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# **16/9/4-Channel Video Multiplexer & Multi-Speed MPEG4 Video SOLO6010 PCI Card RDK Manual**

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Aug 6, 2007

**SoftLogic Inc.**

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## 1. Hardware

Fig. 1-1 shows the picture of the SOLO6010 PCI Card RDK. 16 channel video input signals are connected to 25 pin connector [J3] and video output signal is connected to RCA jack [P2]. 16 channel audio input signals are connected to 20 pin jumper [J5] and audio output signal is connected RCA jack [P3]. 16 channel input sensor signals are connected to 20 pin jumper [J6]. 4 channel alarm/relay output and RS485 signals are connected to 20 pin jumper [J7]. 24 pin jumper [J4] is only for test.



Fig. 1-1 Picture of the SOLO6010 PCI Card RDK

Fig. 1-2 shows the 25 pin connector for 16 channel video inputs, and Table 1-2 shows the pin connections.

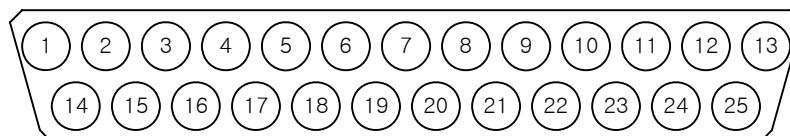


Fig. 1-2 25 Pin Connector for 16 Channel Video Inputs

Table 1-1 25 Pin Connector for 16 Channel Video Inputs [J3]

Pin No.	Description	Pin No.	Description
1	Video Input Channel 0	2	Video Input Channel 1
3	Video Input Channel 2	4	Video Input Channel 3
5	Video Input Channel 4	6	Video Input Channel 5
7	Video Input Channel 6	8	Video Input Channel 7
9	Video Input Channel 8	10	Video Input Channel 9
11	Video Input Channel 10	12	Video Input Channel 11
13	Video Input Channel 12	14	GND
15	N.C.	16	N.C.
17	N.C.	18	N.C.
19	GND	20	Video Input Channel 13
21	GND	22	Video Input Channel 14
23	GND	24	Video Input Channel 15
25	GND		

Fig. 1-3 shows the pin ordering of the 20pin (a) and 24pin (b) jumper at top view (component side).

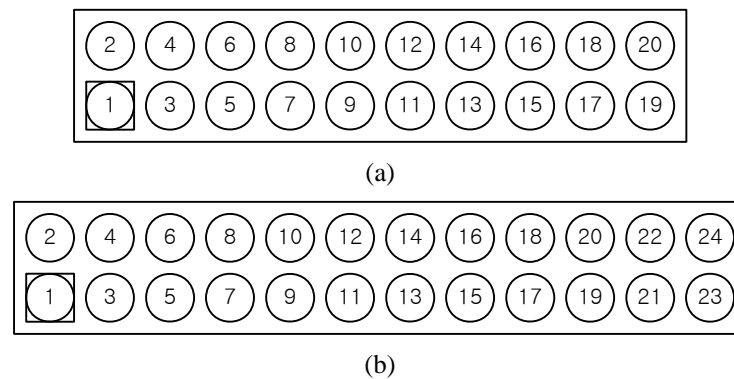


Fig. 1-3 Pin Ordering of Jumpers

Table 1-2 shows 20 pin jumper for 16 channel audio inputs. Table 1-3 shows 20 pin jumper for 16 channel sensor inputs. Table 1-4 shows 20 pin jumper for 4 channel alarm inputs and RS485.

Table 1-2 20 Pin Jumper for 16 Channel Audio Inputs [J5]

Pin No.	Description	Pin No.	Description
1	Audio Input Channel 8	2	Audio Input Channel 0
3	Audio Input Channel 9	4	Audio Input Channel 1
5	Audio Input Channel 10	6	Audio Input Channel 2
7	Audio Input Channel 11	8	Audio Input Channel 3
9	Audio Input Channel 12	10	Audio Input Channel 4
11	Audio Input Channel 13	12	Audio Input Channel 5
13	Audio Input Channel 14	14	Audio Input Channel 6
15	Audio Input Channel 15	16	Audio Input Channel 7
17	Audio Playback Output	18	Audio Mixed Output
19	GND	20	GND

Table 1-3 20 Pin Jumper for 16 Channel Sensor Inputs [J6]

Pin No.	Description	Pin No.	Description
1	Sensor Input Channel 8	2	Sensor Input Channel 0
3	Sensor Input Channel 9	4	Sensor Input Channel 1
5	Sensor Input Channel 10	6	Sensor Input Channel 2
7	Sensor Input Channel 11	8	Sensor Input Channel 3
9	Sensor Input Channel 12	10	Sensor Input Channel 4
11	Sensor Input Channel 13	12	Sensor Input Channel 5
13	Sensor Input Channel 14	14	Sensor Input Channel 6
15	Sensor Input Channel 15	16	Sensor Input Channel 7
17	5.0V	18	3.3V
19	GND	20	GND



Table 1-4 20 Pin Jumper for 4 Channel Alarms (Relay Out) and RS485 [J7]

Pin No.	Description	Pin No.	Description
1	RS485-	2	N.C.
3	RS485+	4	N.C.
5	N.C.	6	N.C.
7	Alarm Channel 0	8	N.C.
9	Alarm Channel 1	10	N.C.
11	Alarm Channel 2	12	N.C.
13	Alarm Channel 3	14	N.C.
15	N.C.	16	N.C.
17	5.0V	18	3.3V
19	GND	20	GND

## 2. Embedded Software

### 2.1. Overview

The SOLO6010 will be the solution for the security system to implement with the cost effectiveness and the high performance. This manual will explain the starting developer to check the SOLO6010 operations and functions easily.

### 2.2. Test Environment

The SOLO6010 driver and simple application software has been developed on Debian Linux kernel version 2.6.8. The remote connections is used for development efficiency and TightVNC(Virtual Network Computing) is the remote connection tools to implement X Window environment on the remote connections.

### 2.3. Module Utility and SOLO6010 driver compile

#### 2.3.1. Module Utility

The SOLO6010 driver will includes the module components which are insmod, lsmod, rmmod, depmod and modprobe. Each module operates the following functions.

insmod	: insert the modules on the kernel
rmmod	: remove the modules on the kernel
lsmod	: show the modules list on the kernel
depmod	: make the dependency of each module.
modprobe	: insert or remove the modules on the kernel

modprobe is the auxiliary promotion to insert the modules on kernel. If the module registration functions are enabled on the kernel and the specific modules are needed, modprobe will insert or remove the modules according to the module registration.

