommended.

NOTE: The use of XLR microphone wire or cabling is not recommended as it is not designed for high speed signalling.

Here is a diagram showing the wiring:



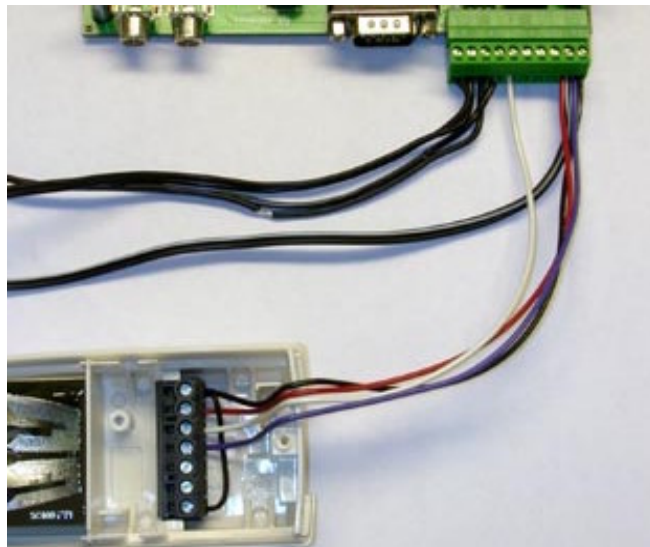
Data is transmitted in serial format asynchronously with the transmission speed of 250 Kbps. Voltage on both pins ("+" and "-") should be between +12 volts and -7 volts (measured to ground). EIA RS-485 defines that the signal voltage between the two wires should be at least 200 millivolts. Higher voltage on the "+" pin and lower voltage on the "-" pin results in a digital "1". Higher voltage on the "-" pin and lower voltage on the "+" pin results in a digital "0". The ground wire is only a reference point and often used for shielding the twisted-pair data lines.

Connecting a Motion Sensor

The CFSound-III can be connected to a motion sensor similar to those used with wired security systems.

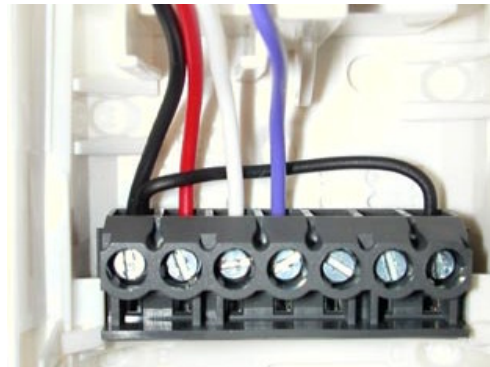
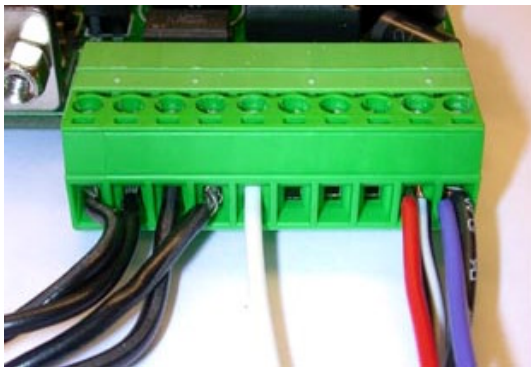
Normal Sized Motion Sensor

The photos below show the CFSound-III wired to the GE AP100 Motion Sensor on contact input #25. ACS sells this sensor online as the "Normal Size Motion Sensor".



CFSound-III MAIN

GE AP100 Motion Sensor



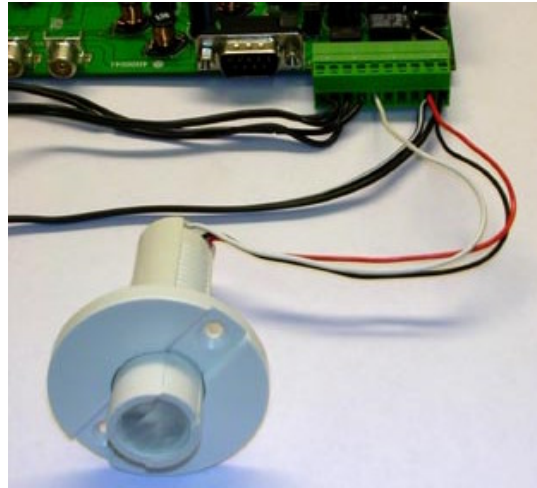
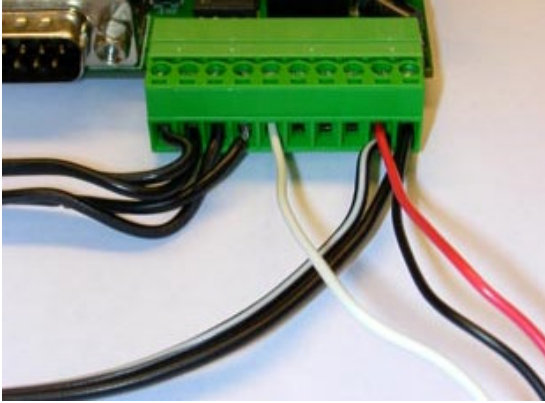
Pins 1-4	BLK	Speakers
Pin 5	WHT	Contact Input #25
Pin 9	BLK/WHT	+12VDC from transformer +12VDC
	RED	power to motion sensor
	BLK	Ground from transformer
Pin 10	BLK	Ground to motion sensor power
	BLUE	Ground to motion sensor loop

Pin 1	BLK	Ground to motion sensor
Pin 2	RED	+12VDC power to motion sensor
Pin 3	WHT	Alarm loop out from sensor
Pin 4	BLUE	Alarm loop in to sensor
Pin 5	BLK	Enables sensor visible LED

Name the file that you want to play when the motion sensor is triggered "190.WAV", since the motion sensor output is normally closed, and it opens when it sees motion.

