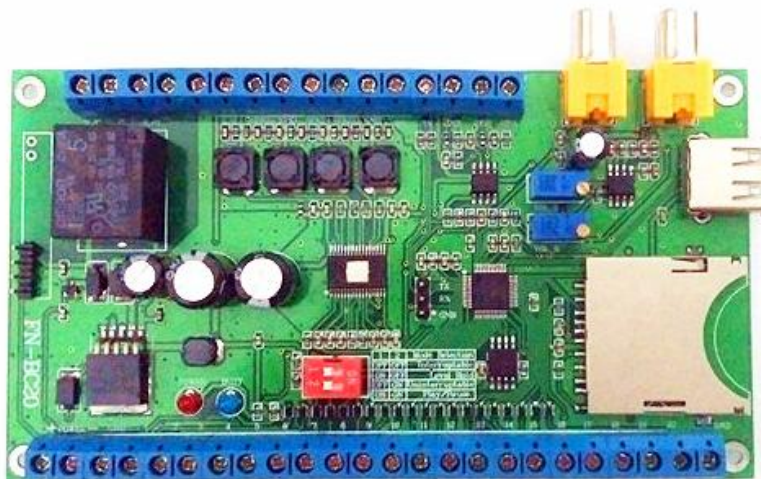


20 Channel MP3 Sound Board

User's Manual

Model: FN-BC20



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1. Overviews

1.1. Brief Introduction

FN- BC20 is a high quality MP3 sound board developed by Flyron Technology Co., Ltd. Equipped with an on-board 2x 15 W class D amplifier, the sound board can be controlled by 20 separate buttons hooked up to the 'one-on-one' inputs terminals, R232 serial port and RS485 serial port. Great audio output, industry-grade design and strong anti-jamming capability make it possible to be used for many different applications.

1.2. Features

- 1) Built-in a high quality 24bit of audio decoder with stereo audio output.
- 2) Supports to play audio files of MP3 and WAV formats.
- 3) On-board a high quality 2x15 Watt class D amplifier to directly connect with two 8 ohm speakers of 15 Watts or more, for left channel and right channel.
- 4) Uses SD card or USB flash drive for sound file storage devices.
- 5) Supports maximum 32GB SD card or 32GB USB flash drive.
- 6) Supports button control mode for RS232 and RS485 serial control mode.
- 7) In button control mode, playback of the 'one-on-one' associated audio files are triggered by negative pulse to any of the 20 input terminals.
- 8) In button control mode, possible playback of 255 MP3/WAV audio files per 20 'one-on-one' associated folders through negative trigger.
- 9) In button control mode, Four Selectable triggering modes are provided.
- 10) Supports audio output to an external amplifier through the RCA audio jacks.
- 11) Separate volume control for each sound channel (only for on-board amplifier).
- 12) On-board relay used to control on/off to external equipment during playback.
- 13) Wide range for power input DC (12V - 24V).
- 14) Industry-grade design and strong anti-jamming capability.
- 15) PCB size: 135mm x 75 mm (5.315 Inches x 2.953 inches).

1.3. Technical Parameters

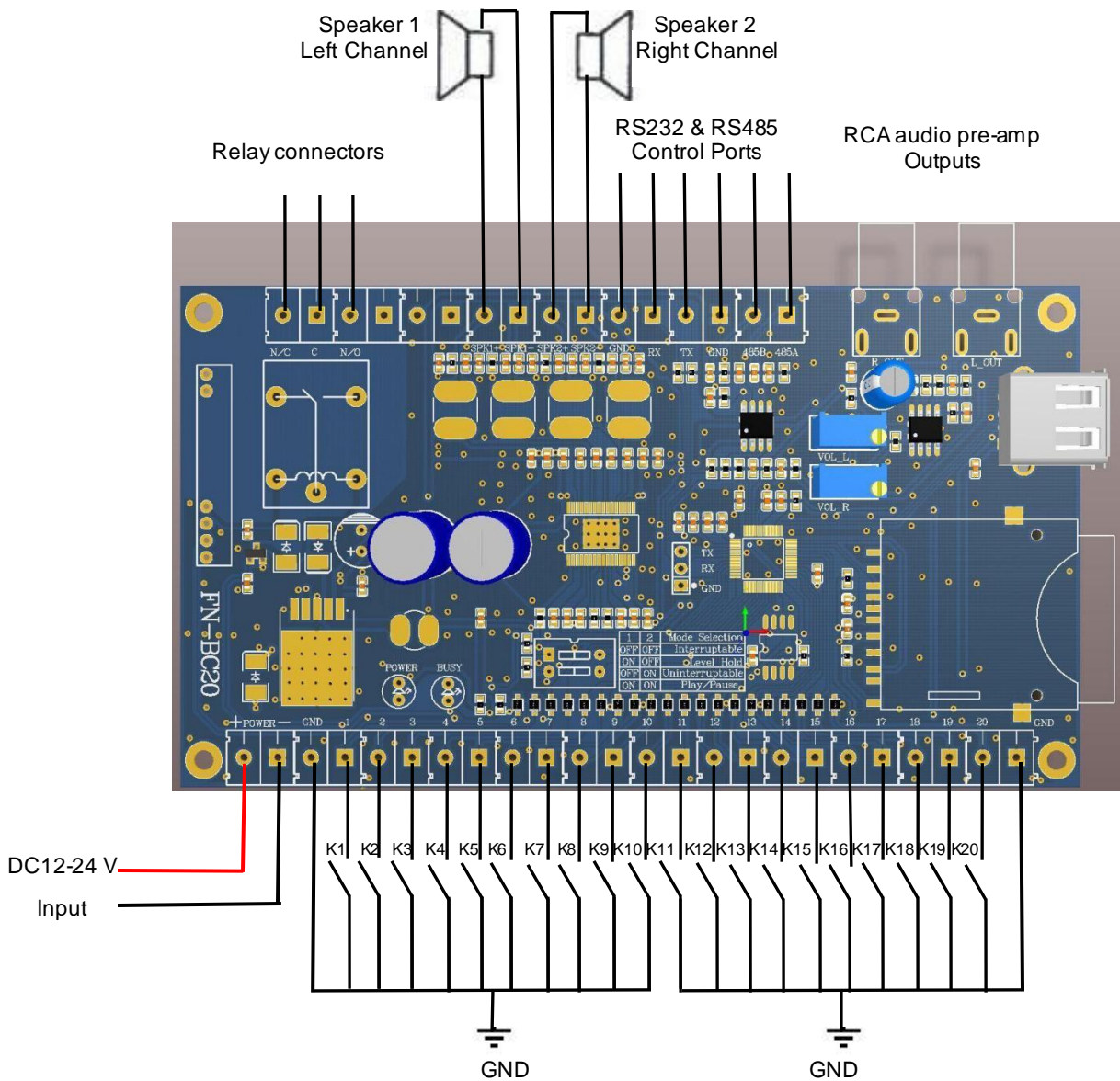
- Power input: DC12V - 24V
- Rated output: 15W×2 (RL= 8 Ω d =1%)
- Noise Voltage: ≤50m V
- Frequency response: 20-20KHz
- SNR: ≥ 90dB

