

Fallguy *MINI*

UNIVERSAL EMBEDDED MP3 MODULE WITH COMPACT FLASH CARD SLOT AND SERIAL INTERFACE

STANDARD FIRMWARE V1.09

Firmware Version 1.09

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General

MP3 files are played from the main directory of the Compact flash card.
 The MINI module could be controlled by the following three interfaces:

- J_BUTTONS – Direct connection for up to six buttons
- J_EXPANSION – Connection for up to 24 buttons via an additional matrix circuit
- J_SERIAL – Serial interface

These three interfaces could be either used separately or combined.

By using an optional configuration file *config.txt* the module could start with specific starting parameters and the different interfaces from above could be set.

Via the optional EXPANSION III adapter (Article-No.0081) from LOETRONIC it is also possible to connect a double spaced character LC-Display to show tracking and volume information.

Compact flash card, MP3 files and configuration file

The Compact flash card must be formatted with the file system FAT32.

The MP3 files **must** be within the main directory of the Compact flash card and should be simply named in the following order:

00.MP3
 01.MP3

...

99.MP3

A maximum of 100 MP3 files could be referenced (00.MP3 – 99.MP3).

The MP3 files are copied manually to the CF card, i.e. by taking the CF card out of the slot and using a CF card reader/writer externally.

After starting the MINI module, the configuration file *config.txt* in the main directory will be searched and loaded. The entries in this file can setup different starting parameters. If there is no file *config.txt* in the main directory, the following standard values are loaded:

OV!0100	-	Volume is set to 100%
EQ!0000	-	Equalizer functions are deactivated
BA!0008	-	Bass (200Hz) is set to 0dB
TR!0008	-	Treble (3kHz) is set to 0dB
SH!0000	-	Shuffle mode is deactivated
RP!0000	-	Repeat mode is deactivated
BU!0000	-	J_BUTTONS interface is in STANDARD mode
MA!0000	-	J_EXPANSION interface is in not in MATRIX mode
DE!0010	-	Debounce time is set to 500ms
IN!0000	-	Interrupt function is deactivated

All settings in the file *config.txt* relate to the serial commands. Every command must be terminated like the serial commands with a 0Dh (CR character) and additionally with a 0Ah (LF character). Every command is read and executed by the MINI module separately. An answer will be given through the serial interface.

If the playback of the MINI module was started using the command *PL!* or *SP!*, no more commands from the configuration file are read!

The command *ID!* will not be executed from the *config.txt*!

If the module should start the playback automatically, the last entry in the configuration file should be the *SP!* command! The configuration file could be prepared with any normal text editor.

J_BUTTONS interface

The J_BUTTONS interface could operate in two different modes. After startup the STANDARD mode is activ, the DIRECT mode must be activated by setting the appropriate command (*BU!0001*).

STANDARD mode:

In this mode the playback is started by button 4. If the shuffle mode is activated (*SH!0001*), the playback is randomly endless. If the shuffle mode is deactivated (*SH!0000*), the playback is sequential up to the last file (*RP!0000*), sequential and endless (*RP!0001*) or only the first file is played endless (*RP!0002*).

With button 1 and 2 the next or previous MP3 files could be started while the module is in playback mode. If the shuffle mode is activated (*SH!0001*), a random MP3 file is started. In this mode there is no difference between button 1 and button 2. With button 5 and button 6 the volume could be changed in 2dB steps.

- Button 1 – Start previous MP3 file
 - Button 2 – Start next MP3 file
 - Button 3 – Stop playback
 - Button 4 – Start playback
 - Button 5 – Decrement the volume by 2dB
 - Button 6 – Increment the volume by 2dB
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DIRECT mode:

In this mode up to 6 MP3 files could be started directly by one specific button. The shuffle mode has no effect on the DIRECT mode. When the file was played, the module stops the playback (*RP!0000* or *RP!0001*) or the same file starts again (*RP!0002*). Another file could be started during the MP3 playback. By adjusting the interrupt function (*IN!0001*), the same file could also be started. Using *IN!0002* no file could be interrupted.