Small Sized Motion Sensor

The photos below show the CFSound-III wired to the SPY4RTE-B Motion Sensor on contact input #25. ACS sells this sensor online as the "Small Size Motion Sensor".



Pins 1-4	BLK	Speakers
Pin 5	WHT	Contact Input #25
Pin 9	BLK/WHT	+12VDC from transformer +12VDC
	RED	power to motion sensor
Pin 10	BLK	Ground from transformer
	BLK	Ground to motion sensor power

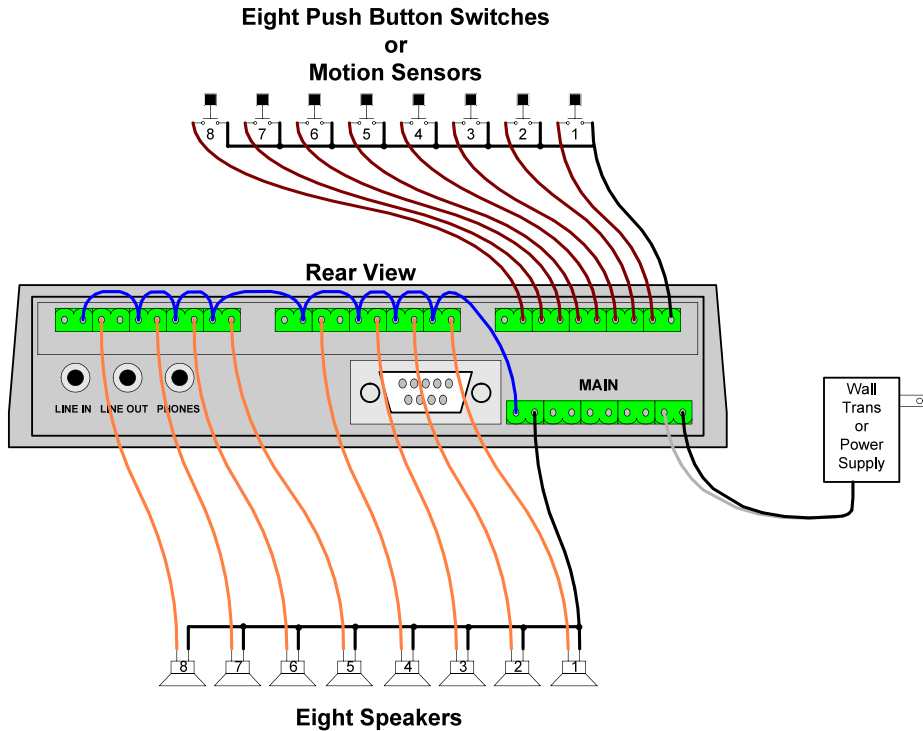
BLK	Ground to motion sensor
WHT	Open collector sensor output
RED	+12VDC power to motion sensor

Name the file that you want to play when the motion sensor is triggered "19C.WAV", since the motion sensor output is normally open, and it closes when the sensor sees motion.

Connecting Multiple Speakers

The CFSound-III can play different audio clips to different speakers, one at a time. This requires monaural audio clips and one or two Contact I/O 8 modules.

The sound files have the 'S' attribute in the filename to activate the associated output contact. One speaker output is then directed to the desired speaker by connecting it through the output contact. The other side of all the speakers is wired in common but may not be grounded. Here's a wiring diagram:



And here's the table of contact / sound names:

Switch #	Speaker #	Filename
Rear Contact I/O 8	Rear Contact I/O 8	Rear Contact I/O 8
#1(Rear INP1 Pin #2)	#1(Rear OUT1 Pin #1)	#1(01CS.WAV)
#2(Rear INP1 Pin #3)	#2(Rear OUT1 Pin #3)	#2(02CS.WAV)
#3(Rear INP1 Pin #4)	#3(Rear OUT1 Pin #5)	#3(03CS.WAV)
#4(Rear INP1 Pin #5)	#4(Rear OUT1 Pin #8)	#4(04CS.WAV)
#5(Rear INP1 Pin #6)	#5(Rear OUT2 Pin #1)	#5(05CS.WAV)
#6(Rear INP1 Pin #7)	#6(Rear OUT2 Pin #3)	#6(06CS.WAV)
#7(Rear INP1 Pin #8)	#7(Rear OUT2 Pin #5)	#7(07CS.WAV)
#8(Rear INP1 Pin #9)	#8(Rear OUT2 Pin #8)	#8(08CS.WAV)
Front Contact I/O 8	Front Contact I/O 8	Front Contact I/O 8
#9(Front INP1 Pin #2)	#9(Front OUT1 Pin #1)	#9(21CS.WAV)
#10(Front INP1 Pin #3)	#10(Front OUT1 Pin #3)	#10(22CS.WAV)
#11(Front INP1 Pin #4)	#11(Front OUT1 Pin #5)	#11(23CS.WAV)
#12(Front INP1 Pin #5)	#12(Front OUT1 Pin #8)	#12(24CS.WAV)
#13(Front INP1 Pin #6)	#13(Front OUT2 Pin #1)	#13(25CS.WAV)
#14(Front INP1 Pin #7)	#14(Front OUT2 Pin #3)	#14(26CS.WAV)
#15(Front INP1 Pin #8)	#15(Front OUT2 Pin #5)	#15(27CS.WAV)
#16(Front INP1 Pin #9)	#16(Front OUT2 Pin #8)	#16(28CS.WAV)