2. Connections

K1 through K20 are representing Normally Open (N.O.) manual buttons. Please refer to the connection example below.

Notes:

- There are two 'GND' connecting terminals for convenient connections on the both sides of the 20 input connection terminals for the buttons.
- The volume potentiometer "VOL_L" associates with "SPK1" while the volume potentiometer "VOL_R" associates with "SPK2".
- The on-board amplifier shuts down automatically, when the on-board RCA audio jacks are connected to an external amplifier. This is achieved through voltage sensing of the pre-amp audio source.
- The relay is triggered (activated) only during playback.



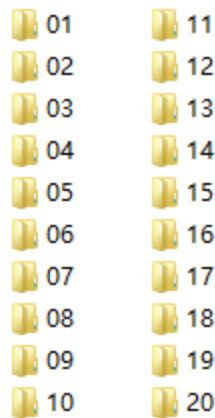
3. Button Input Control Mode

In order to meet different needs, we added 'one-on-one' folder triggering control except for the traditional 'One-on-one' triggering of sound files. 'One-on-one' folder triggering control is used for random playback of the sound files in the associated folder. In other words, each of 20 input triggers can play multiple sound files in the corresponding folders in random order. The traditional 'one-on-one' triggering control mode is that each of the 20 input triggers can only activate a single corresponding sound file.

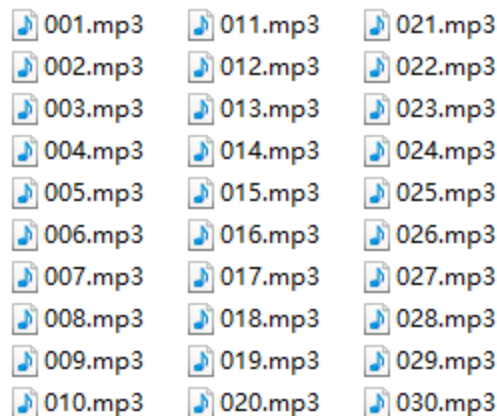
Both of these two triggering control modes can't co-exist. Users can only choose one type to use. See more details as below on how to use both of them.

3.1. 'One-on-one' folder triggering control (for random playback of the sound files in the associated folder)

The SD/USB memory devices that will contain the audio files must be formatted to FAT32 before loading files and folders. After formatting is complete, build 20 folders and rename them from "01" to "20" in the root directory of SD card or USB flash drive as below. The input "K1" associates with folder "01", the input "K2" associates with folder "02"..... the input "K20" associates with folder "20".



Put the sound files in each folder, which can contain maximum 255 sound files. Each folder must contain all Mp3 **OR** Wav audio files. Mp3 and Wav cannot co-exist within each folder. Rename them “001.mp3/wav” to “255.mp3/wav” as shown below. For the quickest timely response once triggered; we suggest that no more than 100 sound files in each folder.



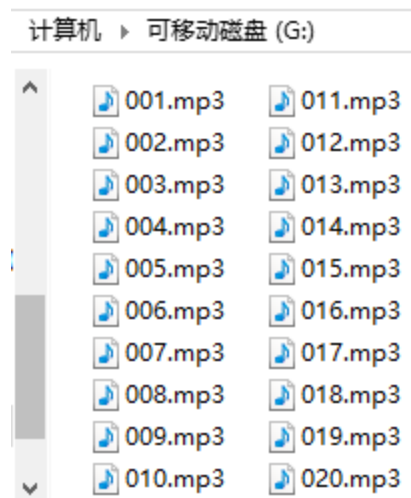
After everything is done as above, remove the SD card or USB flash drive from computer and insert it in to the board. Power it on and push any of the 20 buttons to play a sound randomly in the associated folder. For example, by pushing the button associated with input “K7”. It will randomly play a sound file from the associated folder “07” and stop; push it again, it will randomly play another sound file from the associated folder “07” and stop, etc.

