



## Firmware Version

1.1

## Technical Specifications

### **Operation Mode**

Playback only, one sound file at a time

### **Sound File Format**

MP3 (ISO 11172-3 up to 44.1KHz)

### **Max. Number of Sound Files**

Direct/Round-Robin Trigger: 12  
Sequential Trigger: 12 x 99

### **Memory Card Type**

SD/SDHC

### **Max. Memory Capacity**

2 GB for SD (FAT/FAT16)  
32 GB for SDHC (FAT32)

### **Max. Recording Time**

(based on 128 kbps and 2GB card)  
33 hours

### **Supply Voltage**

10 ~ 15 VDC

### **Typical Standby Current**

30 mA (internal power amp disconnected)  
100 mA (internal power amp connected)

### **Audio Output**

(12V supply, 4 Ohm load, 10% THD+N)  
Stereo: 6W per channel

### **Trigger Interface**

12 inputs  
Contact closure or 3.3V/5V/12V/24V logic

### **Physical Dimensions**

128mm x 90mm x 35mm

## Inputs, Outputs & Controls

### **Power Light (PWR)**

The power light is turned on when power is applied.

### **Trigger Input Terminals: T1 - TC, GD**

These inputs are internally pulled up and seen as logic 1 if left open/un-driven. To be seen as logic 0 these inputs must be actively driven to 0V (ground). The system can be configured to trigger on either logic 0 or 1, or the transition from one value to the other. See the Trigger Logic section for details.

These inputs have serially connected diodes to block positive voltages of up to 40VDC. Therefore applying a DC voltage between 2V and 40V will set the input to logic 1. Applying a DC voltage between 0V and 1V will set the input to logic 0. Applying a DC voltage between 1V and 2V will cause unpredictable system behavior.

The GD terminal is ground, connected internally to the power ground.

To connect wires to these terminals: push the orange tab inward with a small screw driver and, at the same time, insert the wire as far as possible. Then let go the screw driver to lock in the wire.

### **Reset Input Terminal: RS**

Pull this input down to the ground momentarily to reset the unit. Min. duration is 100 ms. This input has the same pull-up characteristics as the trigger inputs.

### **Busy Output Terminal: BY**

This open collector output from an internal transistor is automatically turned on while playing audio, with a maximum sink current of 200 mA. It can be used to synchronously activate an external relay for switching on devices such as lamps and motors.

### **Power Input Terminals: V+, GD**

Use a well regulated DC power supply to obtain the best sound quality. Connect the power supply's positive output to terminal V+, and the negative output to terminal GD. The supply voltage should be within the Supply Voltage specifications.

### **Line Output (LINE): 1/8" Stereo Phone Jack**

This jack provides single ended line output. It can also drive headphones directly.

### **Balance Knob (BAL)**

This knob adjusts the output balance between the two channels.

### **Volume Knob (VOL)**

Turn this knob clockwise to increase the output volume. It affects both the speaker and the line out.

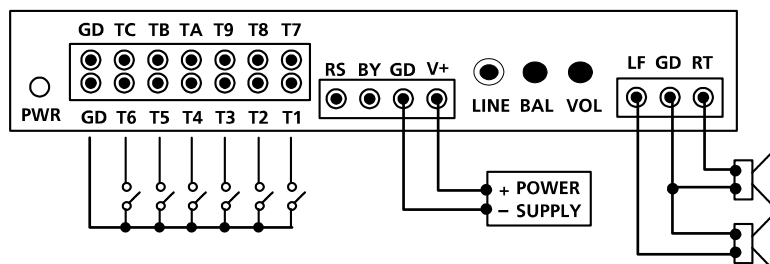
### **Speaker Output Terminals: LF (left channel), GD, RT (right channel)**

See the Speaker Connections section.

Note: If the internal power amp is not to be used, it can be disconnected by removing the shorting cap on internal jumper JP1. Doing so can save about 70 mA of current.

## Typical Wiring Diagram for Push Button Activation

Diagram below shows only six push buttons. Six more push buttons can be connected to trigger inputs T7 ~ TC in a similar fashion.



