

See page 8 for  
quick start

# Full HD Media Player Controlled by I2C With HDMI and LVDS output

## FCO I 30 MediaPlayer FiveCo

### User Manual

Version 1.0



Version: **1.0**  
Last revision: **December 2015**  
Printed in **Switzerland**

© Copyright 2002-2015 FiveCo Sàrl. All rights reserved.  
The contents of this manual may be modified by FiveCo without any warning.

---

#### Trademarks

Linux® is a registered trademark of Linus Torvalds.

#### Warning

This device is not intended to be used in medical, life-support or space products.

Any failure of this device that could cause serious consequences can be prevented through the implementation of backup systems. The user agrees that protection against consequences resulting from device system failure is the user's responsibility. Changes or modifications to this device not explicitly approved by FiveCo will void the user's authority to operate this device.

#### Support

Web page: <http://www.fiveco.ch/mediaPlayer-products.html>

Email: [support@fiveco.ch](mailto:support@fiveco.ch)

**Revision history**

<b>Revision</b>	<b>Date</b>	<b>Author</b>	<b>Note</b>	<b>Hardware Version</b>	<b>Bootloader version</b>	<b>OS version</b>	<b>App version</b>
1.0	08.12.2015	FR	- First revision	1.2c	Since 1.2	1.0	1.5

## Table of Contents

1. Package and operating conditions.....	5
Package contents.....	5
Operating conditions .....	5
2. Overview.....	6
Applications.....	6
Hardware description.....	7
3. Quick start.....	8
Plug and Play.....	8
4. Hardware .....	9
Power supply.....	9
I2C Address .....	9
Screen type .....	10
5. Configuration file.....	16
General.....	16
6. Video Type.....	18
Naming video.....	18
Video Format.....	18
7. I2C Register.....	19
List of registers.....	19
TYPE .....	20
VERSION .....	21
MEDIAACTION.....	22
BRIGHTNESS.....	23
VIDEOOUTPUT .....	24
AUDIOOUTPUT .....	25
8. FMod-LEDSEQUENCER control application.....	26

## I. Package and operating conditions

### Package contents

- FCO130 MediaPlayer FiveCo
- Power Supply 12V / 60W
- USB Stick 4GB with this manual, video sample and configuration file
- This manual

### Operating conditions

- |                                  |  |
|----------------------------------|--|
| ▪ Operating temperature          | 0 – 70 °C  |
| ▪ Supply voltage Vcc             | 12 VDC   |
| ▪ Supply current                 | max 1.2 A (without supplying screen backlight)   |
| ▪ Power consumption <sup>1</sup> | 250mA at startup<br>160mA when playing no video<br>250mA when playing a video<br>300mA when charging new video |
| ▪ Input capacity (Power +,-)     | ?????  |
| ▪ Max. backlight output current  |  |
| ○ Voltage driver                 | 4.0A   |
| ○ Current driver                 | 1.5A   |
| ▪ Max. backlight output voltage  |  |
| ○ Voltage driver                 | 12V (fixed)  |
| ○ Current driver                 | 48V (9.4V min)   |
| ▪ Minimum headphone Load         | 16Ω  |

<sup>1</sup> The power consumption was measured with HDMI output without supplying a screen backlight

## 2. Overview

### *Applications*

---

The FCO130 MediaPlayer FiveCo is a media player controlled by an I2C bus. It can output a video signal by an LVDS (up to 2 channels 24bit color depth) or by an HDMI.

It can read video from an usb data storage or an uSD card.

The device connections and dimensions are described on the following pages.