Note: When both the SD card and USB drive is plugged/inserted into the sound board. Only audio files from the SD card will be played.

3.2. 'One-on-one' sound file triggering control (for direct playback of the associated sound file)

The 20 sound files need to be directly stored in the root directory of the SD card or USB flash drive being used. No other folders can be in the 'root directory'. The arrangements of the sound files are managed by a physical indexing sequence. In other words, the file that is to be loaded first in the storage device will be associated with input "K1". The last file to be loaded in the storage device will be associated with input "K20". In order to guarantee a correct 'one-on-one' order, please refer to the following steps.

- 1) Build a new folder on the computer and put 20 sound files in this new folder.
- 2) Rename the audio files from 001.mp3/wav to "020.mp3/wav", and make sure they are ranked from "001.mp3/wav" to "020.mp3/wav" in order.
- 3) Plug in your SD card or USB flash drive on computer (make sure it is empty).
- 4) Format SD card or USB drive into 'FAT32'.
- 5) Select all the sound files in the folder.
- 6) Right click on the first file (001.mp3/wav) and choose "Send to removable disk".
- 7) This should send the 20 sound files to the SD card or USB flash drive in a correct sequence as below.



- 8) Once the files transfer is complete, safely remove the SD card or USB flash drive from computer and insert it onto the sound board.
- 9) Apply power to the sound board and push any of 20 buttons to play a corresponding sound.
- 10) For example, push button "K1", it will play the sound file "001.m p3/wav" and stop; push button "K7", it will play the sound file "007.mp3 /wav" and stop, etc.

3.3. Triggering Mode Selection

By using the on-board DIP switches, users have 4 triggering modes to choose from:

- Pulse interruptible
- Level hold
- Pulse Uninterruptible
- Play/Pause

The DIP switches are placed in the center of circuit board and a truth table for the DIP switch is a printed on the circuit board just right of the DIP switches. The truth table is also shown below.

| DIP Switch Status | | Triggering Mode |
|-------------------|------|-----------------------|
| No.1 | No.2 | |
| OFF | OFF | Pulse Interruptible |
| ON | OFF | Level Hold |
| OFF | ON | Pulse Uninterruptible |
| ON | ON | Play/Pause |

- Pulse interruptible: In this mode, a single negative pulse will start and stop playback. *It is possible to interrupt the playback by pressing the **same** button used to activate it. Once playback is stopped, pressing the button again will restart the sound file. (If more than one audio file is in the folder. The next audio file to be played will be picked/chosen at random.)*
- Level hold: In this mode, the negative pulse must be held/maintained to the sound board trigger for audio file to complete. *The audio file will **only** playback while button, or negative pulse, is held/maintained during playback. Once the button being held, or negative pulse, is removed, the playback will be stopped/cancelled. (If more than one audio file is in the folder. The next audio file to be play will be picked/chosen at random. Regardless if the last/previous audio file was completed.)*
- Pulse Uninterruptible: In this mode, it's not possible to interrupt the playback. *Once an audio file is triggered. The audio file will **not** be able to be stopped/cancelled during playback. The playback will only end when the audio file has played in its entirety. (If more than one audio file is in the folder. The next audio file to be play will be picked/chosen at random.)*
- Play/Pause: In this mode, a single negative pulse will start and pause the playback. *Once an audio file is triggered. Pushing the **same** button, or reapplying a negative pulse, that triggered the playback, will pause playback; pushing the **same** button, or reapplying a negative pulse, will to continue the original audio file playback.*

Note: The factory default triggering mode is "pulse interruptible". After you shift to another triggering mode, you need to power cycle the board on-off-on, then the new DIP switch setting will be executed.

4. Serial Control Mode

Supports RS232 and RS485 serial control modes. Both of these two control modes share the same communication protocols as below. Regarding RS485, we employed half-duplex communication standard.

4.1. Command Format

- Communication baud rate: 9600 bps
- Data bits: 1
- Checkout: none
- Flow Control: none

| Format: \$S / Ver. / Number / Command / Feedback / Param_MSB / Param_LSB / Check_MSB / Check_LSB / \$O | |
|--|--|
| \$S | Start byte 0x7E |
| Ver. | Version byte, 0xFF by default |
| Number | Number of bytes from version info to Check_LSB, typically 0x06 (checks um not counted) |
| Command | Command byte |
| Feedback | 0x01: Need feedback --send confirmation back to MCU; 0x00: No need feedback |
| Param_MSB | Most significant byte of parameter |
| Param_LSB | Least significant byte of parameter |
| Check_MSB | Most significant byte of checksum |
| Check_LSB | Least significant byte of checksum |
| \$O | End byte 0xEF |

For example, if we specify playback of SD card, we need to send the command "7E FF 06 09 00 00 02 FF F0 EF". The number is 6 bytes, and these 6 bytes are "FF 06 09 00 00 02". Start byte, end byte and checksum are not counted.

4.2. About Checksum

Regarding to calculating checksum, set your 16 bit checks um value to 0. For each byte from the Version byte until the Param_LSB byte, subtract the byte from the checksum.

Normally it's okay whether users choose to use checksum or not, our module can receive serial data with or without checksum, but some of users may use a MCU without crystal oscillator, so if so we strongly suggest users to add checksum to make sure the communication stability.

