XBMC USB Controller
For Media Center PCs

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XBMC is a cross platform Media Center Application with 10-foot UI. In this project we develop USB port base controller for XBMC application. Main functionality of this controller unit is to provide remote control interface, LCD base player information panel and rotary encoder base controller for XBMC. With this given hardware design and software programs, user may be able to control XBMC without using standard input devices such as keyboard and mouse.
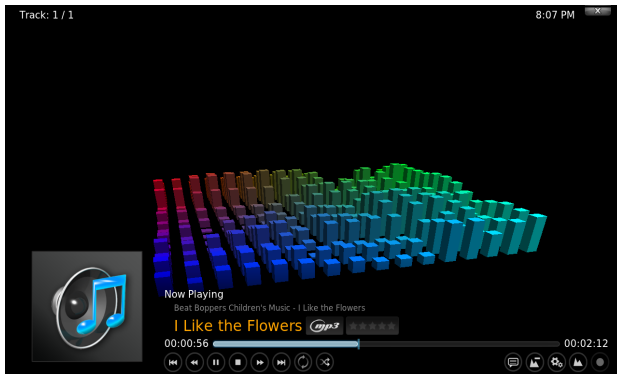

Fig.1 - *XBMC Audio Player*

This device is design to work with XBMC Version 10.1 (codename *Dharma*) or newer versions. Older version of XBMC may not work this system because of the differences in its Web Control Interface.

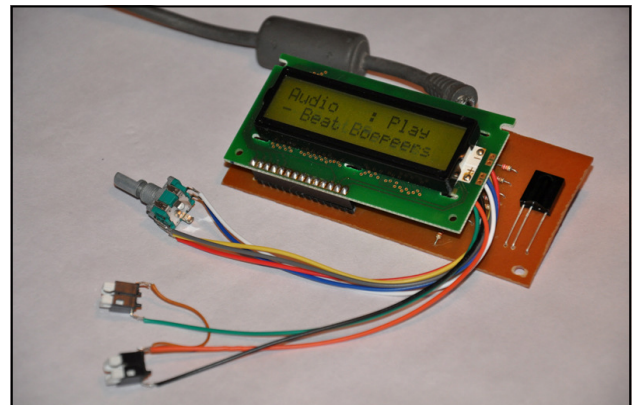This system is design to work with XBMC - JSON RPC interface.

Fig.2- *XBMC USB Controller*

Microchip's PIC18F4550 is a main hardware controller of this system. This microcontroller is used for USB interfacing, as LCD driver, IR base remote control data decoder and as a driver of the other input devices (such as rotary encoder and push switches). XBMC Controller's USB interface is design to work as a USB HID class device.

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This system is design to work with Microsoft Windows Operating Systems and we test this system in Windows XP Professional editions and some few Windows XP Embedded editions also.

Supplied firmware of this system is design to work with Sony SIRC 20bit infrared protocol and supplied ini file is configured for *Sony RMT-V408* remote controller.

Fig.3– *Sony RMT-V408 Remote Controller*

Software Content

This system consists with two main software modules:

1. PIC18F4550 base software (firmware): This software module is developed using MikroC version 4.60.

2. Windows XBMC control application: Developed using Delphi 7 and work as a "virtual" Windows Service Application.

System configuration file

Before work with this system end user need to configure controller application for his/her remote control and for his/her software setup. This configuration file is located at

`\Controller\release` folder with filename "`mcci.ini`". This ini file contains 3 main sections such as "`xbmc`", "`device`" and "`keymap`".

"`xbmc`" section contain 3 parameters:

Address: IP address of the system where XBMC is installed. (In most of the configurations this parameter value set to defaults as `127.0.0.1`)

Port: Port number assigned for XBMC web interface. (This value is need to verify with your XBMC network settings)

Location: full path and filename of the XBMC executable file.

"`device`" section contain 2 parameters related with the USB controller. If your using default firmware, these values must be `VID = 33824` and `PID = 1`.
If you alter firmware with different vendor ID and product IDs, make sure to change these values also.

"`keymap`" section is used to assign functionalities to the remote control buttons. Key and the value formats for this section are described in below.