## Hardware description

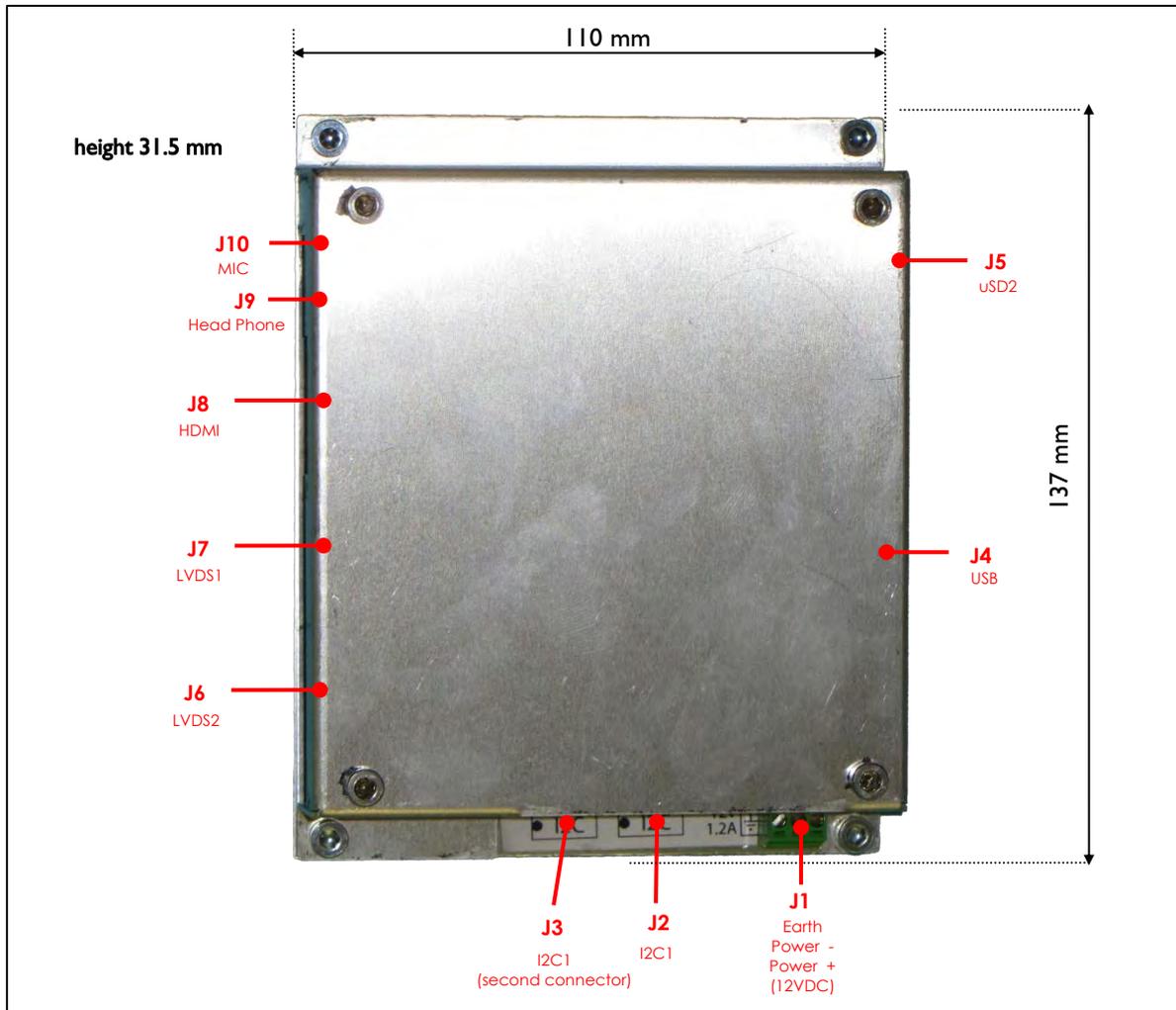


Figure I : Dimension of the media player FCO130

### 3. Quick start

This section is intended to help users quickly plug the device into their system and play a video on an HDMI device. Detailed information about hardware and software is provided further in this document.

#### *Plug and Play*

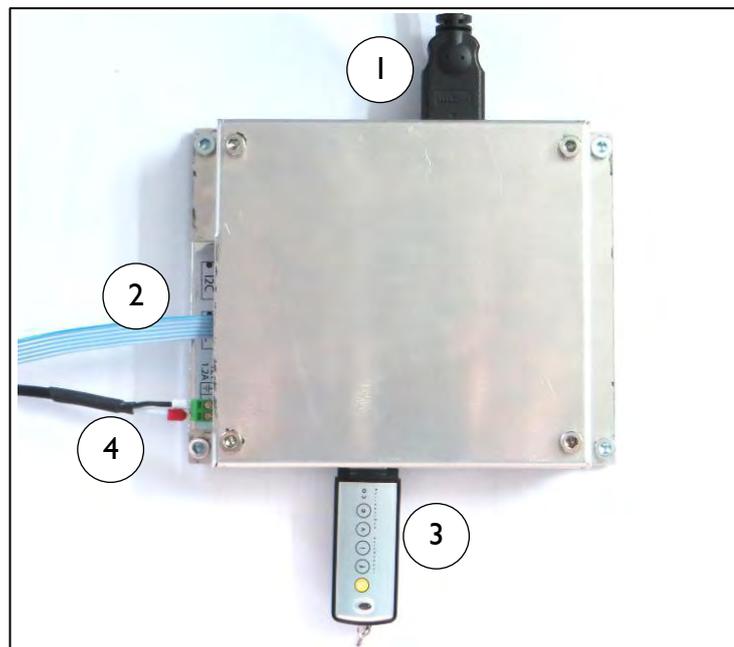


Figure 2 : Std connection for the FCO I30 media player

1. Connect the HDMI cable between the screen and the media player.
2. Connect the I2C cable between the mediaPlayer and the master I2C (The default address is 0x40 or 64). If you want to use the media player in a standalone mode you can skip this step.
3. Plus an USB storage device or a microSD with the video to play and the configuration file.
4. Connect the DC power (12V) and wait 25 second.
5. Send I2C Command to play a video or wait a moment and the media player start in a standalone mode.

## 4. Hardware

### Power supply

A power supply with an output of 12V and minimum 20W must power the mediaplayer. If you want to connect a screen with a LVDS connection you must add the maximum consumption of the screen with a 1.25 factor included the screen backlight to calculate the minimum power of the power supply.

For example :

Screen maximum logic power : 5.5Watt

Screen backlight maximum power : 25.1 Watt

Power of power supply :  $P \geq 20 + (5.5 + 25.1) * 1.25 = 58.25\text{Watt}$

### I2C Address

There are two ways to configure the I2C address of the mediaplayer. This can be done by using the matrix switch SW7. In this case you must comment the I2C\_ADDRESS line in the configuration file. You can find below how to configure an address with the switch matrix.

