Fallguy *ULTRA Carrier Board AMP*

EXPANSION BOARD
WITH EXTENSIVE INTERFACES
AND 2x50W-AMPLIFIER (Class D)

Hardware Version Rev.I 12/2022
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1. Overview

The Fallguy ULTRA Carrier Board AMP is an Expansion Board for the universal Fallguy ULTRA 2 MP3 module by LOETRONIC ®. It expands the extensives digital and analog interfaces of the MP3 module by an additional RS232-level converter, an USB interface (FTDI-IC), an optional LAN-interface (XPORT), an additional 2x50W Class D amplifier and more electronic. All interfaces are reachable by separate connectors on the Carrier Board.

Controlling the module can be done either by three buttons on the Carrier Board or the different digital and analog inputs. The internal firmware of the module can be adapted to the customer needs. The playback behavior is defined through the programmed firmware.

Optionally, time-controlled playback (announcements) via an RTC module (Real Time Clock) or radio control (RF) are also possible.

Please inform yourself about the different configuration possibilities of the ULTRA 2 MP3 module by reading the firmware datasheet! The configuration of the button inputs, the LED outputs and the amplifier must be possibly set up before starting the whole device!

The ULTRA 2 MP3 module can be controlled using the RS232-, the LAN- or USB-interface and a special software by LOETRONIC (*ULTRA Serial Control*, s. www.loetronic.com). The MP3 files themselves can be uploaded and deleted to and from the SD card.

There is also a special casing from LOETRONIC available, so that the ULTRA 2 MP3 module and the Carrier Board AMP can be easily installed using mounting rails provided with the casing.

The following components are available (LOETRONIC Article No.):

ULTRA 2 MP3 module	-	0186
ULTRA Carrier Board AMP	-	0231
LAN for ULTRA Carrier Board	-	0138
ULTRA AMP 2 Casing	-	0233
ULTRA AMP 2 MP3 player	-	0234
RTC module	-	0161
RF receiver	-	0211
RF remote control with 10 buttons	-	0199
RF remote control with 1 button	-	0208

2. Technical data

Control- and visual elements:

- 3 buttons
- 4 status LEDs
- 1 stereo potentiometer for volume controlling

Interfaces:

- 8 button inputs
- 10 digital in- or outputs
- 1 connection for a matrix keypad (max. 4x4 – 16 buttons)
- 1 USB interface (FTDI_IC) or USB-interface (XPORT, optional)
- 1 RS232-interface (115.200 bps) – Control via Terminal or *ULTRA Serial Control*
- 1 interface for a LC-display
- 1 interface for 5 external status LEDs or Relais
- 1 interface for an RTC module
- 1 interface for an RF receiver 868 MHz with Easywave protocol
- 2 Cinch sockets for LINE level **OR** for 2 speakers (Stereo) – 2x50W (4-8 Ohm)

Operating temperature:

- -20 °C to +85 °C

Operating voltage:

- 10 – 26 V (DC) unstabilized

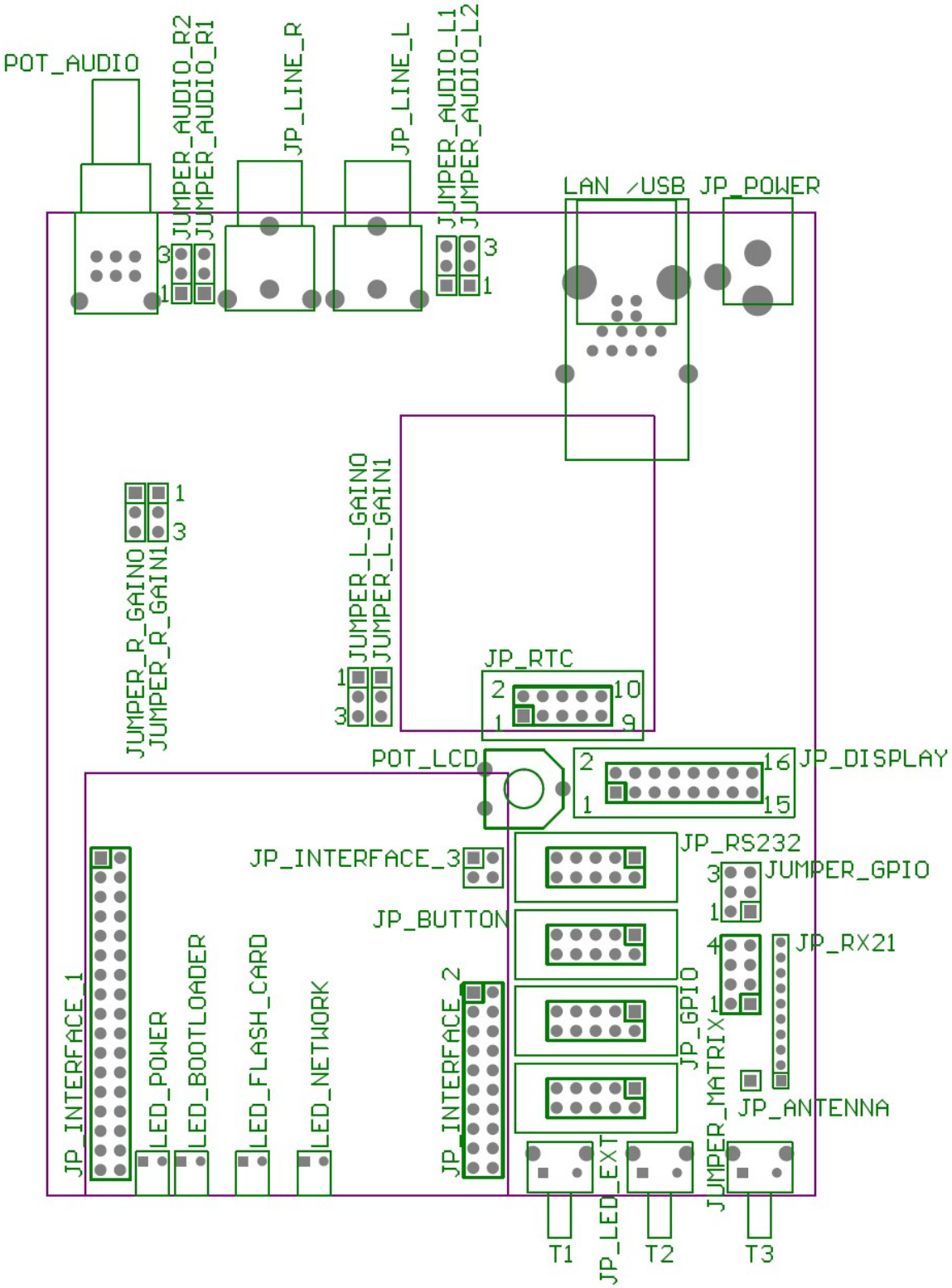
Current consumption:

- 0.15 – 0.75 A (without connected LC-display / without LAN / according to the speakers)

Dimensions:

- 160x100x20mm (LxWxH)

3. Connection possibilities



Picture 3.1 ULTRA Carrier Board AMP Rev.I – Connections and control/visual elements

Button T1, T2, T3

- The buttons control the ULTRA 2 MP3 module. The assignment is defined though the standard firmware on the ULTRA 2 MP3 module.

Assignment:

Button	Name	Function
T1	Button 1 Front	Play/Pause or start Bootloader
T2	Button 2 Front	Stop
T3	Button 3 Front	Next Track

Status LEDs LED_POWER, LED_BOOTLOADER, LED_FLASH_CARD, LED_NETWORK

- The status LEDs display important status information.

