

Fallguy *ULTRA* Carrier Board

EXPANSION BOARD WITH EXTENSIVE INTERFACES

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1. Overview

The Fallguy ULTRA Carrier Board is an Expansion Board for the universal Fallguy ULTRA or ULTRA REC MP3 module by LOETRONIC. It expands the extensive digital and analog interfaces of the MP3 module by additional level converters (RS232- and RS485-interface), by an optional LAN- or USB-interface (XPORT or FTDI-IC), by an additional headphone amplifier and more electronic. All interfaces are reachable by separate connectors on the Carrier Board.

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

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

The ULTRA or ULTRA REC 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, which can be easily installed.

Article numbers:

Fallguy ULTRA Carrier Board	-	0129
LAN for Fallguy ULTRA Carrier Board	-	0138
USB for Fallguy ULTRA Carrier Board	-	0155
Fallguy ULTRA Casing Kit	-	0130

2. Technical data

Control- and visual elements:

- 3 buttons
- 4 status LEDs

Interfaces:

- 5 button inputs with ESD-protection
- 10 digital in- or outputs
- 1 connection for a matrix keypad (max. 6x4 – 24 keys)
- 1 LAN- or USB-interface (XPORT or FTDI-IC, optional)
- 1 RS232-interface (115.200 bps) – Control via Terminal or *ULTRA Serial Control*
- 1 RS485-interface (115.200 bps)
- 1 CAN-interface (optional)
- 1 interface for a LC-display
- 1 interface for 5 external status LEDs
- 2 audio cinch connectors (Left/Right)
- 1 headphone jack plug (Stereo)

Operating temperature:

- -20 °C to +85 °C

Operating voltage:

- 9-12 Volt (DC) un stabilized

Current consumption:

- 350 mA (typical) without connected LC-display / with XPORT

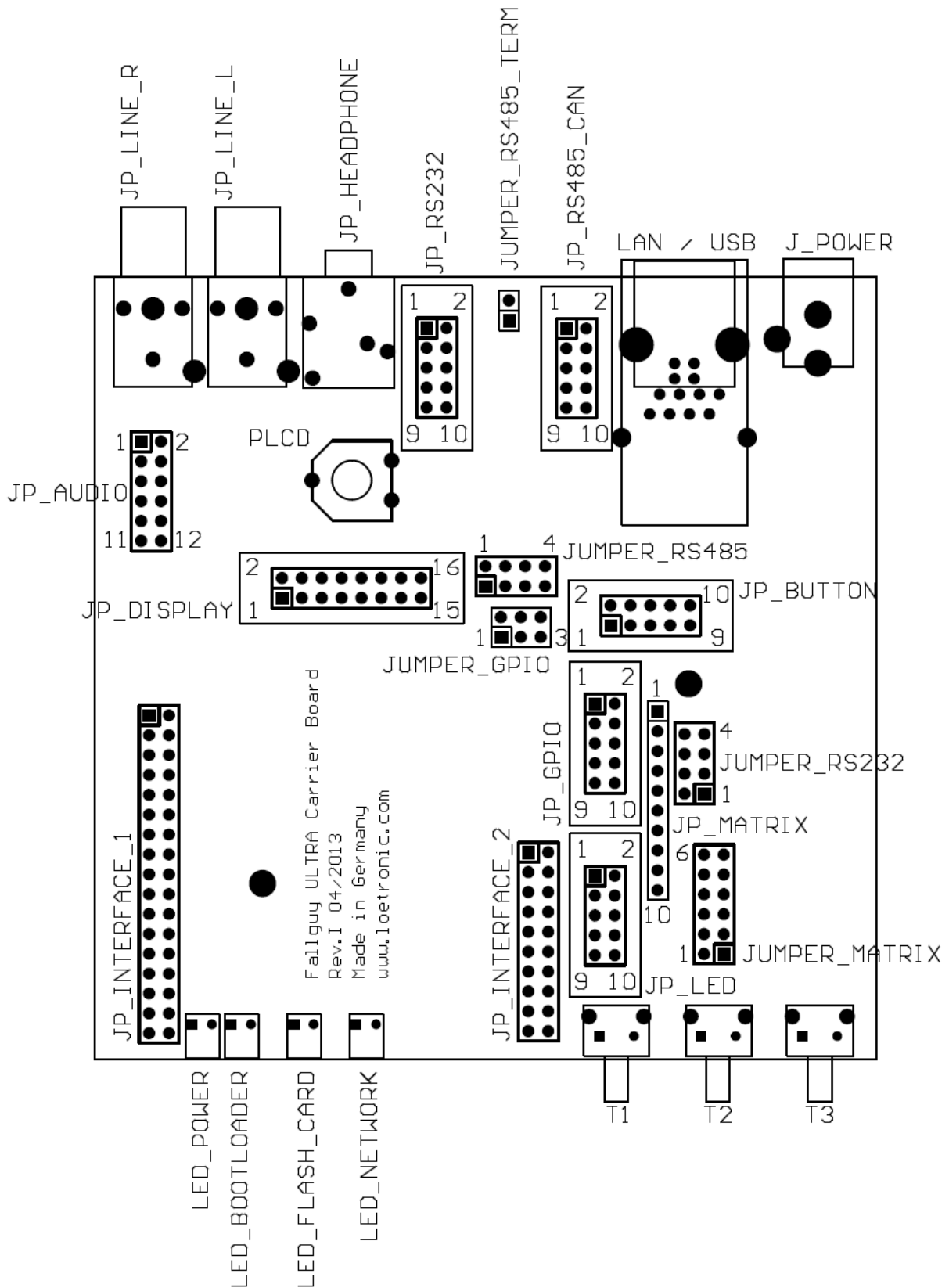
LAN functionality (using the optional XPORT):