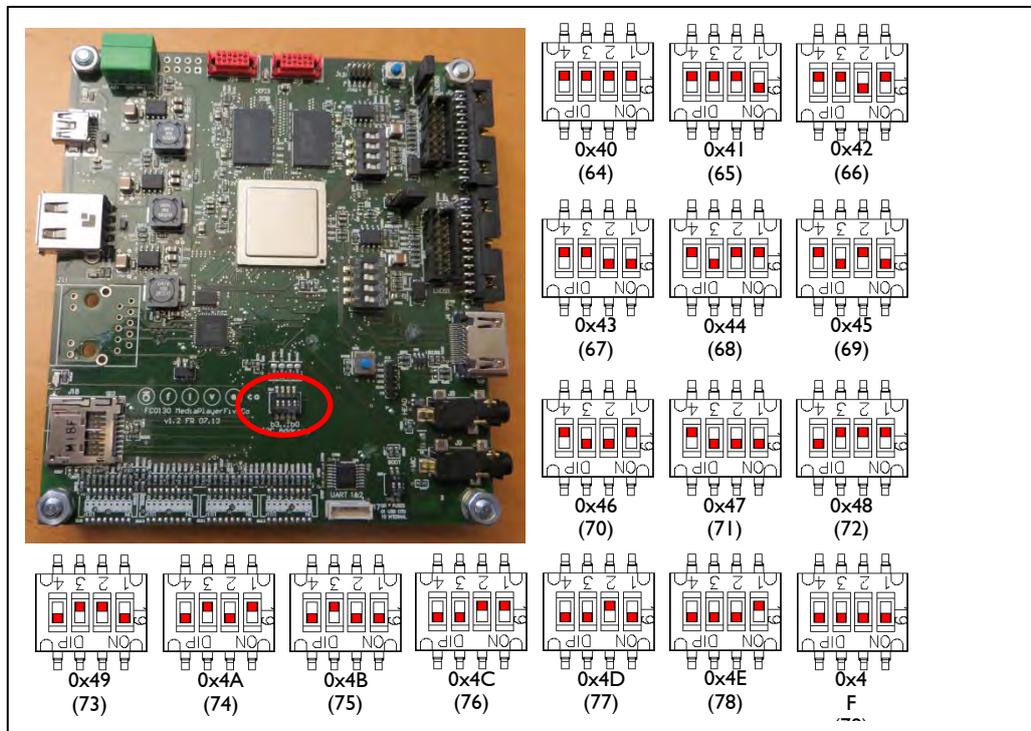


Figure 3 : Matrix switch, I2C Address

## Screen type

The media player can transmit video signal through a HDMI bus or an LVDS bus up to two channels and 24 bit color depth. It can also power a screen backlight and control it by sending control signals (enable, pwm) or directly control the current to power the backlight.

To configure which video and audio output you want to use, please see the chapter 0 “If the wanted current for the screen is not in this list, you must choose the switch configuration with the current just higher of the wanted current and set a PWM in configuration file to adjust the current. For example if you must have a current of 300mA, you select the configuration with a current of 342mA and set the PWM at 223/255 ( $300/342 * 255 = 223$ ).

### Bootscript

LVDS Screen must have a special bootscript to configure correctly LVDS signals.

The bootscript is a binary file place at the root of the uSD which contains OS files.

Actually we have bootscript for following screens:

- AUO G150XG02
  - AUO G190EG02V1
  - AUO G173HW01
  - Samsung LTNI01AL03
  - JXEDP02\_V0.91 (lvds to edp converter)
- Configuration file”.

## HDMI Screen

HDMI Screen must be connected to the media player with an HDMI cable on the connector J8. The screen must have its own power supply.

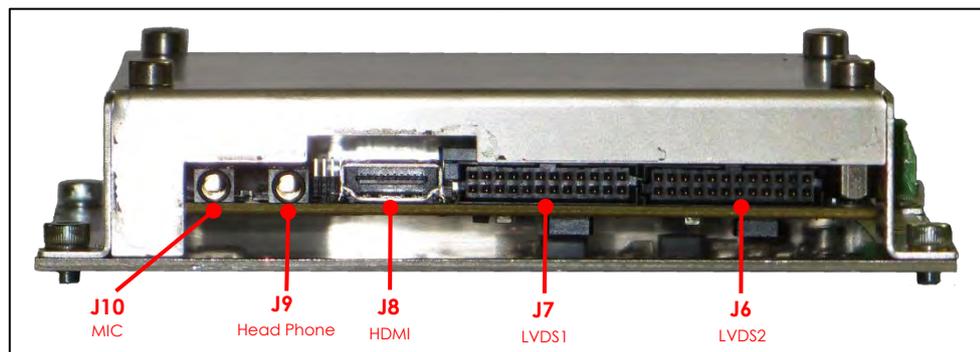


Figure 4 : Output Face of the FCO I30 media player

If you want to play a video with audio track you can transmit audio signal through HDMI bus or through the mini jack J9 (for HeadPhone) which transmit stereo analog signal.

If you use the mini jack connector for playing audio, **be careful, you must use a device with a minimum of 16Ohm impedance.**

This bus can display a video resolution up to 1920x1080px30fps.

### LVDS Screen

LVDS screen must be connected to the media player with a custom cable. There is no standard cable for LVDS, each screen must have its specific cable.

With this media player you can connect LVDS screen which have one or two LVDS channel and a color depth of 18bit or 24bit.

It can also power a screen backlight and control it by sending control signals (enable, pwm) or directly control the current to power the backlight.

This bus can display a video resolution up to 1920x1080px60fps.

### LVDS Connector

If the screen has only one channel LVDS, you must use the LVDS1 connector (J7). The pinning of this connector was described below:

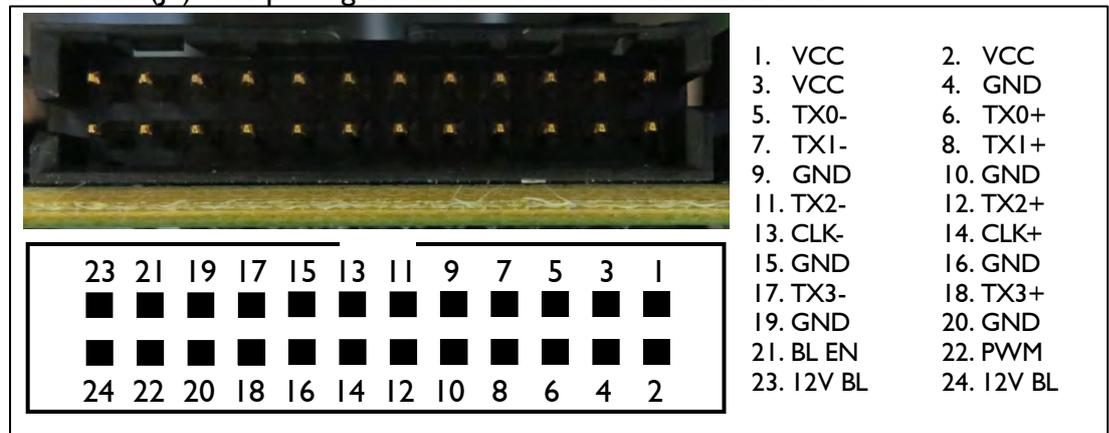


Figure 5 : J7 (LVDS1) connector

Table I : Pin Assignment of J7 (LVDS1)

