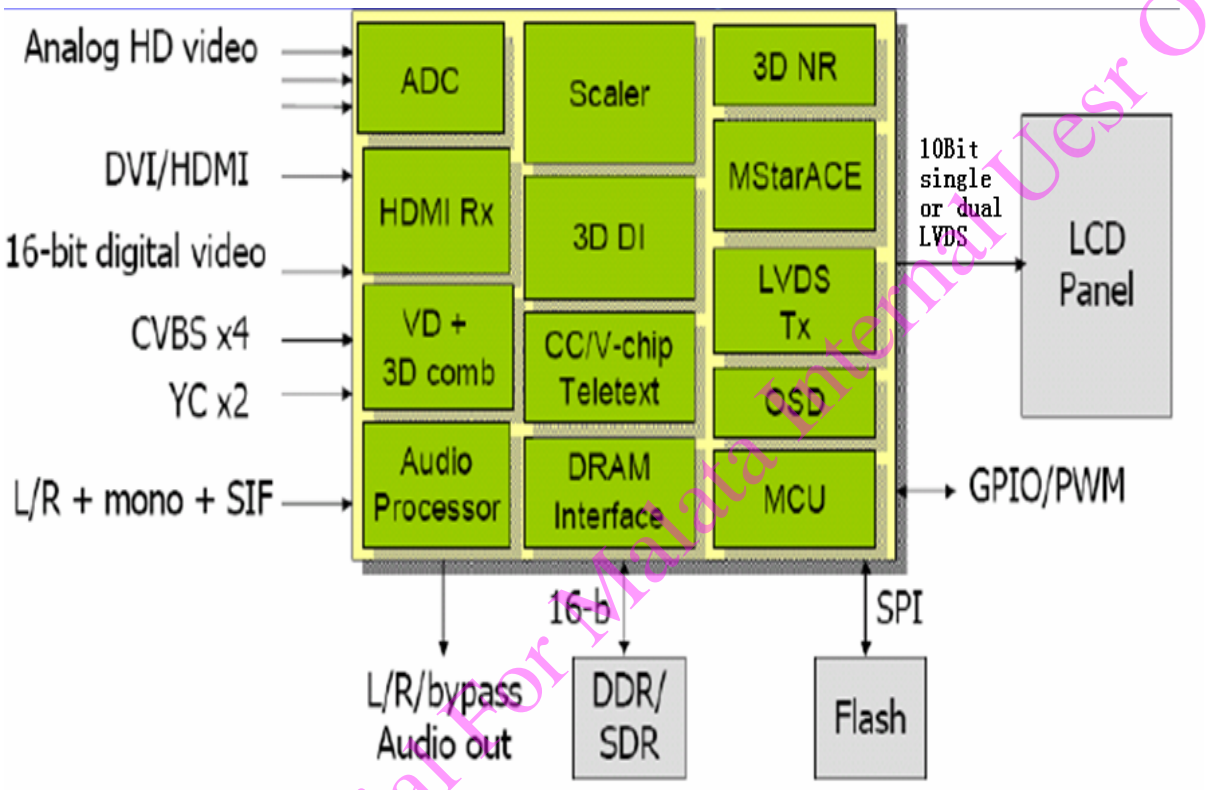
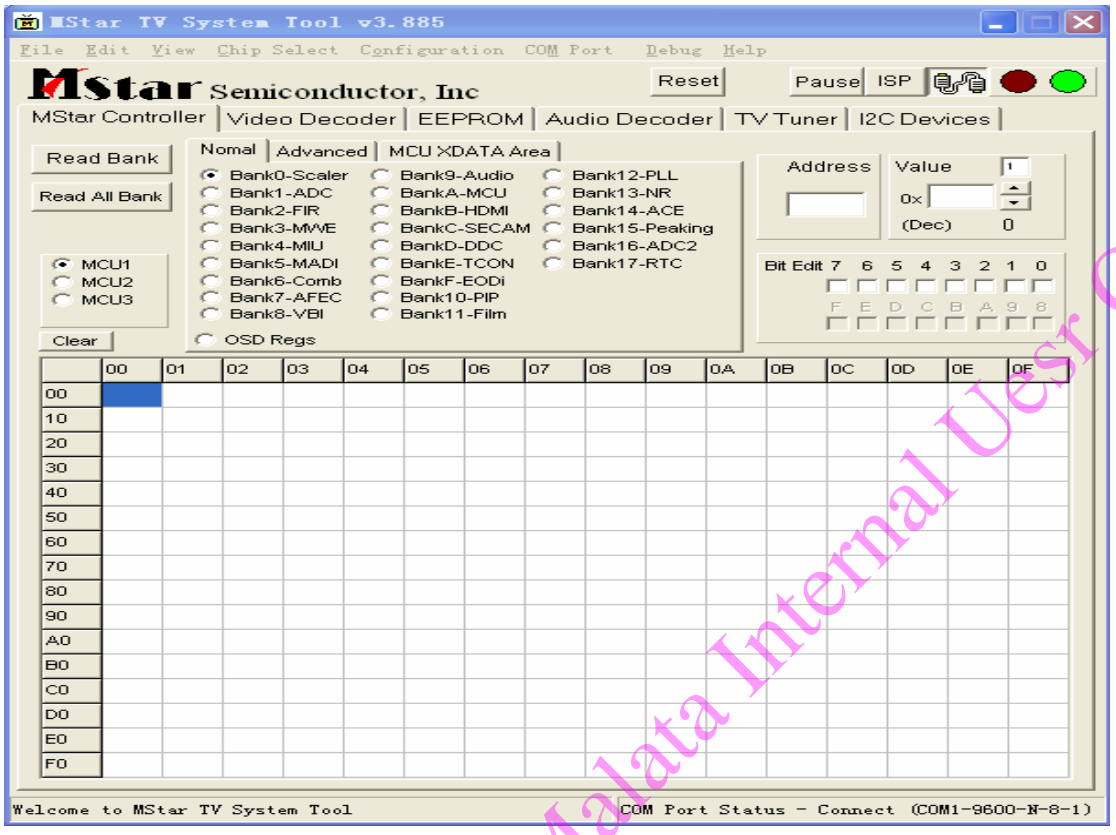
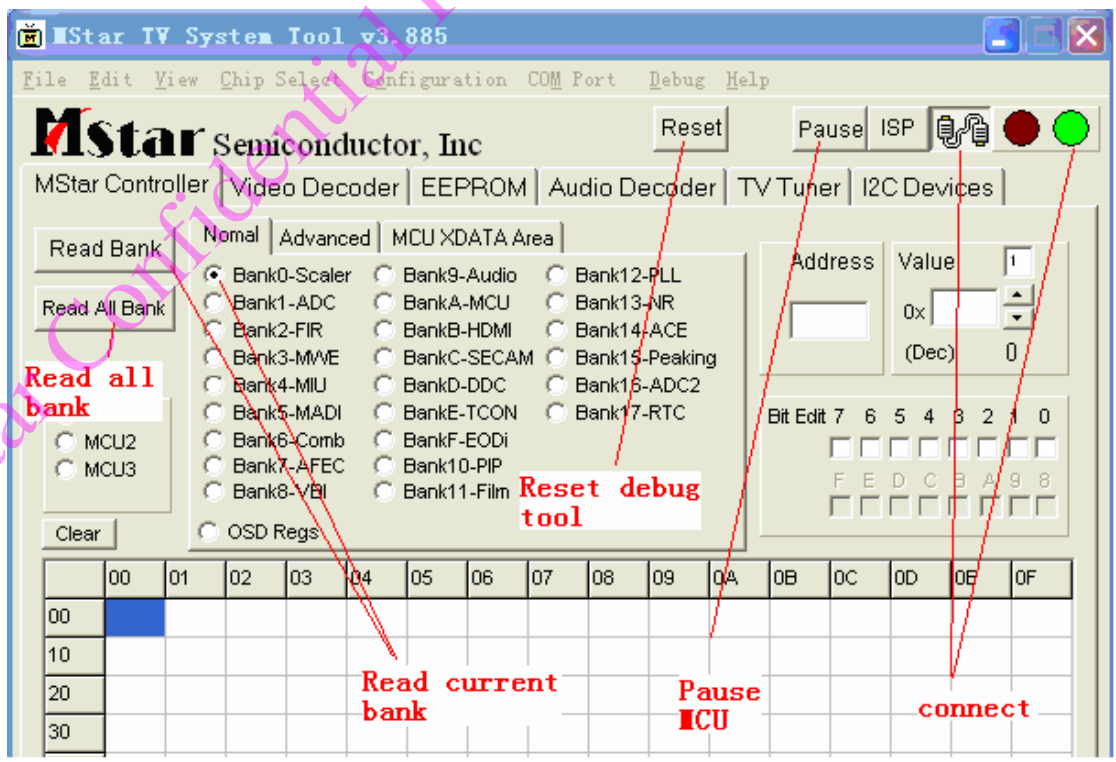
IC Block:



Part 1: Debug Tool



1. Button description to main window:

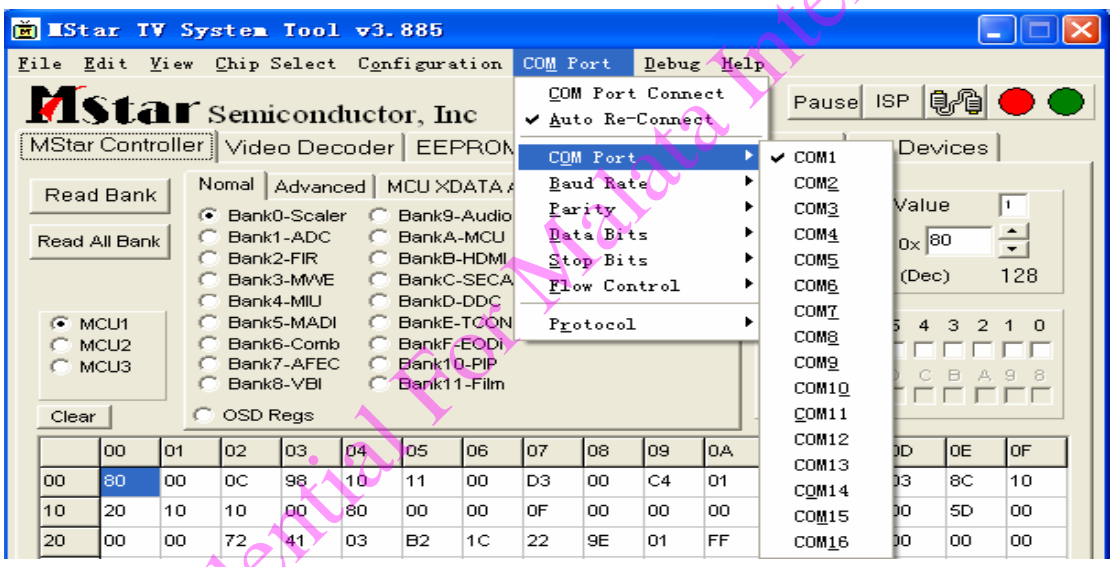


Notes:

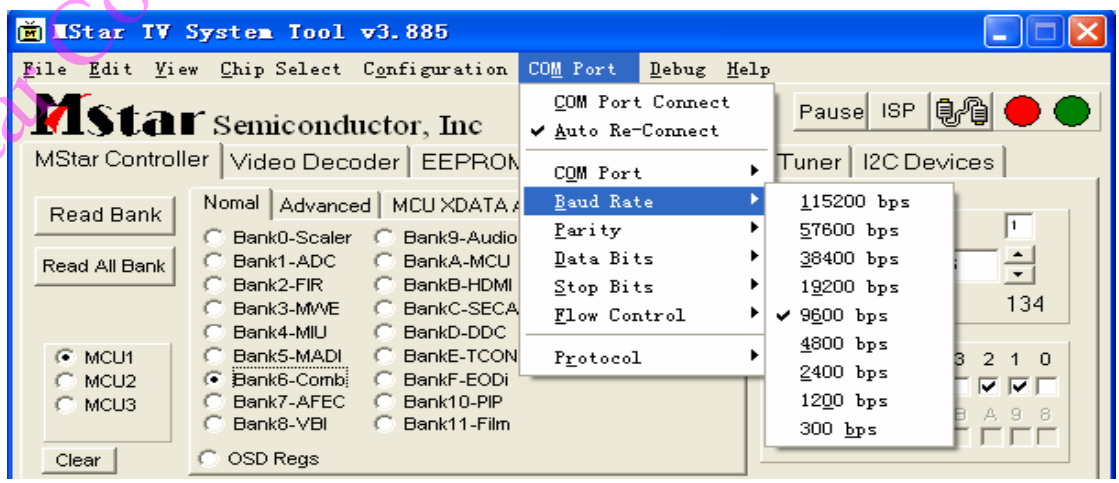
1. When you disconnect the tool, and then connect it again, please reset the tool by pressing “Reset”, otherwise you may get the wrong register.
2. If you open watch dog function, please make sure it is in the status of “off”, otherwise when you press the “pause”. The program will reset automatically.
3. When your tool connects the system, the  will be “down” and the green lap will be shine. Otherwise, please check the “com port” and “baud rate” setting.