Frequently Asked Questions

Q. The RED LED repeatedly flashes four times at power up?

Q. The RED LED flashes two times when I try to play a sound, and no sound plays? Why is my CFSOUND.INI file not making the CFSound-III perform using the features I have specified ?:

This is by far our most commonly asked question. 99% of time, it is because your files have double extensions. I.E. "01C.WAV.WAV" or "CFSOUND.INI.INI". Later versions of Windows hide the file extensions in explorer, so by putting ".WAV" or ".INI" in the filename, you are actually causing a duplicate file extension.

To turn the hiding of file extensions off in Windows XP, do the following:

Click on Start

Then Click on Control Panel

Next, Click on Folder Options

Click on the View tab on the Folder Options Window

Scroll down to "Hide Extensions for Known File Types"

Click on the Check box to the left of it to remove the check mark

Click on the Apply Button

Now the complete file names will be displayed in Explorer, and any folder, and you can remove the duplicate file extensions.

Q. What Inputs and outputs are available on the main CFSound board, without adding I/O Modules ?:

The CFSound main board has a single PTT(Push To Talk) Relay for an output and two contact inputs that appears as Contact #25 & #26 for inputs. Additional Inputs and outputs are added by adding I/O Modules. The CFSound-III revision 2 can accept one I/O module, the CFSound-III revision 3 can accept two I/O modules.

Q. I have a motion sensor tied to an old industrial looping tape deck. The first time the sensor is broken it will play the first of three tracks, the second time the same sensor is broken it plays the second track on the tape and the third time it plays the third track. Can your machine duplicate this task ?:

Yes, the CFSound-III can function as you described. You make three entries into the [CONTACTS] section of the CFSOUND.INI file that you place on the Compact Flash Card.

[Contacts]

SequenceContactNumber=dd

FirstSoundNumber=ff

LastSoundNumber=ll

--> Setting the SequenceContactNumber to anything greater than zero, causes the input # dd to operate in a sequencing mode.

--> FirstSoundNumber sets the first wav file number to be played in the sequence as # ff.

--> LastSoundNumber sets the last wav file number to be played in the sequence as # ll.

You would replace dd with the contact input you wanted to function this way, ff with the first sound that you wanted it to play, and ll with the last sound you want it to play. Every time there is a contact closure on the input specified in dd, it will play the files from ff to ll in sequence, then start over again at ff, and keep repeating. See the Sequential Sound Payout section above for more information.

Q. Can I use a momentary contact closure to initiate a message, but the message needs to stop by using another momentary closure (or open?). So, a momentary to initiate, and a momentary to stop any message that is in progress ?:

Yes, the CFSound-III can function as you described. A triggered message that is playing could be 'stopped' by activating another short silent message associated with another contact input.

Q. Can the Input ports be momentary, or do they need to remain in a closed or open ?:

It depends upon what you're trying to do. If you want a message that is triggered by a contact closure (or opening) you only need a momentary switch.

If you want the sound to only play while the input is closed (or open) then you would need a latching switch. Sounds are associated with inputs by the filenames of the sounds on the CF card. How they are activated is also controlled by 'decorating' the filenames with additional characters.

For example:

To play a sound whenever input 1 momentary closes, the sound file would be named 01C.WAV.

To play a sound whenever input 2 momentary opens the sound file would be named 02O.WAV.

To play a sound only while input 1 is closed, the sound file would be named 01CP.WAV.

To play a sound only while input 1 is open, the sound file would be named 01OP.WAV.

To repeat a sound only while input 1 is closed, the sound file would be named 01CPR.WAV.

Sounds are normally interruptible whenever another input is activated, but you can also add the character "N" to the filename and make the sound(s) non-interruptible.

You can also control the unit through the RS-232 port to start and stop sounds.

Q. Can a background sound or music be played until another input is triggered ?:

You can have one or more background sounds that play (with an optional delay in between). The background sound is interrupted by the contact input activated sound(s), and resumes (if active) when the contact sound is finished playing.

Q. Can we use basic switches to control our various functions. There are no logic circuits, or anything "hi-tech" in this design ?:

You shouldn't need any external logic circuits. We use 'dry' contact closures for the inputs and provide 'dry' contacts for the output(s). Simple off the shelf switches will work just fine. Water tight / weather proof switches should be used if exposed to elements of weather.