SIGNAL NAME	DESCRIPTION	PIN(s)#
VCC	Screen electronic power supply (3.3V or 5V) can be selected with JPI (see below “: Screen voltage selection”)	1, 2, 3
GND	Power Ground	4, 9, 10, 15, 16, 19, 20
TX0-	Negative LVDS differential data input	5
TX0+	Positive LVDS differential data input	6
TX1-	Negative LVDS differential data input	7
TX1+	Positive LVDS differential data input	8
TX2-	Negative LVDS differential data input	11
TX2+	Positive LVDS differential data input	12
CLK-	Negative LVDS differential clock input	13
CLK+	Positive LVDS differential clock input	13

TX3-	Negative LVDS differential data input	17
TX3+	Positive LVDS differential data input	18
BL EN	Backlight enable	21
PWM	Backlight Dimming	22
12V BL	Screen backlight power supply	23, 24

The five differentials pairs must be twisted on the cable.  
 If the screen has only an 18bits color depth, the pair TX3 must not be connected.  
 You can also select the voltage of VCC (pin 1, 2, 3) to power the screen electronic with the Jumper JPI shown below.

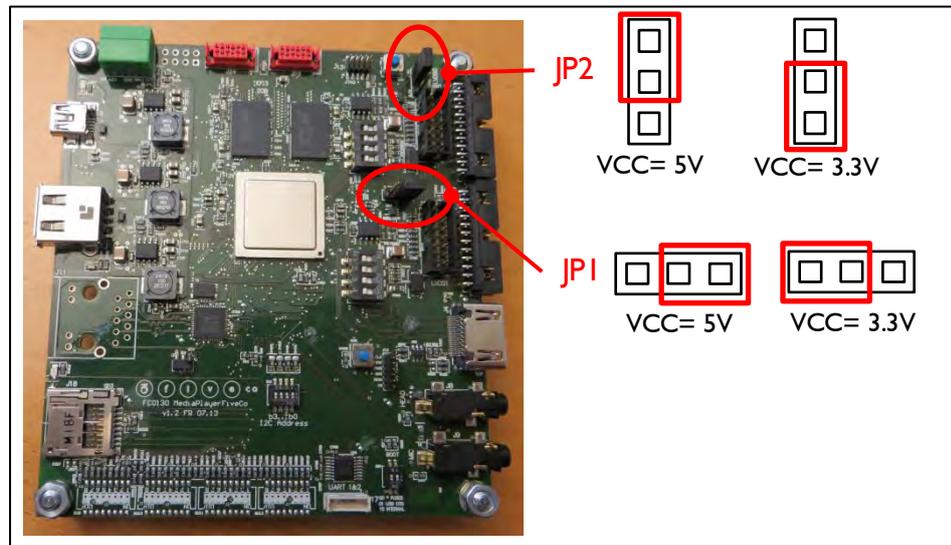


Figure 6 : Screen voltage selection

If the screen has its own electronic for backlight, you can power at 12V with the pin 23, 24(12V) and 19, 20(GND). You can also control it with the pin 21 (backlight enable) and 22 (Pulse With Modulation, 100% = max luminance, 0%=no luminance).

**Two channels LVDS**

If the screen has two LVDS channels, you must use connectors J7 (LVDS1) and connector J6 (LVDS2). The connector J7 has the same pin assignment as itself when there is only one channel, but the differentials pairs are only for odd pixels.

The pins assignments for J6 (LVDS2) are described below:

Table 2 : Pin Assignment of J6 (LVDS2)

SIGNAL NAME	DESCRIPTION	PIN(s)#
VCC	Screen electronic power supply (3.3V or 5V) can be selected with JP2. <b>Be careful use the same voltage as JPI.</b>	1, 2, 3
GND	Power Ground	4, 9, 10,

		15, 16, 19, 20
TXE0-	Negative LVDS differential data input (Even data)	5
TXE0+	Positive LVDS differential data input (Even data)	6
TXE1-	Negative LVDS differential data input (Even data)	7
TXE1+	Positive LVDS differential data input (Even data)	8
TXE2-	Negative LVDS differential data input (Even data)	11
TXE2+	Positive LVDS differential data input (Even data)	12
CLKE-	Negative LVDS differential clock input (Even clock)	13
CLKE+	Positive LVDS differential clock input (Even clock)	13
TXE3-	Negative LVDS differential data input (Even data)	17
TXE3+	Positive LVDS differential data input (Even data)	18
NC	Not connected. <b>Do not connect these pins.</b>	21, 22
12V BL	Screen backlight power supply	23, 24

### Backlight with current supply

If the screen has no integrated electronic for controlling its backlight, the media player must drive a current source for supply the backlight. For this you must connect the backlight cable to the connector J11.