E.g: `1422128=1,38`

Parameter for command

Command Type

Received data from USB controller module
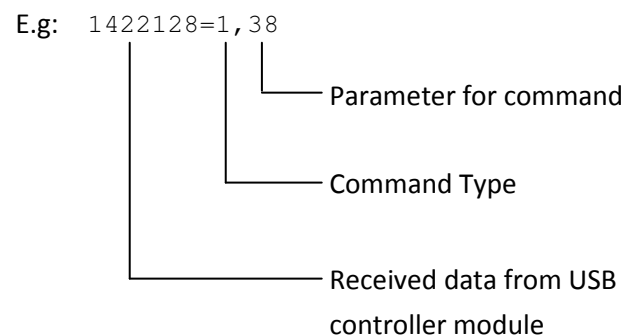
Command Type: Specify the type of the command as integer value. Valid command types are:

Value	Description
1	Send WM_KEYDOWN window message to XBMC. ASCII value of the key is need to specify at the parameter section. E.g: `2422116=1,13`
2	Send WM_CHAR window message to XBMC. Character code is need to specify at the parameter section.
3	Perform predefine actions based on the following parameter values: **1**: Increase volume **2**: Decrease volume **3**: Return to the home screen of XBMC **4**: Toggle audio mute function

USB Controller - hardware connections

This given PCB design have 2 external connectors. J1 connector is used to connect rotary encoder and two push switches to the system. Connection diagrams of the J1 is illustrated in Fig. 4.

J2 connector is used to connect USB cable to the system. Connections to the J2 is listed in below table:

Connection	Description	Cable Color
1	USB D+	Green
2	USB D-	White
3	USB +5V	Red
4	USB Ground	Black
5	Cable Shield	N/A

For J2 use standard 3feet 28/24AWG USB cable with USB male A connector.
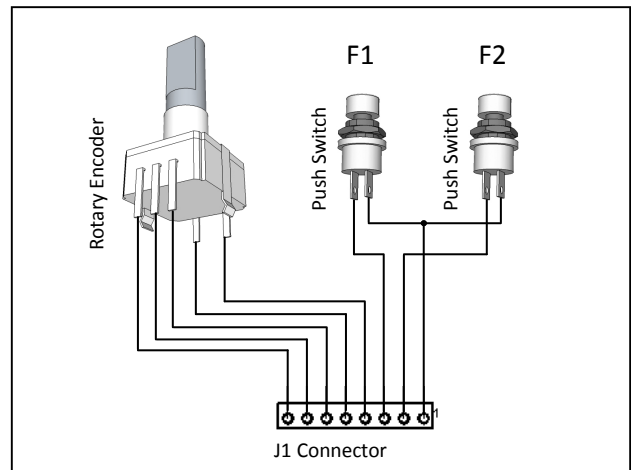
Fig.4– *Connections to Connector J1*

Installation and Initial Setup

Before start the initial setup we assume that target PC may have following minimum system requirements:

- Windows XP or newer version of Windows operating system
- XBMC 10.1 or newer version
- USB 2.0 port
- Suitable SIRC protocol base remote controller unit

If the target system meets the above specified requirement, continue the system setup process as follows:

1. Start XBMC and Click "System" and open "Network" tab.
2. Under the "Services" change the following options:

   Allow control of XBMC via HTTP : ON

   Port   : 80

   Username   :

   Password   :

   (Clear both username and password fields)
3. Press "Esc" key.
4. Close XBMC.

5. Extract supplied software package and make sure that `mcci.ini` file is properly configured.

6. Connect XBMC USB controller to the PC. If device is working properly, Windows automatically detect the device and configure it to the target system.

Fig.5– *XBMC player information*

7. Start mcci.exe application. If everything is properly configured, XBMC starts automatically.
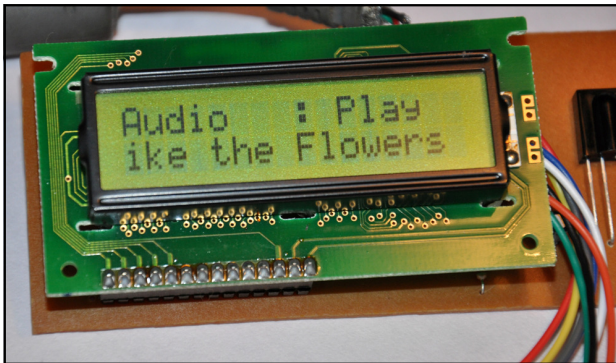
8. Check the all XBMC functionalities with remote controller and controls on the XBMC USB controller.