Assignment:

Light emitting diode	Name	When does the LED light up?
LED_POWER	Power-LED	By powering the ULTRA Carrier Board
LED_BOOTLOADER	Bootloader-LED	By using the bootloader function or when pressing the RF remote control
LED_FLASH_CARD	Flashcard-LED	At SD card activity (Playback of MP3-files or MP3 upload)
LED_NETWORK	Network-LED	At network activity (RS232-, LAN- or USB-interface)

JP_BUTTON

- The interface JP_BUTTON is for connecting up to eight buttons, relais or sensors. The assignment is defined though the standard firmware on the ULTRA 2 MP3 module.
- To activate an input it must be bridged with ground.
- The socket of this interface is a 5x2-socket in RM2.54.
- If the button inputs GPIO_1-3 shall be used, the JUMPER 1-3 on JUMPER_GPIO have to be set, as well as the configuration parameter (*GP!02*).
- **All inputs have 0 – 3.3 Volt level!**

Assignment:

Pin-No.	Name	Description
1	BUTTON_4	Button input 1
2	GPIO_1	Button input 6 / GPIO_1
3	BUTTON_5	Button input 2
4	GPIO_2	Button input 7 / GPIO_2
5	BUTTON_6	Button input 3
6	GPIO_3	Button input 8 / GPIO_3
7	BUTTON_7	Button input 4
8	GND	Ground
9	BUTTON_8	Button input 5
10	GND	Ground

Assignment (JUMPER_GPIO):

Jumper	Name	Description
1	Jumper 1	GPIO_1 is button input 6
2	Jumper 2	GPIO_2 is button input 7
3	Jumper 3	GPIO_3 is button input 8

JP_GPIO

- The interface JP_GPIO is for connecting external periphery and is not fixed to a specific function. Every GPIO can be used as a digital in- or output. The function is selected through the firmware used on the ULTRA 2 MP3 module.
- If the GPIOs should be used as in- and outputs for a matrix keypad, then the appropriate jumpers must be set at JUMPER_MATRIX. Up to 4 jumpers can be set for use with a matrix keypad at JP_GPIO of up to 16 buttons.
- The socket of this interface is a 5x2-socket in RM2.54.
- **All in- and outputs have 0 – 3.3 Volt level!**

Assignment:

Pin-No.	Name	Description
1	GPIO_1	Digital in- or output 1
2	GPIO_6	Digital in- or output 6
3	GPIO_2	Digital in- or output 2
4	GPIO_7	Digital in- or output 7
5	GPIO_3	Digital in- or output 3
6	GPIO_8	Digital in- or output 8
7	GPIO_4	Digital in- or output 4
8	N.C.	Not connected.
9	GPIO_5	Digital in- or output 5
10	N.C.	Not connected.

Assignment (JUMPER_MATRIX):

Jumper	Name	Description
1 (Pin 1 – Pin 2)	Jumper 1	At least a 1x4 matrix keypad can be used. (GPIO_8 to GPIO_4)
2 (Pin 3 – Pin 4)	Jumper 2	At least a 2x4 matrix keypad can be used. (GPIO_8 to GPIO_3)
3 (Pin 5 – Pin 6)	Jumper 3	At least a 3x4 matrix keypad can be used. (GPIO_8 to GPIO_2)
4 (Pin 7 – Pin 8)	Jumper 4	At least a 4x4 matrix keypad can be used. (GPIO_8 to GPIO_1)

JP_LED_EXT

- The interface JP_LED_EXT is for connecting five external LEDs or relais using the Relay Board. The function of these outputs is defined though the standard firmware on the ULTRA 2 MP3 module.
- The socket of this interface is a 5x2-socket in RM2.54.
- **All outputs have 0 – 3.3 Volt level!**

Assignment:

Pin-No.	Name	Description
1	5V	5 Volt power supply for external electronics
2	3.3V	3.3 Volt power supply for external electronics
3	V+	External power supply for external electronics
4	GND	Ground
5	LED_EXT1	External LED output 1
6	LED_EXT2	External LED output 2
7	LED_EXT3	External LED output 3
8	LED_EXT4	External LED output 4
9	LED_EXT5	External LED output 5
10	N.C.	Not connected

JP_DISPLAY

- The interface JP_DISPLAY is for connecting a multiline LC-display with HD44780 chipset and LED backlight. The displayed information on the LCD is defined though the standard firmware on the ULTRA 2 MP3 module.
- The contrast of the liquid crystal is adjusted through the potentiometer POT_LCD.
- The socket of this interface is a 8x2-socket in RM2.54.