2. Com Port s: 4 steps to connect the system

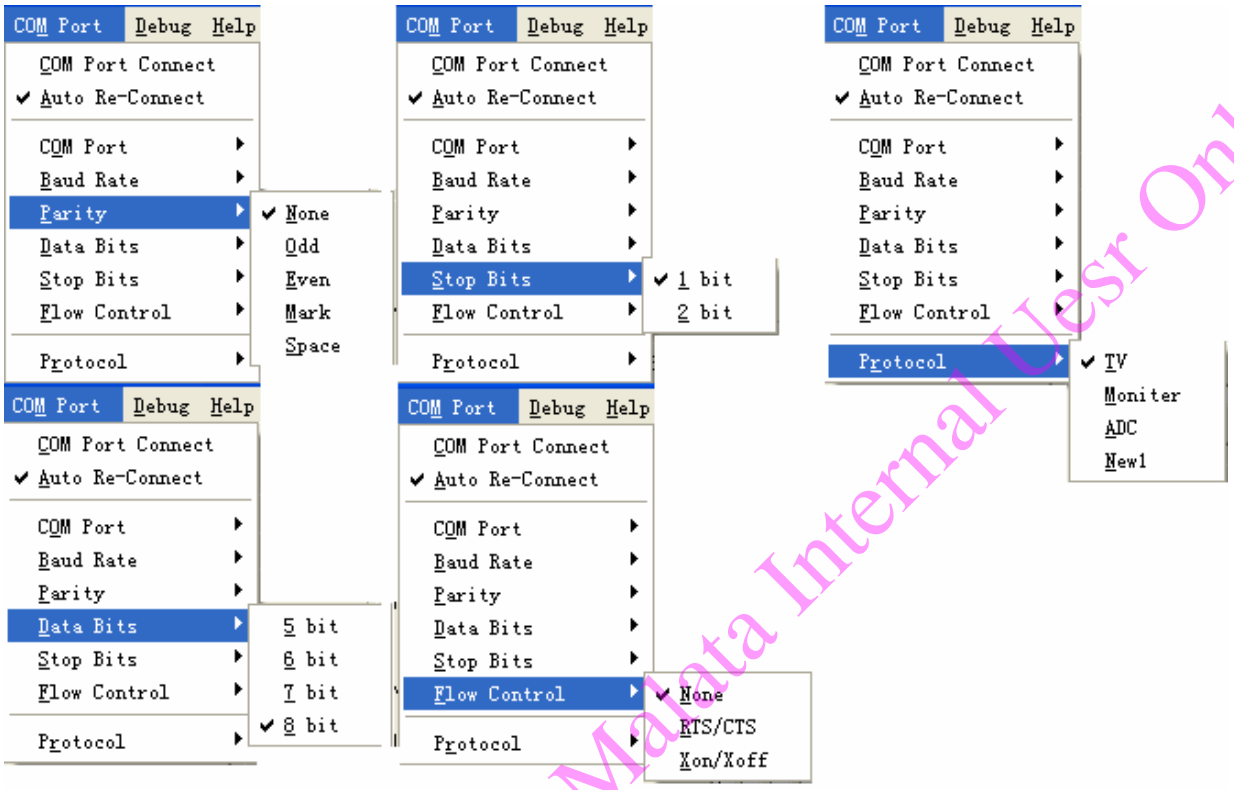
① COM Port selection：If the tool fails in connecting, please check whether the setting of the COM port is right or not firstly. For example, you can go to check the device management of your computer, and have a look whether the setting of the port matches the COM port.



② Baud Rate selection: This item should match the setting of program, which means the setting of the Baud rate have to be the same with the number that program defines.

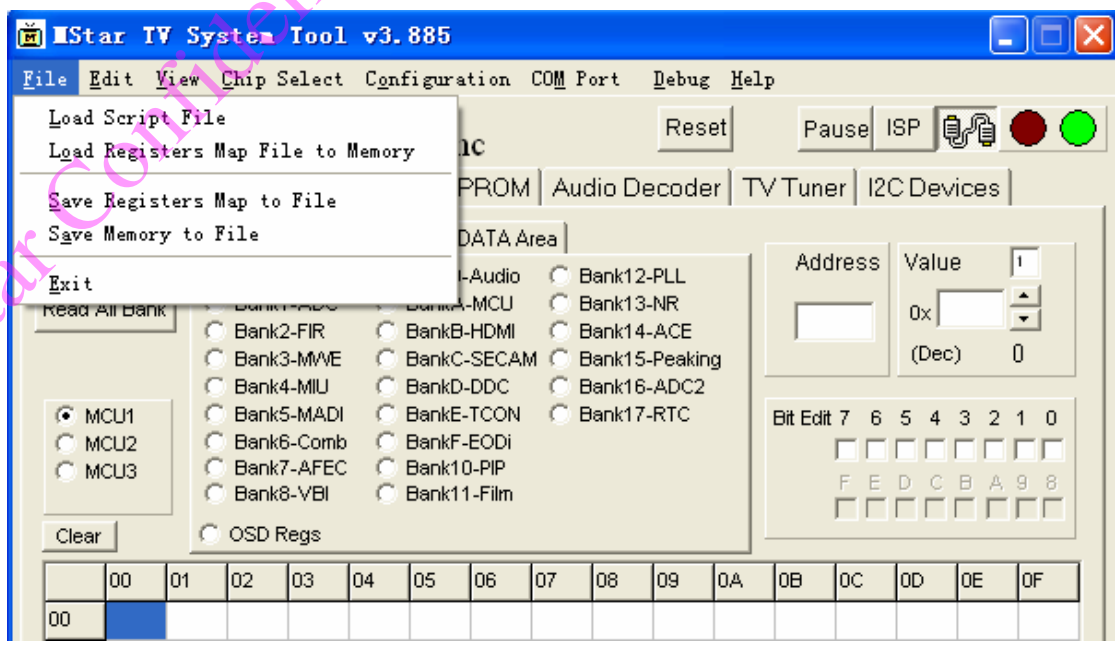


③ Basically, we don't need to change anything in the below five items, but sometime our programmer modify them, therefore, please check whether the program is exactly the same with the item chosen.



④ If those mentioned above are right, however, it still fail to connect, please check the hardware whether there are something wrong.

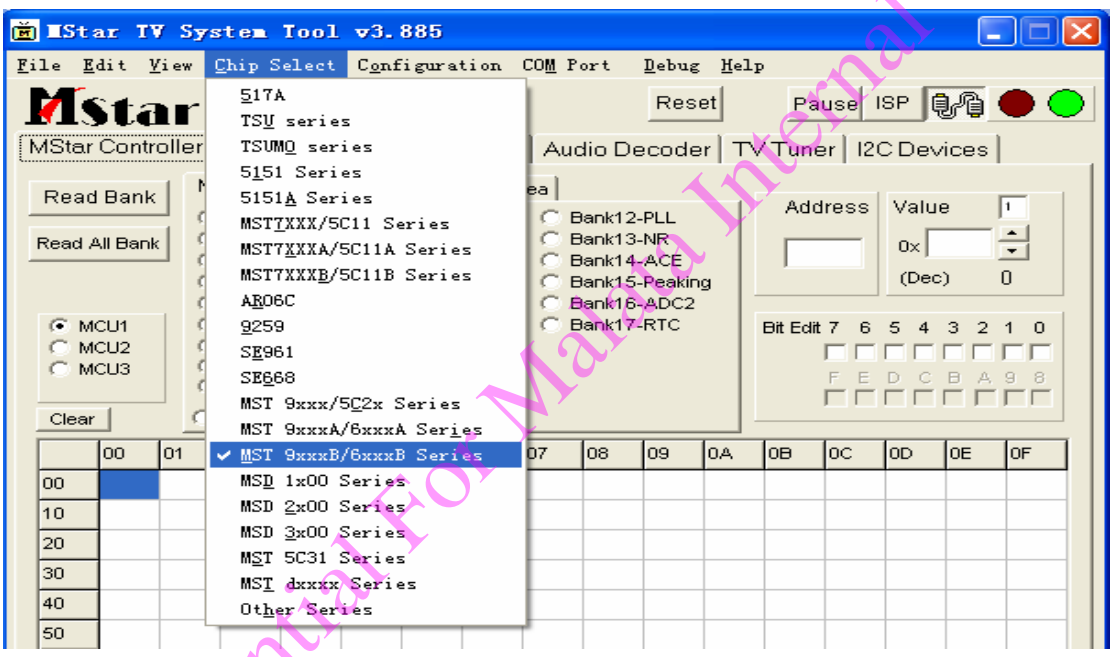
3. File Item



You can load the file by the “Load Scrip file” or “Load Register Map File to Memory” to modify your current setting, the detailed introduction to each item are as follows:

- Load Scrip file: To directly modify your current register.
- Load Register Map File to Memory: The file will store in the memory of your PC, which can be used for comparison.
- Save Registers Map to file: To save the current registers to another file(new file).
- Save Memory to file: saving the file stored in the memory to the new file.

