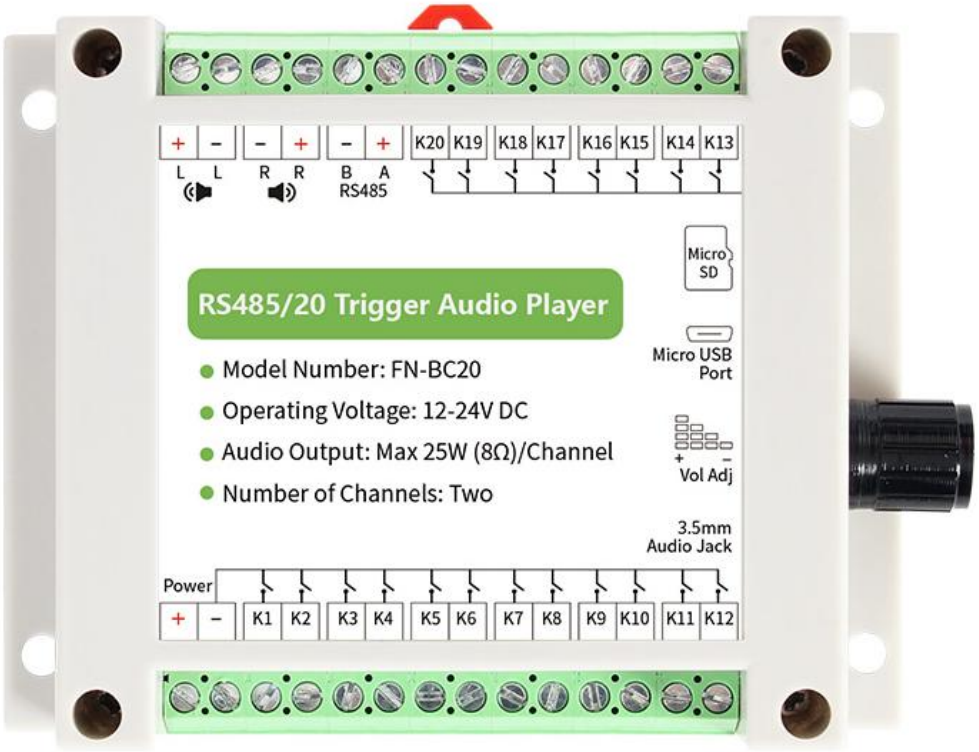
RS485 / 20 Trigger Audio Player

User's Manual

Model: FN-BC20

V2.0



1. Overviews

1.1. Brief Introduction

FN-BC20 is a high quality audio player developed by Flyron Technology Co., Ltd. Equipped with an on-board 25Wx2 class D amplifier, the audio player can directly drive 2 pieces of 10-25W loudspeakers. And it can be controlled by RS485 mode or 20 separate buttons hooked up to the one-on-one inputs terminals. 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). Equipped with a high quality 25Wx2 class D amplifier to directly connect with two 8 ohm speakers of 10-25 Watts, for left channel and right channel.
4). Built-in 16MB SPI flash memory and supports max. 32GB micro SD card.
5). Supports RS485 serial mode and button control mode.
6). 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.