Q. Can individual audio files/channels play simultaneously? i.e. can a file be triggered to play, overlapping a file or files that are already playing ?:

The CFSound cannot play files simultaneously, but it does offer several features that get around this limitation.

1) When the a background sound/file is playing, and it is interrupted by a contact input, it pauses the background sound, plays the sound triggered by the contact input, then continues playing the background sound from where it was interrupted.

2) When sounds are played by an external contact input/trigger, they can be configured by:

Characters in their filename to be:

- a. Not interruptible
- b. Interruptible

There are settings controllable by entries in the CFSOUND.INI file to:

- a. Store inputs/triggers, and play them when the current sound in finished
- b. Not store inputs/triggers while a sound is being played

Q. I am having addressing problems. With the 'old' units I was able to run a lead from common to 'OnCPR' and have the unit start playing a track "n" automatically on power up. This does NOT happen with these units. It seems there is something wrong with addressing operation. Is there any adjustment I can make ?:

We did indeed make a software change that pre-reads the contact inputs on power-up to prevent automatic sound activation if contacts were already closed. We had a customer complain about this 'feature'.

To support this un-documented feature, we added an additional CFSOUND.INI file entry of:

[Contacts]

Force=TRUE/FALSE

--> Setting this value to TRUE restores the original behavior wherein the contact's active status is 'forced' upon reset, power-up or card-insertion. This will cause associated sound activation if the contact was active.

--> Setting this value to FALSE (the default) causes the new behavior wherein the contact's current status is sampled upon reset, power-up or card-insertion. This will cause no associated sound activation until the contact is re-activated.

Q. Do you have more detailed spec's on your amplifier module ?:

The amplifier is based upon Analog Devices AD1994 Class D Amplifier and provides 25W per channel to bridge tied speakers (no ground reference).

Q. How do I use the Windows Sound Recorder to make recordings ?:

1. Click on the Start Button, then Programs, then Accessories, then Entertainment, then Sound Recorder.
2. Click on Files, then Properties. A new window opens named "Properties For Sound".
3. Change the "Format Conversions" "Choose From" drop down box to "All Formats" or "Recording Formats".
4. Next, click on "Convert Now", a new window named "Sound Selection" opens.
5. Make sure "Format" is PCM, 44.1KHz, Stereo or Mono.
7. Click on the OK Button to close the "Sound Selection" window.
8. Click on the OK Button to close the "Properties For Sound" window.
9. To start recording, click on the button with the red dot(record).
10. To stop recording, click on the button with the black square(Stop).
11. Once you have finished recording, Click on File, then Save As, and name your file how you want it to play.
12. I.E. "BACKGRND.WAV" to play when there is no switch closures.
13. I.E. "01C.WAV" to play when input #1 closes.
14. Copy the file to the Compact Flash Card.

You're done.

NOTE: If you click on File, then click new, you will have to set the File properties again before recording.

Q. Can an output contact be used to operate a lamp to indicate that the message has been triggered ?:

If you need individual lights that illuminate when the associated input is active, you would need the Contact I/O 8 module in the CFSound-III. If you only need a single light that is illuminated whenever any sound is playing then you can use the PTT relay that is installed on the main unit and use a Contact Sense 8 or Contact Sense 24 module.

Q. When I try to use a Lexar CF Card, the CFSound-III Flashes the RED Error light once every six seconds ?:

Not all LEXAR Media Compact Flash cards are 100% compatible in True IDE mode and as such may NOT be COMPATIBLE with the Compact Flash III Digital Audio System.

We have asked Lexar for technical information on this incompatibility, and they have not responded.

Q. When I try to use a Kingston CF Card, the CFSound-III Flashes the RED Error light once every six seconds ?:

Kingston has manufactured a batch of CF cards that are not 100% compatible with the CF card standard. While they may work in your PC, the CFSound-III uses a memory mapped mode of operation. Kingston CF cards that were manufactured using a SMIC controller chip have a bug in their firmware when attempting to operate in this mode. Kingston is aware of the problem and should refund your money.

We have asked both Kingston and SMIC for technical information on this incompatibility, and they have chosen to not respond.

Q. We have a client who has a specific need -- an interval timer function. They want their very short message to go off every 30 minutes (not seconds). Does your equipment have a provision for an interval timer ?:

By placing a file named CFSOUND.INI on the compact flash card along with your sound files, you can control several operating features of the unit.

For your application the following entry would provide the 30 minute delay between the background sound:

[Background]

BackgroundDelay=1800

This .INI file option sets the delay in seconds between background sound play-outs to the decimal value of 1800 seconds (30 minutes). The default is 0 seconds (no delay). This is not a high-resolution timer and may be affected by other sounds playing while the timer is active.

Q. We need to have a light associated with an individual "message initiate" momentary switch when that message is playing. Do we need only the Contact I/O 8 module, or do we also need the Contact Sense 8 ?:

The Contact I/O 8 has 8 contact sense inputs and 8 contact outputs. The Contact Sense 8 has 8 contact sense inputs and the Contact Sense 24 has 24 contact sense inputs. The CFSound-III revision 2 can accept one I/O module, the CFSound-III revision 3 can accept two I/O modules.