4.3. Serial Communication Commands

4.3.1 Control commands

| Command | Function | Remarks |
|---------|--|-------------------------|
| 0 x01 | Play Next | |
| 0 x02 | Play Previous | |
| 0 x03 | Specify playback of a track | See 4.5.1 for details |
| 0 x04 | Increase volume | |
| 0 x05 | Decrease volume | |
| 0 x06 | Specify volume | See 4.5.2 for details |
| 0 x07 | N/A (reserved) | |
| 0 x08 | Specify single repeat playback | See 4.5.3 for details |
| 0 x09 | Specify playback of a device | See 4.5.4 for details |
| 0 x0 A | Set sleep mode | See 4.5.5 for details |
| 0 x0B | Awake from sleep | |
| 0 x0C | Reset | |
| 0 x0D | Play | |
| 0 x0E | Pause | |
| 0 x0 F | Specify playback of a track in a folder | See 4.5.6 for details |
| 0 x13 | Inter-cut an advertisement | See 4.5.7 for details |
| 0 x14 | N/A (reserved) | |
| 0 x15 | Stop playing inter-cut advertisement | See 4.5.8 for details |
| 0 x16 | Stop | |
| 0 x17 | Specify repeat playback of a folder | See 4.5.9 for details |
| 0 x18 | Set random playback | See 4.5.10 for de tails |
| 0 x19 | Set repeat playback of current track | See 4.5.11 for de tails |
| 0 x21 | Combination playback (playback of a group) | See 4.5.13 for de tails |
| 0 x22 | Specify playback of a track with a specific volume level | See 4.5.14 for de tails |

4.3.2 Examples of sending control commands

| Command Description | Serial Commands [with checksum] | Serial Commands [without checksum] | Notes |
|---|---------------------------------|------------------------------------|--|
| Play Next | 7E FF 06 01 00 00 00 FE FA EF | 7E FF 06 01 00 00 00 EF | |
| Play Previous | 7E FF 06 02 00 00 00 FE F9 EF | 7E FF 06 02 00 00 00 EF | |
| Specify playback of a track (under the root directory) | 7E FF 06 03 00 00 01 FE F7 EF | 7E FF 06 03 00 00 01 EF | Specify playback of the 1st track |
| | 7E FF 06 03 00 00 02 FE F6 EF | 7E FF 06 03 00 00 02 EF | Specify playback of the 2nd track |
| | 7E FF 06 03 00 00 0A FE EE EF | 7E FF 06 03 00 00 0A EF | Specify playback of the 10th track |
| Increase volume | 7E FF 06 04 00 00 00 FE F7 EF | 7E FF 06 04 00 00 00 EF | |
| Decrease volume | 7E FF 06 05 00 00 00 FE F6 EF | 7E FF 06 05 00 00 00 EF | |
| Specify volume | 7E FF 06 06 00 00 1E FE D7 EF | 7E FF 06 06 00 00 1E EF | Specified volume is level 30 |
| Specify single repeat playback (under the root directory) | 7E FF 06 08 00 00 01 FE F2 EF | 7E FF 06 08 00 00 01 EF | Repeatedly play the 1st track |
| | 7E FF 06 08 00 00 02 FE F1 EF | 7E FF 06 08 00 00 02 EF | Repeatedly play the 2nd track |
| | 7E FF 06 08 00 00 0A FE E9 EF | 7E FF 06 08 00 00 0A EF | Repeatedly play the 10th track |
| Specify playback of a device | 7E FF 06 09 00 00 01 FE F1 EF | 7E FF 06 09 00 00 01 EF | Specified device is USB flash disk |
| | 7E FF 06 09 00 00 02 FE F0 EF | 7E FF 06 09 00 00 02 EF | Specified device is SD card |
| Set sleep mode | 7E FF 06 0A 00 00 00 FE F1 EF | 7E FF 06 0A 00 00 00 EF | |
| Awake from sleep | 7E FF 06 0B 0 0 0 0 00 FE F0 EF | 7E FF 06 0B 0 0 0 0 00 EF | |
| Reset | 7E FF 06 0C 00 00 00 FE EF EF | 7E FF 06 0C 00 00 00 EF | |
| Play | 7E FF 06 0D 00 00 00 FE EE EF | 7E FF 06 0D 00 00 00 EF | |
| Pause | 7E FF 06 0E 0 0 0 0 00 FE ED EF | 7E FF 06 0E 0 0 0 0 00 EF | |
| Specify playback of a track in a folder | 7E FF 06 0F 00 01 01 FE EA EF | 7E FF 06 0F 00 01 01 EF | Specify track "001" in the folder "01" |
| | 7E FF 06 0F 00 01 02 FE E9 EF | 7E FF 06 0F 00 01 02 EF | Specify track "002" in the folder "01" |
| Inter-cut an advertisement | 7E FF 06 13 00 00 01 FE E7 EF | 7E FF 06 13 00 00 01 EF | Inter-cut track "0001" in the folder "ADVERT" |
| | 7E FF 06 13 00 00 02 FE E6 EF | 7E FF 06 13 00 00 02 EF | Inter-cut track "0002" in the folder "ADVERT" |
| | 7E FF 06 13 00 00 FF FD E9 EF | 7E FF 06 13 00 00 FF EF | Inter-cut track "0255" in the folder "ADVERT" |
| Stop playing inter-cut advertisement | 7E FF 06 15 00 00 00 FE E6 EF | 7E FF 06 15 00 00 00 EF | Go back and continue to play the music interrupted |
| Stop | 7E FF 06 16 00 00 00 FE E5 EF | 7E FF 06 16 00 00 00 EF | Stop all playback tasks |
| Specify repeat playback of a folder | 7E FF 06 17 00 02 00 FE E2 EF | 7E FF 06 17 00 02 00 EF | Specify repeat playback of the folder "02" |
| | 7E FF 06 17 00 01 00 FE E3 EF | 7E FF 06 17 00 01 00 EF | Specify repeat playback of the folder "01" |
| Set random playback | 7E FF 06 18 00 00 00 FE E3 EF | 7E FF 06 18 00 00 00 EF | Random playback of the whole device |