Assignment:

Pin-No.	Name	Description
1	5V	5 Volt power supply for the LC-display
2	GND	Ground
3	LCD_RS	Control line for the LC-display – RS
4	LCD_VO	Voltage for contrast setting of the LC-display
5	LCD_E	Control line for the LC-display – E
6	GND	Ground
7	N.C.	Not connected
8	N.C.	Not connected
9	N.C.	Not connected
10	N.C.	Not connected
11	LCD_DB5	Data line for the LC-display – DB5
12	LCD_DB4	Data line for the LC-display – DB4
13	LCD_DB7	Data line for the LC-display – DB7
14	LCD_DB6	Data line for the LC-display – DB6
15	GND	Connection for LED backlight (Cathode)
16	RLCD	Connection for LED backlight (Anode)

JP_RS232

- The interface JP_RS232 is for connecting the ULTRA 2 MP3 module to an external PC or microcontroller using the well known RS232-interface. The voltage level of this serial interface is conform to RS232.
- This serial interface (UART 1) is set to **115.200 bps with 8N1** (8 data bits, 1 stop bit, no parity) in the standard firmware of the ULTRA 2 MP3 module. Furthermore a hardware handshake is set (**Hardware handshake RTS/CTS**) permanently. If the serial interface (UART 1) should be used as a RS232-interface, it must be activated in the standard firmware using the configuration command (*RS!00*).
- The ASCII based protocol in the JP_RS232 interface is defined in the standard firmware and is described inside the datasheet for this firmware.

Assignment:

Pin-No.	Name	Description
1	GND	Ground
2	RS232_RX	Receive line of the 1. UART on the ULTRA 2 MP3 module (RS232)
3	RS232_TX	Send line of the 1. UART on the ULTRA 2 MP3 module (RS232)
4	N.C.	Not connected
5	GND	Ground
6	N.C.	Not connected
7	RS232_RTS	Hardware handshake – „Request to Send“ (RS232)
8	RS232_CTS	Hardware handshake – „Clear to Send“ (RS232)
9	5V	5 Volt power supply for external devices

LAN / USB

- Via the LAN-interface and the XPORT the ULTRA 2 MP3 module can be connected to a Local Area Network (LAN). The configuration of the XPort is described inside chapter 4 of this datasheet.
- Via the USB-interface and the FTDI-IC the ULTRA 2 MP3 module can be connected to a PC. Appropriate USB driver can be downloaded from the website (*ULTRA Serial Control* software, www.loetronic.com).
- For controlling the module an ASCII protocol is used, which is identical to the ASCII protocol of the serial interface (RS232). The ASCII based protocol is defined in the standard firmware and is described inside the datasheet for this firmware. For controlling the module via the RS232-, LAN- or USB-interface the software *ULTRA Serial Control* (www.loetronic.com) can be used. The module can be configured in extensive ways and the MP3 files can be uploaded and deleted to and from the SD card.

JP_INTERFACE_1

- The JP_INTERFACE_1 interface together with the JP_INTERFACE_2 interface is for connecting the ULTRA 2 MP3 module to the Carrier Board. The MP3 module has to be clipped simply on the Board. The lines in detail are described in the datasheet of the ULTRA 2 MP3 module.

JP_INTERFACE_2

- The JP_INTERFACE_2 interface together with the JP_INTERFACE_1 interface is for connecting the ULTRA 2 MP3 module to the Carrier Board. The MP3 module has to be clipped simply on the Board. The lines in detail are described in the datasheet of the ULTRA 2 MP3 module.

JP_RTC

- The interface JP_RTC is used to connect to the RTC module from LOETRONIC. Time-controlled announcements can be played via the RTC module. A specific time can be assigned to the MP3 files using the *ULTRA RTC Control* software from LOETRONIC.