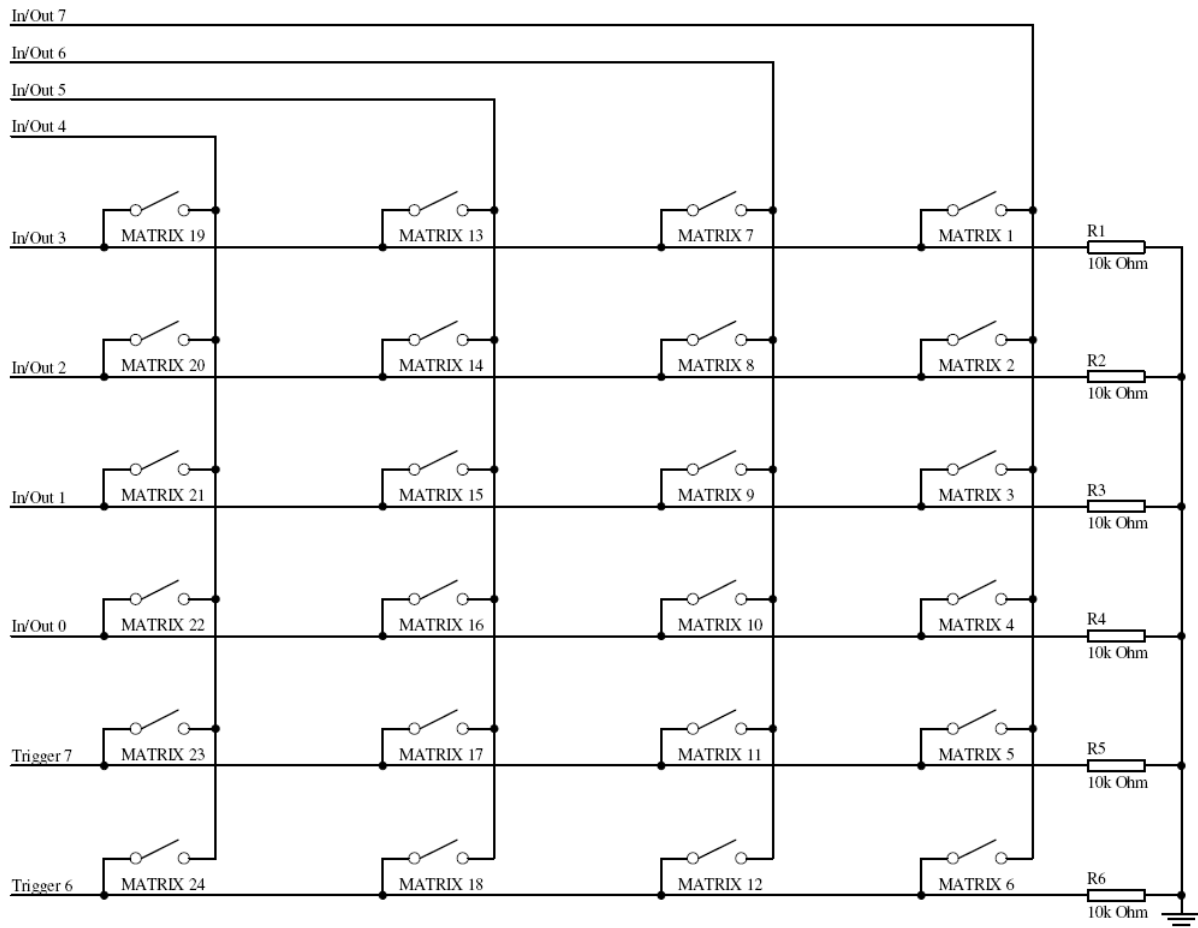
- Button 1 – Start first MP3 file (00.MP3)
 - Button 2 – Start second MP3 file (01.MP3)
 - Button 3 – Start third MP3 file (02.MP3)
 - Button 4 – Start fourth MP3 file (03.MP3)
 - Button 5 – Start fifth MP3 file (04.MP3)
 - Button 6 – Start sixth MP3 file (05.MP3)
-

The button inputs must be pressed for a minimum of 50ms to be a valid signal!

J_EXPANSION interface

Via the J_EXPANSION interface additional buttons could be connected using a matrix circuit. Different sizes of matrix keypads are possible: 1x4-, 2x4-, 3x4-, 4x4-, 5x4- and 6x4. Up to 24 buttons are possible using this interface.

The following circuit demonstrates the connection of a 6x4 foil keypad:



Smaller foil keypads must be connected by the following scheme:

- 1x4 - IO_7 to IO_4, as well as IO_3
- 2x4 - IO_7 to IO_4, as well as IO_3 to IO_2
- 3x4 - IO_7 to IO_4, as well as IO_3 to IO_1
- 4x4 - IO_7 to IO_4, as well as IO_3 to IO_0
- 5x4 - IO_7 to IO_4, as well as IO_3 to IO_0 and TRIG_IN_7

The MATRIX mode must be activated by the corresponding command (*MA!0001 – MA!0006*).

MATRIX mode:

In this mode up to 24 MP3 files could be started directly by one specific button. The shuffle mode has no effect on the MATRIX mode. When the file was played, the module stops the playback (*RP!0000* or *RP!0001*) or the same file starts again (*RP!0002*). Another file could be started during the MP3 playback. By adjusting the interrupt function (*IN!0001*), the same file could also be started. Using *IN!0002* no file could be interrupted.