4.3.2 Examples of sending control commands (Continued)

| Command Description | Serial Commands [with c heck sum] | Serial Commands [without c heck sum] | Notes |
|--|--------------------------------------|---|-------------------------------------|
| Set repeat playback of current track | 7E FF 06 19 00 00 00 FE E2 EF | 7E FF 06 19 00 00 00 EF | Turn on single repeat playback |
| | 7E FF 06 19 00 00 01 FE E1 EF | 7E FF 06 19 00 00 01 EF | Turn off single repeat playback |
| Specify playback of a track with a specific volume level | 7E FF 06 22 00 1 E 01 FE B A EF | 7E FF 06 22 00 1 E 01 EF | Play 1st track with volume level 30 |
| | 7E FF 06 22 00 0 F 02 FE C8 EF | 7E FF 06 22 00 0 F 02 EF | Play 2nd track with volume level 15 |

4.3.3 Query commands

| Command | Function | Rem arks |
|---------|--|-----------------------|
| 0 x3F | Query current online storage device | See 4.6.1 for details |
| 0 x40 | Module returns an error data with this command | |
| 0 x41 | Module reports a feedback with this command | |
| 0 x42 | Query current status | See 4.6.2 for details |
| 0 x43 | Query current volume | |
| 0 x44 | N/A (Reserved) | |
| 0 x45 | N/A (Reserved) | |
| 0 x46 | N/A (Reserved) | |
| 0 x47 | Query total track numbers in USB flash disk | |
| 0 x48 | Query total track numbers in SD Card | |
| 0 x4B | Query current track in USB flash disk | by physical sequence |
| 0 x4C | Query current track in SD Card | by physical sequence |
| 0 x4E | Query total track numbers in a folder | See 4.6.3 for details |
| 0 x4F | Query total folder numbers in the storage device | See 4.6.4 for details |

4.3.4 Examples of sending query commands

| Command Description | Serial Commands [with c heck sum] | Serial Commands [without c heck sum] | Notes |
|--|--|---|--------------------------------------|
| Query current online storage device | 7E FF 06 3F 00 00 00 FE BC EF | 7E FF 06 3F 00 00 00 EF | |
| Query current status | 7E FF 06 42 00 00 00 FE B9 EF | 7E FF 06 42 00 00 00 EF | |
| Query current volume | 7E FF 06 43 00 00 00 FE B8 EF | 7E FF 06 43 00 00 00 EF | |
| Query total track numbers in USB flash disk | 7E FF 06 47 00 00 00 FE B4 EF | 7E FF 06 47 00 00 00 EF | Total file numbers of current device |
| Query total track numbers in SD card | 7E FF 06 48 00 00 00 FE B3 EF | 7E FF 06 48 00 00 00 EF | Total file numbers of current device |
| Query current track in USB flash disk | 7E FF 06 4B 00 00 00 FE B0 EF | 7E FF 06 4B 00 00 00 EF | Query the track being |
| Query current track in SD card | 7E FF 06 4C 00 00 00 FE AF EF | 7E FF 06 4C 00 00 00 EF | Query the track being played |
| Query total track numbers in a folder | 7E FF 06 4E 00 00 01 FE AC EF | 7E FF 06 4E 00 01 00 EF | |
| Query total folder numbers in current storage device | 7E FF 06 4F 00 00 00 FE AC EF | 7E FF 06 4F 00 00 00 EF | SD card or USB flash disk |

4.4. Returned Data from Module

4.4.1 Returned data after the module is powered on

- 1) After the module is powered on, normally it needs about no more than 500ms to 1500ms (depending on the actual track quantities in the storage device) initialization time. Once the initialization is done, the module returns a data to MCU. If it does not return a data after more than the initialization time, it means there is an error for initialization, and please check the hardware connections.
- 2) The returned data from module after initialization means the current effective storage device /online equipment. For example, the module returns 7E FF 06 3F 00 00 03 xx xx EF. 0x3F is the returned command by module, and 0x03 represents USB flash and SD card are effective online at the same time. See the details as below.

| Online Equipment | Returned Data |
|------------------------------|-------------------------------|
| USB flash online | 7E FF 06 3F 00 00 01 xx xx EF |
| SD card online | 7E FF 06 3F 00 00 02 xx xx EF |
| PC online | 7E FF 06 3F 00 00 04 xx xx EF |
| USB flash and SD card online | 7E FF 06 3F 00 00 03 xx xx EF |

- 3) MCU cannot send commands to control the module until the initialization of the module is done and a data is returned, otherwise the commands sent by MCU will be ignored and also this will effect initializing of the module.

4.4.2 Returned data after a track is finished playing

| Track Played | Returned Data |
|--|-------------------------------|
| 1 st track is finished playing in USB flash | 7E FF 06 3C 00 00 01 xx xx EF |
| 2 nd track is finished playing in USB flash | 7E FF 06 3C 00 00 02 xx xx EF |
| 1 st track is finished playing in SD card | 7E FF 06 3D 00 00 01 xx EF |
| 2 nd track is finished playing in SD card | 7E FF 06 3D 00 00 02 xx xx EF |

- 1) There is a returned data after a track is finished playing. For example, the returned data is 7E FF 06 3C 00 00 01 xx xx EF. 0x3C represents USB flash and 0x3D represents SD card. 0x00 and 0x01 represents the 1st track. 0x01 and 0xF4 represents the 500th track (0x01F4=500).
- 2) Because all of the files (tracks) in the storage device are read in physical sequence, the returned data still follow the physical sequence, which needs to be noted.