Q. I ordered an enclosed CFSound-III, and no volume control knob was installed/received ?:

We do not ship a volume knob with the CFSound-III, since the volume may be adjusted by pushbuttons on the front of the unit.

Q. When wiring the power supply connector to the supplied power supply, which side is plus and which side is ground ?:

Please see the MAIN connector description earlier in the manual for correct power supply wiring.

Q. Will it finish playing the current file even if another input is tripped half way through the file ?:

If you add an "N" in the filenames of your files, it marks the files as non-interruptible. Then setting SaveNIContacts= TRUE in the [CONTACTS] section of the ini file, will cause the contact closure during play out of the Non-Interruptible file to be saved until it completes playing.

Q. How long does it take the CFSound-III to power-up and be ready to play sounds ?:

The unit must either scan the card upon power-up, or scan the card every time a sound is initiated. We opted to scan the card upon power-up to enable each sound to be played quicker. Many of the delays upon power-up are due to having to support the variety of Compact Flash cards on the market - some of which require several seconds upon power-up before they are accessible. The firmware is designed to accommodate the worst case card, and we've had to slow it down in production as people encountered problems with various cards that couldn't be read. There is no firmware modification available that will shorten this delay. A freshly formatted small card with a limited number of sounds will scan the fastest. We have measured this delay at 5-15 seconds.

Q. How long does it take the CFSound-III to play a sound in response to a contact closure ?:

The unit debounces the contact inputs by sampling them every 20mSEC. It requires a three sample

sequence of open, open, closed to qualify a contact input as valid. Then the file must be opened and buffering started. We have measured this delay at ~100mSEC.

Sample Messages

The following sample messages were captured from the CFSound-III serial port using Windows HyperTerminal. The default connection serial format is 2400 baud, 8 data bits, 1 stop bit.

Sample Power Up Message, no CF card

```
CFSound-III v4.1 on Jul 25 2007 12:29:56 cksum=89F0353A
no CF card

ACS Basic v1.8 Jul 24 2007 11:09:24
Ready
```

Sample Power Up Message, CFSound Mode

```
CFSound-III v4.1 on Jul 25 2007 12:29:56 cksum=89F0353A
Model Number: Hitachi XXM2.3.0
Firmware Revision: Rev 3.00
Serial Number: X0813 20050720013941
# of Cylinders: 978
# of Heads: 8
# of Sectors/Track: 32
# of Sectors: 250368
No partition found, file system at sector: 0

Scanning card directory for .WAV files...
Sound Table:

#      Sound      Sample      Sound      Sound
#      Filename    Rate      Offst      Length    C O P R S B N
+-----+-----+-----+-----+-----+-----+-----+-----+
1      01CS.WAV 44100 Hz M    44      44016 C - - - S - -
2      02CS.WAV 44100 Hz M    44      40900 C - - - S - -
3      03CS.WAV 44100 Hz M    44      44016 C - - - S - -
4      04CS.WAV 44100 Hz M    44      38124 C - - - S - -
5      05CS.WAV 44100 Hz M    44      44708 C - - - S - -
6      06CS.WAV 44100 Hz M    44      54760 C - - - S - -
7      07CS.WAV 44100 Hz M    44      53028 C - - - S - -
8      08CS.WAV 44100 Hz M    44      39856 C - - - S - -
126    7EB.WAV 44100 Hz S    44      306016 - - - - - B -
127    7FB.WAV 44100 Hz S    44      1164188 - - - - - B -

[Background] BackgroundDelay=0
[Background] BackgroundRestart=TRUE

[DEBUG] ShowStartStop=TRUE

Background start:7E
```

Sample Power Up Message, Basic Mode

```
CFSound-III v4.1 on Jul 25 2007 12:29:56 cksum=89F0353A
Model Number: SanDisk SDCFH-64
Firmware Revision: Vdg 8.21
Serial Number: 111921F2403S0502
# of Cylinders: 490
# of Heads: 8
# of Sectors/Track: 32
# of Sectors: 125440
Using partition type: 1 at sector: 32

Scanning card directory for .WAV files...
ACS Basic v1.8 Jul 24 2007 11:09:24
Ready
```