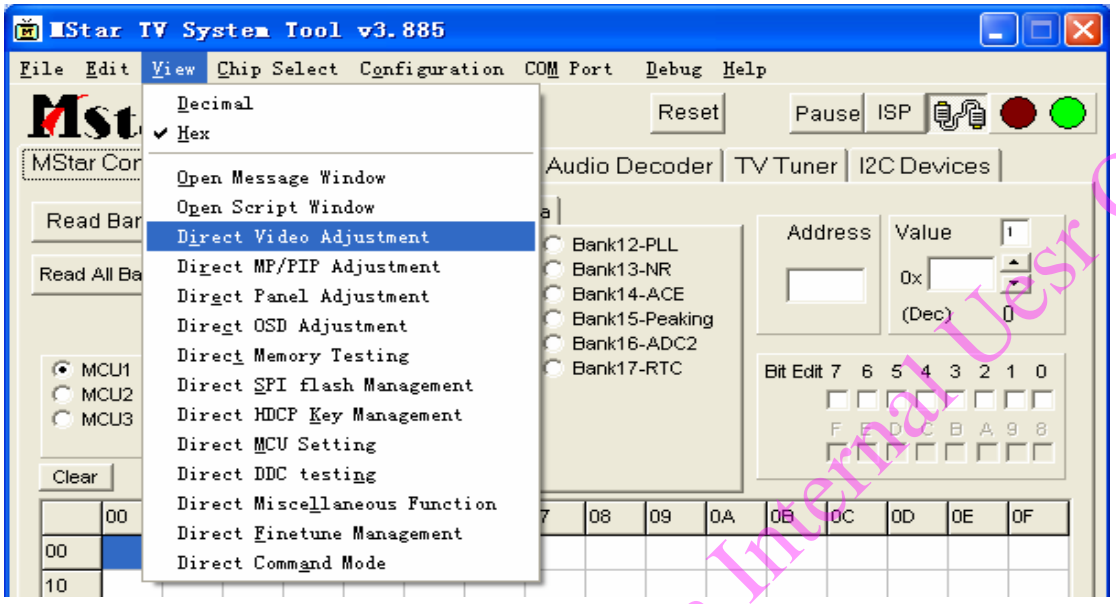
4. Chip selection:



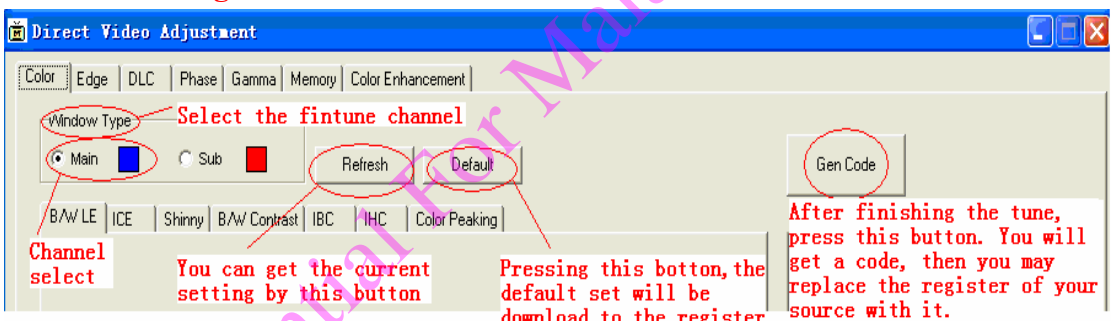
★You must select the right chip, otherwise you definitely get the wrong function.

5. View:

This is the picture quality fine tune window, by which we can tune the picture quality easily.



In which one of items is called "Direct Video Adjustment, when you click it, the following window will come out:

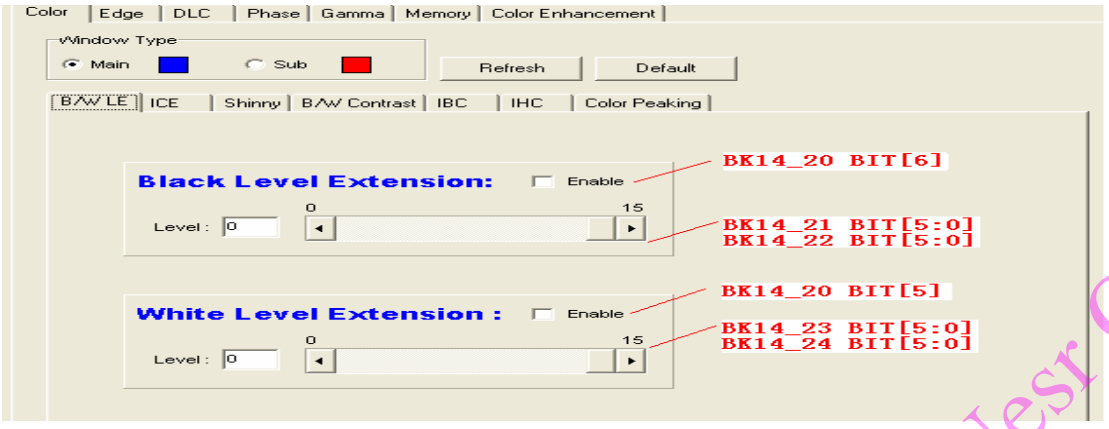


5.1 Color

This color column is with 7 different items to choose, which are as follows:

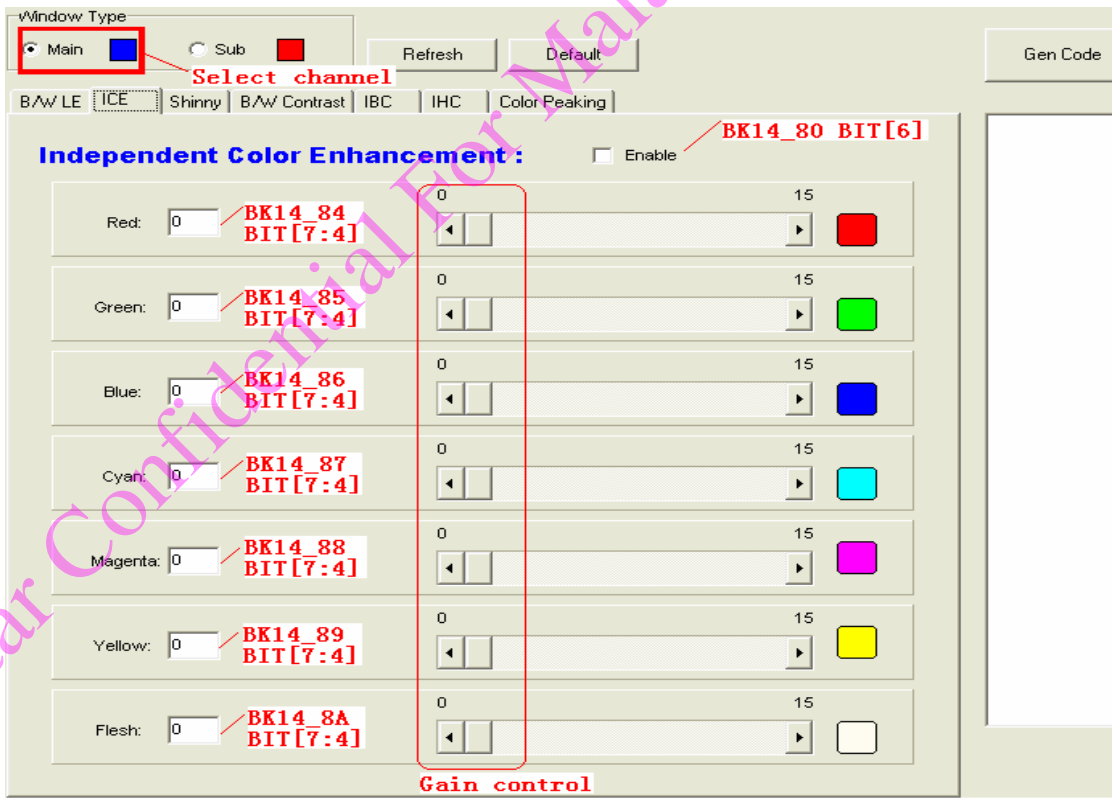
(1) **Black/white level extend**
(2) **Independent color saturation enhance**
(3) **Shinny color**
(4) **Black/white contrast**
(5) **Independent color brightness control**
(6) **Independent hue control**
(7) **Color peaking**

(1) Black/white level extend:



★**Function description:** BLE/WLE can enhance deepness of image. However, to some extent, it will lose some details of Black and White. Consequently, we have to give attention to this. In addition, we can tune the Level of Extension in this window as well.

(2) Independent color saturation enhance



★Function description: Color saturation of R, G, B, C, M, Y and Flesh can be adjusted independently here, and the effect of ICE on Green and Red bar can be seen in Figure 1.1 as well as the saturation of Green and Red bar are enhanced.

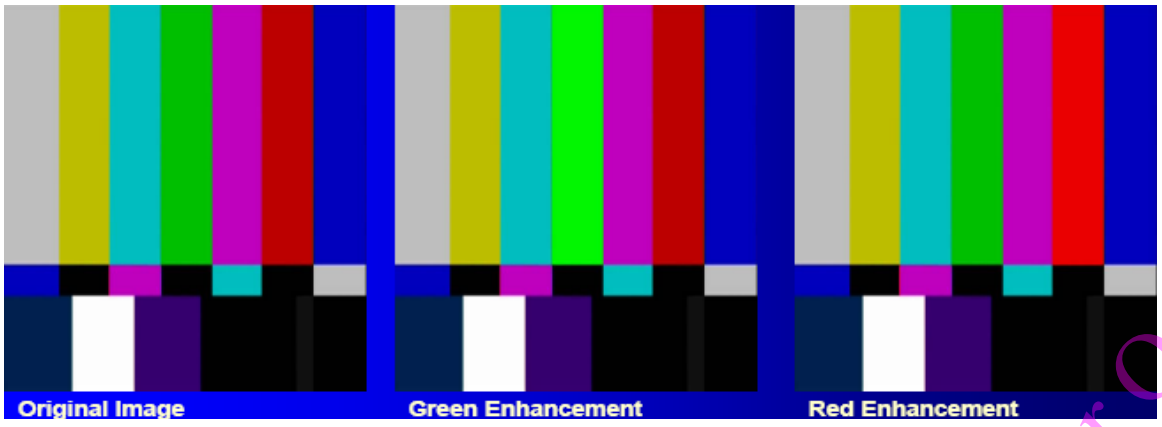


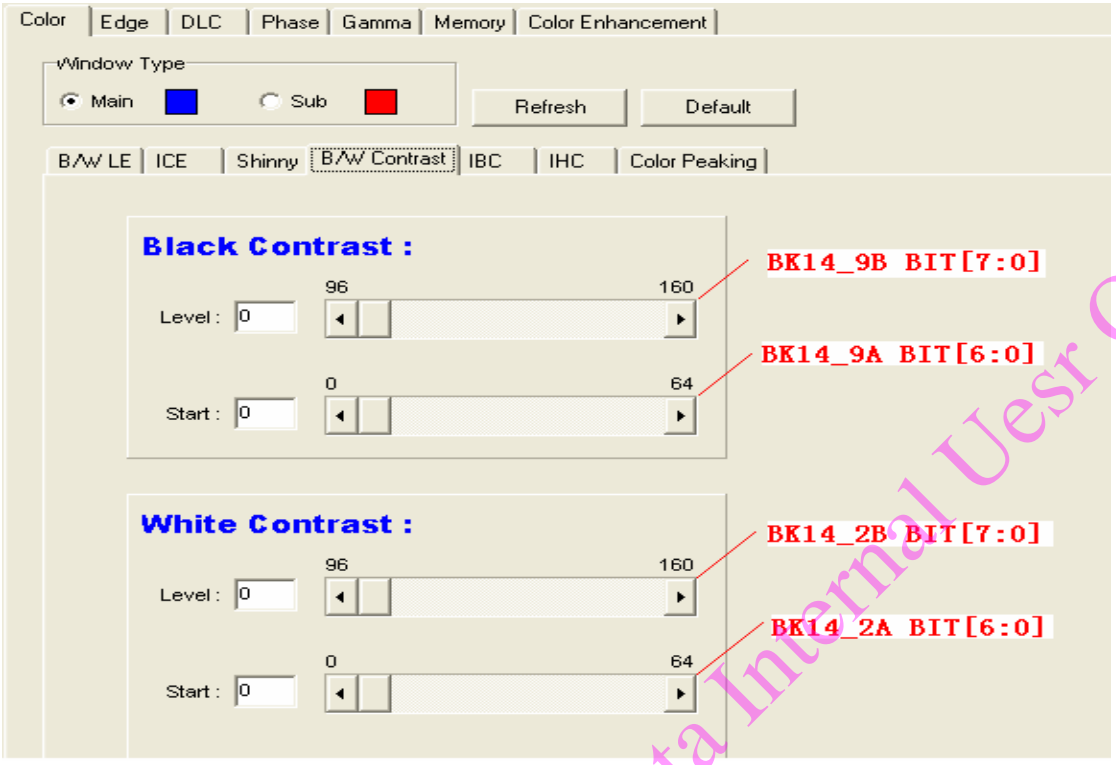
Figure 1.1: Independent Color Enhancement (ICE)