4.4.3 Returned data of feedback from module

| | |
|--------------------|-------------------------------|
| Module returns ACK | 7E FF 06 41 00 00 00 xx xx EF |
|--------------------|-------------------------------|

- 1) In order to enhance stability between data communication, the function of a feedback from module is added. Once there is a feedback to MCU from the module, it means the module has successfully received the command that MCU sent out. 0x41 is the returned command by module.
- 2) Users are free to choose this feedback or not. It's also fine not to choose this function.

4.4.4 Returned data of errors

| Returned Data of Errors | Meaning Description |
|-------------------------------|---|
| 7E FF 06 40 00 00 01 xx xx EF | Module busy (this info is returned when the initialization is not done) |
| 7E FF 06 40 00 00 02 xx xx EF | Currently sleep mode (supports only specified device in sleep mode) |
| 7E FF 06 40 00 00 03 xx xx EF | Serial receiving error (a frame has not been received completely yet) |
| 7E FF 06 40 00 00 04 xx xx EF | Checksum incorrect |
| 7E FF 06 40 00 00 05 xx xx EF | Specified track is out of current track scope |
| 7E FF 06 40 00 00 06 xx xx EF | Specified track is not found |
| 7E FF 06 40 00 00 07 xx xx EF | Inter-cut error (an inter-cut operation only can be done when a track is being played) |
| 7E FF 06 40 00 00 08 xx xx EF | SD card reading failed (SD card pulled out or damaged) |
| 7E FF 06 40 00 00 0A xx xx EF | Entered in to sleep mode |

When the module is powered on, it reads SD card first and if SD card is not available it goes to USB flash drive.

4.4.5 Returned data after a storage device is plugged in or pull out

| Stat us | Re turned Da ta |
|---|-------------------------------|
| USB flash is plugged in | 7E FF 06 3A 00 00 01 xx xx EF |
| SD card is plugged in | 7E FF 06 3A 00 00 02 xx xx EF |
| USB cable connected to PC is plugged in | 7E FF 06 3A 00 00 04 xx xx EF |
| USB flash is pulled out | 7E FF 06 3B 00 00 01 xx xx EF |
| SD card is pulled out | 7E FF 06 3B 00 00 02 xx xx EF |
| USB cable connected to PC is pulled out | 7E FF 06 3B 00 00 04 xx xx EF |

0x3A represents a device is plugged in while 0x3B represents a device is pull out. 0x01, 0x02, 0x04 represent USB flash, SD card and USB cable connected to PC respectively.

4.5. Detailed Annotation of Control Commands

4.5.1 Specify playback of a track (under the root directory of the storage device)

The available selectable tracks are from 1st to 3000th under the root directory of the storage device. Actually it can support more, but if we make it support more, the operation speed will become slow. Usually most of applications do not need to support much more files. Normally if the total track quantity is under 1,000 in the storage device the response speed of the module is quicker than 50ms. If the total track quantity is more than 1000 the response speed is a little slower than 100ms.

- 1) For example, if set the first track to be played, send the command 7E FF 06 03 00 00 01 FE F7 EF
 - 7E --- Start byte
 - FF --- Version Information
 - 06 --- Number of bytes
 - 03 --- Actual command (specify playback of a track)
 - 00 --- 0 x01 : need feedback ; 0 x00 : no need feedback
 - 00 --- Most significant byte of the track (MSB of Parameter)
 - 01 --- Least significant byte of the track (LSB of Parameter) FE --- Most significant byte of checksum (MSB of checksum) F7 --- Least significant byte of checksum (LSB of checksum) EF --- End byte 0xEF
- 2) Regarding track selection, if the 100th song (track) is selected to be played, firstly convert 100 to hexadecimal. It is double-byte by default, i.e. 0 x0064. MS B=0 x00 ; LS B=0 x64

4.5.2 Specify volume

- 1) Our system power-on default volume is level 30, if you want to set the volume, then directly send the corresponding command.
- 2) For example, if specify the volume to level 15, send the command 7E FF 06 06 00 00 0F FF D5 EF.
- 3) MSB=0x00; LSB=0x0F, 15 is converted to hexadecimal 0x000F.

4.5.3 Specify single repeat playback (under the root directory of the storage device)

| | |
|---------------------------------------|-------------------------------|
| Repeatedly play 1 st track | 7E FF 06 08 00 00 01 xx xx EF |
| Repeatedly play 2 nd track | 7E FF 06 08 00 00 02 xx xx EF |
| Repeatedly play 3 rd track | 7E FF 06 08 00 00 03 xx xx EF |

During single repeat playback, you can still normally execute the operations Play/Pause, Previous, Next, Volume +/- and repeat playback. Users can specify single track playback or send the stop command to turn off single repeat playback status.