#### 2.3.2. SOLO6010 driver compile

The SOLO6010 directory is denoted as “soloDir”. The driver includes module and app subdirectories of “soloDir”. Subdirectory module and app include the files relating SOLO6010 driver and the files relating the simple application, respectively. The module file SOLO6010.ko will be generated by executing make on subdirectory module and app, respectively. Fig. 2-1 shows the inserted modules. As shown in Fig. 2-2, fb1, solo6010\_dec0, solo6010\_enc0, solo6010\_g723\_0, solo6010-vin0 device files are inserted.

```
leedolsDEB:~/solo6010/module# lsmod
Module                Size  Used by
solo6010              61484  0
ip6t                 265124  17
appletalk            36660  20
pcspkr                3592   0
rtc                  12760   0
snd_via82xx          29540   0
```

Fig. 2-1 The result of lsmod

```
leedolsDEB:/dev# ls
MAKEDEV  hda2    port    ram14   sequencer  stdout
audio    hda5    ppp     ram15   sequencer2  tty
console  initctl printer ram2     shm         tty0
core     input  psaux   ram3     snd         tty1
dsp      kmem   ptmx    ram4     sndstat     tty10
dspw     kmsg   pts     ram5     solo6010_dec0  tty11
fb0      log    ram0    ram6     solo6010_disp0  tty12
fb1      loop   ram1    ram7     solo6010_enc0  tty13
fd       mem    ram10   ram8     solo6010_g723_0  tty14
full     mixer  ram11   ram9     solo6010_vin0  tty15
hda      net    ram12   random  stderr      tty16
hda1     null   ram13   rtc     stdin       tty17
leedolsDEB:/dev#
```

Fig. 2-2 The directory /dev/

fb1 is the frame buffer device file of the SOLO6010. solo6010\_dec0 is the decoder device file. solo6010\_enc0 is the encoder device file. solo6010\_g723 is the G.723 voice codec device file. solo6010\_vin is the video input device file. These device files are used by the application program.

rmmod solo6010 is used to remove the module. There should be no video channels which are set to encoding. If the set module is removed, the system will cause the stop or fatal errors.

## 2.4. SOLO6010 Application

### 2.4.1. Display

Display utility will output the video from the video input channels on SOLO6010 PCI card RDK and execute the motion detection function. It can be accept the maximum 16 channel video input and output the various scaled video output such as 1, 4, 6, 8, 9, 16 split scaled video. Fig. 2-3 shows the video output examples. Table 2-1 shows the program options. /dev/solo6010\_disp0 is used basically. K option enables the keyboard input and the program can be executed by the input key values and Table 2-2 shows the executed program according to key values.

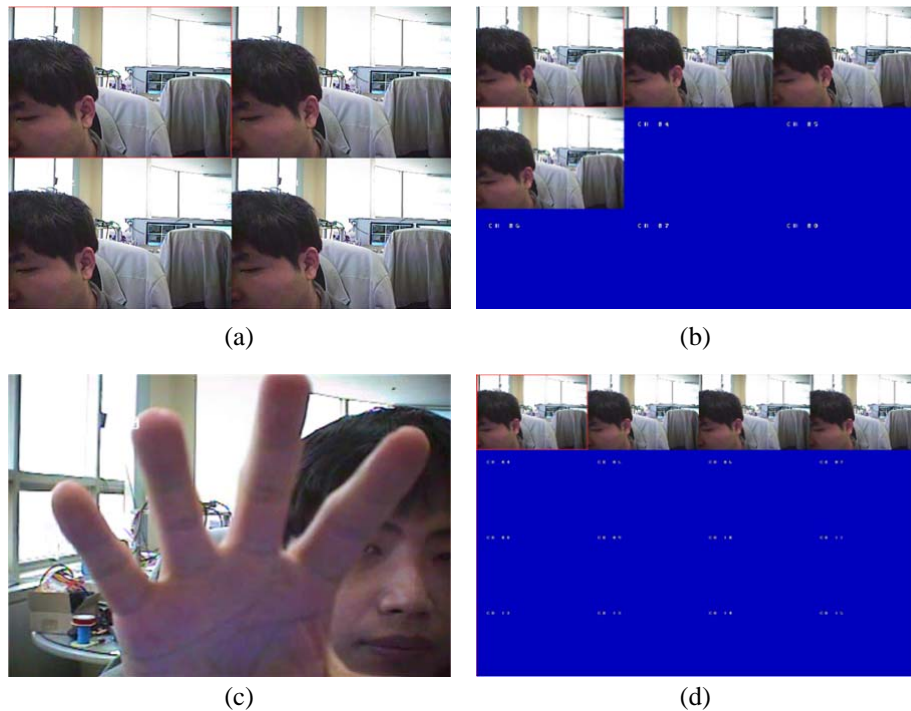


Fig. 2-3 The video output examples

Table 2-1 Program options

Option	Functions
d	Specify the device
m	Select the video display mode. (1, 4, 6, 8, 9, 16 split display)
k	Open the program to be accepted the keyboard.
h	Print the help

Table 2-2 Executed functions

Key Input	Executed functions
m	Motion detection
↑	Display the video display as 1, 4, 6, 8, 9, 16 split display
↓	Display the video display as 16, 9, 8, 6, 4, 1 split display
Q or q	Quit the program

As mentioned above, display utility includes the motion detection function which is sensing the moving area. As shown in Fig. 2-4, the motion detected area can be displayed as the marked video.



Fig. 2-4 The motion detected area display

#### 2.4.2. Encoding Configuration

enc\_config utility is used to set encoding configuration for each video input channel (0 ~ 15). It can set the video input encoding configuration before the input video channels are recorded using stream\_rec will be explained later. With the cursor library, the application executes the functions by interfacing keyboard basically. Table 2-3 explains the encoding configuration functions.

Table 2-3 Executed functions

Key Input	Executed functions
0	Configure Off for the video input channel 0 ~ 15
1	Configure 352×240 for the video input channel 0 ~ 15
2	Configure 704×240 for the video input channel 0 ~ 7
3	Configure 704×480 for the video input channel 0 ~ 3
S	Apply the configuration on encoder
G	Apply the encoder configuration on enc_config
Q	Quit the program

Fig. 2-5(a) shows the initial status of the encoding configuration which means set to off for all video input channels. Fig. 2-5(b) shows the 352x240 status for all video input channels using enc\_config.

CHANNEL	SCALE	QP	INTVL	GOP	EN_E	QP_E	INTVL_E	GOP_E
00	352x240	04	001	030	off	04	001	030
01	352x240	04	001	030	off	04	001	030
02	352x240	04	001	030	off	04	001	030
03	352x240	04	001	030	off	04	001	030
04	352x240	04	001	030	off	04	001	030
05	352x240	04	001	030	off	04	001	030
06	352x240	04	001	030	off	04	001	030
07	352x240	04	001	030	off	04	001	030
08	352x240	04	001	030	off	04	001	030
09	352x240	04	001	030	off	04	001	030
10	352x240	04	001	030	off	04	001	030
11	352x240	04	001	030	off	04	001	030
12	352x240	04	001	030	off	04	001	030
13	352x240	04	001	030	off	04	001	030
14	352x240	04	001	030	off	04	001	030
15	352x240	04	001	030	off	04	001	030

1. 352x240 16channel	S. Set config to device
2. 704x240 8channel	G. Get config from device
3. 704x480 4channel	Q. Quit
0. Off	

(a)

CHANNEL	SCALE	QP	INTVL	GOP	EN_E	QP_E	INTVL_E	GOP_E
00	off	04	001	001	off	04	001	001
01	off	04	001	001	off	04	001	001
02	off	04	001	001	off	04	001	001
03	off	04	001	001	off	04	001	001
04	off	04	001	001	off	04	001	001
05	off	04	001	001	off	04	001	001
06	off	04	001	001	off	04	001	001
07	off	04	001	001	off	04	001	001
08	off	04	001	001	off	04	001	001
09	off	04	001	001	off	04	001	001
10	off	04	001	001	off	04	001	001
11	off	04	001	001	off	04	001	001
12	off	04	001	001	off	04	001	001
13	off	04	001	001	off	04	001	001
14	off	04	001	001	off	04	001	001
15	off	04	001	001	off	04	001	001

1. 352x240 16channel	S. Set config to device
2. 704x240 8channel	G. Get config from device
3. 704x480 4channel	Q. Quit
0. Off	

(b)

Fig. 2-5 The encoding configuration

### 2.4.3. Stream Recording

Encoding configuration should be defined using `enc_config` before `stream_rec` is executed. If all video input channels are defined as the initial state, recording will not be executed as shown in Fig. 2-6(a). Recording will be executed as the followings.

```
stream_rec <filename>
```

The following command is an example to store as filename `test.mp4` for the current video input channel.

```
stream_rec test.mp4
```

CTRL-C is used to top recording.