Firmware Revisions

Version	Date	Notes
0.01	7-07-04	First started development.
3.0	11-12-04	Version 3.0 first translated from CFSound-II v2.19 firmware.
3.0a	12-28-04	Fixed intermittent sample rate distortion problem by changing which Sport interrupt updated the Codec.
3.0b	12-30-04	Changed clock multiplier to improve reliability with slower CF cards.
3.1	8-04-05	Added timeout on Codec initial frame detection with Red LED error flash. Slowed down flash rate.
3.2 3.3	4-25-06	Changes for revision 1 prototypes - new codec, new amplifier, extra contact input.
3.4	5-04-06	Extended conditionals in sound end if/else chain to skip checking for background sound restart/start when autoplay sequence is running. Also restart any BackgroundDelayTimer when an autoplay sequence ends.
3.5	5-10-06	First version with FAT32 support. Also moved partition detection into RDCF with new call. Increased ATA_Reset() software reset command delay to allow Sandisk 4GB CF card to work. Added volume up/down autokey. Corrected cardID display of cylinders/heads/sectors by eliminating the byte swapping for 'endianess'.
3.6	7-03-06	Changed LoadSoundBuffer() to always return the number of bytes read from the file, whether mono/stereo. Changed calls to process the returned result based upon mono/stereo. Fixes the problem of mono files stopping halfway through play-out.
3.7	8-01-06	Integration of ACS Basic interpreter. Changed contact debounce processing to force on-board contacts 25 & 26 at the end of the contact array so they can be treated identically everywhere instead of as special cases. Corrected bug in UDA1345 interrupt handler that caused premature end of contact triggered sounds.
3.8	9-26-06	Cleared the PlaySound queue in PlaySound_Stop() for ACS Basic. Changed UART escape detection logic to require two successive escapes so that LCD key commands with escapes can be processed. Corrected problem with PlaySound() not clearing the CurrentPlaySound before calling IsValidWaveFile() that led to Basic incorrectly playing mono sounds as stereo. Upgraded ACS Basic to v1.4.
3.9	10-12-06	Changed partition table logic to handle CF cards formatted without a partition table.
3.10	11-15-06	Rewrote partition table logic to improve compatibility with various CF card formats. Upgrade ACS Basic to v1.5. Added extra Red LED flashing error codes, and allow up to four codes to be flashed in sequence. Slowed Green LED flashing when running ACS Basic. Corrected bug introduced in VDSP v4.5 sscanf() used in parsing received RS-232 command messages.
3.11	11-29-06	Upgraded ACS Basic to v1.6. Corrected PlaySound_SetVolume() to correctly set the volume from Basic. Modified UART_Init() to choose closer integer baud rate divisor.
3.12	1-08-07	Added ability to set, increase or decrease the volume from the RS-232 serial port.
3.13	2-08-07	Added ability to mute or un-mute the speaker amplifier from the RS-232 serial port. Added Red LED error code to indicate when the speaker is muted. Upgrade ACS Basic to v1.7.
3.14	5-08-07	Added ability to fade the the volume from the RS-232 port.
3.15	7-30-07	Added detection of amplifier over-current and recovery due to output shorts.
4.0	6-25-07	Added support for second contact I/O card for new Revision 3 CFSound-III. Upgrade ACS Basic to v1.8.
4.1	7-25-07	Shortened startup delay. Added BackgroundRestart CFSOUND.INI option.
4.2	7-31-07	Added detection of amplifier over-current and restart due to output shorts. Added support for LineIn to Speakers/LineOut when no sound is playing. Added CFSOUND.INI [LineIn] section with LineInputEnabled=TRUE/FALSE (default=FALSE) configuration item. Upgrade ACS Basic to v1.9.
4.3	8-02-07	Renamed CFSOUND.INI option LineInputEnabled to LineInputAlwaysEnabled. Added [Contacts]LineInputEnableContactNumber option. Added code to stop any playing sound and enable LineIn when the specified contact is active (Closed). Added Red LED flashing error code if SequenceContactNumber and LineInputEnableContactNumber are set to the same value.

Compact FLASH III Digital Audio System

Version	Date	Notes
4.4	8-31-07	Upgraded ACS Basic to v1.10. Added [Contacts]PttOutputWithLineInputEnableContact option, if TRUE PTT relay follows non-zero LineInputEnableContactNumber state, otherwise PTT relay is controlled by sounds with the Relay attribute in their filename.
4.5	9-16-07	Upgraded ACS Basic to v1.11. Corrected PTT relay operation for sounds broken by changes in v4.4.
4.6	9-24-07	Upgraded ACS Basic to v1.12.
4.7	11-7-07	Upgraded ACS Basic to v1.13. Increase buffer size to speed-up file I/O. Corrected Real-Time Clock calculation for year and month rollover at midnight.
4.8	11-27-07	Internal development version. Upgraded ACS Basic to v1.14.
4.9	4-22-08	Added support for new DMX I/O module. Upgraded ACS Basic to v1.15. Fixed bug in filesystem where file creation date had incorrect year. Added compilation option to build version that will execute out of Flash or faster SDRAM.
4.10	5-15-08	Upgraded ACS Basic to v1.16. Corrected a race condition in PlaySound_Process() that caused intermittent failures of sound queue empty signaling.
4.11	8-27-08	Upgraded ACS Basic to v1.17. Corrected DMX flickering between sounds if no background sound present. Introduced faster SDRAM versions.
4.12	9-16-08	Removed debugging delay that was causing inadvertent contact activation during power-up detection of optional DMX module.
4.13	12-09-08	Upgraded ACS Basic to v1.18.
4.14	1-27-09	Removed debugging error messages in Read/WriteDmxIO().
4.15	2-10-09	Increased MAX_DMX_SCENE_CHANNELS from 16 to 32. Upgraded ACS Basic to v1.19.
4.16	2-26-09	Corrected OneSecondPrescaler and SoundFrameTimerPrescaler operation in Timer0_Process() to correct off by one error. Change ReadDmxIO() and WriteDmxIO() to detect incorrect interface state and reset it - this requires an updated DMX module. Upgraded ACS Basic to v1.20.

Upgrading the Firmware

The CFSound-III is designed to be field-upgradeable. The firmware that controls the unit's operation may be upgraded in the field with new versions to add features or functionality, or to correct problems.