4.5.4 Specify playback of a device

| | |
|-------------------------------|-------------------------------|
| Specify playback of USB flash | 7E FF 06 09 00 00 01 FE F1 EF |
| Specify playback of SD card | 7E FF 06 09 00 00 02 FE F0 EF |

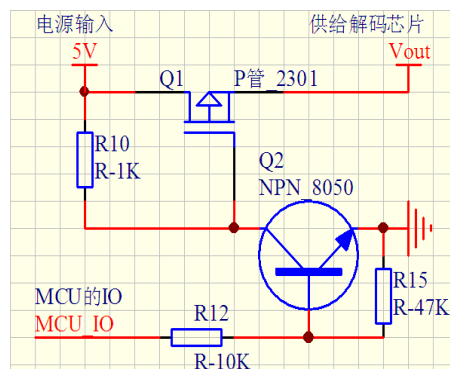
- 1) The module supports two types of playback devices (USB flash and SD card). The device must be on-line so it can be specified playback. It automatically detects if a device is on-line or not.
- 2) It automatically enters into the standby status after specifying a device, waiting MCU to specify a track to play. It takes about 200ms from specifying device to the module finishes initialization of file system. Please wait for 200ms and then send the specified command to play a track.

4.5.5 Set sleep mode, awake from sleep and reset

| | |
|------------------|--------------------------------|
| Set sleep mode | 7E FF 06 0A 00 00 00 FE F1 EF |
| Awake from sleep | 7E FF 06 0B 00 0 0 00 FE F0 EF |
| Reset | 7E FF 06 0C 00 00 00 FE EF EF |

- 1) After set the module enter into sleep mode, there is also other two ways other than sending the command to awake the module.
 - a. Specify playback of the storage device, either USB flash or SD card.
 - b. Pull out the storage device and re-plug it in.
- 2) The reset is a soft reset. The reset time is 5-8 seconds. This allows the reset command under any status.

Note: When the module enters into the sleep mode, the standby power consumption is about 10mA. If users are very strict to the power consumption, you can use a MOS and a transistor to control power supply of the module. It is possible to cut off the power supply completely when standby is not necessary. Please refer to the schematic as below.



4.5.6 Specify playback of a track in a folder

| | |
|--|-------------------------------|
| Specify playback of track 001 in the folder 01 | 7E FF 06 0F 00 01 01 xx xx EF |
| Specify playback of track 100 in the folder 11 | 7E FF 06 0F 00 0B 64 xx xx EF |
| Specify playback of track 255 in the folder 99 | 7E FF 06 0F 00 63 FF xx xx EF |

- The default folders are named as "01", "11", and "99" in this way. In order to be with better system stability, it is made to support maximum 99 folders and maximum 255 tracks in each folder. For example:
 - If specify to play "100.m p3" in the folder "01", send the command 7E FF 06 0F 00 01 64 xx EF MSB: represents the name of the folder, maximum supports 99 folders from 01 - 99. LSB: represents the track, maximum supports 255 tracks from 0x01 to 0xFF
 - You must specify both the folder and the file name to target a track. This feature supports MP3 and WAV audio formats.
 - The following two images illustrate naming method of folders and files.



4.5.7 Inter-cut an advertisement

| | |
|---|-------------------------------|
| Inter-cut track "0001" in the folder "ADVERT" | 7E FF 06 13 00 00 01 FE E7 EF |
| Inter-cut track "0002" in the folder "ADVERT" | 7E FF 06 13 00 00 02 FE E6 EF |
| Inter-cut track "0255" in the folder "ADVERT" | 7E FF 06 13 00 00 FF FD E9 EF |
| Inter-cut track "1999" in the folder "ADVERT" | 7E FF 06 13 00 07 CF FE 12 EF |
| Inter-cut track "3000" in the folder "ADVERT" | 7E FF 06 13 00 0B B8 FE 25 EF |

- This module supports inter-cut advertisements during playback of a track, so that it can meet some special needs for some applications.
- After sending the command 0x13, the system will save the ID V3 information of the track being played and pause, and then it will play the specified inter-cut track (advertisement). When the inter-cut track is finished, the system will go back and continue to play the track that was interrupted until to the end.
- The setting method is build a folder named "ADVERT" in the storage device and put the tracks (ads) you need in the folder and name the files as "0001 .mp3/wav", "0002.mp3/wav".
- If you send an inter-cut command when the module is at Pause status or Stop status, it will not work and there will be returned error information. In the course of an inter-cut, you can continue to intercut the other tracks (ads). When the last inter-cut track goes to the end, the systems till goes back to the ID V3 position saved at the first time.

4.5.8 Stop

| | |
|--------------------------------------|-------------------------------|
| Stop playing inter-cut advertisement | 7E FF 06 15 00 00 00 FE E6 EF |
| Stop | 7E FF 06 16 00 00 00 FE E5 EF |

During playback of the module, there are two modes to stop. One is to stop playing the inter-cut advertisement, and go back and continue to play the music interrupted and the other mode is to stop all playback (stop decoding). For example, suppose the module is playing an inter-cut advertisement and now if send a stop command 0x16, it will stop all playback tasks.

4.5.9 Specify repeat playback of a folder

| | |
|--|--------------------------------|
| Specify repeat playback of the folder "02" | 7E FF 06 17 00 00 02 FE E2 E F |
| Specify re pea t playback of the folder "01" | 7E FF 06 17 00 00 01 FE E3 E F |

The folder names must be 01 - 99, and no more than 99. After sending the command, it repeatedly plays the tracks in the specific folder and it will not stop until it receives a command to stop.

4.5.10 Set random playback

| | |
|--|-------------------------------|
| Random playback of the whole s to rage de vice | 7E FF 06 18 00 00 00 FE E3 EF |
|--|-------------------------------|

This command is used to randomly play all of the tracks in the storage device according to physical sequence and no matter if there is a folder or not in the device.

4.5.11 Set repeat playback of current track

| | |
|---------------------------------|-------------------------------|
| Turn on single repeat playback | 7E FF 06 19 00 00 00 FE E2 EF |
| Turn off single repeat playback | 7E FF 06 19 00 00 01 FE E1 EF |

During playback, send the turn-on command, and it will repeatedly play the current track. If the module is at Pause or Stop status, it will not respond to this command. If you need to turn off repeat playback, just send the turn-off command.