Technical Specifications of the Device

Please note that all these technical specifications are valid only with the bundled firmware file (Version 1.0.0.31).

- USB Version   : 2.0
- Device Class   : 0x0
- Vendor ID   : 0x8420
- Product ID   : 0x1
- Manufacturer   : Dilshan R Jayakody
- Product   : Media Center Control Interface
- Product Version   : 0.1
- Power Mode   : Self powered 100mA Max
- USB interfaces   : 0x3 - HID class

Component List

C1	4.7MFD/10V Capacitor
C2, C3	10pF Capacitor
C4, C5	0.1MFD Capacitor
R1	100Ω Resistor
R2, R3, R4, R5, R6, R7	22kΩ Resistor
Q1	20.0MHz Crystal (HC49U Package)
IR1	TSOP1136
IC1	PIC18F4550
J1	8pin Header connector
J2	5pin Header connector
SV1	14pin Header connector
LCD1	MC1602 LCD Module
SW1, SW2	6mm tactile momentary switch—TL1240N
RE1	Panasonic EVQ-WTEF2515 or equivalent mechanical rotary encoder
USB1	3feet long 28/24AWG USB port cable with male A connector.

References

PIC18F2455/2550/4455/4550 Data sheet
http://ww1.microchip.com/downloads/en/DeviceDoc/39632e.pdf

IR Receiver Modules for Remote Control Systems TSOP11xx
http://www.vishay.com/docs/82006/tsop11xx.pdf

JSON RPC - XBMC
http://wiki.xbmc.org/index.php?title=JSON_RPC

JSON-RPC 2.0 Specification
http://groups.google.com/group/json-rpc-2-0?pli=1

CONTROL_IN (J1) :8 - ROTERY_A
7 - ROTERY_COM
6 - ROTERY_B
5 - ROTERY_SW1A
4 - ROTERY_SW1B
3 - SW2A
2 - SW3A
1 - SW2/3_COM

R1
100R
+5V

C1
4.7MFD/10V
GND

+5V

R2
22K

IR1
VS
VO
GND
TSOP1136

C2
10pF
C3
10pF
+5V

20.00MHz
Q1

C4
0.1MFD

C5
0.1MFD

GND

IC1

1	MCLR/VPP/RE3	RB7/BKI3/PGD	40
2	RA0/AN0	RB6/KBI2/PGC	39
3	RA1/AN1	RB5/KBI1/PGM	38
4	RA2/AN2/VREF-/CVREF	RB4/AN11/KBI0/CSSPP	37
5	RA3/AN3/VREF+	RB3/AN9/CCP2/VPO	36
6	RA4/T0CKI/CIOUT/RCV	RB2/AN8/INT2/VMO	35
7	RA5/AN4/SS/HLVDIN/C2OUT	RB1/AN10/INT1/SCK/SCL	34
8	RE0/AN5/CK1SPP	RB0/AN12/INT0/LFT0/SDI/SDA	33
9	RE1/AN6/CK2SPP	VDD	32
10	RE2/AN7/OESPP	VSS	31
11	VDD	RD7/SPP7/P1D	30
12	VSS	RD6/SPP6/P1C	29
13	OSC1/CLKI	RD5/SPP5/P1B	28
14	RA6/OSC2/CLKO	RD4/SPP4	27
15	RC0/TIOSO/T13CKI	RC7/RX/DT/SDO	26
16	RC1/T1OSI/ICCP2/UOE	RC6/TX/CK	25
17	RC2/CCP1/P1A	RC5/D+/VP	24
18	VUSB	RC4/D-/VM	23
19	RD0/SPP0	RD3/SPP3	22
20	RD1/SPP1	RD2/SPP2	21

PIC18F4550_40

22K
R3
22K
R5
22K
R4
GND
+5V

22K
R6
22K
R7
+5V

GND

J1
CONTROL_IN

J2
USB

1 - GREEN (D+)
2 - WHITE (D-)
3 - RED (+5V)
4 - BLACK (GND)
5 - SHIELD

+5V
GND

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	

SV1
LCD 1602

USB J2

IC1 PIC18F4550_40

CNTRL J1

Q1
20.00MHz

C2 10pF
C3 10pF

C4 0.1MFD
C5 0.1MFD

100R R1

R2 22K

R3 22K
R4 22K
R5 22K
22K
22K

TSOP1136

IR1

4.7MFD/10V C1

LCD
15   SV1   1