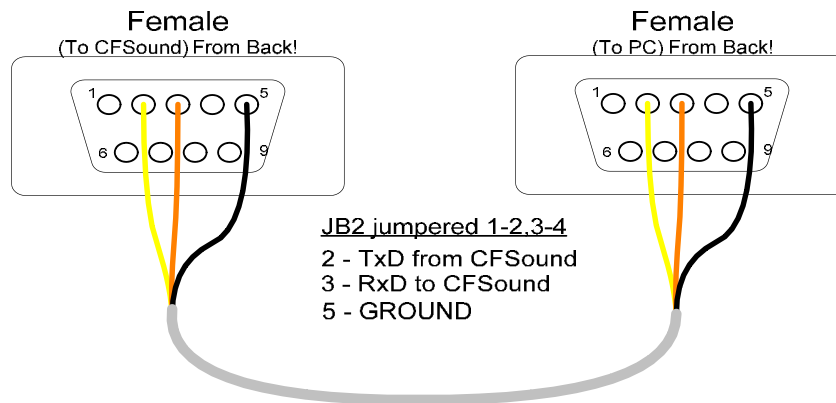
The process requires a PC running Windows with an available serial port. A USB serial port may or may not work depending upon how well the device's driver was written. ACS recommends using a conventional serial port if at all possible.

The unit is connected to the programming PC with a one-to-one DB9 Female/Female 9-pin serial cable and gender changer. These are available at CablesOnline:

<http://cablesonline.stores.yahoo.net/69wirdb9mfex.html>

<http://cablesonline.stores.yahoo.net/db9femslimge.html>

As an alternative, a cable may be constructed with a pair of DB9 Female solder cup connectors and three wires:


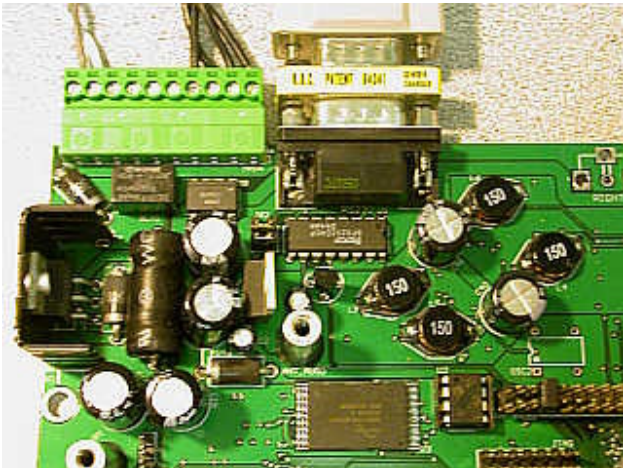


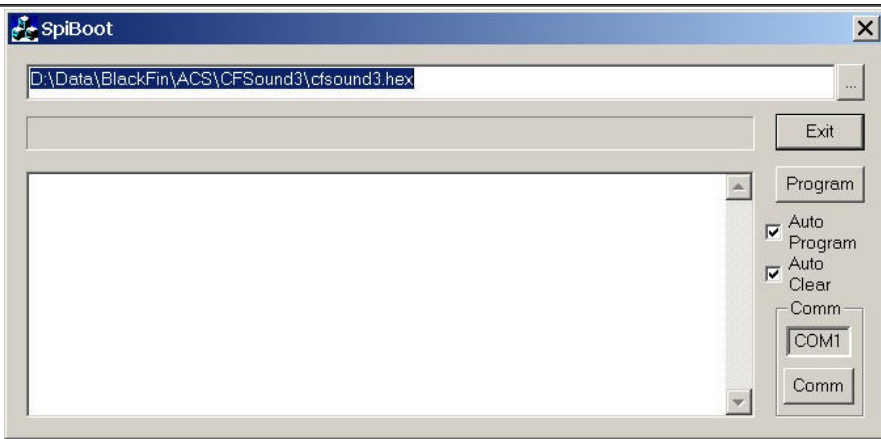
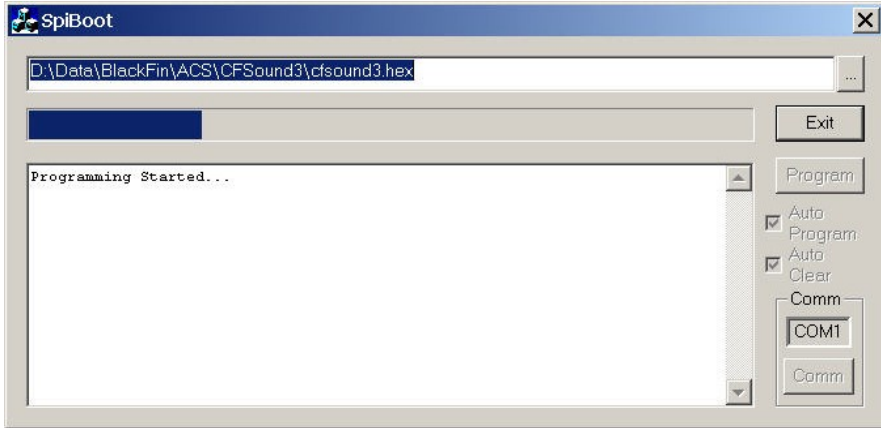
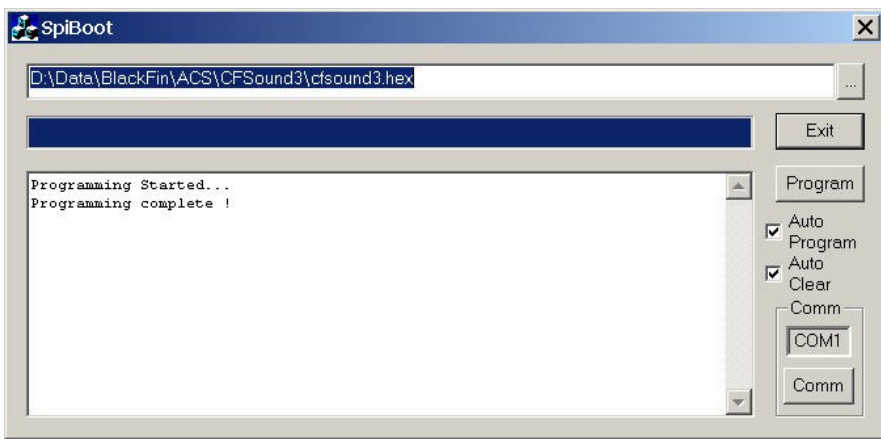
Note that this same cable may be used to view the CFSound-III's power-up diagnostic messages, which includes the current firmware version, by using Window's Hyperterminal accessory on the PC configured to 2400 baud, 8 data bits, 1 stop bit, no flow control. CFSound jumper block JB2 provides a Null Modem capability to swap the RxD and TxD signals by rotating the pair of jumpers 90 degrees.

