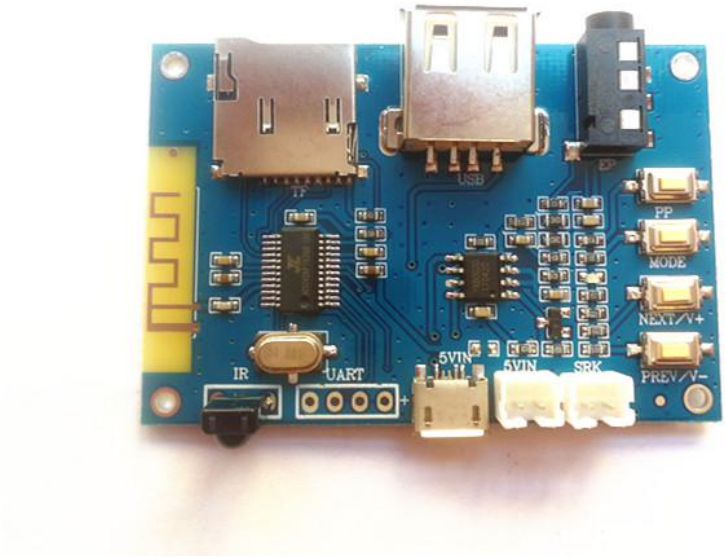
FN-BT91 Bluetooth Audio Player Module

User's Manual

V1.0



Released on Dec. 18, 2017

1. Features

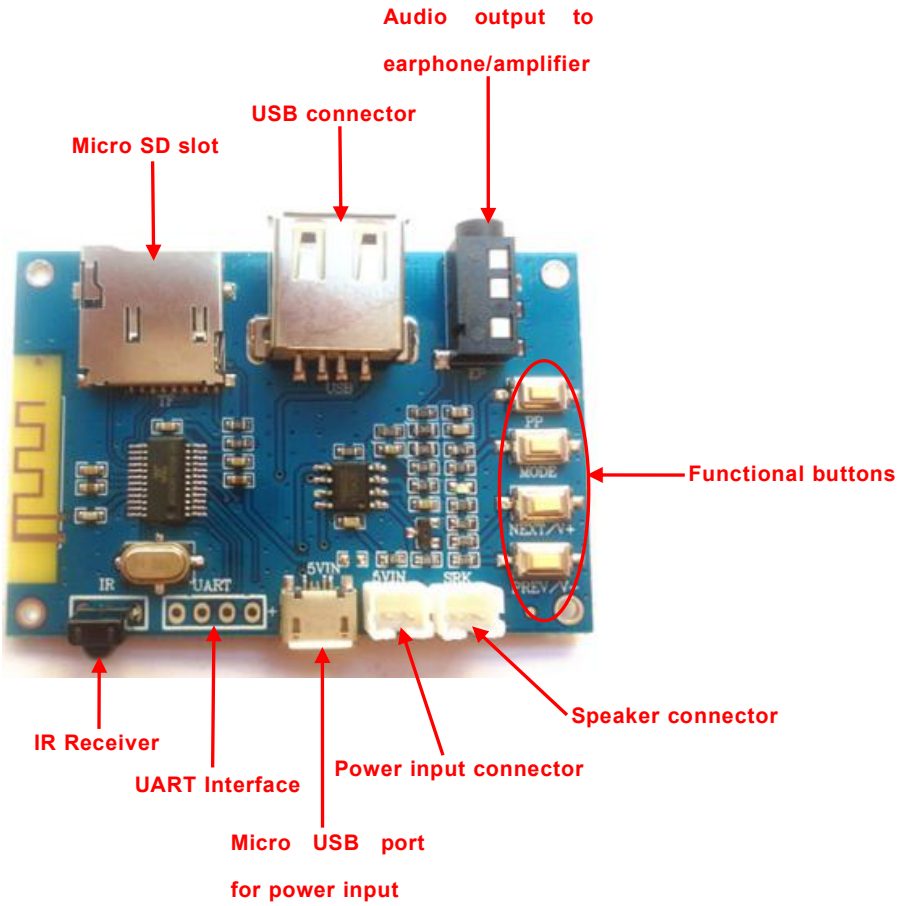
- ✧ Adopts Bluetooth 4.2 communication technology.
- ✧ Built-in a high quality audio decoder that can decode MP3, WAV, WMA, FLAC, AAC, and APE.
- ✧ With an on-board 3W mono amplifier that can directly drive a 4ohms/8ohms 3 Watts speaker.
- ✧ 24-bit DAC output and supports dynamic range 90dB and SNR 85dB.
- ✧ Equipped with a 3.5mm headphone jack that is able to connect with a headphone or an external amplifier.
- ✧ Uses micro SD card and USB flash disk for the storage devices.
- ✧ Supports max. 128GB micro SD card and max.128GB USB flash disk.
- ✧ Automatically plays audio files from micro SD card or USB flash disk when it is powered on.
- ✧ 4 functional buttons “Prev/V-”, “Next/V+”, “Play/Pause” and “Mode”.
- ✧ Power-off memory function.
- ✧ Supports to work with a IR remote control.
- ✧ Supports UART serial control mode.
- ✧ 3.3-5V DC power input.
- ✧ 30 levels adjustable volume, and 5 levels adjustable EQ.
- ✧ Superior sound quality and easy wiring.
- ✧ PCB size: 60mmx40mm