(3) Shinny color

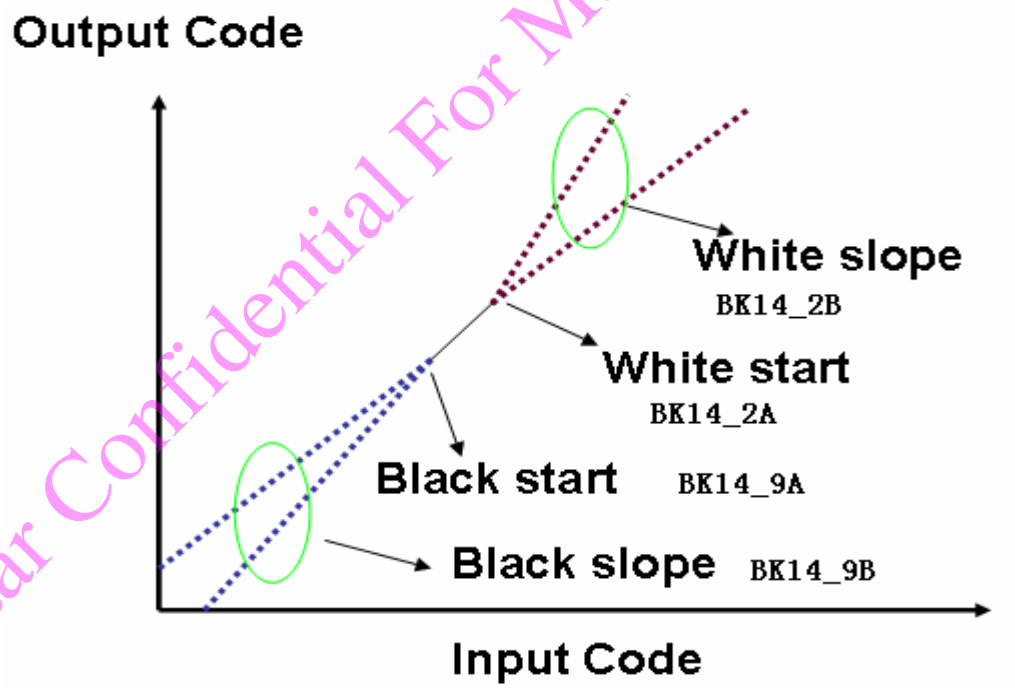
★Function description: Shinny color can enhance luminance when chrominance is not grey the effect of the shinny color acting on the image can be seen in Figure 1.2.

Figure 1.2 Shinny Color

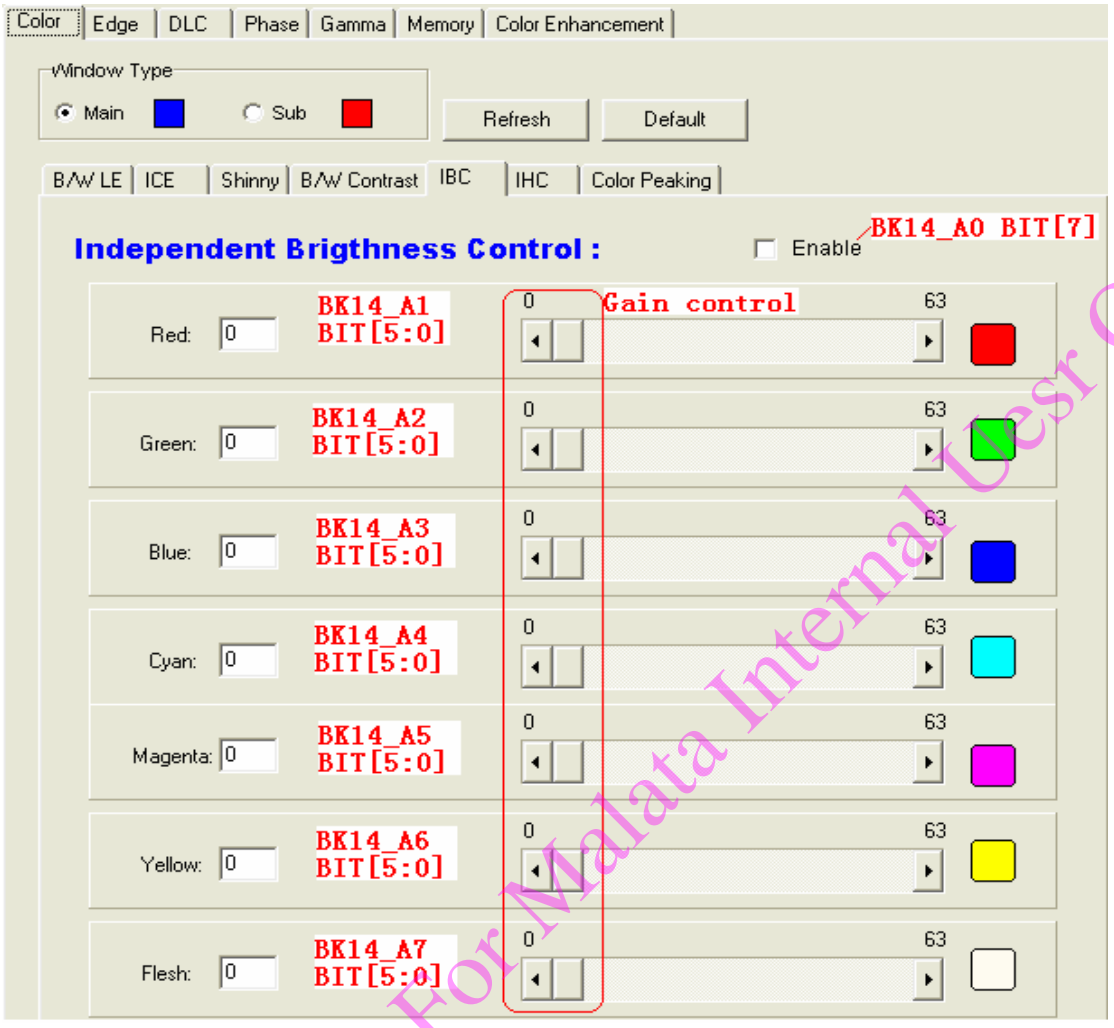
(4) Black/white contrast



★ **Function description: Black/white contrast can enhance deepess of picture. On the other hand, the relation of input code and output code shows below:**



(5) Independent color brightness control



★ Function description: Color brightness of R, G, B, C, M, Y and Flesh can be adjusted independently in this window. For instance, Figure 1.3 shows the brightness of green has been increased dramatically.

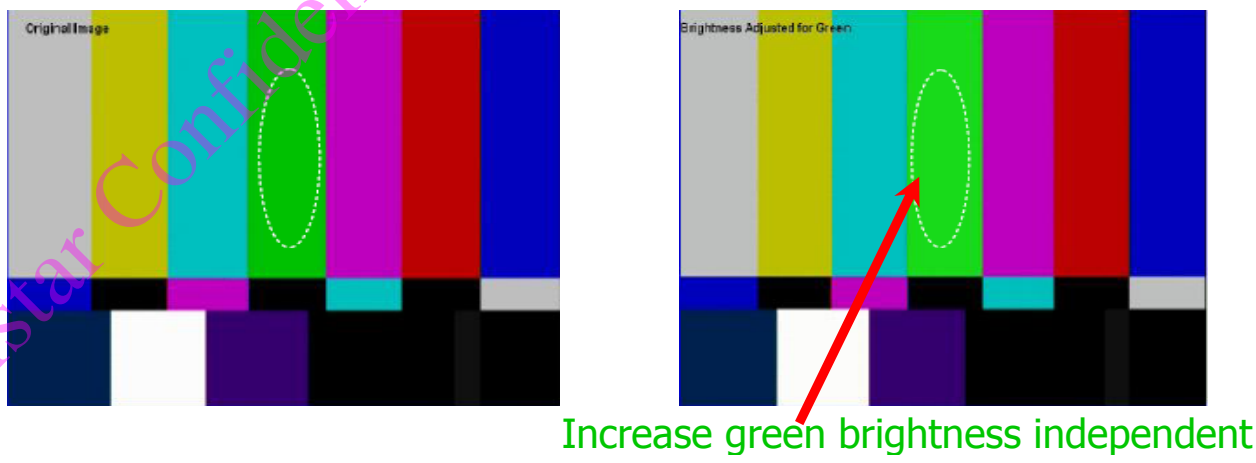
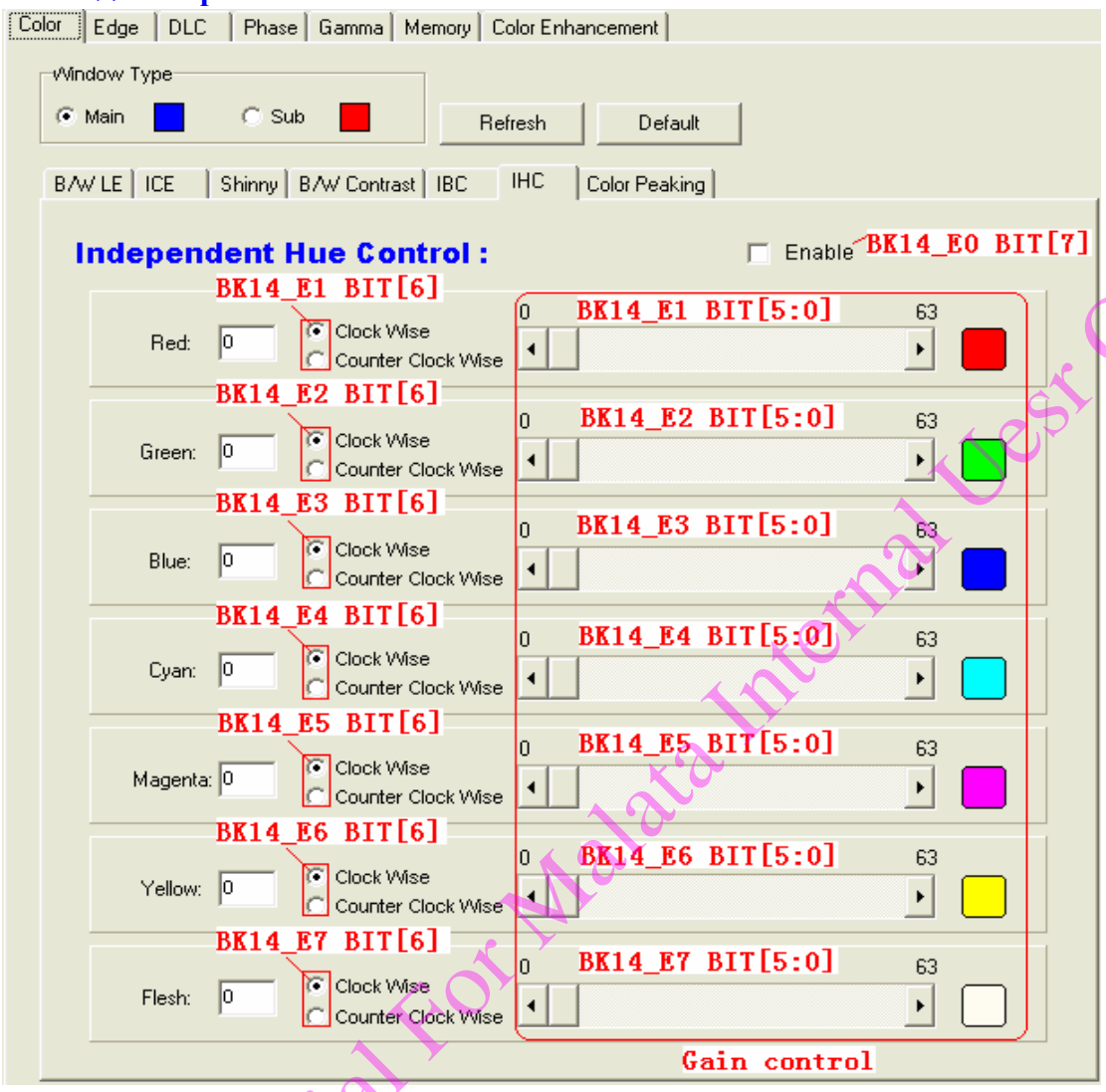


Figure 1.3: Independent Color Control

(6) Independent hue control



-★ Function description: Color hue of R, G, B, C, M, Y and Flesh can be adjusted independently. Also, hue rotation can be chose by “Clock Wise” and “Counter Clock Wise”. The effect of the IHC acting on image can be seen in Figure 1.4.