- Lantronix XPort
- 10/100 Mbit
- Protocol: TCP/IP, DHCP
- Configurable via webbrowser/telnet or serial interface
- Control via Terminal or *ULTRA Serial Control*

USB functionality (using the optional FTDI-IC):

- FT231XS by FTDI
- Full Speed USB
- Control via Terminal or *ULTRA Serial Control*

3. Connection possibilities



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

Buttons T1, T2, T3

- The buttons control the ULTRA MP3 module. The assignment is defined though the standard firmware on the ULTRA 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 Fallguy ULTRA Carrier Board up
LED_BOOTLOADER	Bootloader-LED	By using the bootloader function
LED_FLASH_CARD	Flashcard-LED	At SD card activity (Playback/Record of MP3-files or MP3 upload)
LED_NETWORK	Network-LED	At network activity (RS232-, RS485- or 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 MP3 module.
- The button inputs are protected against ESD.
- To activate an input it must be bridged with ground.
- The socket of this interface is a 5x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 10).
- If the button inputs 9-11 shall be used, the JUMPER 1-3 on JUMPER_GPIO have to be set, as well as the configuration parameter (*GPIO2*).
- All inputs have 0 – 3.3 Volt level!**

Assignment:

Pin-No.	Name	Description
1	BUTTON_4	Button input 4
2	BUTTON_9	Button input 9 / GPIO_1
3	BUTTON_5	Button input 5
4	BUTTON_10	Button input 10 / GPIO_2
5	BUTTON_6	Button input 6
6	BUTTON_11	Button input 11 / GPIO_3
7	BUTTON_7	Button input 7
8	GND	Ground
9	BUTTON_8	Button input 8
10	GND	Ground

Assignment (JUMPER_GPIO):

Jumper	Name	Description
1	Jumper 1	GPIO_1 is button input 9
2	Jumper 2	GPIO_2 is button input 10
3	Jumper 3	GPIO_3 is button input 11

JP_GPIO and JP_MATRIX

- The interface JP_GPIO is for connecting external periphery and is not fixed to a specific function. Every GPIO could be used as a digital in- or output. The function is selected through the firmware used on the ULTRA MP3 module. **The GPIOs are connected directly to the microcontroller and are not protected against ESD!**
- 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 6 jumpers could be set for use with a matrix keypad at JP_MATRIX of up to 24 keys.
- The socket of the JP_GPIO interface is a 5x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 10).
- The socket of the JP_MATRIX interface is a 10x1-socket in RM2,54.
- **All in- and outputs have 0 – 3,3 Volt level!**