2. Technical Parameters

Item	Parameters
MP3 format	Supports 11172-3 and ISO13813-3 layer3 audio decoding
	Supports sampling rate (KHZ):8/11.025/12/16/22.05/24/32/44.1/48
	Supports Normal, Jazz, Classic, Pop, Rock, etc.
USB Interface	Standard USB 2.0
UART Interface	Standard serial port and 3.3V TTL level
Working Voltage	3.3V-5V(A diode is suggested to be attached after 7805)
Rated Current	10mA(quiescent state)
Amplifier Power	3 Watts
Work Temp.	-40~+80℃
Humidity	5% ~95%

3. Operation Guide for Button Control and Bluetooth Connection

3.1. Module Illustration



3.2. Button Operating Instructions

Button "P/P": Short press for Play/Pause.

Button "MODE": Short press for switching Bluetooth connection mode and music playback mode on micro SD card or USB flash drive. It's also able to switch reading music between micro SD card and USB flash drive when both of the devices are connected to the player at the same time.

Button "Prev / V-": Shot press for switching to previous song, and long press for volume down.

Button "Next/v+": Shot press for switching to next song, and long press for volume up.

Notes:

1). If you use a USB flash disk, we suggest you use 5V power supply, because some USB flash disks don't support lower power supply.

2). When either a micro SD card or a USB flash drive is installed, the player directly plays songs from the micro SD card or the USB flash drive directly. When both devices are installed, you need to manually choose one of both devices through the button "MODE".

3.3. About Bluetooth Connection

When the module powers on, search a Bluetooth device on your mobile phone and there will be a device named "SSYBTV1" displayed on your mobile phone. Match it with your mobile phone, and then play music/sound messages through the module.

4. UART Serial Control Mode

4.1. Communication Format

Supports asynchronous serial communication mode, via which accept serial commands sent by upper computer.	
Communication standard: 115200 bps **Data bit: 8** **Stop bit: 1** **Check bit: none** **Flow control: none**	
Format：$S Len CMD1 CMD2 DAT... $O	
$S	Start byte 0x7E
Len	Number of byte from Len to Dat(Checksum not counted)
CMD1	Command code(functional command)
CMD2	Command code(operation command)
Dat	Parameter
$O	End byte 0xEF

4.2. Communication Commands

We divide the communication commands into two parts, control commands and query commands.