## Trigger Mode

The Trigger Mode defines how the playback is to be triggered.

### **Direct Trigger (default)**

Each input always triggers a specific file: T1 = file 001, T2 = file 002, ....., TA = file 00A, TB = file 00B, TC = file 00C.

The Direct Trigger is prioritized from T1 (the highest) to TC (the lowest). However, it does not mean a higher priority input can interrupt a lower one. It only means that if multiple triggers are applied at the same time, the highest priority wins.

### **Sequential Trigger**

Use this mode to sequentially trigger up to 99 different files per input as described below.

T1 triggers file 101 ~ 199

T2 triggers file 201 ~ 299

.....

TA triggers file A01 ~ A99

TB triggers file B01 ~ B99

TC triggers file C01 ~ C99

Each trigger on the same input activates the next file in the sequence. The sequence automatically restarts when either the end of the sequence is reached or there is a break in the sequence. For example, if there are only three files on the flash card: 101, 102, and 104, the system will only sequence between 101 and 102. File 104 will never be played because file 103 is missing.

The Sequential Trigger is prioritized from T1 (the highest) to TC (the lowest). However, it does not mean a higher priority input can interrupt a lower one. It only means that if multiple triggers are applied at the same time, the highest priority wins.

### **Round-Robin Trigger**

This mode is very similar to the Direct Trigger mode except that the inputs are not prioritized. So if multiple inputs are triggered at the same time the system will handle them one after another. The Round-Robin mode can only be used in conjunction with the Non-interruptible Playback mode.

## Playback Mode

The Playback Mode defines how the playback is to proceed.

### **Non-interruptible Playback (default)**

The file is played once per trigger. The playback is not interruptible except by the system reset. Looping is possible by applying a constant trigger on the input.

### **Interruptible Playback**

The file is played once per trigger if not interrupted. Any input can interrupt the playback except that an input cannot interrupt itself if the Trigger Polarity is either Closed or Open.

### **Holdable Playback**

The file is played for as long as the input is triggered, looping if necessary. It is not interruptible except by the system reset.

## Trigger Logic

The Trigger Logic defines how the trigger is to be applied.

### **Closed Contact**

The input is continuously triggered when it's at logic 0, e.g. when the push button is pressed down.

### **Open Contact**

The input is continuously triggered when it's at logic 1, e.g. when the push button is not pressed down.

### **Make Contact**

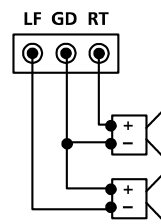
The input is triggered one time as it goes from logic 1 to 0, e.g. when the push button is pressed down.

### **Break Contact**

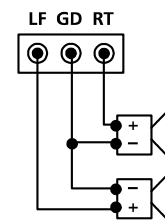
The input is triggered one time as it goes from logic 0 to 1, e.g. when the push button is released.

## Speaker Connections

### **Regular Stereo**



### **Virtual Surround Stereo**



The left channel signal is internally inverted and that's why the left speaker has an inverted polarity for regular stereo output. If the left speaker is not inverted then the output is virtual surround stereo.

By default the left channel is inverted internally. But if the Line Output is to be converted to mono with a stereo-to-mono patch cord then the inverted left channel will cancel out most, if not all, of the right channel. In this case, see the System Configuration section for how to prevent the left channel from inverting.

## Background Music

To play background music automatically when the system is idle (not triggered), just assign M01 as the file number to the background music file. When the M01 file is present on the SD card, the system will automatically play it as the background music.

To play a list of background music files sequentially, just number them M01, M02 ... (up to M99).

After interruption by input triggering, background music will resume from where it left off.

## Power Saving Tips

If the internal power amp is not to be used, it can be disconnected by removing the shorting cap on internal jumper JP1. Doing so can save about 70 mA of current.