As shown in Fig. 2-6(a) (b), the increase of the file size can be checked. `/dev/solo6010_enc0` is the device which used by `stream_rec`. However, the device name can be changed by using `d` option and its example as described as the followings.

```
stream_rec test.mp4 -d <device-path>
```

```
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r--  1 root root 0 2007-04-19 00:47 test.mp4
leedolsDEB:~/solo6010/app#
```

(a)

```

leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 14931168 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 16072176 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 16511152 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 16784368 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 17005768 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 17278832 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 17486008 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 17761168 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 17990520 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 18255320 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 18457408 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 18659288 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 18904824 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 19121448 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 19401200 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app# ls -al test.mp4
-rw-r--r-- 1 root root 19969320 2007-04-18 19:23 test.mp4
leedolsDEB:~/solo6010/app#

```

(b)

Fig. 2-6 The encoding results

#### 2.4.4. Stream Playback

stream\_play is used to playback the recording file by stream\_rec. Table 2-4 shows the options and functions of the stream\_play. The display of stream\_play is the same as Fig. 2-3(a).

Table 2-4 Stream playback functions

Option	Functions
d	Specify the decoding device
D	Specify the display device
a	Specify the streaming data arrangement
m	Specify the motion information
s	Specify the decoding speed
c	Specify the decoding channel

Option a is used to define the byte number when reading the encoded data. Therefore, it defines the



offset of the read data. Option a supports 4 time speed when encoding configuration is off and 2time speed when encoding configuration is activated, and its initial value is 1. Option c defines the position of split video output display to be displayed.

#### 2.4.5. Frame Buffer

The frame buffer is the memory device which buffers the graphic data temporarily before display. For example, the graphic processor stores the graphic data on the frame buffer of the host CPU memory. The each memory unit of the frame buffer correspond to the video display memory unit on the SOLO6010. Therefore, the frame buffer space should be allocated the same as the video frame size. For example, its memory space will be 704 x 480 x2 bytes in case of NTSC system.

There are a few methods to draw the graphic on Linux. X-Window can be possible but it cannot be operated for the embedded systems because its resources are very limited. By using the frame buffer of the SOLO6010, user interface can be controlled directly on GUI environment.

fbctrl is the program to control the frame buffer. Table 2-5 shows the frame buffer functions.

Table 2-5 Frame buffer functions

Option	Functions
d	Specify the frame buffer device
e	Erase the data on the frame buffer
a	Erase the data on the frame buffer automatically (It is used to update the frame buffer data)
x	Specify the starting position of the window on coordinate x
y	Specify the starting position of the window on coordinate y
w	Specify the width of the window
h	Specify the height of the window
r	Specify the alpha blending strength

The initial resolution of the frame buffer is 704 x 480. Therefore, the initial values of the option x, y, w, h are 0, 0, 704, 480, respectively. The value of the option r can be 0 to 63 and the frame buffer and video displays are same when r = 32.

```
./fbctrl -a -d /dev/fb1
```

fb\_print is the program display the characters on the frame buffer and will display the "SoftLogic" by default. fb\_print should be modified to display other characters. The execution command is ./fb\_print.

sdvr is the simple example program to illustrate the zoom, mosaic, etc with PS2 mouse interface. When the command is executed, the 16 channel split video channels are displayed.

(1) Display mode change

The display mode will be changed 1, 4, 6, 8, 9, 16 split display when clicking the right button of the mouse.

(2) Video Input channel selection

To select the video channel, press, the left button of the mouse.

(3) Zoom In/Out

To zoom in/out for 1 channel display mode, press, the center button of the mouse.

(4) Mosaic

To make the mosaic region, drag the mouse from left top to right bottom. To remove the mosaic region, drag the mouse from right bottom to left top.

Fig. 2-7 show the zoom example. Fig. 2-7(a) (b) show the original video and zoom in video, respectively.

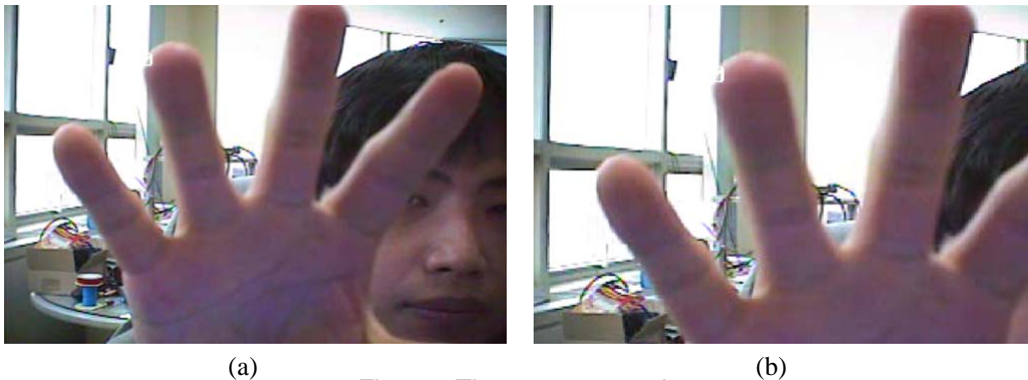


Fig. 2-7 The zoom example

Fig. 2-8 shows the mosaic example. Fig. 2-8(a) (b) show the original video and mosaic video, respectively.



Fig. 2-8 The mosaic example

### 2.4.6. Network Streaming

stream\_server is the program to support the remote viewer client (TestStreamDlgApp). TestStreamDlgApp is the windows application program. As shown in Fig. 2-9, TestStreamDlgApp includes viewer, controller and status bar. Viewer part will display the video after decoding the MPEG4 video stream. Controller part is used for the program operation control. Status part will show the current connection status.