JP_RX21

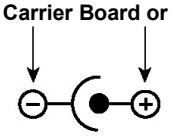
- The interface JP_RX21 is used to connect a RF receiver in the 868 MHZ range. By this it is possible to control the ULTRA 2 MP3 module via a RF remote control.

JP_ANTENNA

- If the receiving power oft he RF receiver is not sufficient, an additional antenna can be connected here.

JP_POWER

- Using the socket JP_POWER the ULTRA Carrier Board AMP has to be supplied with 10 – 26 Volt (DC).
- **A wrong polarity can destroy the complete Carrier Board or the components!**



Volume potentiometer POT_AUDIO

- The level of both audio channels can be adjusted through the stereo potentiometer POT_AUDIO.

JP_LINE_L

- Depending on the configuration of the jumpers JUMPER_AUDIO_Lx, an external amplifier (LINE level) or a passive speaker (4-8 Ohms, max. 50W) can be connected here. Two jumpers must be inserted in the same position (Pin 1 + 2 **OR** Pin 2 + 3).
- Appropriate adapters are included in the scope of delivery of the Carrier Board AMP (Cinch socket to 2-pin screw terminal).

Assignment (JUMPER_AUDIO_L1):

Jumper	Name	Description
Pin 1 – Pin 2	Jumper 1	LINE-Pegel Left
Pin 2 – Pin 3	Jumper 1	Speaker Left

Assignment (JUMPER_AUDIO_L2):

Jumper	Name	Description
Pin 1 – Pin 2	Jumper 2	LINE-Pegel Left
Pin 2 – Pin 3	Jumper 2	Speaker Left

JP_LINE_R

- Depending on the configuration of the jumpers JUMPER_AUDIO_Rx, an external amplifier (LINE level) or a passive speaker (4-8 Ohms, max. 50W) can be connected here. Two jumpers must be inserted in the same position (Pin 1 + 2 **OR** Pin 2 + 3).
- Appropriate adapters are included in the scope of delivery of the Carrier Board AMP (Cinch socket to 2-pin screw terminal).

Assignment (JUMPER_AUDIO_R1):

Jumper	Name	Description
Pin 1 – Pin 2	Jumper 1	LINE-Pegel Right
Pin 2 – Pin 3	Jumper 1	Speaker Right

Assignment (JUMPER_AUDIO_R2):

Jumper	Name	Description
Pin 1 – Pin 2	Jumper 2	LINE-Pegel Right
Pin 2 – Pin 3	Jumper 2	Speaker Right

Jumper Anmplifer Gain

- Four different amplifier stages can be configured via jumpers per channel (left or right).

Assignment (JUMPER_L_GAIN0 + JUMPER_L_GAIN1):

Jumper	Description
GAIN0 Pin 1 – Pin 2 + GAIN1 Pin 1 – Pin 2	+33,6dB
GAIN0 Pin 1 – Pin 2 + GAIN1 Pin 2 – Pin 3	+31,1dB
GAIN0 Pin 2 – Pin 3 + GAIN1 Pin 1 – Pin 2	+27,6dB
GAIN0 Pin 2 – Pin 3 + GAIN1 Pin 2 – Pin 3	+21,6dB

Assignement (JUMPER_R_GAIN0 + JUMPER_R_GAIN1):

Jumper	Description
GAIN0 Pin 1 – Pin 2 + GAIN1 Pin 1 – Pin 2	+33,6dB
GAIN0 Pin 1 – Pin 2 + GAIN1 Pin 2 – Pin 3	+31,1dB
GAIN0 Pin 2 – Pin 3 + GAIN1 Pin 1 – Pin 2	+27,6dB
GAIN0 Pin 2 – Pin 3 + GAIN1 Pin 2 – Pin 3	+21,6dB

4. Getting started

The ULTRA Carrier Board AMP with ULTRA 2 MP3 module clipped on must be connected to a voltage source of 10 - 26 Volt (DC) at JP_POWER. An external amplifier **OR** two external speakers can be connected depending on the configuration of the jumpers JUMPER_AUDIO_Lx and JUMPER_AUDIO_Rx to the Cinch sockets JP_LINE_L and JP_LINE_R.