Control Commands---See 4.2.1

Query Commands--See 4.2.2

Examples of Sending Serial Commands--See 4.2.3

Highlights for CMD1		
We divided the main program into the parts below:		
Function Assigning	**Command**	**Note**
Public function	0xF1	This system foreground proceeds the public functions like volume adjustment, mute, and mode switching.
Music function	0xF2	Music playing from USB flash drive or micro SD card
FM function	0xF3	FM radio functions **(Not Available)**
Bluetooth function	0xF4	Music playing via Bluetooth and phone functions

4.2.1. Control Commands

CMD1	CMD2	Function	Parameter(16 bit)
0xF1[Public]	0x01	Mute	Valid to all status
	0x02	Vol+	
	0x03	Vol-	
	0x04	Set Volume	The max volume level is 30 while the minimum one is 0.
	0x05	Mode Switch	USB->micro SD->BT
	0x06	Specify Mode	
	0x07	Reset	Valid to all status
	0x08	Set DAC	[0==DAC high resistance] [1==DAC normal]
	0x09	Set Function	See 4.3.1 for details
0xF2[Music]	0x01	Play/Pause	During playing, if this command is sent, it will be paused.
	0x02	Next	
	0x03	Previous	
	0x04	Specify Track(NUM)	
	0x05	Play	During playing, it will be not valid to send this command.
	0x06	Pause	
0xF4[BT]	0x01	Play/Pause	When a call is coming, send this command to answer, and send it again to hang up.
	0x02	Next	
	0x03	Previous	
	0x04	Answer/Hang up the phone	
	0x05	Answer	
	0x06	Hang up and and reject	
	0x07	Call back	
	0x08	Disconnect and enter into pairing	

◆ Regarding to the commands without parameter, the two bytes of parameter/data use 00, 00 to indicate.

4.2.2. Query Commands

CMD1	CMD2	Function	Parameter(16bit)
0xF1[Public]	0x3C	N/A(Reserved)	
	0x3D	N/A(Reserved)	
	0x3E	N/A(Reserved)	
	0x3F	Query online device	See 4.3.1
	0x40	Return error information	See 4.3.7
	0x41	ACK	See 4.3.2
	0x42	Query current status(including volume and functions)	
0xF2[Music]	0x45	Query total number of files in USB flash drive	See 4.3.3
	0x46	Query total number of files in micro SD card	See 4.3.3
	0x49	Query current info in the state of playing of USB flash drive	See 4.3.4
	0x4B	Query current info in the state of playing of micro SD Card	See 4.3.4
0xF4[BT]	0x50	Return Bluetooth status	See 4.3.5
	0x51	Return phone number	See 4.3.6

4.2.3. Examples of Sending Serial Commands

Work Mode	Serial Command Data	Function	Note
Public	7E 05 F1 01 00 00 EF	Mute	Valid to all status
	7E 05 F1 02 00 00 EF	Vol+	
	7E 05 F1 03 00 00 EF	Vol-	
	7E 05 F1 04 00 1E EF	Set Volume	Set the volume level 30
	7E 05 F1 05 00 00 EF	Mode Switch	USB->micro SD-> BT
	7E 05 F1 06 00 00 EF	Specify Mode	
	7E 05 F1 07 00 01 EF	Reset	Valid to all status
	7E 05 F1 08 00 01 EF	Set DAC	Turn on DAC
	7E 05 F1 08 00 00 EF	Set DAC	Turn off DAC and set it high resistance
	7E 05 F1 09 00 13 EF	Set Bluetooth call	Start Bluetooth call
Music	7E 05 F2 01 00 00 EF	Play/Pause	During playing, if this command is sent, it will be paused.
	7E 05 F2 02 00 00 EF	Next	
	7E 05 F2 03 00 00 EF	Previous	
	7E 05 F2 04 00 0A EF	Specify Track(NUM)	Specify to play 10th track

Bluetooth	7E 05 F4 01 00 00 EF	Play/Pause	
	7E 05 F4 02 00 00 EF	Next	
	7E 05 F4 03 00 00 EF	Previous	
	7E 05 F4 04 00 00 EF	Answer/Hang up the phone	
	7E 05 F4 05 00 00 EF	Answer	
	7E 05 F4 06 00 00 EF	Hang up and and reject	
	7E 05 F4 07 00 00 EF	Call back	
	7E 05 F4 08 00 00 EF	Disconnect and enter into matching	

4.3. Returned data from the module

The module returns data in key situations, so that users can master the working status of the module.