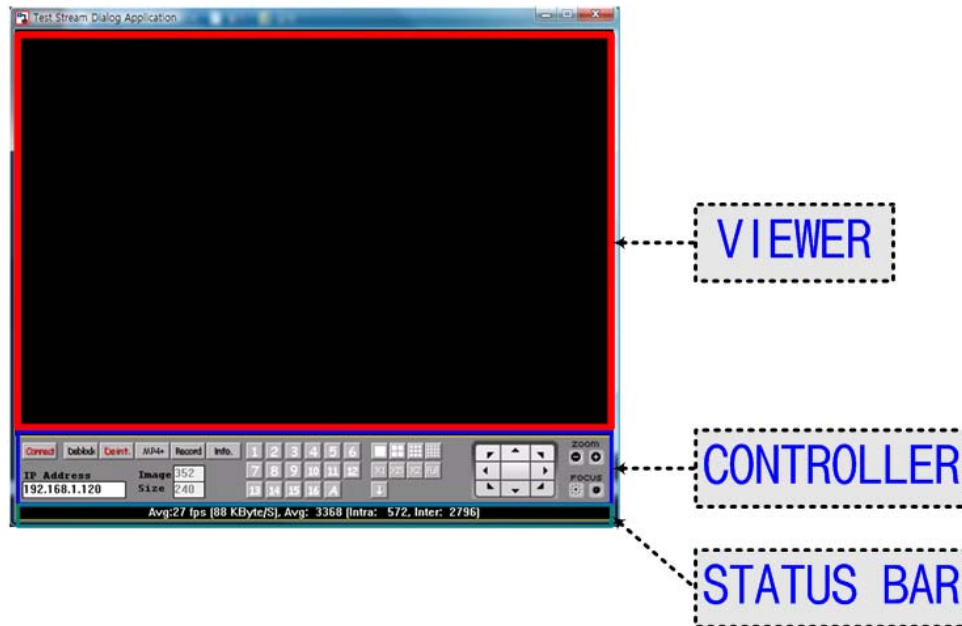


Fig. 2-9 TestStreamDlgApp

Fig. 2-10 shows the network transmission and the video processing buttons such as Connect, Deblock, Deint, MP4+, Record and Info. The TestStreamDlgApp will try to connect to the IP address which is defined in Fig. 2-10(b) if users click the Connect button. Deblock button and Deint button are used to enable applying the deblocking filter and de-interlaced filter, respectively. These functions will improve the video quality under increase the CPU resource because they need a complex computations.



(a)



(b)

Fig. 2-10 Network transmission and video processing buttons

Fig. 2-11(a) shows the video input channel1 is set to QP = 15 using enc\_config. Fig. 2-11(b) (c) shows the MPEG4 decoded video which is not applied de-blocking filter. There results show the blocking effect. Fig. 2-11(d) shows the smooth MPEG4 decoded video with de-blocking file.



Fig. 2-11 Examples of the de-blocking filter

Deint button is used to apply the de-interlace filter. When the interlaced video is display on the progressive VGA monitor, the unexpected lines on the fast moving part will be displayed because of the differences between two fields timing differences. The de-interlace filter will remove the unexpected lines.

MP4+ button will used to apply I picture based prediction. This function will be helpful to the network transmission on the narrow bandwidth network environment. However, it increases the bit rates and it is not compatible to MPEG4 standards network clients. Therefore, it is better to used dual CODEC feature and dual streaming with the SOLO6010 JPEG and the virtual channels.

Record button is used to record the MPEG4 stream as the Windows files.

Fig. 2-12 shows the display control buttons. The buttons in Fig. 2-12(a) are used to select the video input channels. Fig. 2-12(b) includes three groups. Group (a) is used to select the video split mode and Group(b) is used to select the video scale mode, and Group (c) is used to hide the controller and status bar.

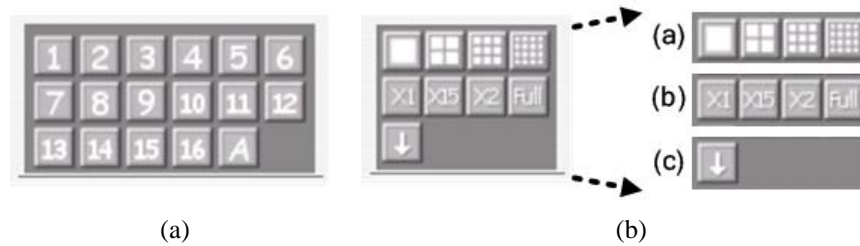


Fig. 2-12 Display control buttons

Fig. 2-13 shows the status bar. Avg:31fps (9 Kbytes/S) will shows the average 31 frame per second and the average 9 Kbytes/Second. AVG : 321 (Intra : 170, Inter : 151) will shows the I picture average size is 170 bytes and P picture average size 151, and total average picture size is 321.



Fig. 2-13 Status bar

Fig. 2-14 shows the JPEG applications. As shown in Fig. 2-14(b), BOA server will load jpeg\_cgi, which mean copying jpeg\_cgi on /var/www. The motion JPEG will be displayed like Fig. 2-14(b) by connecting web browser like firefox.

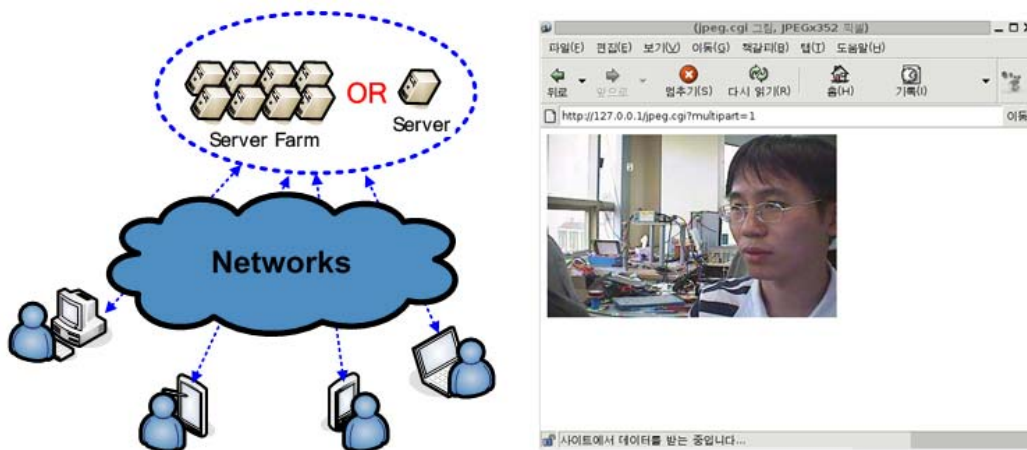


Fig. 2-14 JPEG display

### 3. Windows Software

#### 3.1. Compile Environment

For compiling the Windows software, the following program should be installed.

1. Visual C++ 6.0
2. Windows2000 DDK
3. DirectX SDK 7.0 or higher
4. NASM

It can be downloaded at <http://nasm.sourceforge.net>

How to link NASM with Visual C++.

1. Change filename NASMW.exe to NASM.exe.
2. Select Visual C++ "Tool" menu.
3. Select "Options..." menu.
4. Select "Directories" Tab.
5. Select "Executable File" Option.
6. Insert NASM path into list.

Workspace SOLO6010RDK.dsw includes 3 projects as the followings.

1. S6010StreamTester

This is an application program to play back the recoded MPEG4 video, JPEG and G.723 files.

2. SOLO6010App

This is an application program to test SOLO6010 PCI RDK.

3. SOLO6010Drv

This is a SOLO6010 PCI RDK driver.