Assignment (JP_GPIO):

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	GPIO_9	Digital in- or output 9
9	GPIO_5	Digital in- or output 5
10	GPIO_10	Digital in- or output 10

Assignment (JP_MATRIX):

Pin-No.	Name	Description
1	GPIO_1	Digital in- or output 1
2	GPIO_2	Digital in- or output 2
3	GPIO_3	Digital in- or output 3
4	GPIO_4	Digital in- or output 4
5	GPIO_5	Digital in- or output 5
6	GPIO_6	Digital in- or output 6
7	GPIO_7	Digital in- or output 7
8	GPIO_8	Digital in- or output 8
9	GPIO_9	Digital in- or output 9
10	GPIO_10	Digital in- or output 10

Assignment (JUMPER_MATRIX):

Jumper	Name	Beschreibung
1	Jumper 1	At least a 1x4 matrix keypad could be used. (Pin 10 to Pin 6 at JP_MATRIX)
2	Jumper 2	At least a 2x4 matrix keypad could be used. (Pin 10 to Pin 5 at JP_MATRIX)
3	Jumper 3	At least a 3x4 matrix keypad could be used. (Pin 10 to Pin 4 at JP_MATRIX)
4	Jumper 4	At least a 4x4 matrix keypad could be used. (Pin 10 to Pin 3 at JP_MATRIX)
5	Jumper 5	At least a 5x4 matrix keypad could be used. (Pin 10 to Pin 2 at JP_MATRIX)
6	Jumper 6	At least a 6x4 matrix keypad could be used. (Pin 10 to Pin 1 at JP_MATRIX)

JP_LED

- The interface JP_LED is for connecting five external LEDs. The function of these LEDs is defined through the standard firmware on the ULTRA MP3 module.
- The LED outputs of JP_LED already have series resistors of 220 Ohm each.
- The socket of this interface is a 5x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 10).
- **All LED outputs have 0 – 3,3 Volt level!**

Assignment:

Pin-No.	Name	Description
1	LED_EXT1 K	External LED 1 – Cathode
2	LED_EXT1 A	External LED 1 – Anode
3	LED_EXT2 K	External LED 2 – Cathode
4	LED_EXT2 A	External LED 2 – Anode
5	LED_EXT3 K	External LED 3 – Cathode
6	LED_EXT3 A	External LED 3 – Anode
7	LED_EXT4 K	External LED 4 – Cathode
8	LED_EXT4 A	External LED 4 – Anode
9	LED_EXT5 K	External LED 5 – Cathode
10	LED_EXT5 A	External LED 5 – Anode

JP_LCD

- The interface JP_LCD is for connecting a multiline LC-display with HD44780 chipset and LED backlight. The displayed information on the LCD is defined through the standard firmware on the ULTRA MP3 module.
- The contrast of the liquid crystal is adjusted through the potentiometer PLCD.
- The socket of this interface is a 8x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 16).

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 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 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, all jumpers at JUMPER_RS232 must be set. Existing jumpers at JUMPER_RS485 must be removed. Only one interface JP_RS232 **or** JP_RS485 could be used, not both parallel. Furthermore the adequate interface (JP_RS232 or JP_RS485) must be activated in the standard firmware using the configuration command (*RS!xx*).
- The ASCII based protocol in the JP_RS232 interface is defined in the standard firmware and is described inside the datasheet for this firmware.
- The socket of this interface is a 5x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 10).