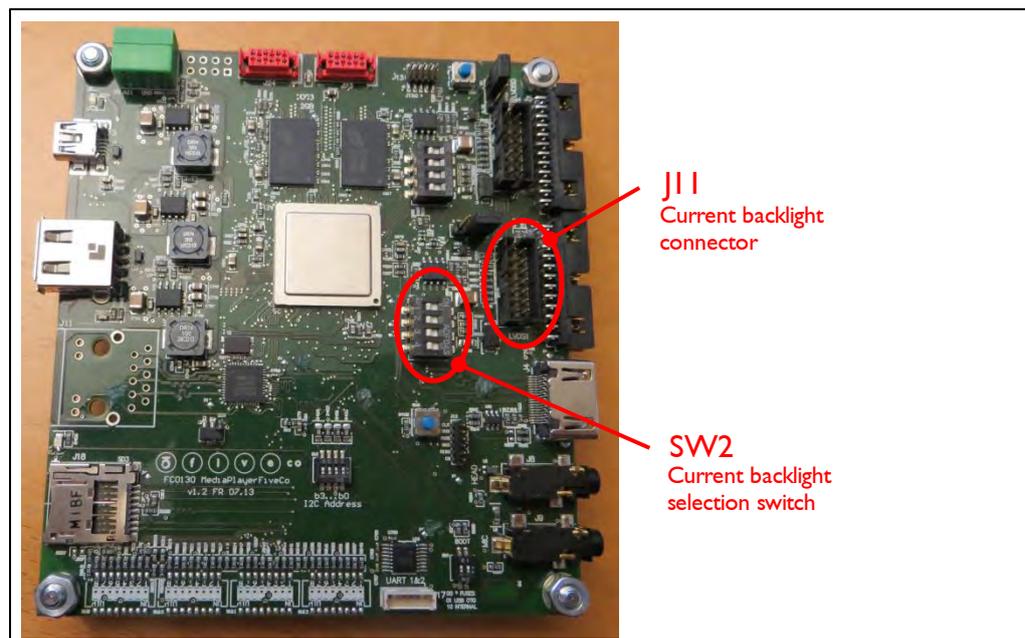


Figure 7 : Current backlight interface

The pinning of this connector J11 was described below:

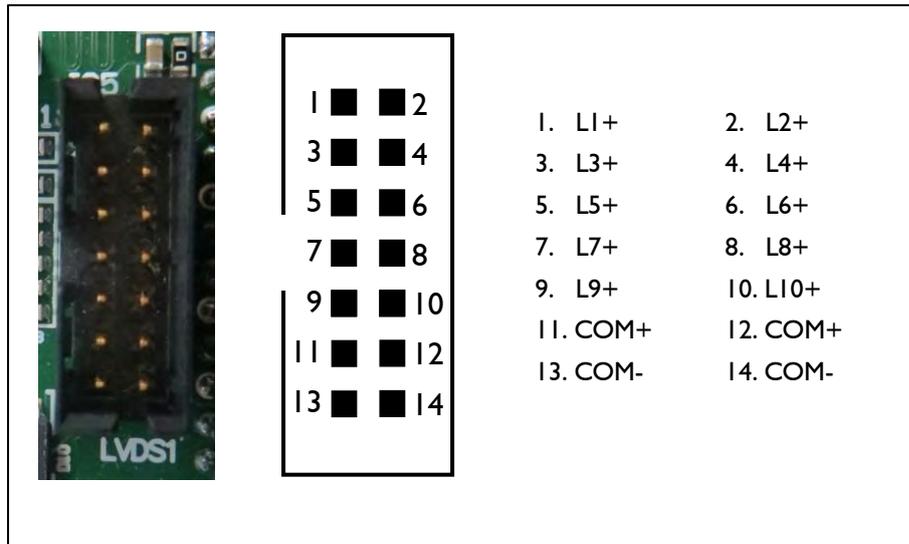


Figure 8 : J11 (Backlight current) connector

Table 3: Pin Assignment of J11 (backlight current)

SIGNAL NAME	DESCRIPTION	PIN(s)#
Lx+	Anode for 1 Line Led (a line is several leds connected in serial configuration). <b>Max 80mA/line</b>	1-10
COM+	Anode for all Backlight Unit	11, 12
COM-	Cathode for all Backlight Unit	13, 14

If the backlight connector have one pin for each line at anode side (like the scheme bellow) please use the Lx+ pins if the current is under 80mA. Otherwise use the COM+ pins.

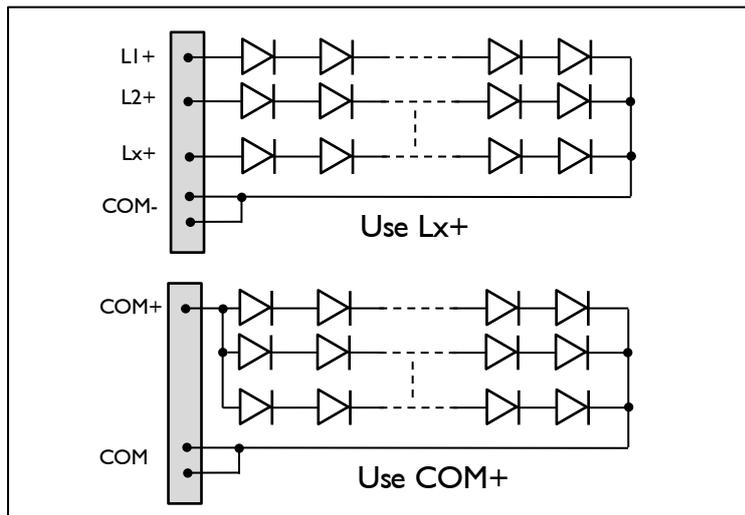


Figure 9: Backlight current connection

**This power supply cannot have a voltage below 12V.**  
 Please consider this table to select the good current to supply your screen with the SW2 (current backlight selection).