**[Notice] The MPEG4 decoder software (slmp4core.dll) used in S6010StreamTester and SOLO6010App is developed by modifying XVID decoder. In order to use slmp4core.dll, users should keep the GNU license agreements because XVID belong to GNU license. The source files of slmp4core.dll are included in "Document" directory.**

### 3.2. Installation

1. Insert the SOLO6010 PCI card in the empty PCI slot on the main board. Heat sensitive PCI card should be moved to other slot because the SOLO6010 PCI cards heat them. In case of the weak power supply, sometimes the SOLO6010 PCI card will not be worked – especially I2C operation. Please, install it on the PC with enough power supply.
2. Install the driver after inserting the SOLO6010 PCI card. The compiled driver using the above environment or SOLO6010.sys and SOLO6010.inf files in “bin” directory of RDK can be installed.
3. Execute the SOLO6010App application program.

### 3.3. Operation

SOLO6010App application program consist of 4 parts.

#### 3.3.1. Live display & hardware player

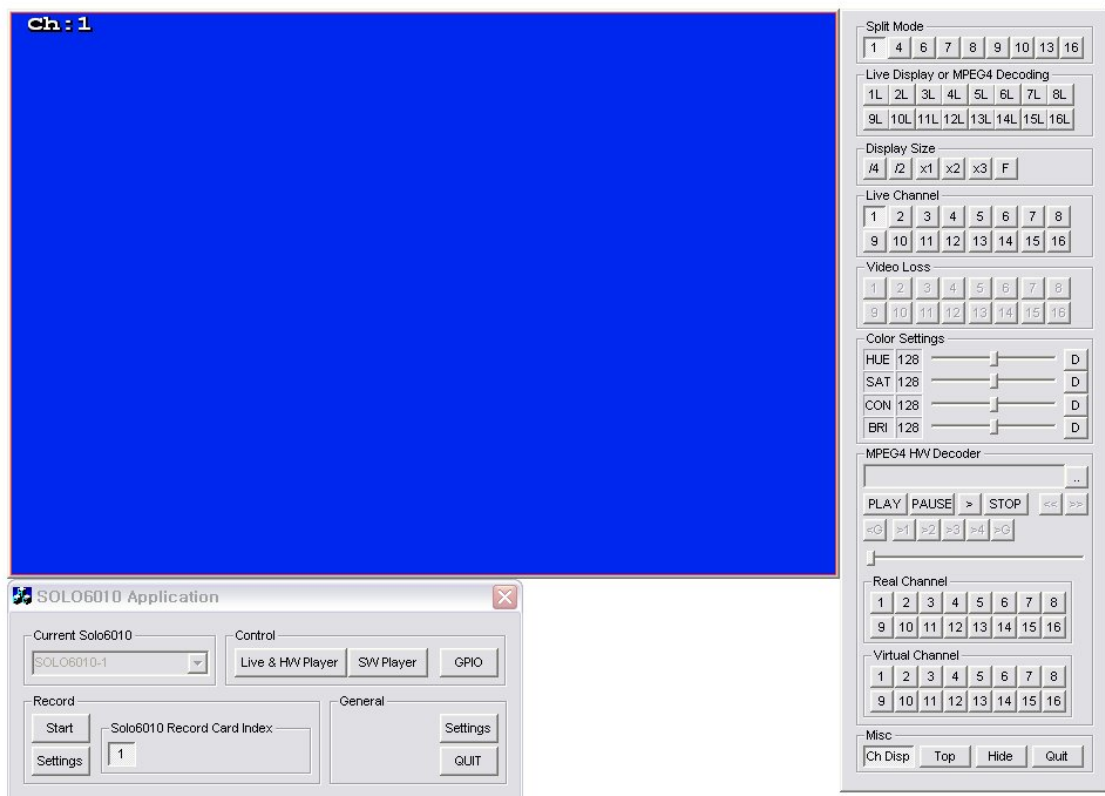


Fig. 3-1 Live display & hardware player

As show in **Fig. 3-1**, the program shows the live video stream. Button <Split> enables to test the video multiplexer of SOLO6010. Hardware MPEG4 decoder and G.723 decoder operation can mainly be



tested using this menu. The detail operation functions are described in section 3.4.2. **If the live display is not working, refer to “Live Display Mode” in section 3.4.6.** The video matrix configuration relating the video input can be referred “Camera to Decoder Channel (Matrix)” in section 3.4.6.

### 3.3.2. MPEG4, JPEG, G.723 Record

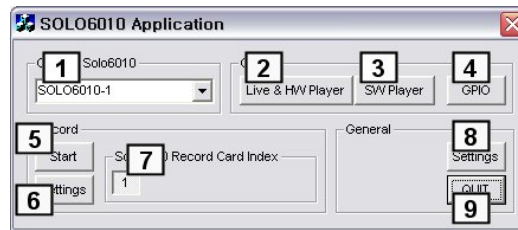


Fig. 3-2 MPEG4, JPEG, G.723 Record

This menu enables to store the video and audio data as the stream. The operating SOLO6010 card can be selected using the combo box Current SOLO6010 [1]. The recording options can be configured using the button “Recording Settings” [6]. After configuring the recoding options, SOLO6010 cards to record can be selected using the buttons SOLO6010 Record Card Index [7]. The Recoding Card Index buttons will be displayed as the number of cards install on PC (up to six cards). Finally, the recording will be started by pushing the button Record Start [5]. One more pushing this button will stop recording.

The recoding will be operated independently on the Live Display and Software Player functions. In other words, the recoding will be operated during the Live Display and Software Player functions are operating. Especially, the hardware MPEG4 decoder operation will not affect any of the recoding and live display performance.

The streams will be stored on the directory specified on General Settings and its filename structures are as the following.

AAA\_B\_YYYYMMDD\_HHMMSS.slf

a) AAA

It represents the type of streams. RM4 means the MPEG4 stream, RJP means the motion JPEG stream, RG7 means the G723 stream.

b) B

It represents the index number of the SOLO6010 PCI cards.

c) YYYYMMDD

It represents the date. year(YYYY), month(MM), day(DD).

d) HHMMSS

It represents the time. hour(HH), minute(MM), second(SS).



Ex) RM4\_0\_20070724\_124559.slf

It represents MPEG4 stream from Card1 and is stored on 12:45:59, Jul. 24, 2007.

More detailed explanation relating the recording will be refer to clause 3.4.1, 3.4.5, and 3.4.6. The stream is stored as one multi channel file by default, but the MPEG4 streams can be recorded separately by the channel, which is refer to 3.4.6.

### 3.3.3. Software Player



Fig. 3-3 Software Player

This function is used to playback the stored MPEG4, JPEG and G.723 streams. XVID decoder, IJL 1.5 (Intel JPEG Library) and G.723 open source were used for implementing MPEG4 decoder, JPEG decoder and G.723 decoder, respectively. The software player operation is referred to 3.4.3.

### 3.3.4. ETC

The NTSC or PAL mode selection is referred to 3.4.6. The GPIO configuration and testing is referred to 3.4.4. Mosaic and motion detection functions are referred to 3.4.6.