## **System Configuration**

By default, the system works in the following mode without a configuration file:

*Trigger Mode: Direct*

*Playback Mode: Non-Interruptible*

*Trigger Logic: Closed Contact*

To operate the system in any other modes, you need to create a plain text file called "MODE.TXT" containing up to four letters:

### **First Letter: Trigger Mode**

D = Direct

S = Sequential

R = Round Robin

### **Second Letter: Playback Mode**

N = Non-interruptible

I = Interruptible

H = Holdable

### **Third Letter: Trigger Logic**

C = Closed Contact

O = Open Contact

M = Make Contact

B = Break Contact

### **Fourth Letter: R or (none)**

By default the left channel is inverted internally. But if the Line Output is to be converted to mono with a stereo-to-mono patch cord then the inverted left channel will cancel out most, if not all, of the right channel. In this case, add this letter 'R' to prevent the left channel from being inverted internally.

## **File Number Assignment**

Sound files on the flash card must be assigned a unique file number for identification purpose. The file number must be a three digit number within the following range:

For Direct Trigger: 001 ~ 00C

For Sequential Trigger: 101 ~ 199 (for T1), 201 ~ 299 (for T2),  
301 ~ 399 (for T3), .... C01 ~ C99 (for TC)

Simply add the file number to the beginning of the original filename, e.g. "001 mysound.mp3". Note that if the flash card is formatted with FAT (FAT16) and you want to store the maximum number of files (511) on the card, you should keep the filenames (including the file number) within 8 characters and use only upper case letters and numbers. If the flash card is formatted with FAT32 then you may use any filename that Windows allows.

## **Trouble Shooting Guide**

### **1. No sound.**

- a. File numbers are not assigned properly.
- b. The system is in the wrong mode due to missing or incorrect configuration file.
- c. If the flash card is inserted when the power is on, the system may not work. To fix this problem, recycle the power or use the RS input to reset the system.
- d. The output volume may have been set too low. Try turning it up.

### **2. Plays the wrong file.**

- a. File numbers are not assigned properly.
- b. The system is in the wrong mode due to missing or incorrect configuration file.

### **3. Noisy playback.**

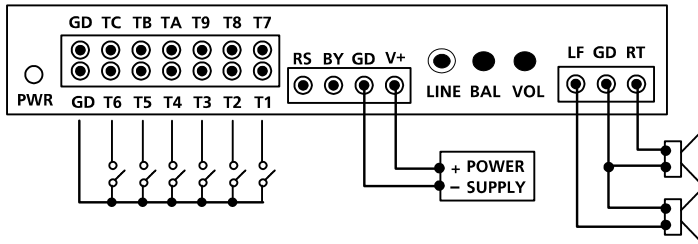
The speed of the flash card is too slow. Use a faster flash card or convert the file to a lower bit rate.

### **4. Very weak or no audio from Line Output when it's converted to mono with a stereo-to-mono patch cord.**

Add the fourth letter 'R' in MODE.TXT. See the System Configuration section for details.

**Application Example**

*Triggering with Normally Open Push Buttons*



**1. Playback without interruption.**

**Intended Operation**

- Press button #1 to play file #001 once.
- Press button #2 to play file #002 once.
- When playing, pressing any button has no effect.

**Required Text in MODE.TXT**

None, this is the default mode (DNC).

**Notes**

- The button can be released or held down when playing.
- If the button is held down when the playback finishes, the sound will play again.
- If both buttons are pressed/held down at the same time, button #1 prevails.

**2. Allow interruption during playback.**

**Intended Operation**

- Press button #1 to play file #001 once.
- Press button #2 to play file #002 once.
- Playback is interruptible by pressing any button other than itself.

**Required Text in MODE.TXT**

DIC

**Notes**

- When playing, pressing the same button again has no effect.

**3. Play the sound only once even if the button is held down.**

**Intended Operation**

- Press button #1 to play file #001.
- Press button #2 to play file #002.
- Don't repeat the sound even if the same button is held down.

**Required Text in MODE.TXT**

DNM

- if playback is to be non-interruptible

DIM

- if playback is to be interruptible

**4. Play only when the button is held down.**

**Intended Operation**

- Press & hold button #1 to play file #001.
- Press & hold button #2 to play file #002.