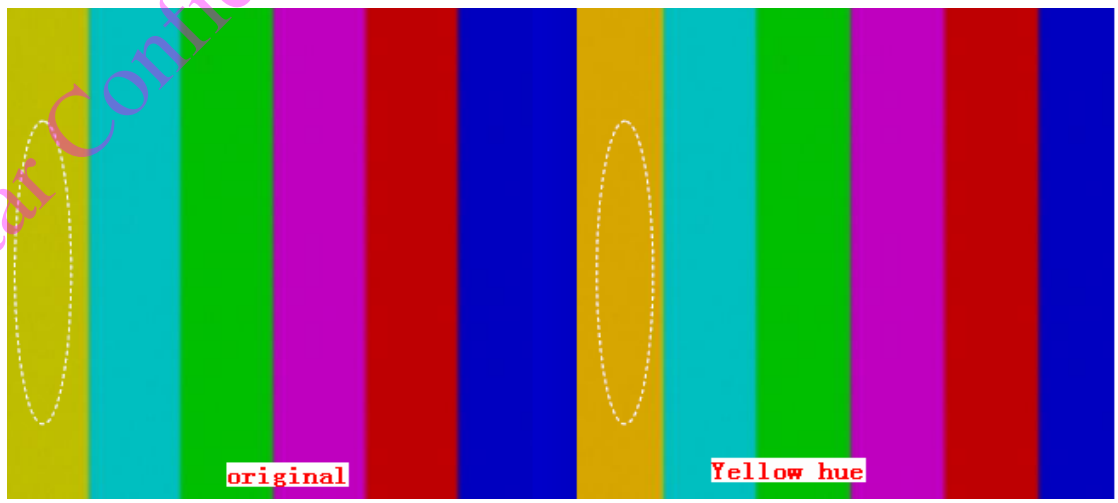
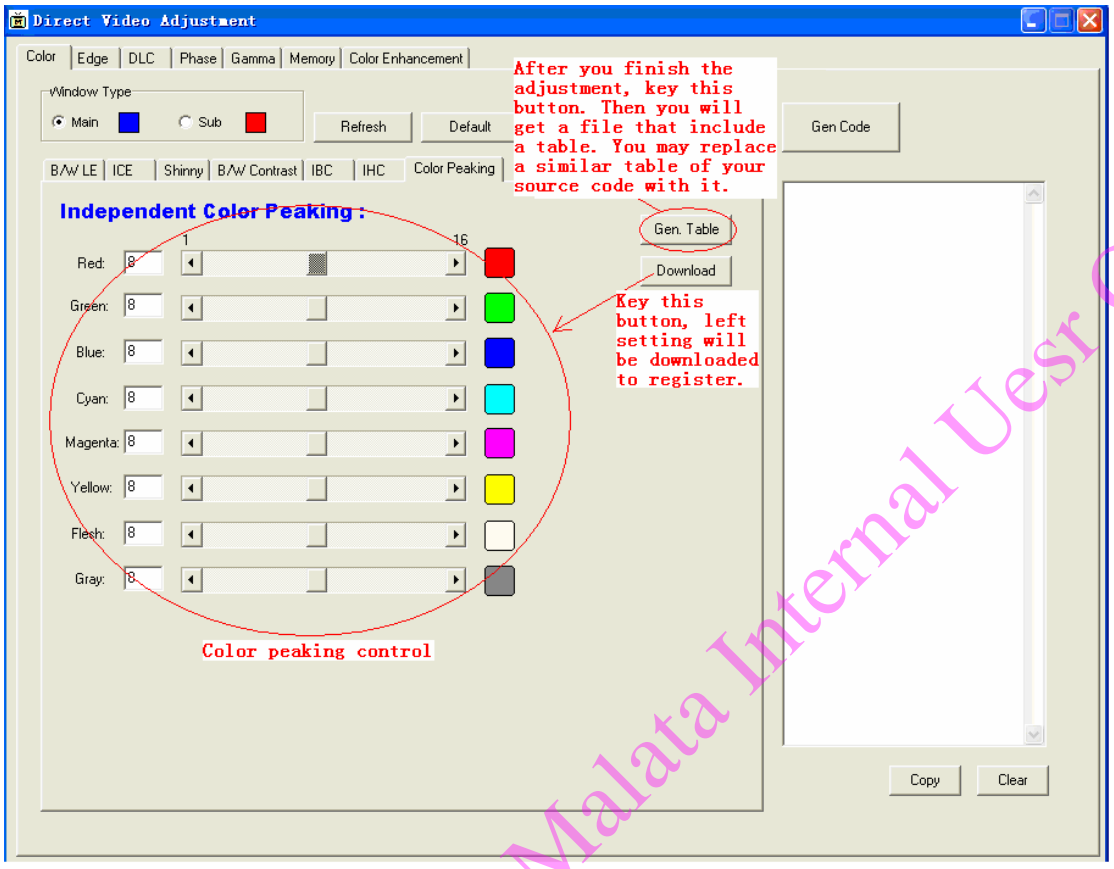


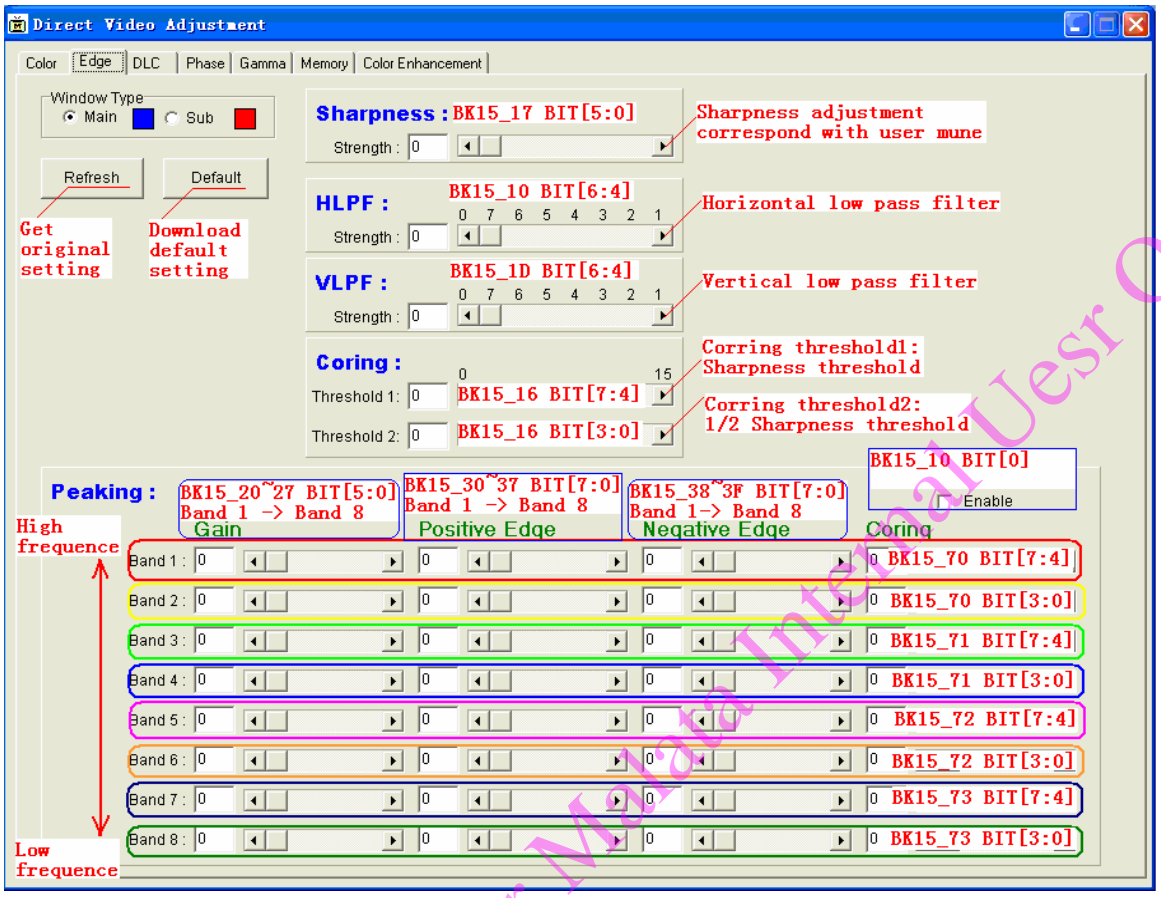
Figure 1.4 :Independent Hue Control

(7) Color peaking



★Function description: Color peaking of R, G, B, C, M, Y and Flesh can be adjusted independently. And the effect can be checked directly by pressing the button of "download". If it is ok, please press the "Gen Table". Then the file called "ColorPeakingTable" will generate automatically. After this, please use this file to replace original one in your code before.

5.2 Edge adjustment:



★Window description:

(1) Sharpness: This sharpness corresponds with user menu sharpness

(2) HLPF/VLPF: As a low pass filter, it helps to filter some noise of high-frequency before processing the peaking module

(3) Coring: Normally it is used to define the sharpness of threshold by edge of signal. When the edge of signal is larger than "Threshold1", then we do full sharpness. When the edge of signal is between "Threshold1" and "threshold2", we do 1/2 sharpness. (Therefore the figure of "Threshold1" should be larger than "Threshold2"). When the edge of signal is less than "Threshold2", we don't need to do any sharpness.