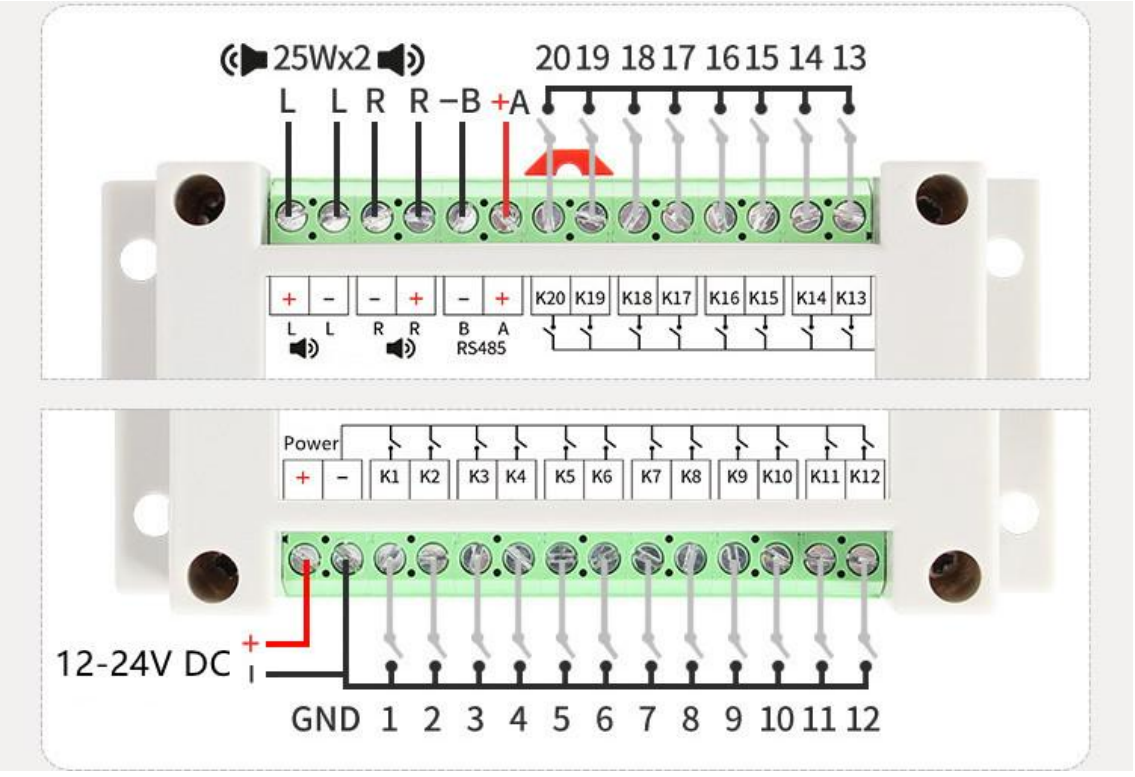
7). In button control mode, possible playback of 255 MP3/WAV audio files per 20 one-on-one associated folders through negative trigger.
8). In button control mode, four select-able triggering modes are provided through a configuration file.
9). Supports audio output to an external amplifier through the 3.5mm female audio jack.
10). Separate volume control for each sound channel (only for on-board amplifier).
11). Wide range for power input DC (12V - 24V).
12). Industry-grade design and strong anti-jamming capability.
13). Size: 115 x 90 x 40mm.

1.3. Technical Parameters

1). Power input: 12V-24V DC
2). Rated output: 25W×2 (RL= 8 Ω d =1%)
3). Noise Voltage: ≤50m V
4). Frequency response: 20-20KHz
5). SNR: ≥ 90dB
6). Audio format: MP3 (128Kbps is preferable) or WAV

2. Connections

The terminals A(+) and B(-) are used to connect with a RS485 controller, while K1 through K20 represent Normally Open (N.O.) manual buttons. Please refer to the connection example below.



Note: The built-in amplifier disconnects with speakers automatically, when the 3.5mm audio jack is connected to an external amplifier/active speaker.

3. RS485 Serial Control Mode

3.1. 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.

3.2. About Checksum

Regarding to calculating checksum, you can use the following formula to count.

Checksum (2 bytes) = 0xFFFF–(CMD + Feedback + Para_MSB + Para_LSB) + 1

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

3.3. Serial Commands

Command	Description	Serial Command [with checksum]	Serial Command [without checksum]	Note
0x01	Play Next	7E FF 06 01 00 00 00 FE FA EF	7E FF 06 01 00 00 00 EF	
0x02	Play Previous	7E FF 06 02 00 00 00 FE F9 EF	7E FF 06 02 00 00 00 EF	
0x03	Specify playback of a track in 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
0x04	Increase volume	7E FF 06 04 00 00 00 FE F7 EF	7E FF 06 04 00 00 00 EF	
0x05	Decrease volume	7E FF 06 05 00 00 00 FE F6 EF	7E FF 06 05 00 00 00 EF	
0x06	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

0x08	Specify single repeat playback in 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
0x09	Specify playback of a device	7E FF 06 09 00 00 02 FE F0 EF	7E FF 06 09 00 00 02 EF	Specified device is SD card
		7E FF 06 09 00 00 04 FE ED EF	7E FF 06 09 00 00 04 EF	Specified device is built-in SPI flash
0x0A	Set sleep mode	7E FF 06 0 A 00 00 00 FE F1 EF	7E FF 06 0 A 00 00 00 EF	
0X0B	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	
0x0C	Reset	7E FF 06 0C 00 00 00 FE EF EF	7E FF 06 0C 00 00 00 EF	
0x0D	Play	7E FF 06 0D 00 00 00 FE EE EF	7E FF 06 0D 00 00 00 EF	
0x0E	Pause	7E FF 06 0E 00 00 00 FE ED EF	7E FF 06 0E 00 00 00 EF	
0x0F	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”
0x11	Play all tracks in a loop	7E FF 06 11 00 00 01 FE E9 EF	7E FF 06 11 00 00 01 EF	Start playing all tracks in a loop
		7E FF 06 11 00 00 00 FE EA EF	7E FF 06 11 00 00 00 EF	Stop playing all tracks in a loop
0X13	Inter-cut an advertisement	7E FF 06 13 00 00 01 FE E7 E F	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”
0X15	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
0x16	Stop	7E FF 06 16 00 00 00 FE E5 EF	7E FF 06 16 00 00 00 EF	Stop all playback tasks
0x17	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”
0x18	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
0x19	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