Assignment:

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

JP_RS485

- The interface JP_RS485 is for connecting the ULTRA MP3 module to an external bus interface using the well known RS485-interface. The voltage level of this serial interface is conform to RS485.
- 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 MP3 module. If the serial interface (UART 1) should be used as a RS485-interface, all jumpers at JUMPER_RS485 must be set. Existing jumpers at JUMPER_RS232 must be removed. Only one interface JP_RS232 **or** JP_RS485 could be used not both parallel. Furthermore the adequate interface (JP_RS232 or JP_RS485) must be activated in the standard firmware using the configuration command (*RS!xx*).
- The appropriate bus termination (JUMPER_RS485_TERM) could be set by a jumper on the Fallguy ULTRA Carrier Board.
- The ASCII based protocol in the JP_RS485 interface is defined in the standard firmware and is described inside the datasheet for this firmware.
- The socket of this interface is a 5x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 10).

Assignment:

Pin-No.	Name	Description
1	RS485_A	RS485 bus line A
2	RS485_B	RS485 bus line B
3	N.C.	Not connected
4	N.C.	Not connected
5	5V	5 Volt power supply for external devices
6	GND	Ground
7	N.C.	Not connected
8	N.C.	Not connected
9	N.C.	Not connected
10	N.C.	Not connected

LAN / USB

- Via the LAN-interface and the XPORT the ULTRA MP3 module can be connected to a Local Area Network (LAN). The configuration of the XPort is described inside chapter 5 of this datasheet.
- Via the USB-interface and the FTDI-IC the ULTRA 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 interfaces (RS232 and RS485). 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

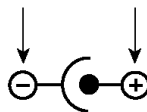
- The JP_INTERFACE_1 interface together with the JP_INTERFACE_2 interface is for connecting the Fallguy ULTRA or ULTRA REC MP3 module to the Carrier Board. The MP3 module has to be clipped simply on the Board. The lines in detail are described in the datasheet of the ULTRA and ULTRA REC MP3 module.

JP_INTERFACE_2

- The JP_INTERFACE_2 interface together with the JP_INTERFACE_1 interface is for connecting the Fallguy ULTRA or ULTRA REC 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 and ULTRA REC MP3 module.

JP_POWER

- The Fallguy ULTRA Carrier Board is supplied with 9-12 Volt (DC) through the socket JP_POWER.
- **A wrong polarity, non conforming voltage or electrostatic discharge could destroy the complete Carrier Board or the components!**



JP_LINE_L and JP_LINE_R

- Using the cinch sockets JP_LINE_L (Analog audio output left) and JP_LINE_R (Analog audio output right) the Fallguy ULTRA Carrier Board could be connected to an external amplifier. Both audio outputs have line level.

JP_HEADPHONE

- Using the stereo jack plug JP_HEADPHONE a stereo headphone could be connected to the Fallguy ULTRA Carrier Board.

JP_AUDIO

- The interface JP_AUDIO is for connecting the different analog and digital audio lines of the ULTRA or ULTRA REC MP3 module to external electronic.
- The socket of this interface is a 5x2-socket in RM2,54. Appropriate sockets for use with crimped ribbon cables are available for example at www.reichelt.de (PFL 10).