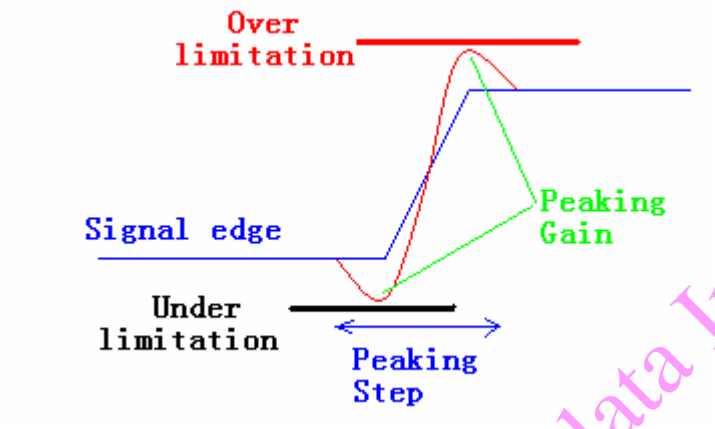
(4) Peaking: When Band 1 to Band 4 are peaking, its frequency is from high to low for horizontal peaking. And the Band 5 to Band 8 are the same as Bank1to Band 4 for vertical peaking. The function acting on each band has four items:

- Gain: Peaking gain is a function that can enhance the sharpness of signal edge.
- Positive Edge: The item is Overshoot limitation. It defines the upper limitation of peaking gain. The rule of positive edge should be Band 1>= Band 2>=…Band 4; Band 5>=Band 6…>=Band 8.

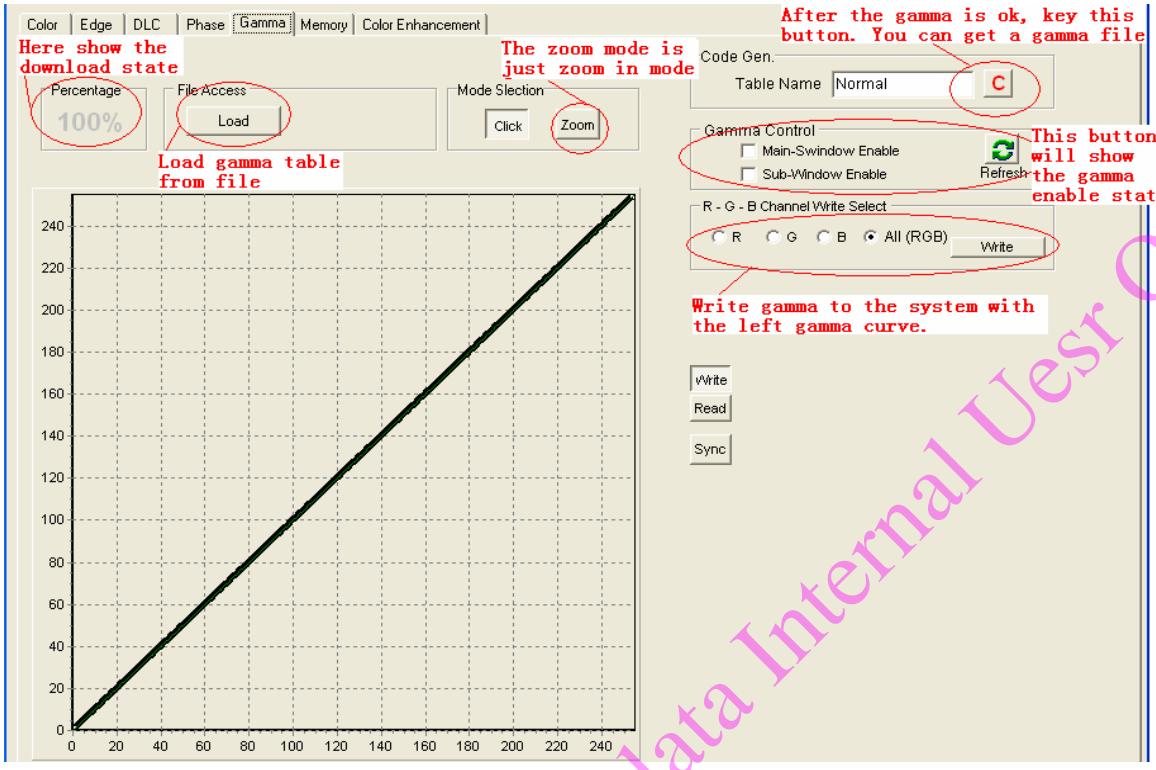
- Negative Edge: The item is undershoot limitation. It defines the lower limitation of peaking. The rule of the negative edge is Band 1>= Band 2>=…Band 4; Band 5…>=Band 8.
- Coring: It defines the threshold of peaking. When the signal Edge is larger than the figure of coring, the peaking will star to work.

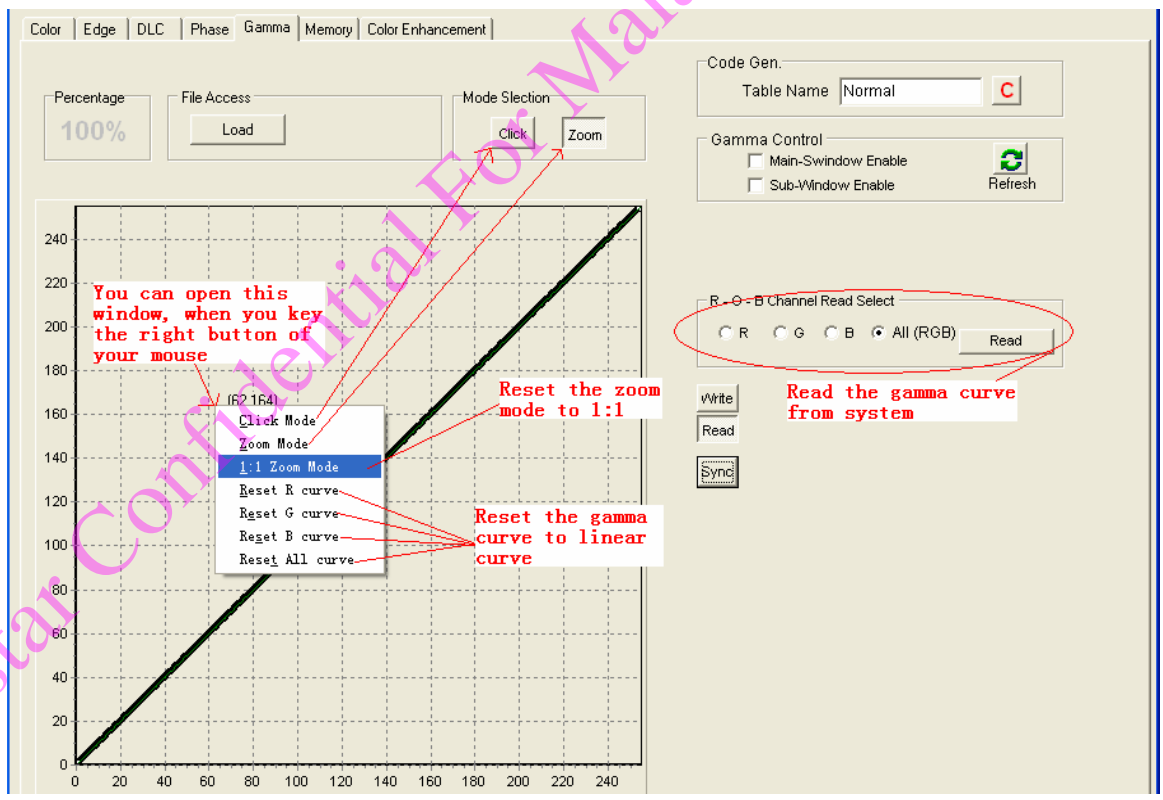
Once the tuning finish then you must read bank15 and get the register data that you adjusted. So that you can modify your source code as well.

Peaking diagram:

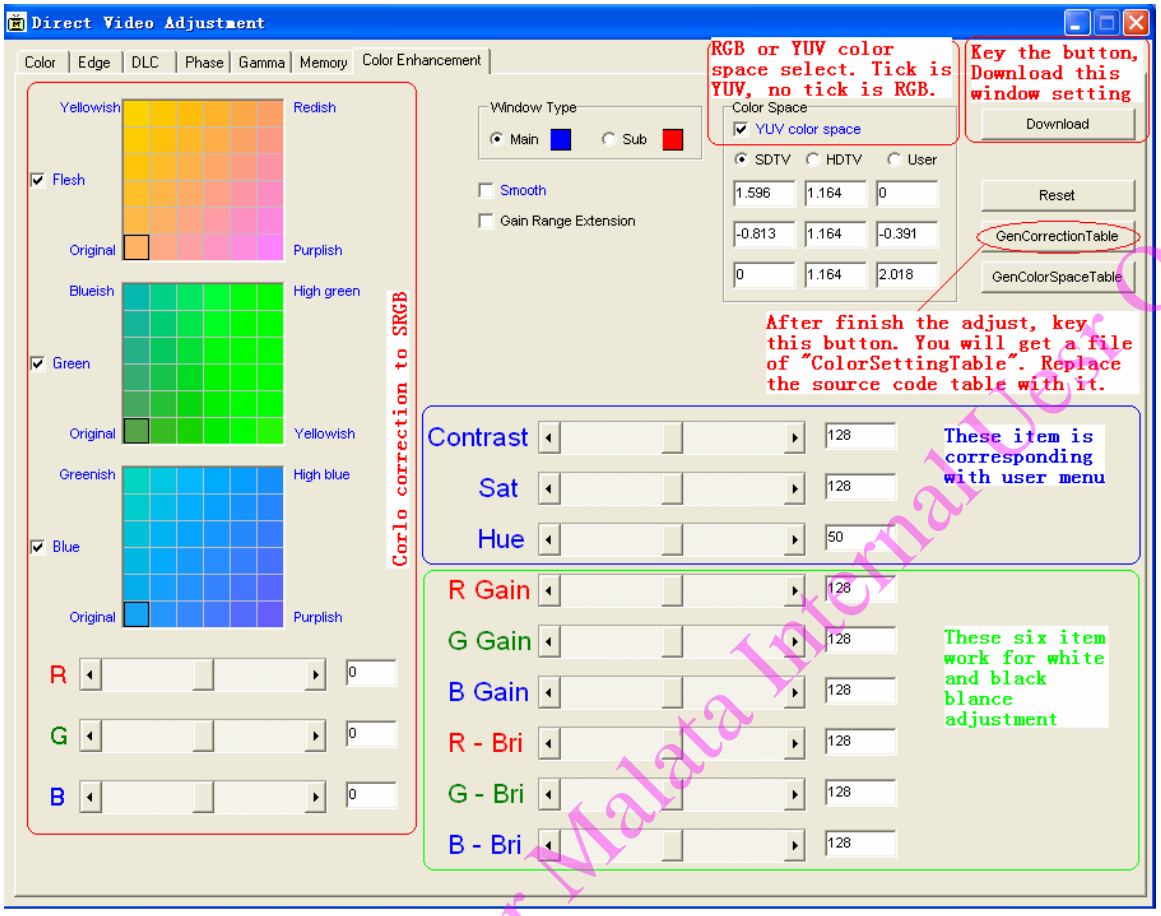


5.3 Gamma:





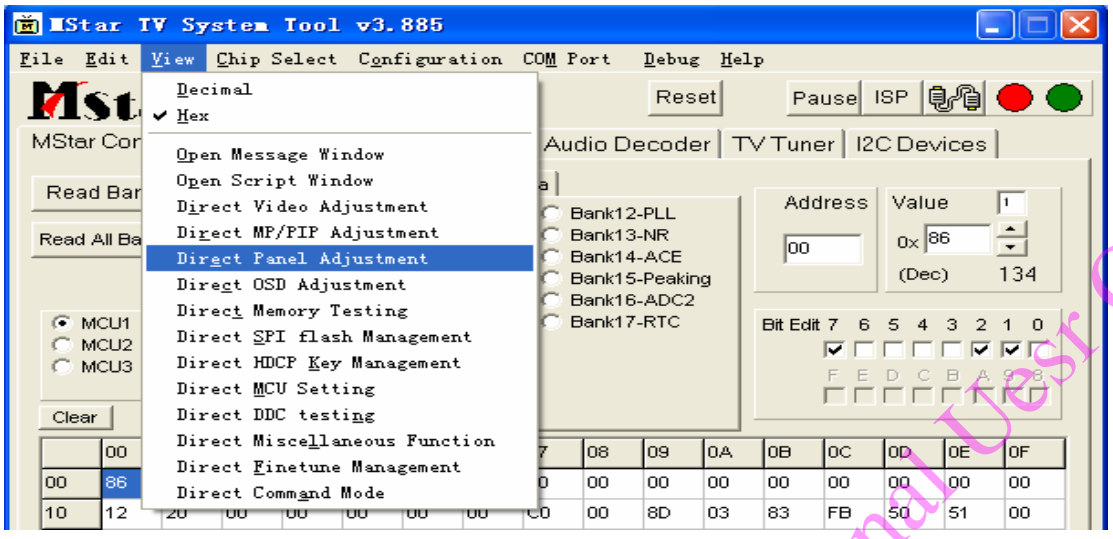
5.4 Color enhancement:



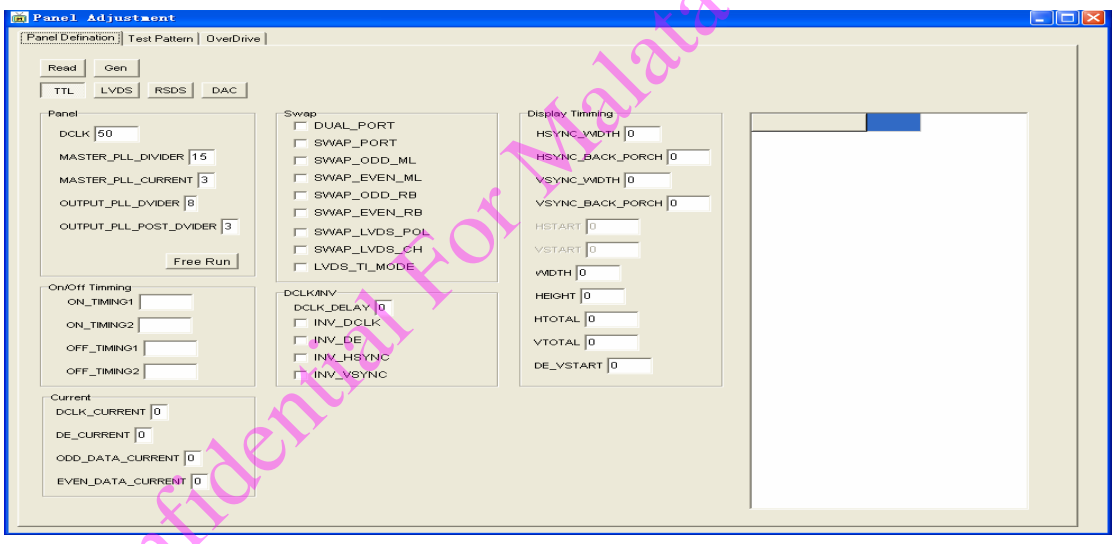
★Function description: Perfect color can be adjusted in color domain randomly.

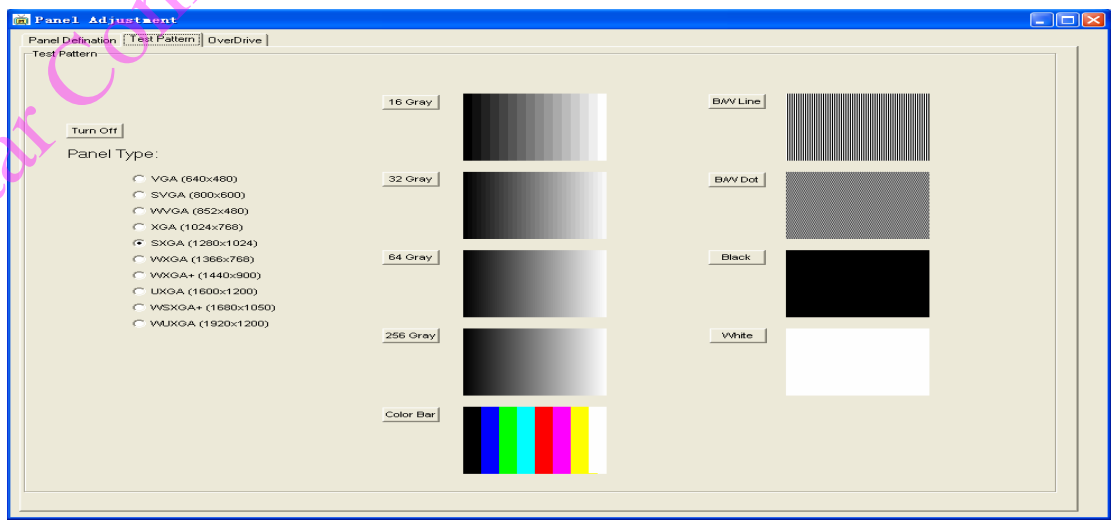
- Red block is the SRGB correction. Adjusting the color can help to get a fancy color. Once finish, please press “GenCorrectionTable” and get a file called “ColorSettingTable”. Of course, you can press the “download” button, if you want to check the effect directly.
- Green block is the white and black balance adjustment. Gain is white balance adjustment, and Bri is black balance adjustment.

6 Panel Adjustment:



★In this window, it is easy to get some information of the panel. On the other hand, OSD test pattern can be generated by "Test Pattern" window. In addition, some issues involved by the front-end (scale) or back-end (panel) can be checked as well.





Part 2: Register Block

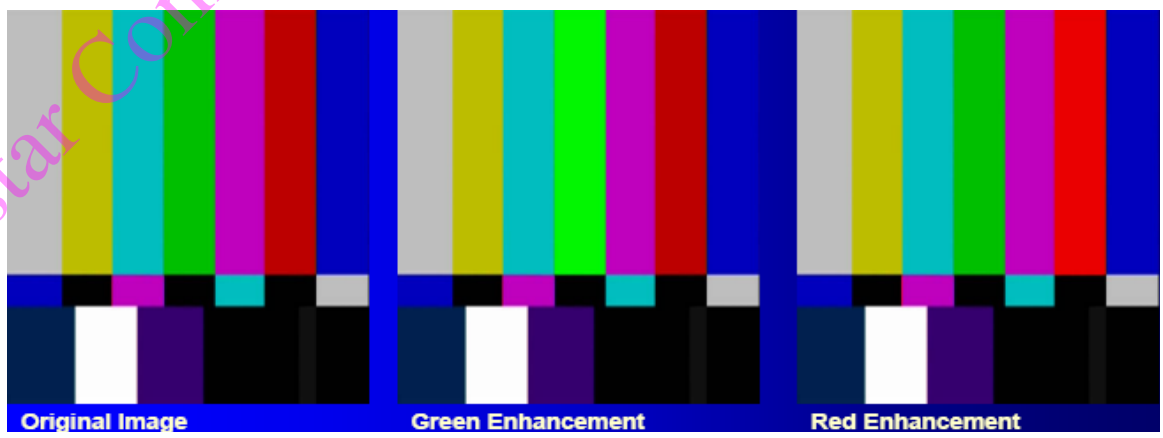
☆ Brightness:

16	0E		ADC Cr gain 80 default <80 increase >80 decrease
16	0F		ADC Y gain 80 default <80 increase >80 decrease
16	10		ADC Cb gain 80 default <80 increase >80 decrease
16	11		ADC Cr Offset 80 default <80 decrease >80 increase
16	12		ADC Y Offset 80 default <80 decrease >80 increase
16	13		ADC Cb Offset 80 default <80 decrease >80 increase
6	73		Comb Contrast
6	74	88	Comb Brightness
6	75	98	Comb Sat
6	80		Luma Gain for U/V demodulation[7:0]
14	9A/9C(Sub)		BLE Function StartPoint
14	9B/9D(Sub)		BLE Function Slope 80 slope=1 >80 slope>1
0	72		R Code Offset //user brightness
0	73		G Code Offset //user brightness
0	74		B Code Offset //user brightness
14	9E/9F(Sub)		Y Code offset (front end) 00 default FF-1 01 +1 只加减亮度

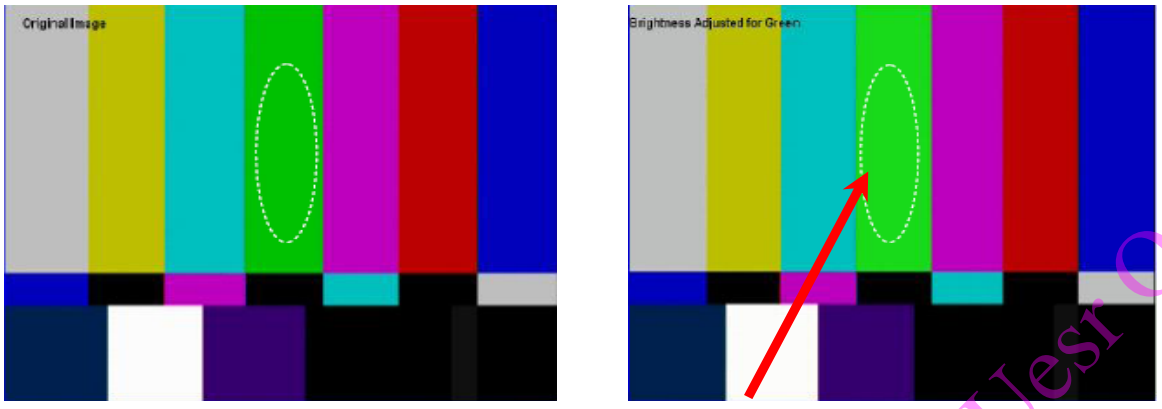
☆ Color Setting:

Bank	Address	Value	Description
14	80	CC	**Main Win CbCr to UV enable[7]** **Main ICC** Enable [6] Main UV Compensate Enable [5] Sub Win CbCr to UV enable[3] Sub ICC Enable [2] Sub UV Compensate Enable [1]
14	84/85/86~8A		ICC R/G/B/C/M/Y/F gain Main[7:4] Sub[3:0]
14	A0	A2	**Main IBC** Enable[7] Sub IBC Enable[6] IBC Y_LPF Enable[5] IBC Coring Threshold[3:0]_the bigger the figure you set, the less the luminance will increase
14	A1/A2~/A7 A8~AE(Sub)		IBC R/G/B/C/M/Y/F gain [5:0] control) 20 default <20 decrease >20 increase
14	E0		**IHC** Enable[7] Sub IHC Enable[6]
14	E1/E2~/E7 E8~EE(Sub)		IHC R/G/B/C/M/Y/F rotate [5:0] control) rotation direction[6]

ICCfunction :

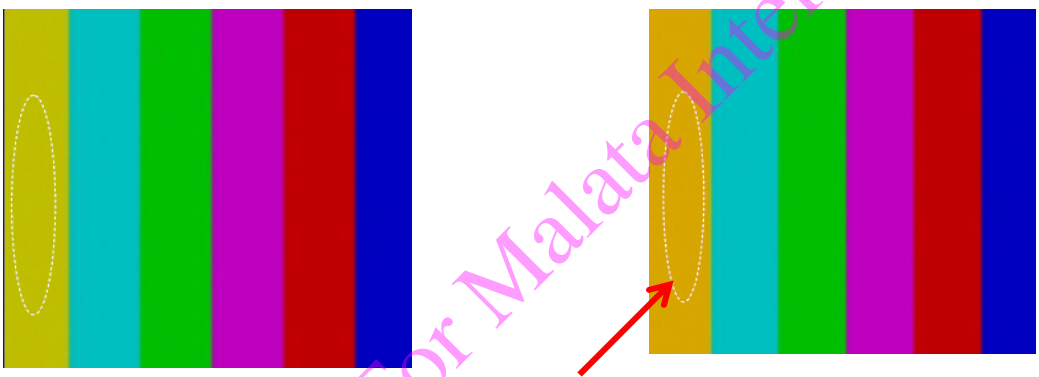


IBC function:



Increase green brightness independent

IHC function:



Adjust yellow hue independent

☆ Sharpness:

Bank	Address	Value	Description
15	10/18(Sub)		Main window horizontal Y LPF coefficient.[6,4] MAIN_PP_CTRL1_reg[3]; main_dia_mode enable[1]; main_post_peaking_en[0];
15	11/19(Sub)		Band1~Band8 peaking enable [0:7]
15	12/1A(Sub)		Band1 Coef step [1:0] Band2 Coef step [3:2] Band3 Coef step [5:4] Band4 Coef step [7:6]
15	13/1B(Sub)		Band5 Coef step [1:0] Band6 Coef step [3:2] Band7 Coef step [5:4] Band8 Coef step [7:6]

15	15/1D(Sub)		Vertical_LPF_coef_2[6:4]; Vertical_LPF_coef_1[2:0];
15	16/1E(Sub)		Coring_thrd_2[7:4]; Coring_thrd_1[3:0]; *(1)
15	17/1F(Sub)		OSD_SHARPNESS_reg[5:0];
15	20/40(Sub)	18	Band1 Coeff[5:0] Horizontal high Frq
15	21/41(Sub)	18	Band2 Coeff[5:0] Horizontal middle Frq
15	22/42(Sub)	14	Band3 Coeff[5:0] Horizontal low Frq
15	23/43(Sub)	10	Band4 Coeff[5:0] Horizontal lowest Frq
15	24/44(Sub)	10	Band5 Coeff[5:0] Vertical peaking
15	25/45(Sub)	18	Band6 Coeff[5:0] Vertical peaking
15	26/46(Sub)	18	Band7 Coeff[5:0] Vertical peaking
15	27/47(Sub)	12	Band8 Coeff[5:0] Vertical peaking
15	30/50(Sub)	A0	Band1 Overshoot Limit[7:0]
15	31/51(Sub)	60	Band2 Overshoot Limit[7:0]
15	32/52(Sub)	10	Band3 Overshoot Limit[7:0]
15	33/53(Sub)	02	Band4 Overshoot Limit[7:0]
15	34/54(Sub)	20	Band5 Overshoot Limit[7:0]
15	35/55(Sub)	20	Band6 Overshoot Limit[7:0]
15	36/56(Sub)	20	Band7 Overshoot Limit[7:0]
15	37/57(Sub)	20	Band8 Overshoot Limit[7:0]
15	38/58(Sub)	A0	Band1 Undershoot Limit[7:0]
15	39/59(Sub)	60	Band2 Undershoot Limit[7:0]
15	3A/5A(Sub)	10	Band3 Undershoot Limit[7:0]
15	3B/5B(Sub)	02	Band4 Undershoot Limit[7:0]
15	3C/5C(Sub)	20	Band5 Undershoot Limit[7:0]
15	3D/5D(Sub)	20	Band6 Undershoot Limit[7:0]
15	3E/5E(Sub)	20	Band7 Undershoot Limit[7:0]
15	3F/5F(Sub)	20	Band8 Undershoot Limit[7:0]
15	70/74(Sub)	1	Band1 coring threshold[7:4]
15	70/74(Sub)	1	Band2 coring threshold[3:0]
15	71/75(Sub)	1	Band3 coring threshold[7:4]
15	71/75(Sub)	1	Band4 coring thresholdβ:0]
15	72/76(Sub)	1	Band5 coring threshold[7:4]
15	72/76(Sub)	1	Band6 coring thresholdβ:0]
15	73/77(Sub)	1	Band7 coring threshold[7:4]
15	73/77(Sub)	1	Band8 coring thresholdβ:0]

☆ NR(Noise Reduction):

Bank	Address	Value	Description
5	40/C0(Sub)		Force NR bits[7] Bob Mode bits[6] Field [5] NR enable [4] Force Progressive mode[3] **Dynamic NR enable [2]** Dynamic NR [1,0]/NR Mode select
13	C0~C7	78/56/34/23/12/01/00/00	Y DNR Table
13	A0~A7	78/56/34/23/12/01/00/00	C DNR Table
13	20~22 40~42	22/22/12 22/22/12	PNR C Table PNR Y Table

Note:

Y DNRTable：C0 BIT[3 :0] is Y difference 1 ~ C7 BIT[7:4] is Y difference 16. The larger the data is, the stronger the NR will be. The effect of NR are in the following order:

Y difference 16> Y difference 15>…> Y difference 1.

Attention: the setting to NR should not be too large, otherwise it will make picture delay

☆ ADC :

Bank	Address	Value	Description
16	0E		Cr gain 80 default <80 increase >80 decrease
16	0F		Y gain 80 default <80 increase

			>80 decrease
16	10		Cb gain 80 default <80 increase >80 decrease
16	11		Cr Offset 80 default <80 decrease >80 increase
16	12		Y Offset 80 default <80 decrease >80 increase
16	13		Cb Offset 80 default <80 decrease >80 increase
16	14	By timing	Clamp Placement based on ADC clock
16	15	By timing	Clamp Duration based on ADC clock
16	06		ADC Phase
1	37[7:4]		ADC BW Filter

Note:

●**ADC Gain and Offset:** Before we fine tune YPbPr and VGA, we have to set the ADC gain and Offset rightly and firstly, after all the AUTO color function exists in the "Factory",

YPbPr AUTO pattern: 75% Color bar
VGA AUTO pattern: Full scale white and black pattern

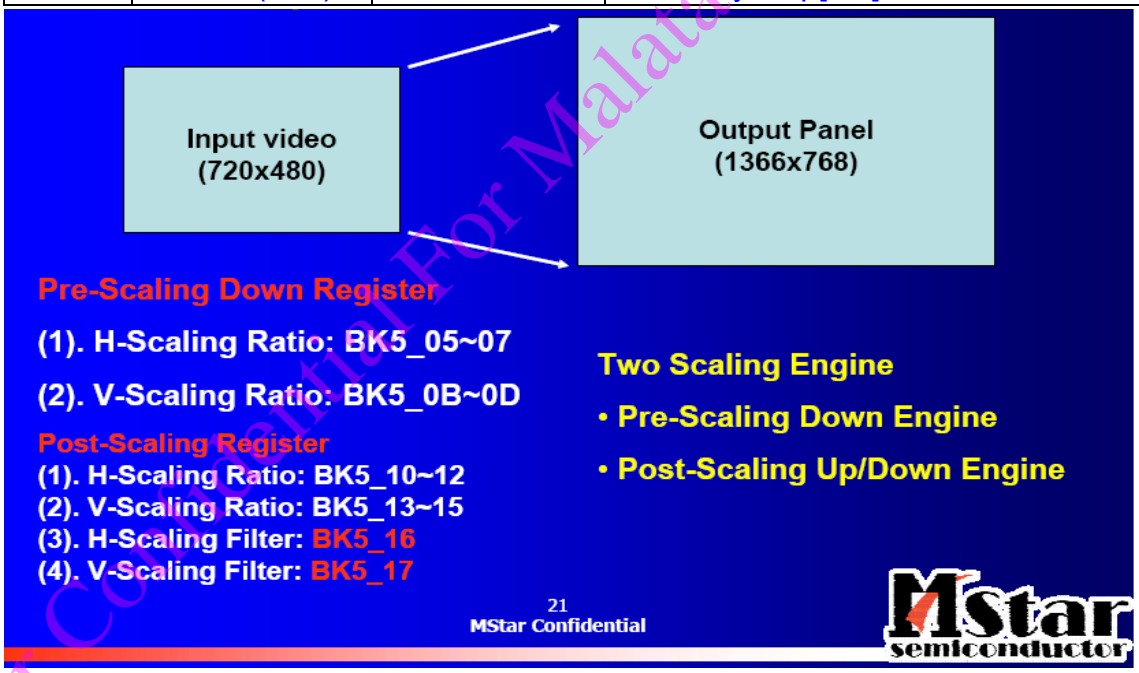
●**ADC Clamping:** Clamping setting defines the signal black level of ADC. If the image color deflect green or Magenta on gray pattern, please check the "clamping" setting.

●**ADC BW:** It's bandwidth can be defined by EIA/CEA-861-B.

☆ Scaling:

Bank	Address	Value	Description
5	16/96(Sub)	05	Y table[7:6] C table[5:4] H scaling filter[3:0] larger -> clearer
5	17/97(Sub)	75	Y table[7:6]

			C table[5:4] V scaling filter[3:0] larger -> clearer
5	05/06/07	Horizontal Pre_scaling ratio	
5	0B/0C/0D	Vertical Pre_scaling ratio	
5	10/11/12	Horizontal Post_scaling ratio	
5	13/14/15	Vertical Post_scaling ratio	
5	0F/8F(Sub)		space filter[7] UV swap[6] C/Y delay enable[4] =1: C delay YC delay step[3:0]



Attention: Scaling filter-BK16,17 BIT[3:0] can enhance sharpness of horizontal or vertical boundary. But its side-effect is that the saw-edge will be more obvious on the bevel edge.

☆ COMB Setting: Bank 6

Address		Name	Value	Description
10	[2:0]	WorkMd	3'd7	2: pure 2D mode, 3: 3D Comb enable 7: 3D Comb with motion
	[4]			New Mode Enable
30	[7]	MotXEn	1'd1	add the extra motion detection
	[5]	MotZEn	1'd1	add the extra motion detection
	[1:0]	DynThMd	2'd3	multiply the motion difference ;
31	[7:0]	MotYThU	8'h25	Upper bound motionY threshold.
32	[7:0]	MotYThL	8'h10	Lower bound motionY threshold.
33	[7:0]	MotCThU	8'h30	Upper bound motionC threshold.
34	[7:0]	MotCThL	8'h10	Lower bound motionC threshold.
35	[7:0]	MotThX	8'h20	MotX threshold with reg_30[7] set
36	[7:0]	MotThZ	8'h30	MotZ threshold with reg_30[5] set
37			88	Still image detection enable[7] Still threshold[6:0]
38	[7:6]	MFmode	2'd0	motion hitsory factor mode (0x0max ; 0x1: avg; 0x2MotY ;0x3MotC)
73		80	Comb Contrast	
74		90	Comb Brightness	
75		98	Comb Sat	
80		C0	Luma Gain for U/V demodulation[7:0]	
83			IIR coefficient for CTI[7,6] CTI Mode[5,4] Luma Pipe Delay[3,2] Cb/Cr Low Pass Mode[1,0] 00:off 01:Weak 10:Normal 11:Strong	
60 *(2)		bit[7:6]	IF compensation mode.	
		bit[5:0]	IF compensation coefficient, 2-bit integer, 4-bit frac.	

Note:

◆**3D threshold: When** increasing the figure of the BK6_31,32,33,34, it is easy to tell that the image is still, and then start to be in the mode of 3D comb.

◆**CTI:** BK6_83 have the same effect with SECAM.

Attention: IF compensation only enable when TV NTSC input.

☆ SECAM

Bank	Address	Value	Description
C	2E	00	IF Compensation filter mode
C	25 BIT[1:0]	0	Static De-Blanking level (upper 2 bits).
C	26	FC	Static De-Blanking level (lower 8 bits).