4.5.13 Combination playback (playback of a group)

- 1) We added this function to meet some users' special need that when users need to send only one frame data to play multiple tracks one by one without pause. It supports maximum 15 tracks together for combination playback. All of the sound files used for combination playback need to be put in folders (folder 01 -folder 99).
- 2) If MCU sends a frame data as **7E FF 15 21 01 0201 0301 0401 0501 0602 0103 0504 0705 09 EF**, see the analysis as below.
 - Command: 0x21
 - Number of bytes : 0x15=21 bytes - - **FF 15 2 1 01 0201 0301 0401 0501 0602 0103 0504 0705 09**(two parameters for one track, i.e. the folder number and the track number)
 - The module will play track 002 in folder 01, track 003 in folder 01, track 004 in folder 01, track 005 in folder 01, track 006 in folder 01, track 001 in folder 02, track 005 in folder 03, track 007 in folder 04 , and track 009 in folder 05 .

- 3) During combination playback, it is allowed to Play/Pause and set volume, but not allowed to set previous and next. If need stop, just direct send the Stop command. And it is not allowed to play another group of combination during it is working. Users need to send the stop command to stop the current combination playback before start another group of combination playback.
- 4) If a track specified to be played in combination is not in the folder, it will stop playing at this track position, so please make sure the track specified to play must be available in the folder.
- 5) If users are very strict to the combination playback, please edit the sound sources with some audio edit software like Adobe Audition or GoldWave to cut off the silence at the beginning and end of the sound file.

4.5.14 Specify playback of a track with a specific volume level (under the root directory)

| | |
|---|-------------------------------|
| Play 1 st track at volume level 30 | 7E FF 06 22 00 1E 01 FE BA EF |
| Play 2 nd track at volume level 15 | 7E FF 06 22 00 0F 02 FE C8 EF |

- 1) This function is added to meet some users' needs to play a track at a specific volume level with one command only, but this only can be executed for the tracks under the root directory of the storage device. The command is 0x22.
- 2) For normal operations, users still need to send the volume command first and then specify playback of a track with the corresponding command like most of MP3 players.

4.6. Detailed Annotation of Query Commands

4.6.1 Query current online storage device

| | |
|-------------------------------------|-------------------------------|
| Query current online storage device | 7E FF 06 3F 00 00 00 FE BC EF |
|-------------------------------------|-------------------------------|

When the module is working, users can use the command as above (0x3F) to query the status of the online storage devices. For example, if the module returns the data 7E FF 06 3F 00 00 0A xx xx EF, LSB 0x0A (0000 1010) represents SD card online. If LSB is 0x1F (0000 1111), it represents all of USB flash, SD card and PC online (PC online means module is connecting with PC via a USB cable).

4.6.2 Query current status

| | |
|-------------------------------------|-------------------------------|
| Query current online storage device | 7E FF 06 42 00 00 00 FE B9 EF |
|-------------------------------------|-------------------------------|

- 1) There are 4 status (playing, paused playing, stopped playing and in sleep) that can be queried during the module is decoding. Users can query the current status via sending the command as above (0 x42).

2) Interpretation of returned data

| Returned Data | Status |
|-------------------------------|------------------------------|
| 7E FF 06 42 00 01 01 xx xx EF | USB flash is being played |
| 7E FF 06 42 00 02 02 xx xx EF | SD card is paused playing |
| 7E FF 06 42 00 01 00 xx xx EF | USB flash is stopped playing |
| 7E FF 06 42 00 10 00 xx xx EF | Module in sleep |

3) MSB and LSB Representations

| MSB Representation | | LSB Representation | |
|--------------------|----------------------|--------------------|---------|
| 0x01 | USB flash | 0x00 | Stopped |
| 0x02 | SD card | 0x01 | Playing |
| 0x10 | Module in sleep mode | 0x02 | Paused |

4.6.3 Query total track numbers in a folder

| | |
|--|-------------------------------|
| Query total track numbers in folder 01 | 7E FF 06 4E 00 00 01 FE AC EF |
| Query total track numbers in folder 11 | 7E FF 06 4E 00 00 0B FE A2 EF |

If the folder queried is empty without any files, the module will report an error and the data 7E FF 06 40 00 00 06 FE B5 EF will be returned.

4.6.4 Query total folder numbers in current storage device

| | |
|--|--------------------------------|
| Query total folder numbers in current storage device | 7E FF 06 4 F 00 00 00 FE AC EF |
|--|--------------------------------|

Users can query the total folder numbers of the current storage device through sending the command above. This just supports to query the folder numbers under the root directory of the device. Not possible to query the sub-folder numbers (Please do not build any sub-folders under a folder).

4.7. About Delay of Serial Programming

- 1) After the module is powered on, it needs about 500ms to 1500ms (depending on the track quantities in the storage device) to initialize. After that, some data related to initialization returns to MCU. Users can choose to ignore these data.
- 2) After specifying playback of a device (SD card or USB flash), it needs 200ms delay before sending the command to execute the relative operation.
- 3) The module processes a serial data per 10ms, so when MCU continuously sends commands one by one, 20ms delay must be added before sending next command, otherwise the command MCU sends out will not be executed.
- 4) If specifying playback of a track in a folder, the delay must be longer than 40ms, as it needs time to target a track in a folder. And even so song as sending the commands related to query a track or a folder, 40ms delay is required.