**Required Text in MODE.TXT**

DHC

**Notes**

- Playback stops as soon as the button is released. If the same button is pressed again later, playing re-starts from the beginning of the file instead of where it left off.
- If both buttons are held down, button #1 prevails. To play both sounds alternately when both buttons are held down, use the RHC mode.

**5. Play a list of sounds sequentially, one per trigger, when the same button is pressed.**

**Intended Operation**

- Press button #1 to play file #101 the first time, file #102 the second time, and etc.
- Button #2 sequences through file #201, #202...
- When playing, pressing any button has no effect.

**Required Text in MODE.TXT**

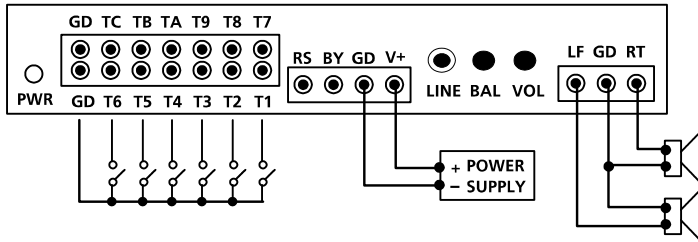
SNC

**Notes**

- Up to 99 files can be assigned to each button but file numbers must be consecutive.
- To allow interruption from other inputs, use the SIC mode.
- To play only when the button is held down, use the SHC mode. In the SHC mode, the same sound will repeat for as long as the button is held down. To advance to the next sound, the button must be released and pressed.

**Application Example**

*Automatic Playback on Power-up*



**1. Repeat continuously on power-up.**

**Intended Operation**

- Play file #001 on power-up if switch #1 is closed.
- Play file #002 on power-up if switch #2 is closed.
- .....
- Play file #006 on power-up if switch #6 is closed.
- If more than one switch is closed, play all corresponding files sequentially.
- Repeat the file(s) until power is turned off.

**Required Text in MODE.TXT**

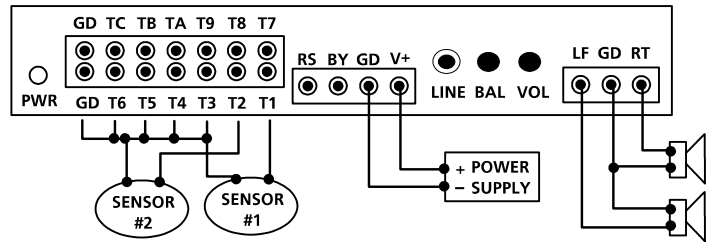
RNC

**Notes**

- If priority is required, use DNC instead of RNC. In this case switch #1 has the highest priority, switch #2 has the second highest priority, and switch #C has the lowest priority. If more than one switch is turned on, only the file for the switch of the highest priority will be played.

**Application Example**

*Triggering with Normally Closed Switches & Sensors*



**1. Play when the switch/sensor opens, with no priorities.**

**Intended Operation**

- Play file #001 when sensor #1 opens.
- Play file #002 when sensor #2 opens.
- Repeat the sound for as long as the sensor is open.
- If multiple sensors are open at the same time, play all corresponding files sequentially.

**Required Text in MODE.TXT**

RNO

**Notes**

- Unused inputs must be connected to the ground, as shown in the wiring diagram.

**2. Play when the switch/sensor opens, with priorities.**

**Intended Operation**

- Same as the example above, but if multiple sensors are open at the same time, the sensor of the highest priority prevails.

**Required Text in MODE.TXT**

DNO

**Notes**

- The sensor connected to T1 has the highest priority, and the sensor connected to TC has the lowest priority.

**3. Play when the switch/sensor opens, but don't repeat.**

**Intended Operation**

- Play file #001 when sensor #1 opens.
- Play file #002 when sensor #2 opens.
- Do not repeat the sound.

**Required Text in MODE.TXT**

DNB

- if playback is to be non- interruptible

DIB

- if playback is to be interruptible