3.4. Query Commands

Command	Description	Serial Command [with c heck sum]	Serial Command [without c heck sum]	Note
0x3F	Query current online storage device	7E FF 06 3F 00 00 00 FE BC EF	7E FF 06 3F 00 00 00 EF	
0x42	Query current status	7E FF 06 42 00 00 00 FE B9 EF	7E FF 06 42 00 00 00 EF	
0x43	Query current volume	7E FF 06 43 00 00 00 FE B8 EF	7E FF 06 43 00 00 00 EF	
0x48	Query number of tracks in the micro 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
0x49	Query number of tracks in the SPI flash	7E FF 06 49 00 00 00 FE B2 EF	7E FF 06 49 00 00 00 EF	Total file numbers of current device
0x4C	Query current track in the micro 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
0x4D	Query current track in the SPI flash	7E FF 06 4D 00 00 00 FE AE EF	7E FF 06 4D 00 00 00 EF	Query the track being played

0x4E	Query number of tracks in a folder	7E FF 06 4E 00 00 01 FE AC EF	7E FF 06 4E 00 01 00 EF	
0x4F	Query number of folders in the current storage device	7E FF 06 4F 00 00 00 FE AC EF	7E FF 06 4F 00 00 00 EF	

4. Button Control Mode

4.1. Trigger Mode Selection

In button control mode, there are 4 trigger modes available for users to choose according to the actual needs. Any of these 4 trigger modes can be set/acquired through a configuration file named “read.cfg”, which comes from a text file(.txt) originally. Users just need to fill in a digit/parameter that is corresponding to a trigger mode in a new built text file. Save it and rename it “read.cfg”, then put it together with the audio files/folders in the root directory of the built-in flash memory or the SD card.

Please refer to the sheet below about the digits and the associated trigger modes.

Digit in file “read.cfg”	Corresponding Trigger Mode
0	Pulse interruptible one-on-one playback
1	Level hold loop playback
2	Pulse non-interruptible one-on-one playback
3	Standard MP3 key mode playback

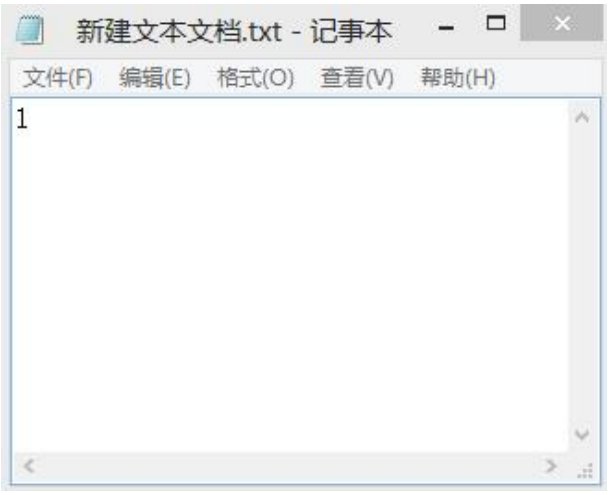
- Pulse interruptible one-on-one playback: In this mode, a single negative pulse will start playback. It is possible to interrupt the playback by pressing the same button used to activate. Once playback is interrupted, it will automatically restart the audio file immediately. It’s also possible to interrupt the play back by pressing any of the other 9 buttons. Once playback is interrupted, it will automatically start the sound that is associated with the button pressed.

- Level hold loop playback: In this mode, the negative pulse must be held/maintained to the sound module trigger for audio file to complete. The audio file will only play back while button, or negative pulse, is held/maintained. Once the button being held, or negative pulse, is removed, the playback will be stopped/ canceled. Once the button is kept holding, when the playback of the audio file is finished, it will start to play it repeatedly(loop playback).

- Pulse non-interruptible one-on-one playback: In this mode, a single negative pulse will start playback. It's not possible to interrupt the playback by pressing the same button or the other buttons. Once an audio file is triggered, the audio file will not be able to be interrupted/canceled during playback. The playback will only end when the audio file has played its entirety.

- Standard MP3 key mode playback: In this mode, only the buttons between K1 and K4 are valid. These 4 buttons will be functioned as Previous, Next, Play/pause, and Stop respectively. In this case not like the other 3 trigger modes above, more than 20 audio files can be placed.

For example, if the trigger mode of level hold loop playback is needed, firstly build a new text file on the computer, and simply enter the digit “1” as below, and save the file.