### 3.4. SOLO6010App functions

#### 3.4.1. Main Dialog Box

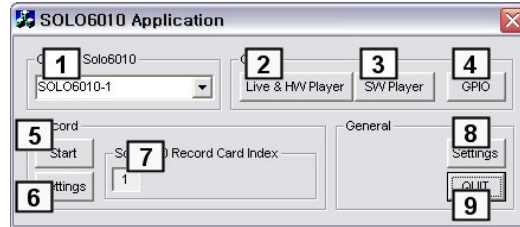


Fig. 3-4 Main Dialog Box

1) Current SOLO6010

The operating SOLO6010 card will be selected. Each card can be configured its configuration for “Record Settings”, “General Settings”, etc.

2) Live & HW Player

The live display and hardware player can be tested using this function. (Refer to 3.4.2.)

3) SW Player

The recorded MPEG4, JPEG, G.723 files can be played back using this function. (Refer to 3.4.3.)

4) GPIO

GPIO port configuration and GPIO data input/output can be tested using this function. (Refer to 3.4.4.)

5) Record Start

The record will be started by pushing this button. The recording data will be recorded by the pre-configuration information by “Recording Settings” (Refer to 3.4.5.)

6) Record Settings

This dialog box is for the configuration of the recording information. (Refer to 3.4.5.)

7) SOLO6010 Record Card Index

The recording SOLO6010 PCI card is selected by this menu. When multiple SOLO6010 cards are installed, the number button will be displayed as the number of the installed cards. When the “Record Start” button is pressed, the selected cards will be started to record.

8) General Settings

“Video Type”, “Live Overlay”, “Mosaic and Video Motion”, “Camera Matrix” functions are configured using this menu. (Refer to 3.4.6.)

9) Quit

The SOLO6010 application program will be quit by pressing this button.

### 3.4.2. Live display and hardware player

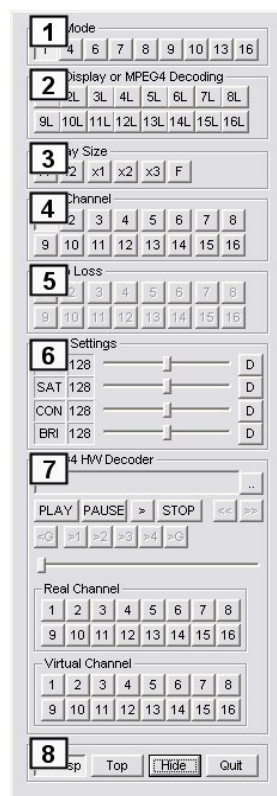


Fig. 3-5 Live and Hardware Player

1) Split Mode

You can change live video split mode by these buttons.

2) Live Display or MPEG4 Decoding

The number in each button represents the channel number. The following character represents whether it display live video (L) or hardware decoded image (D).

3) Display Size

The size of the live display window will be set by this menu. In addition, the mouse dragging on the window edge can change the size as well.

4) Live Channel

The live channel of the currently selected window can be changed by these buttons.

5) Video Loss

Under implementation

6) Color Setting

The color configuration can be changed by manipulating the slide control. The default value will be set by pushing “D” button.

7) MPEG4 HW Decoder

a) .. (Open Stream File)

The decoding MPEG4 stream can be opened by this button.

b) PLAY

c) PAUSE

d) >

Go to the next frame.

e) STOP

f) Real Channel, Virtual Channel

The channel information of the MPEG4 stream will be shown. In addition, the current selected windows channel can be changed by pushing these buttons.

g) Other disabled items

Under Implementation

8) Misc

a) Ch Disp

The channel information can be displayed or not by this button.

b) Top

The Live Display window will be set to topmost window. One more pushing will reset this function.

c) Hide

The live control dialog box will disappear by pushing this button. The dialog box re-appears by double clicking the live display window.

d) Quit

The live display can be quit by pushing this button.

### 3.4.3. Software Player

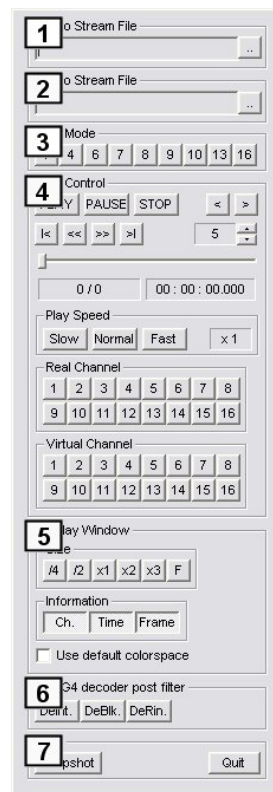


Fig. 3-6 SW Player

1) Open Video Stream File

The recorded MPEG4 or JPEG stream file is opened by this button.

2) Open Audio Stream File

The recorded G.723 stream file is opened by this button.

3) Split Mode

The split mode of the SW Player is changed by these buttons.

4) Play Control

a) PLAY, PAUSE, STOP

These buttons are used to play back, pause and stop, respectively.

b) 1 step move buttons [ $\leftarrow$ ], [ $\rightarrow$ ]

These buttons are used to go to the previous or the next frame, respectively.

c) Multi step move buttons [ $\ll$ ], [ $\ll$ ], [ $\gg$ ], [ $\gg$ ]

[ $\ll$ ] button : go to the start frame

[ $\ll$ ] button : go to the previous frame by the unit of the number specified at right side

[ $\gg$ ] button : go to the next frame by the unit of the number specified at right side

[ $\gg$ ] button : go to the end frame

d) Play Slider control

The Play Slider control indicates the current playback position. The current playback position can be changed by moving this control. The below boxes indicate “the current frame / the entire frame” and the time information of the current frame, respectively.

e) Play Speed control

The playback speed is changed by this menu. The configured playback speed is displayed on the right side.

f) Real Channel , Virtual Channel buttons

The channel information of the current stream is displayed. The channel displayed on the window can be changed by pushing these buttons.

5) Display Window

a) Size

The size of player window can be changed by these buttons or by mouse dragging like the live window does.

b) Information

The stream information (channel, time, frame number) is displayed or not by these buttons.

c) Use Default Color space

MPEG4 and JPEG decoder use the optimal color-space to decoding stream. But this function can be result in abnormal display problem. In case of abnormal display or black screen display, set this button.

6) MPEG4 decoder post filter

Under implementation

7) Misc

a) Snapshot

Under implementation

b) Quit

The player will be quit by pushing this button.