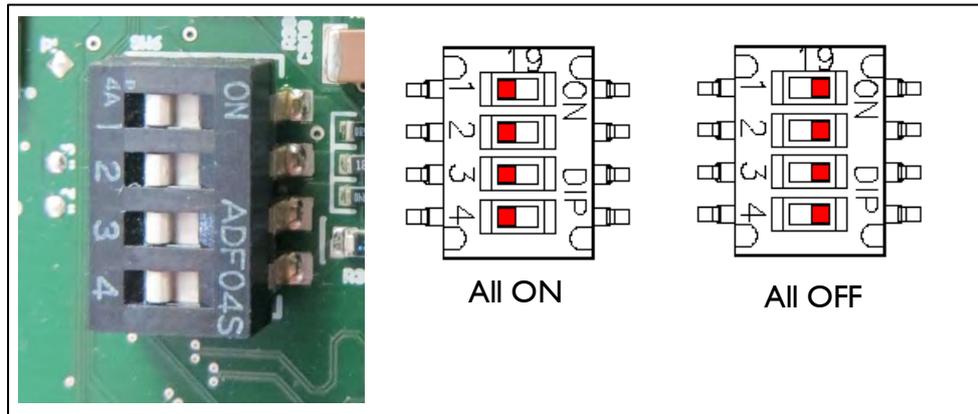


Figure 10 : Switch current backlight selection

The current is for a PWM = 100%

Switch On	Current [mA]	Voltage max [V]	Power max [W]
3	100	48	4.8
2	159	48	7.6
2+3	259	48	12.3
1	346	38	13
1+3	446	30.5	13.5
1+2	505	27.9	14
1+2+3	605	24.1	14.5
4	839	16.7	15
3+4	939	16.6	15.5
2+4	998	16.0	16
2+3+4	1'098	15.0	16.5
1+4	1'185	14.1	17
1+3+4	1'285	13.5	17.5
1+2+4	1'344	13.3	18
1+2+3+4	1'444	12.7	18.5

If the wanted current for the screen is not in this list, you must choose the switch configuration with the current just higher of the wanted current and set a PWM in configuration file to adjust the current. For example if you must have a current of 300mA, you select the configuration with a current of 342mA and set the PWM at 223/255 ( $300/342 * 255 = 223$ ).

### Bootscrip

LVDS Screen must have a special bootscrip to configure correctly LVDS signals.

The bootscrip is a binary file place at the root of the uSD which contains OS files.

Actually we have bootscrip for following screens:

- AUO G150XG02
- AUO G190EG02V1
- AUO G173HW01
- Samsung LTNI01AL03
- JXEDP02\_V0.91 (lvds to edp converter)

## 5. Configuration file

### General

---

The configuration file is a text file placed at the root of the uSD or the USB storage device which contains video to play.

This file allows some configuration for the media player.

If a line starts with '#', the line was not taken into account by the media player. To take this line into account you must remove the '#'.

### I2C\_ADDRESS

---

```
#I2C_ADDRESS 64 # i2c-address (decimal only)
# WARNING! If I2C_ADDRESS is defined, the
# jumper will be ignored
```

If you want to set an address I2C with this configuration file, you can remove the first '#' and write the new address. The address must be written in decimal and must be between 8 and 118.

### AUTO\_MODE\_PAUSE\_MS

---

```
AUTO_MODE_PAUSE_MS 1000 # automatic reading config (standalone)
# = 0 : disabled
# > 0 : pause between 2 videos in ms,
# forward reading
# < 0 : pause between 2 videos in ms,
# backward reading
```

This configuration is used in standalone mode, you can disable standalone mode by setting 0 or select the time in millisecond between the end of a video and the start of the next video.

If you want to play video 0, then video 1, then video 2 ... set a positive value. If you want to play video 10 then, then video 9, then video 8 ... set a negative value.

### AUTO\_MODE\_INITIAL\_WAIT\_MS

---

```
AUTO_MODE_INITIAL_WAIT_MS 10000 # initial wait before mediaplayer starts
# to auto-play
```

This configuration is used to define the time in millisecond before media players starts to auto-play (standalone mode).

### LVDS\_BRIGHTNESS

---

```
LVDS_BRIGHTNESS 255 # Brightness [0-255], 255 = max
```

This configuration is used to define the brightness of the screen. It works only for LVDS screen.

0 is not backlight, and 255 is the maximum luminosity.

Be careful if you use a LVDS screen with current control on the media player, you may not pass the maximum admissible current of the screen.

## VIDEO\_DEVICE

---

```
VIDEO_DEVICE 1 # Video device selection (0 = disabled, 1 = primary, 2 = secondary)
              # (1 and 2 may be HDMI or LVDS (usually 1 is HDMI))
```

This configuration is used to select the output to display video.

0 disable video output.

1 Select the primary output (This output give the best performance)

2 Select the secondary output

1 and 2 may be HDMI or LVDS it depend on the bootscript. If you have the standard bootscript the primary output is HDMI.

## AUDIO\_DEVICE

---

```
AUDIO_DEVICE 1 # Audio device selection (0 = disabled, 1 = HDMI, 2 = jack)
```

This configuration is used to select the output to play audio.

0 disable audio output.

1 Select the HDMI bus to transmit audio signal.

2 Select the jack connector to transmit audio signal

**Be careful do not select the HDMI output for audio if you have nothing connected on the hdmi connector. A video with an audio track can block the media player.**

## MAX\_MEDIA\_NB

---

```
#MAX_MEDIA_NB 1024 # Max media-file number
```

This line defines the maximum number of media-file.

## MEDIA\_DIR

---

```
#MEDIA_DIR /media/.... # My specific media repository
```

TODO

## 6. Video Type

All videos to displays must be either on the micro SD on J5 or on an USB storage device on J4 at the root of the device if a specific media repository was not define in the configuration file.