- Matrix 1 – Start first MP3 file (00.MP3)
- Matrix 2 – Start second MP3 file (01.MP3)
- ...
- Matrix 24 – Start last MP3 file (23.MP3)

The button inputs must be pressed for a minimum of 50ms to be a valid signal!

J_SERIAL interface

The MINI module could be remotely controlled from any external PC or microcontroller using the J_SERIAL interface. An ASCII based protocol was developed for this purpose and is described below. The voltage level of the serial interface conforms to TTL. If a PC with RS232 interface should be connected to the MINI module, the EXPANSION III adapter (Article-No.0081) from LOETRONIC could be used. It just has to be stuck on the module and has to be connected by the delivered flat cable and a null modem cable with the PC.

The serial interface has the following parameters:

19.200 bit/s, 1 start bit / 8 data bits / 1 stop bit / no parity (8N1), no hardware handshake

ASCII protocol for serial interfacing

The following protocol rules are effective:

- A command consists of ASCII coded characters.
- All commands are terminated by a 0Dh (CR character).
- A command consists of one identifier, a ',' and optional data.
- A command identifier consists of two alphabetic characters (a-z or A-Z).
- Optional data consists of four numerical characters (0-9).
- Every command is answered by the MINI module.
- The answer consists of one identifier and a ','.
- The answer informs, whether the command was executed or an error occurred.
- Some commands are answered additionally by an extended answer.

The MINI module sends some welcome messages after starting, reads an existing configuration file *config.txt* and executes the entries in this file. Answers will be given through the serial interface.

Besides the answers on the commands all playback or volume changes are sent from the MINI module via the serial interface. This affects also the control of the module by the J_BUTTONS and the J_EXPANSION interface.

List of general answers:

Answer	Description
RD!	The MINI module was started and initialised.

Answer	Description
BE :xxxx	An error occurred during initialisation.
xxxx	0001 The Compact flash card contains no partition signature.
	0002 The Compact flash card contains no partition table.
	0004 The Compact flash card contains no correct partition table.
	0008 The MP3 decoder chip could not be initialised.
	0016 The MP3 decoder chip could not be initialised.
	0024 The MP3 decoder chip could not be initialised.
	0032 There is no Compact flash card.

Answer	Description
OK!	The command was executed.

Answer	Description
NP!	The command could not be executed.

Answer	Description
CD!	The total length of the command was not correct.

Answer	Description
BL!	The optional data is not within the correct range.

Answer	Description
UC!	The command was unknown.

List of general answers:

Answer	Description
TE : xxxx	An error occurred through transmission.
xxxx	0002 Framing error
	0004 Noise
	0008 Buffer overrun
	0016 Buffer full

Answer	Description
PL : 00XX	A MP3 file was started.
00XX	0000 – 0099 The MP3 file.

Answer	Description
ST : 00XX	A MP3 file was stopped.
00XX	0000 – 0099 The MP3 file.

Answer	Description
PA : 00XX	The playback of a MP3 file was paused.
00XX	0000 – 0099 The MP3 file.

Answer	Description
PS : 00XX	The playback of a MP3 file was continued.
00XX	0000 – 0099 The MP3 file.

Answer	Description
OV : 0XXX	The volume level was adjusted.
0XXX	0000 – 0100 The volume level from –100 dB to 0 dB in 1 dB steps.

List of commands – MP3 playback:

Command	Description
SP!	Starts the playback of the first MP3 file.
	Not possible while playback.

Command	Description
PL!00XX	Starts the playback of a specific MP3 file.
	Not possible while playback.
00XX	0000 – 0099 The selected MP3 file.

Command	Description
ST!	Stops the playback.
	Only possible while playback.

Command	Description
PA!	Pauses the playback.
	Only possible while playback.

Command	Description
ID!00XX	Returns the ID3 song tag of a specific MP3 file.
	Not possible while playback.
00XX	0000 – 0099 The selected MP3 file.

Command	Description
NT!	Starts the next MP3 file.
	Only possible while playback.

Command	Description
PT!	Starts the previous MP3 file.
	Only possible while playback.

List of commands – General:

Command	Description
GN!	Returns the number of MP3 files.
	Not possible while playback.
Extended answer	
GN:XXXX	
XXXX	0000 – 0100 The number of MP3 files.
Example	
GN:0021	

Command	Description
GS!	Returns the playback state.
	Always possible.
Extended Answer	
GS:0x 00XX	
0x	01 No playback.
	02 Playback.
	03 Paused playback.
00XX	0000 – 0099 The selected MP3 file.
Example	
GS:02 0001	

Command	Description
GV!	Returns the version number of the firmware.
	Always possible.
Extended answer	
GV:STANDARD + Vx.xx	
Vx.xx	The version number of the firmware.
Example	
GV:STANDARD V1.07	