### 3.4.4. GPIO Configuration

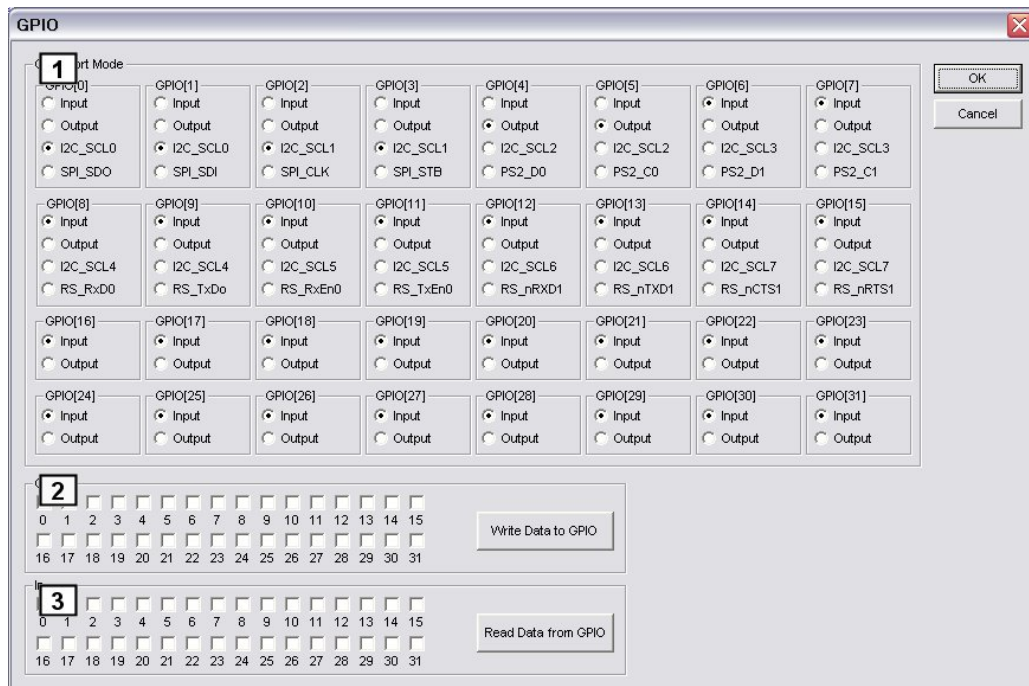


Fig. 3-7 GPIO Configuration

## 1) GPIO Port Mode

You can change GPIO port operation mode by this menu. All GPIO port operation mode can be freely changed to input or output mode. Some GPIO port can have special mode (I2C, or PS2 function). GPIO port 0 to 3 is used for I2C operation on SOLO6010 PCI RDK card. Thus if you change GPIO port 0 to 3 operation mode, I2C function of SOLO6010 PCI RDK card does not work.

## 2) Out

You can write data to GPIO port by this menu. After configuring the data using check boxes, the data will be written to GPIO port by pressing “Write Data to GPIO” button.

## 3) In

The read data from GPIO port will be displayed. The current read data will be displayed by pressing “Read Data from GPIO” button.

### 3.4.5. Recording Configuration

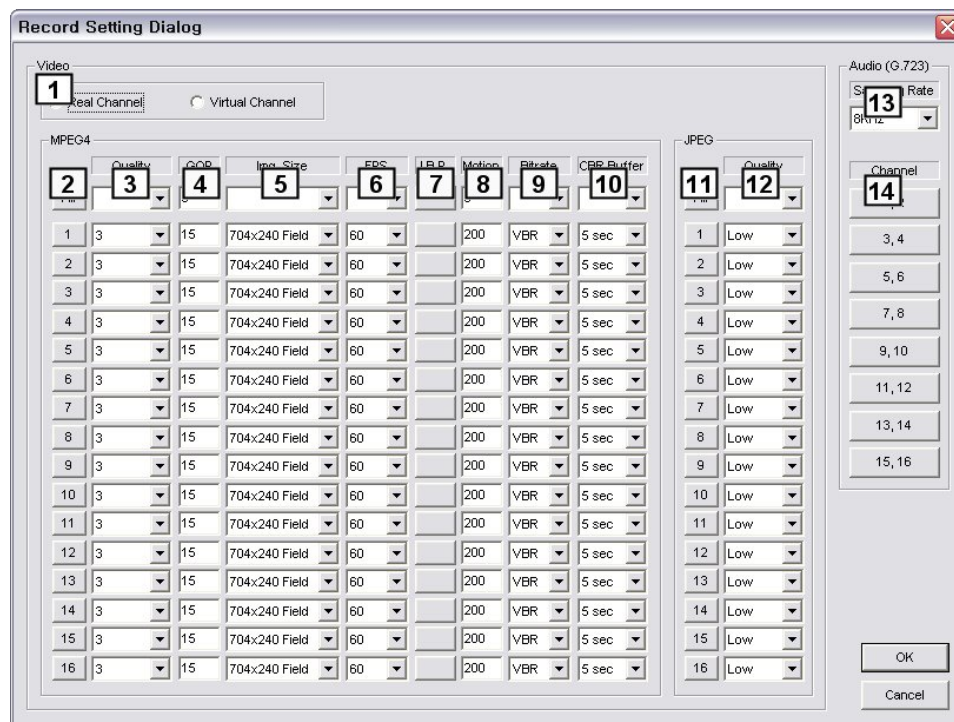


Fig. 3-8 Recording Configuration

SOLO6010 supports encoding 4 time speed D1 (704x480x30Hz for NTSC, 704x576x25Hz for PAL) for the video input in real time. Therefore, it also supports to encode 8 time speed HD1 (704x240x30Hz



for NTSC, 704x288x25Hz for PAL) or 16 time speed CIF (352x250x30Hz for NTSC, 352x288x25Hz for PAL). When it is set by the value over the chip performance, the error message will be displayed.

1) Real / Virtual Channel Configuration

SOLO6010 supports the virtual channel encoding for MPEG4 and JPEG. The video size of the virtual channel is same as that of the basic channel, but the video quality, the frame rate, the GOP size and the bit rate can be set to different from the basic channel.

2) MPEG4 Record Channel Configuration

The recording channel is selected by this menu. All channels are selected or set by pushing button “All”. Only the selected channel can be recorded.

3) MPEG4 Record Video Quality Configuration

The video quality is configured by this menu. “1” is the best quality with the highest bit rate, and “29” is the worst quality with the lowest bit rate.

4) MPEG4 I frame Interval Configuration

I frame interval (GOP Size) is configured by this menu.

5) MPEG4 Video Size Configuration

The video size is configured by this menu. The size can be set to one of D1 (704x288/240), HD1 (704x288/240), or CIF (352x288/240).

6) MPEG4 frame rate Configuration

The frame rate is configured by this menu.

7) MPEG4 I-frame based prediction

The P frame is encoded by referring the I frame (not previous P frame). In this case, the MPEG4 stream is not MPEG4 standard stream.

8) MPEG4 encoder motion threshold

The encoder motion threshold is configured by the menu. The encoding motion is calculated by the SAD(sum of absolute difference) of the motion estimation. It is different method from the video multiplexer. (Refer to 3.4.6.) The video motion detection function is recommended because it will produce better results.

9) MPEG4 bit rate configuration

The bit rate is configured by this menu. In case of VBR, the video will be encoded according to the configured video quality value. The bit rate will be variable but the picture quality is constant when encoding VBR.

10) MPEG4 CBR buffer size configuration

The buffer size is configured by the menu when encoding CBR. It represents the virtual buffer size for CBR. The buffer size is bigger, the picture quality will be better but the variation of bit rate will increase.

11) JPEG recoding channel configuration

The recoding JPEG channel is configured by this menu. Only MPEG4 recording channels are selectable.

12) JPEG recoding picture quality configuration

The JPEG recording picture quality is configured by this menu.

13) G.723 sampling rate configuration

The sampling rate is configured as 8kHz or 16kHz.

14) G.723 recording channel configuration

The recording channel is configured by this menu. A pair of channels is always selectable.