Return data when the power-on initialization is done	See 4.3.1
Return ACK data once a command is received successfully	See 4.3.2
Return data when the initialization of USB flash drive or micro SD card is done	See 4.3.3
Return data when it is playing music from USB flash drive or micro SD card	See 4.3.4
Return data of Bluetooth Status	See 4.3.5
Return data of phone number when there is call is coming via Bluetooth	See 4.3.6
Return error information	See 4.3.7

4.3.1.Returned data when the module is powered on[0x3F]

1. When the module powers on, it needs a certain period of time to finish initialization.

1). The purpose of such a initialization is to detect if the USB flash drive or micro SD card is online. Normally the time duration is 1.5 seconds.

2). If the initialization data is still not sent out over than 1.5 second, it proves the initialization gets some error. Now please check the hardware and connection.

3). The returned initialization data is just like 7E 05 F1 3F 1E 03 EF

4). 0x1E represents the volume level 30

5). 0x03 represents both USB flash drive and micro SD card is online

USB flash drive online	7E 05 F1 3F 1E 01 EF	
Micro SD Card online	7E 05 F1 3F 1E 02 EF	
Both USB flash drive and micro SD card online	7E 05 F1 3F 1E 03 EF	
Bluetooth call online	7E 05 F1 3F 1E 10 EF	Bluetooth phone call is open

2. Highlight of power-on initialization devices

The module automatically detects if the USB flash drive and micro SD card is connected, which is set by default at factory, but it is not able to automatically detect if there is a Bluetooth phone call, so users need to set to open this function.

0x01	Represents USB flash drive	The module detects it automatically(set by default at factory)
0x02	Represents micro SD card	The module detects it automatically(set by default at factory)
0x10	Represents Bluetooth phone call	Uses need to set to open it

When the MCU receives the returned data of module initialization or any other time, send the command 7E 05 F1 09 00 13 EF to open Bluetooth phone call.

The LSB 0x13=0001 0011; it means to open Bluetooth phone call.

4.3.2. Returned ACK data once a command is received successfully by module[0x41]

Module returns ACK	7E 05 F1 41 10 03 EF	It proves the module receives the command successfully

1). In order to enhance the communication stability, we added ACK function

2). To some general applications, it's okay not to receive ACK.

3). The returned ACK data is with some functional information, for example 7E 05 F1 41 10 03 EF above

0x10 == 16, represents the current system volume is level 16.

0x03 == BIT(1)|BIT(0), represents both USB flash drive and micro SD card is online and Bluetooth phone call is not available.

4.3.3. Returned data when the initialization of USB flash drive or micro SD card is done [0x45][0x46]

Initialization of USB flash drive is finished	7E 05 F2 45 01 1E 00 01 EF	Total number of files=0x011E, the track ready to be played=0x0001
Initialization of micro SD card is finished	7E 05 F2 46 01 1E 01 00 EF	Total number of files=0x011E, the track ready to be played=0x0100

1). When the initialization of USB flash drive or micro SD card is finished, the data above will be returned. Also, so long a USB flash drive or micro SD card is inserted, the module will initialize it and bridge the file system, and the data above must be returned.

2). The returned data means the drive of USB flash drive or micro SD card is Okay. Reading and writing of the file system is also Okay.

3). If currently it is playing music from USB flash drive and in the same time the micro SD card is inserted, once the USB flash drive is taken off, it will automatically jump to micro SD card and from which play music. Also the above data will be returned.

4.3.4. Returned data when it is playing music from USB flash drive or micro SD card[0x49][0x4B]

Playing music from USB flash drive	7E 05 F2 49 00 02 00 01 EF	The track is being played=0x0002, the play time=0x0001
Playing music from micro SD card	7E 05 F2 4B 00 64 00 10 EF	The track is being played=0x0064, the play time=0x0010

1). When the module is playing music from USB flash drive or micro SD card, the data above will be returned every other 1 second.