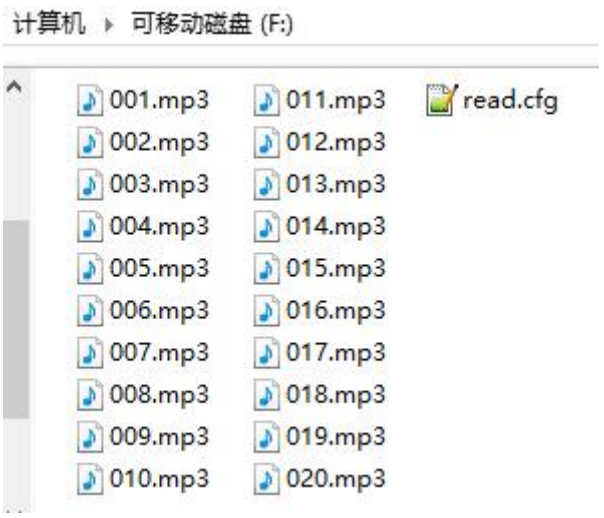
And change the file name “xxx.txt” to “read.cfg” as below, then the configuration file with level hold loop playback mode is made successfully. Please be noted the extension name”.txt” of the text file must be changed to “.cfg”, otherwise the configuration will not work.

Note: The factory default triggering mode is “pulse interruptible", so it’s also workable even though you don’t put the configuration file for “pulse interruptible".

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 built-in flash memory or SD card 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 the 20 audio files in this new folder.
2). Rename the audio files from 001.mp3 to “020.mp3”, and make sure they are ranked from “001.mp3 to “020.mp3” in order.
3). Connect the module to computer through a USB data cable.
4). Delete the pre-loaded audio files for tested purpose at factory, or empty the micro SD card if it has other files inside.
5). Go back to the folder and select all of the 20 audio files in the folder.
6). Right click on the first file (001.mp3) and choose "Send to removable disk" or “Send to USB flash drive”.
7). This will send the 20 audio files to the on-board flash memory or micro SD card one by one in a correct sequence.
8). Move the prepared config file with the trigger mode needed onto the root directory together with the audio files as below then refresh.

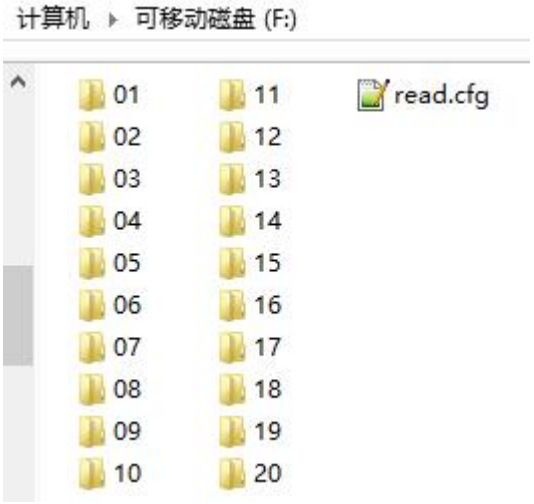


9). Safely remove the USB connection from computer.

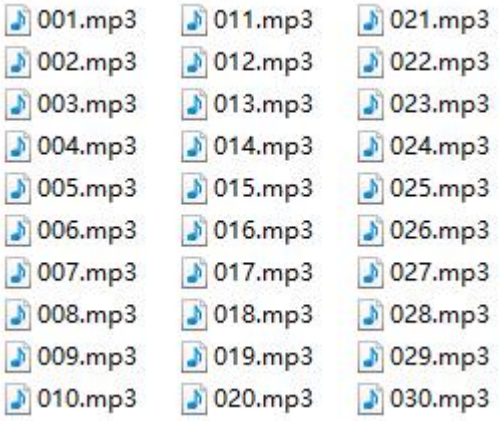
3.3. 'One-on-one' folder triggering control (for random playback of the sound files in the associated folder)

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.

1). Build 20 folders and rename them from "01" to "20" in the root directory of the built-in flash memory or SD card. The input "K1" associates with folder "01", the input "K2" associates with folder "02"..... the input "K20" associates with folder "20". Put the prepared configuration file together with the folders in the root directory of the built-in flash memory or SD card as below.



2). Put the audio files in each folder, which can contain maximum 255 audio 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 audio files in each folder.



3). After everything is done as above, safely remove USB connection from computer. 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 audio file from the associated folder “07” and stop, etc.

Notes:

1). This device is with the feature of card reader, so when loading audio files onto a SD card, you just need to connect the micro USB port to computer.

2). When a micro SD card is plugged into the module, only audio files from the SD card will be played.