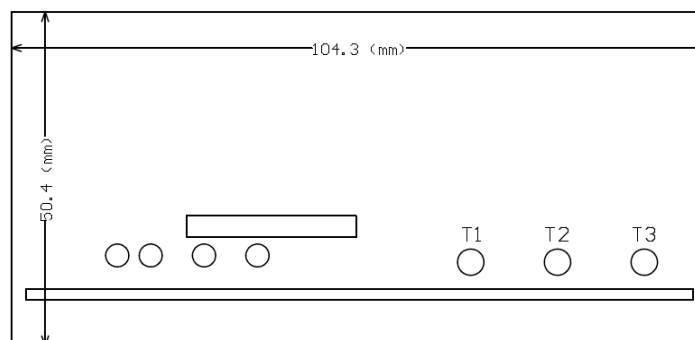
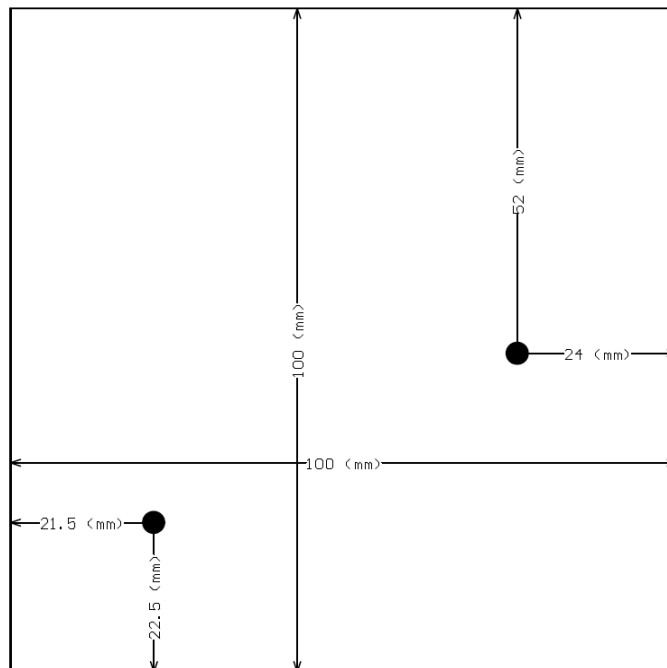
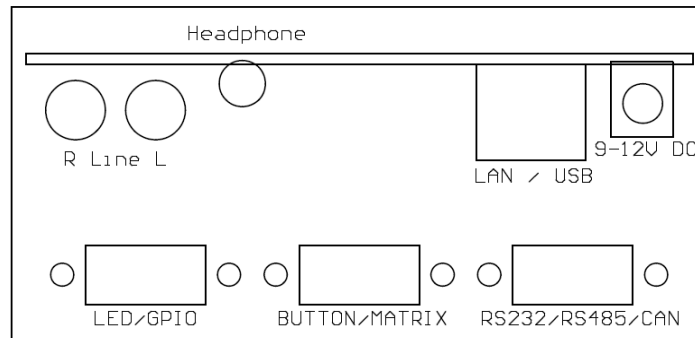
Assignment:

Pin-No.	Name	Description
1	A_LINE_R	Analog audio output Right (Line level)
2	GND	Ground
3	A_LINE_L	Analog audio output Left (Line level)
4	GND	Ground
5	A_HP_R	Analog audio output Right (Headphone level)
6	GND	Ground
7	A_HP_L	Analog audio output Left (Headphone level)
8	GND	Ground
9	SCLK / LINE_IN_L	Digital audio output I2S – SCLK or analog audio input Left (ULTRA REC)
10	SDATA / LINE_IN_R	Digital audio output I2S – SDATA or analog audio input Right (ULTRA REC)
11	MCLK / HP_GBUF	Digital audio output I2S – MCLK or HP_GBUF (ULTRA REC)
12	LRCK / MICN	Digital audio output I2S – LRCK or MICN (ULTRA REC)

4. Mechanical dimensions

Dimensions:

- Carrier Board: 100x115x25 mm (WxDxH), with Fallguy ULTRA or ULTRA REC MP3 module clipped on!
- ULTRA Casing: 105x115x52mm (WxDxH)



Picture 4.1 Fallguy ULTRA Carrier Board Rev.I and ULTRA Casing - Dimensions

5. Getting started

The Fallguy ULTRA Carrier Board with Fallguy ULTRA or ULTRA REC MP3 module clipped on must be connected to a voltage source of 9-12 Volt (DC) at JP_POWER. An external amplifier could be connected at the cinch sockets JP_LINE_L and JP_LINE_R, a headphone at the jack plug JP_HEADPHONE.

Any SD flashcard – 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 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 static address and subnet mask(**192.168.0.200, 255.255.255.0**). The user can test, whether 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 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.

6. 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 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 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 BOOTLOADER V1.04:

- 1 – Sector cannot be erased
- 2 – Erased sector cannot be verified
- 3 – Sector cannot be programmed
- 4 – Programmed sector cannot be verified
- 5 – Firmware file (*.LOE) is not correct
- 6 – Partition signature not found
- 8 – Partition table not ok
- 9 – Firmware file (*.LOE) not found in main directory
- 11 – SD card is not present