2). The returned play time serves for MCU that needs to display.

3). The returned track number is referred to physical sequence, i.e. the logical order in the device.

4.3.5. Returned data of Bluetooth Status[0x50]

Status of after opening Bluetooth	7E 04 F4 50 17 0D EF	It means the Bluetooth is in the status of connecting back
Bluetooth is connected successfully	7E 04 F4 50 1A 04 EF	It means the connection is done
Bluetooth is paring	7E 04 F4 50 16 06 EF	It means waiting for connection

1). When Bluetooth is connected, the module will return it's status every other 0.5 second, so as to the MCU can master the current status.

2). Here we provide 2 bytes to users for detection of status. They are simple status and complicated status. Users make a choice according to the actual needs.

3). If a Bluetooth phone call is needed, we suggest to use complicated status. Please refer to the sheet 2 below.

4). The paring for Bluetooth here has two types, connecting back and paring.

Connecting back: When the module is powered on, the Bluetooth will connect back the device paired last time in priority. It initiates such a connection and will be valid within 3 seconds after powering on. During it tries to connect back, other mobile phones can't make a connection with it.

Paring: It means the Bluetooth is in the status of paring and all of mobile phones can pair with it.

Sheet 1 for Simple Status---High Bytes		
Status	**Para.**	**Note**
BT_STATUS_INITING	0x15	Initializing
BT_STATUS_WAITINT_CONN	0x16	Waiting for connection
BT_STATUS_AUTO_CONNECTINT	0x17	Connecting back
BT_STATUS_CONNECTING	0x18	Connected(not phoning or playing music)
BT_STATUS_TAKEING_PHONE	0x19	Phoning
BT_STATUS_PLAYING_MUSIC	0x1A	Playing music

Sheet 2 for Complicated Status---Low Bytes		
Status	**Para.**	**Note**
BT_STATUS_POWER_ON	0x01	Power on
BT_STATUS_POWER_OFF	0x02	Turn off Bluetooth
BT_STATUS_INIT_OK	0x03	Initialization is done
BT_STATUS_FIRST_CONNECTED	0x04	Connection is successful
BT_STATUS_SECOND_CONNECTED	0x05	Connection is successful
BT_STATUS_FIRST_DISCONNECT	0x06	Disconnect
BT_STATUS_SECOND_DISCONNECT	0x07	Disconnect
BT_STATUS_PHONE_INCOME	0x08	Incoming call
BT_STATUS_PHONE_NUMBER	0x09	Phone number of incoming call
BT_STATUS_PHONE_OUT	0x0A	Phone out
BT_STATUS_PHONE_ACTIVE	0x0B	Get through the phone
BT_STATUS_PHONE_HANGUP	0x0C	Hang up the phone
BT_STATUS_BEGIN_AUTO_CON	0x0D	Start to connect back
BT_STATUS_MUSIC_SOUND_COME	0x0E	Start to play music
BT_STATUS_MUSIC_SOUND_GO	0x0F	Pause playing music

4.3.6. Returned data of phone number of incoming call via Bluetooth[0x50]

If the phone number of the incoming call is 13510250437, the module returns 7E 05 F4 51 31 33 35 31 30 32 35 30 34 33 37 EF.

1). If Bluetooth phone call is open and when there is phone call is incoming, it will returns the data like above.

2). The module returns such a data every other 2 seconds. The returning will not be stopped until hanging up or answering the call.

4.3.7. Return error information[0x40]

7E 05 F1 40 00 01 EF	System is busy and the current command is not executed
7E 05 F1 40 00 02 EF	Currently it is at busy status
7E 05 F1 40 00 03 EF	Entered into sleep mode
7E 05 F1 40 00 04 EF	Current serial command is not received completely
7E 05 F1 40 00 05 EF	Pending(N/A)
7E 05 F1 40 00 06 EF	Pending(N/A)
7E 05 F1 40 00 07 EF	Pending(N/A)
7E 05 F1 40 00 08 EF	Currently no playback device