Any SD flashcard of the type SD or SDHC can be used. The SD card must be formatted in **FAT32** with standard settings and there must only be one partition on it.

Except the LAN-interface all interfaces are described in chapter 3 of this datasheet. The LAN-interface (XPORT) is described here more detailed:
By using the LAN-interface the ULTRA Carrier Board can be connected to a Local Area Network (LAN). The component XPort by Lantronix used for this purpose communicates between the 2. UART of the ULTRA 2 MP3 module and the LAN.
The XPort must be set to a static and valid IP address and subnet mask or must get its address via DHCP from a DHCP server. Per default the Carrier Board is set to a dynamic address (DHCP). The user can test, wether the server is correctly connected to the Carrier Board by using the *ping* command on the server.

Furthermore the serial interface of the XPort and some more TCP settings must be configured. Per default all settings are ready. Must anything be changed, the webbrowser or a Telnet-Communication is used (DeviceInstaller). The Carrier Board has to be connected to a network and the IP address of the XPort has to be entered into the webbrowser. Is there any address conflict in the network, the software DeviceInstaller from Lantronix must be started and the IP address must be changed through the DeviceInstaller.

After entering the XPort through the webbrowser a username and a password are necessary. Per default these settings are empty. The following settings are important:

Expert (Telnet)	-	CPU performance: High
Network	-	DHCP oder statische IP
Channel 1 – Serial Settings	-	Baud Rate 921600, FlowControl CTS/RTS (Hardware)
Configurable Pins	-	CP0 Flow Control Out (CTS) Low
		CP2 Flow Control In (RTS) Low

After changing any setting the button *Apply Settings* has to be pressed. The XPort saves the new settings and reboots then. This can take some seconds.

If it is not possible to configure the XPort through the webbrowser or Telnet, it is also possible to use the RS232-interface on the Carrier Board.

Before the Carrier Board is supplied with power, the second and third button have to be pressed simultaneously (BUTTON_2 / T2 und BUTTON_3 / T3). After powering the Board up, there should be some XPort messages on the terminal window on the connected PC. Now the XPort could be new configured using the terminal software. The configuration of the XPort via a terminal is described in the datasheet of the XPort (*XPort User Guide*, *Chapter 6: Setup Mode: Server Configuration*).

The playback attitude is defined through the programmed firmware and is not described in this datasheet. Every ULTRA 2 MP3 module is equipped with the standard firmware or a customer specific firmware and is delivered with a datasheet describing all functions, settings and the ASCII protocol of this interface.

5. Firmware updates with the integrated bootloader

To program a new firmware file into the internal flash memory of the microcontroller, the firmware file (*.LOE) must be in the main directory of the SD card. There should be only one firmware file in the main directory!
Deleting and programming the internal flash memory is done by the internal bootloader of the ULTRA 2 MP3 module. When the module is off, the first button (**BUTTON_1 / T1 / Play/Pause**) must be pressed (bridged with ground) and then it must be turned on with the button pressed down. The ULTRA 2 MP3 module will now boot up the bootloader and the Bootloader-LED (LED_BLD) will light up. The programming sequence is automatically initiated, this means the module reads the firmware file in the main directory (*.LOE), erases the memory and programs it with the new firmware. As it is ready, the module will boot up the new firmware and the Bootloader-LED will go off.

To display errors and to diagnose them, the Bootloader-LED is used. It will blink every 0,5 s up, if there was a problem initialising the SD card or programming the flash memory. The counts of blinking up represent the error and will repeated every 3 s.

Error messages ULTRA 2 BOOTLOADER V1.03:

1 – Sector cannot be erased -> Module is defective
3 – Sector cannot be programmed -> Module is defective
5 – Firmware file (*.LOE) is not correct
6 – Partition signature (FAT32) not found -> SD card has to be formatted again
8 – Partition table (FAT32) not ok -> SD card has to be formatted again
9 – Firmware file (*.LOE) not found on the SD card
11 – SD card is not present