### *Naming video*

---

Each video must have a unique number, the name of the video must be like one of the following examples:

- FILExx\_nameOfTheVideo.mp4
- filexx\_nameOfTheVideo.mp4
- Filexx\_nameOfTheVideo.mp4

'xx' must be a number between 0 and 1023, some zeros can be added before the number (like 002 or 02 or 023). This number matches to the number of the video, if you want to play this video, send this number with the I2C command.

### *Video Format*

---

Bla bla

#### **Size and speed**

---

The video cannot have a memory size bigger than TODO MB. The resolution cannot be bigger than Full HD (1920x1080p) and the speed of the video must not be higher of 30 fps for Full HD and 60 fps for HD ready (1280x720p).

#### **Container**

---

MP4 or AVI TODO.

#### **Video Codec**

---

TODO.

#### **Audio Codec**

---

TODO.

## 7. I2C Register

### List of registers

Address	Byte	Name
<b>General Information</b>		
0x00	4	TYPE
0x01	4	VERSION
<b>Command</b>		
0x20	4	MEDIAACTION
<b>General configuration</b>		
0x40	1	BRIGHTNESS
0x41	1	VIDEOOUTPUT
0x42	1	AUDIOOUTPUT

$K_P$ ,  $K_I$ ,  $K_D$  depend mainly on the type of motor, voltage and encoder resolution. The more the encoder has pulses per revolution, the smaller the  $K_P$ ,  $K_I$ ,  $K_D$  values will be.

The main *INPUT* (PWM/Speed/Position) is software-limited with configurable *INPUTMIN* and *INPUTMAX* values.

TYPE

Register Address	Register Name	Function	Read/Write Control
0x00	TYPE	Product ID	Read Only

Register Size	Register structure
4 Bytes	Unsigned Int 16 bits (HH-HL) TYPE   Unsigned Int 16 bits (LH-LL) MODEL

**Description :**

Product identifier composed of a Type and Model number.

It defines which kind of peripheral it is.

Normally different TYPE modules are not software compatible.

**Example:**

Device with TYPE = 0x002E0001 means Type = 2E (2E = FCO130 MediaPlayer), Model = 1.

**Limits:**

None

**Active:**

Each time the processor running after the boot (~25 seconds)

**VERSION**

Register Address	Register Name	Function	Read/Write Control
0x01	VERSION	Hw/Sw version	Read Only

Register Size	Register structure	
4 Bytes	2x Unsigned Int 8 bits (HH-HL) Hardware Major and minor version	2x Unsigned Int 8 bits (LH-LL) Software Major and minor version

**Description :**

Hardware version and Software version, with version and revision number. Normally same version with different revision is backward compatible.

**Example:**

Device with VERSION = 0x01020304 means Hardware version = 1.2, Software version = 3.4. This software version is compatible with all earlier revision of the same version (ver 3.0 to 3.3) but has new functionalities (which are deactivated by default) or code optimizations.

**Limits:**

None

**Active:**

Each time the processor running after the boot (~25 seconds)

**MEDIAACTION**

Register Address	Register Name	Function	Read/Write Control
0x20	MEDIAACTION	Action on media	Write Only

Register Size	Register structure
4 Bytes	Unsigned Int 8 bits (HH) Action type 3x Unsigned Int 8 bits (HL-LH-LL) Action Data

**Description :**

Command to do an action on the media.

Action type	Description	Action Data
1	Start new video	The number of the video
2	Pause current video	None
3	Resume current video	None
4	Stop current video	None
5	Seek current video	Time in ms
6	Load video in Pause	The number of the video
7	Configure Auto Mode	Action Data = 0 => Disabled Auto-mode Action Data >0 => Time between video, load next video Action Data < 0 => Time between video, load previous video
8	Start next video	None
9	Load next video in Pause	None
10	Start previous video	None
11	Load previous video in Pause	None

**Example:**

MEDIAACTION = 0x01E65405 (action type = 0x05, action data = 0x01E654 = 124500) means goes in current video at time 124.5 seconds.

MEDIAACTION = 0x00000806 (action type = 0x06, action data = 0x000008) means load video 8 and put it in Pause.

MEDIAACTION = 0xFFD8F007 (action type = 0x07, action data = 0xFFD8F0 = -10000) means configure Auto Mode with a pause of 10 seconds between videos and load previous video.

**Limits:**

None

**Active:**

Each time the processor running after the boot (~25 seconds).

Some actions (2, 3, 4, 5) works only when a video is loaded.

**BRIGHTNESS**

---

Register Address	Register Name	Function	Read/Write Control
0x40	BRIGHTNESS	Sets backlight brightness	R/W

Register Size	Register structure
1 Byte	Unsigned Int 8

**Description:**

Sets the screen brightness.

Minimum 0 (black screen), maximum 255 (maximum luminosity).

**Example:**

Device with BRIGHTNESS = 0xFF means screen with full brightness.

**Limits:**

Works only with screen connected with an LVDS bus. **Be careful some screen with backlight current control on media player must not exceed current max and brightness value must be lower than a specific value lower than 255 (see Backlight with current supply on page 13) .**

**Active:**

Each time the processor running after the boot (~25 seconds)

## VIDEOOUTPUT

---

Register Address	Register Name	Function	Read/Write Control
0x41	VIDEOOUTPUT	Sets the video output	R/W

Register Size	Register structure
1 Byte	Unsigned Int 8

### Description:

Sets the video output.

0 : No video

1 : Primary video output

2 : Secondary video output

### Example:

Device with VIDEOOUTPUT = 0x01 means video output on primary output.