### **3.4.6. General Setting**

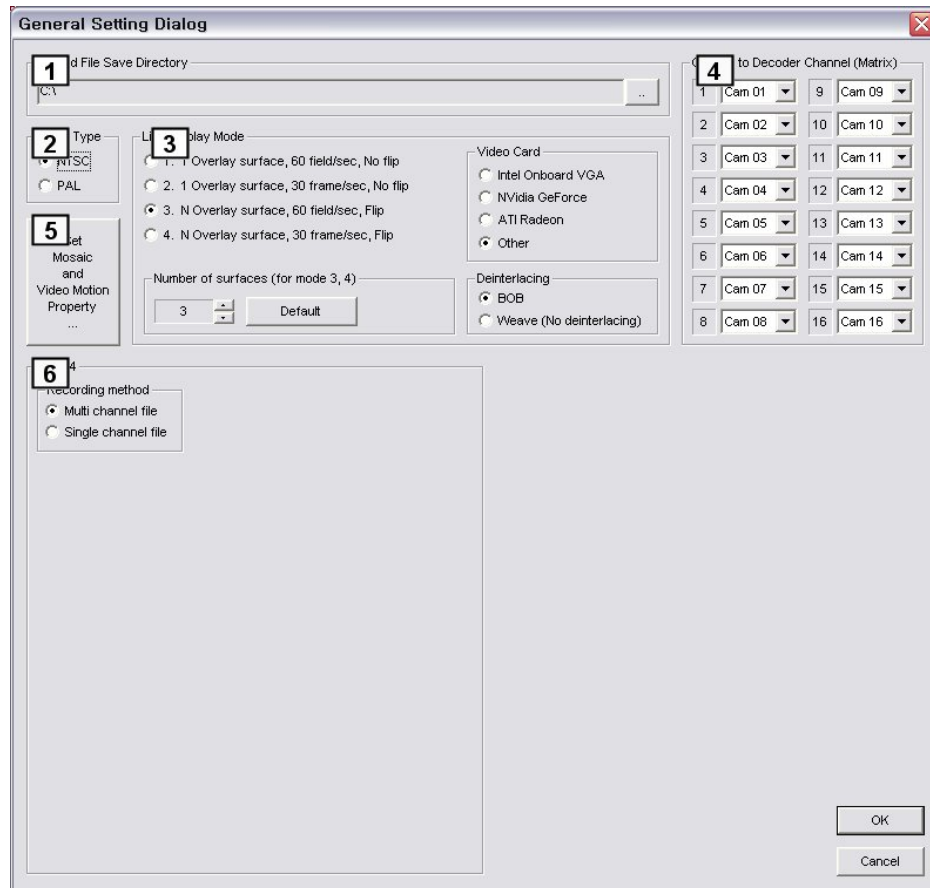


Fig. 3-9 General Configuration

1) Record File Save Directory

The MPEG4, JPEG, G.723 stream record directory can be configured by this menu.

2) Video Type

The video system (NTSC or PAL) is configured by this menu.

3) Live Display Mode

The options relating the live display and de-interlacing are configured by this menu. If “Live Display” function is not working, please change this option to No. 3 or No. 4, and set the number of surface to 2 or more. If video card of your PC is “Intel onboard VGA graphic cards” please select “Intel Onboard VGA” item of Video Card menu. With these options, “Live Display” function will work on most video cards. If “Live Display” function does not work with this option, please inquire SoftLogic.

- ATI VGA cards (Recommended) is worked well for any options. For better video overlay

quality, the overlay option is set to No.3 or No.4 and the number of surfaces value is set to 1.

If the “Live Display” function does not work with this configuration, set the number of surfaces value to default.

- GeForce will not work with No.1 or No.2 overlay options. The number of surfaces value is needed to set to more than or equal to 2.
- Intel onboard VGA card will be work with the “Intel Onboard VGA” option.
  
- Overlay option No.1 or No.2 will display the best 60 fields/sec or 30 frame/sec, but the tearing for the fast moving pictures.
- Overlay option No.3 or No.4 will not display the tearing because it flips two video buffers. However, flip is operated on the application side, thus it sometimes cannot support 60 field / sec or 30 frame / sec because flip can be delayed when the usage of CPU is high. This option should be selected for GeForce graphic cards.
- Video Card option is needed to set as the installed VGA card on PC.
- Number of surfaces option is relating No.3 or No.4. Normally, the default value is recommended.
- Deinterlacing option enables the deinterlacing function of the graphic card. BOB enables the deinterlacing function of the video cards, and the video quality is dependent to the graphic card performance. Weave disables the deinterlacing function of the graphic card. With weave option, the video quality will be good for mostly pictures, but will be very poor for moving picture.

#### 4) Camera to Decoder Channel (Matrix)

The matrix connects the physical camera input to the internal video channel. In order to display camera1 on channel 1 and 2, set “1” to Cam01 and set “2” to Cam01.

#### 5) Set Mosaic and Video Motion Property

The following dialog box will be displayed by pushing this button. Mosaic and Video Motion functions can be configured by this dialog.

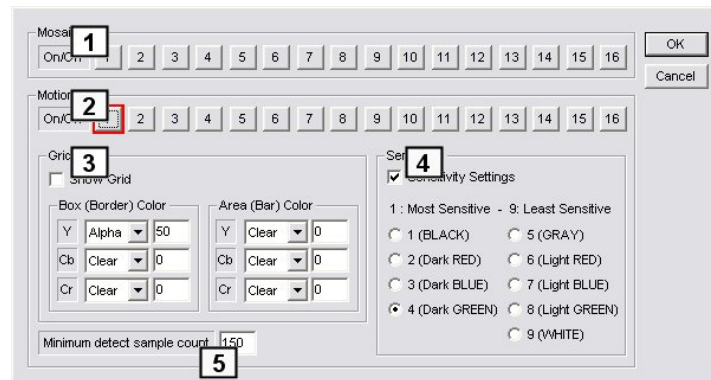


Fig. 3-10 Set Mosaic and Video Motion Property

1) Mosaic On / Off

The mosaic function is set or not by this menu. The mosaic area can be configured as mouse dragging on the live window.

2) Video Motion On / Off

The video motion function is set or not by this menu. The motion area can be configured as mosaic area does.

3) Video Motion Grid

This menu determines the display of the video motion grid and its color. The video motion grid means the square which is drawn at the motion detected position. (This square is drawn by SOLO6010 not by software.)

4) Video Motion Sensitivity

The video motion sensitivity is configured by this menu. The current video motion sensitivity will be display if the sensitivity setting check box is checked. After the video motion sensitivity is selected at the below radio button, the selected sensitivity can be configured by mouse dragging on the window.

5) Video Motion Minimum detect sample count

The motion interrupt will be occurred when the number of the video motion block is more than the value configured by this menu. The motion interrupt will be displayed on the live display by event.

6) MPEG4 Recording Method

This function decides whether make 1 multi-channel file or N each channel files to record

MPEG4 stream.

### **3.5. Remains to do**

1. MPEG4 HW Player Optimization
2. G.723 HW Player Implementation
3. Video Loss Detection
4. Encoder OSG & Video OSG Implementation
5. Watchdog Timer
6. PIP
7. SW Player (Remained Options)