Command	Description
CF!	Returns the identification of the Compact flash card.
	Always possible.
Extended answer	
CF:...	
...	The identification of the CF card.
Example	
CF:TOSHIBA 512MB	

Command	Description
GH!00XX	Returns the MP3 header information (Coding method, sampling frequency and bitrate).
	Not possible while playback.
00XX	0000 – 0099 The selected MP3 file.
Extended answer	
GH:00XX MPEGx xkHz xkbit/s	
00XX	0000 – 0099 The selected MP3 file.
MPEGx	MPEG1, MPEG2, MPEG2.5 The coding method.
xkHz	11.03 kHz – 48 kHz
xkbit/s	8 kbit/s – 320 kbit/s
Example	
GH:0001 MPEG1 44.1kHz 112 kbit/s	

List of commands – General:

Command	Description
GT!00XX	Returns the playback time and the total time.
	Only possible while playback.
00XX	0000 – 0099 The selected MP3 file.
Extended answer	
GT:00XX dd:mm:yy dd:mm:yy	
00XX	0000 – 0099 The selected MP3 file.
dd:mm:yy	The playback time.
dd:mm:yy	The total time of the MP3 file.
Example	
GT:0002 00:04:56 00:05:08	

Command	Description
GF!00XX	Returns the size of the MP3 file in kByte.
	Not possible while playback.
00XX	0000 – 0099 The selected MP3 file.
Extended answer	
GF:00XX xKByte	
00XX	0000 – 0099 The selected MP3 file.
xKByte	The size of the MP3 file in kByte.
Example	
GF:0021 3912KByte	

List of commands – Audio:

Command	Description
OV!0xxx	Adjusts the volume level.
	Always possible.
0xxx	0000 – 0100 The volume level from –100 dB to 0 dB in 1 dB steps.

Command	Description
EQ!000x	Activates/Deactivates the equalizer.
	Not possible while playback. - and - Not possible, if the bass and treble frequencies were adjusted.
000x	0000 The equalizer is deactivated.
	0001 The equalizer is activated.

Command	Description
BA!00xx	Adjusts the bass frequencies (200Hz).
	Not possible, if the equalizer was deactivated.
00xx	0000 – 0016 The bass frequencies from –12 dB to +12 dB in 1.5 dB steps.

Command	Description
TR!00xx	Adjusts the treble frequencies (3kHz).
	Not possible, if the equalizer was deactivated.
00xx	0000 – 0016 The treble frequencies from –12 dB to +12 dB in 1.5 dB steps.

List of commands – Configuration:

Command	Description
SH!000x	Activates/Deactivates the shuffle playback.
	Not possible while playback.
000x	0000 The shuffle playback is deactivated.
	0001 The shuffle playback is activated.

Command	Description
RP!000x	Activates/Deactivates the endless playback or repeat option of a MP3 file.
	Not possible while playback.
000x	0000 After ending a MP3 file the next MP3 file will be started. After the last MP3 file the playback stops.
	0001 After ending a MP3 file the next MP3 file will be started. After the last MP3 file the playback will be restarted with the first MP3 file.
	0002 After ending a MP3 file the same MP3 file will be started.
	0003 After ending a MP3 file the playback stops.

Command	Description
BU!000x	Adjusts the button mode (J_BUTTONS).
	Not possible while playback.
000x	0000 The button inputs are in STANDARD mode.
	0001 The button inputs are in DIRECT mode.

Command	Description
MA!000x	Adjusts the matrix input mode (J_EXPANSION).
	Not possible while playback.
000x	0000 The matrix inputs are deactivated.
	0001 The matrix inputs are in 1x4 mode.
	0002 The matrix inputs are in 2x4 mode.
	0003 The matrix inputs are in 3x4 mode.
	0004 The matrix inputs are in 4x4 mode.
	0005 The matrix inputs are in 5x4 mode.
	0006 The matrix inputs are in 6x4 mode.

Command	Description
DE!00xx	Adjusts the debouncing time of the button and matrix inputs.
	Not possible while playback.
00xx	0000 – 0020 The debouncing time from 0 s to 1 s in 50 ms steps.

Command	Description
IN!000x	Adjusts the interrupt option of the button and matrix inputs.
	Not possible while playback.
000x	0000 A MP3 file being played could be interrupted by starting another MP3 file, but not by starting the same MP3 file.
	0001 A MP3 file being played could be interrupted by any MP3 file.
	0002 A MP3 file being played could not be interrupted.

List of commands – Configuration:

Command	Description
DF!	Loads the default configuration.
	Not possible while playback.

Command	Description
SC!	Returns the current configuration.
	Always possible.
Extended answer	
OV: 0xxx	
EQ: 000x	
BA: 00xx	
TR: 00xx	
SH: 000x	
RP: 000x	
BU: 000x	
MA: 000x	
DE: 00xx	
IN: 000x	