### Limits:

HDMI and LVDS can be either primary or secondary, it depends on the bootscript file. If the bootscript is the standard one, the HDMI is the primary output.

### Active:

Each time the processor running after the boot (~25 seconds)

## AUDIOOUTPUT

---

Register Address	Register Name	Function	Read/Write Control
0x42	AUDIOOUTPUT	Sets the audio output	R/W

Register Size	Register structure
1 Byte	Unsigned Int 8

**Description:**

Sets the audio output.

0 : No audio

1 : Audio output on HDMI

2 : Audio output on jack (analog output)

**Example:**

Device with AUDIOOUTPUT = 0x01 means audio output on HDMI bus.

**Limits:**

None.

**Active:**

Each time the processor running after the boot (~25 seconds)

## 8. FMod-LEDSEQUENCER control application

The JAVA application for the FMod-LEDSEQUENCER includes since version 2.4 the Media Player FiveCo type.

This type has some command to play, stop pause a video.

It has also command to go at a specific time in a video.

It can also adjust brightness and select audio and video output.

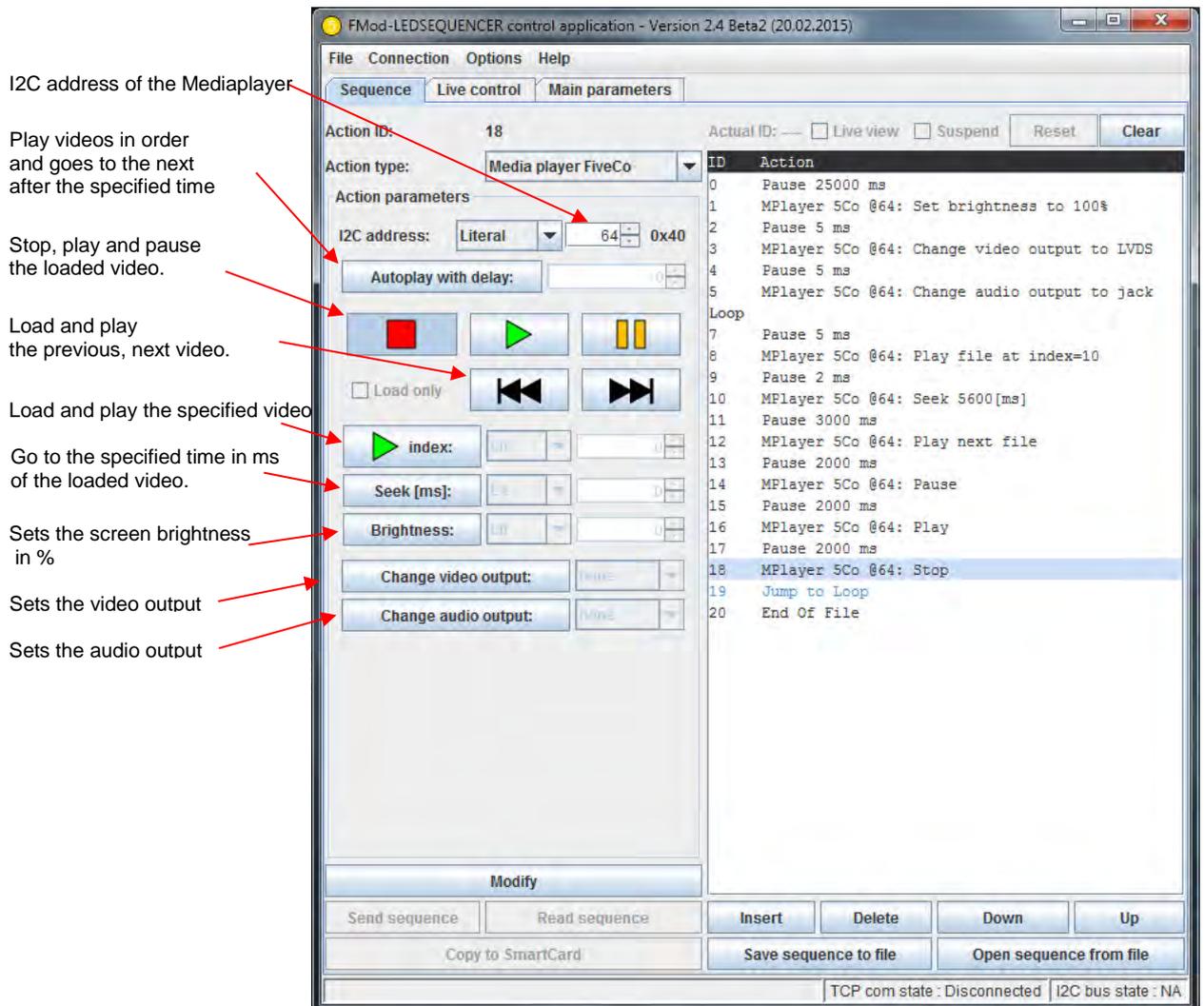


Figure 21 : Java application, Media player

### Remarks :

If the pause of function « Autoplay » is negativ, the videos will be played in reverse order.

If the case « Load only » is checked, functions « Play next file », « Play previous file », « Play file at index » just load video and put it in « Pause » state. You must send command « Play » to play it. This reduces the time

and the variations of time between sending « Play » command and when the video starts really.

« Seek » command goes to the nearest « Key Frame » of the video of the specified time.

**Contact address:**

FiveCo - Innovative Engineering  
En Budron H 1 I  
CH-1052 Le Mont-sur-Lausanne  
Switzerland  
Tel: +41 21 632 60 10  
Fax: +41 21 632 60 11

[www.fiveco.com](http://www.fiveco.com)  
[info@fiveco.com](mailto:info@fiveco.com)