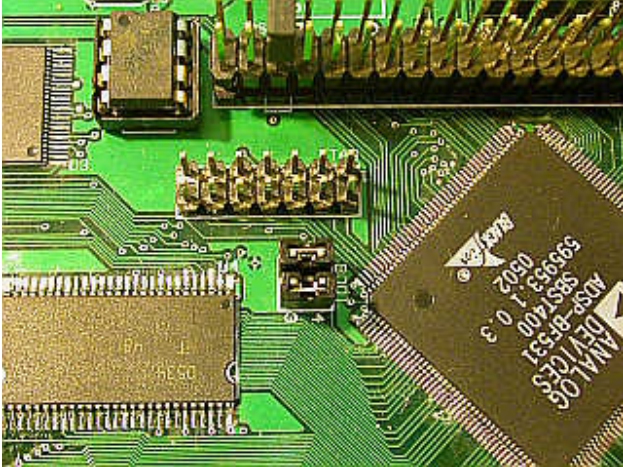

The CFSound-III case must be opened to allow access to the BOOT jumpers. Two screws on the bottom of the unit allow the case to be opened.

The BOOT jumpers determine whether the CFSound-III starts running from Flash memory (both installed), from SDRAM memory (BOOT 1 - 2 installed, BOOT 3 - 4 uninstalled) or from a small bootstrap EEPROM (both BOOT jumpers uninstalled). Operation from Flash or SDRAM is dependent upon what firmware has been programmed into the Flash memory - if the filename as SDRAM in in, then it's a version compiled to run out of SDRAM (faster) instead of flash.

The sequence of steps in the following table outlines the firmware upgrade process.

Step	Description / Photo
1.	<p>Remove both shunts from the BOOT jumper block.</p> 
2.	<p>Connect the programming computer's serial port to the CFSound-III's serial port. Apply power to the CFSound-III.</p> 
3.	<p>Start the SPIBOOT Windows programming utility. Press the ellipsis button <input type="button" value="..."/> to navigate to the desired firmware file if the filename and path are not correct. Press the <input type="button" value="Comm"/> button to select the correct serial port that the CFSound-III is connected to if not correct. The baud rate should be set to 38400. These settings are saved in a SPIBOOT.INI file between sessions.</p> <p>Checking the Auto Program configures the SPIBOOT utility to start programming as soon as it receives the initial ACK from the CFSound-III. Checking the Auto Clear allows the SPIBOOT utility to clear the status window when programming begins:</p>

	
<p>4.</p>	<p>Press the CFSound-III Reset Button. The SPIBOOT software should begin programming. Note that there is an initial delay of up to 15 seconds while the flash memory on the CFSound-III is being erased. The progress bar above the status window advances as programming proceeds:</p> 
<p>5.</p>	<p>After programming has completed, exit the SPIBOOT Windows programming utility. Programming problems are reported in the status window:</p> 
<p>6.</p>	<p>Remove power from the CFSound-III. Disconnect the serial cable from the CFSound-</p>

	III.
7.	<p>For non-SDRAM firmware versions re-install the shunts on the BOOT jumper block so they connect 1 to 2 and 3 to 4 as shown:</p>  <p>For SDRAM firmware versions re-install the shunt on the BOOT jumper block so that 1 to 2 is connected and 3 to 4 is not connected as shown:</p> 
8.	<p>Reset the CFSound-III. The new firmware should now be installed and running. The new firmware version may be verified using the Window's Hyperterminal serial communications utility as outlined below the cable diagram above.</p>