MSTV Series
PQ Tool Application Note for Sigmastar reference

Version 0.6

REVISION HISTORY

Document	Description	Date
mstv_pq_tool_apn_v06_branch	ı Initial release for Sigmastar	March 2018

TABLE OF CONTENTS

1. ABBREVIATIONS AND ACRONYMS

DLC	Dynamic Luminance Control
IHC	Independent Hue Control
ICC	Independent Saturation Control
FCC	Favor Color Control
CSC	Color Space Transformation

2. RELATED DOCUMENTS

3. PQ TOOL SOFTWARE INTERFACE INTRODUCTION

3.1. Tool Main Form Introduction

- **Before Use:** It is necessary to have the SW Driver for MSTV Debug Tool. The user should install the tool driver (same as MSTV Debug Tool). Please refer to "MI QuickStart Guide" for details or ask MStar Support Window.

In this chapter, we will introduce the main form of PQ tool and how it is commonly used.

Figure 1 shows MStar PQ tool program icon. Double click to open the program.

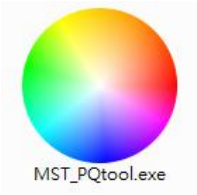


Figure 1: PQ Tool Icon

The tool may inquire your User Name on the User message box (Figure 2) the first time it is opened. The user should ask MStar Support Window to get the username and type it in the box below to open related PQ tuning functions, or else the user can only see a few PQ tuning pages. The user just needs to key in their username the first time using it, and can click "Apply" to make the tool remember the username automatically.

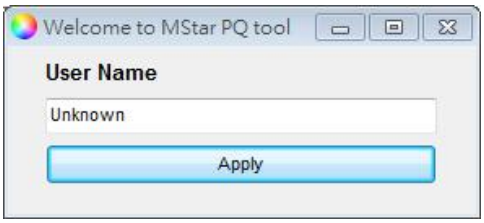


Figure 2: User Login Message Box

Then, the PQ tool Start interface will show on windows (Figure 3)

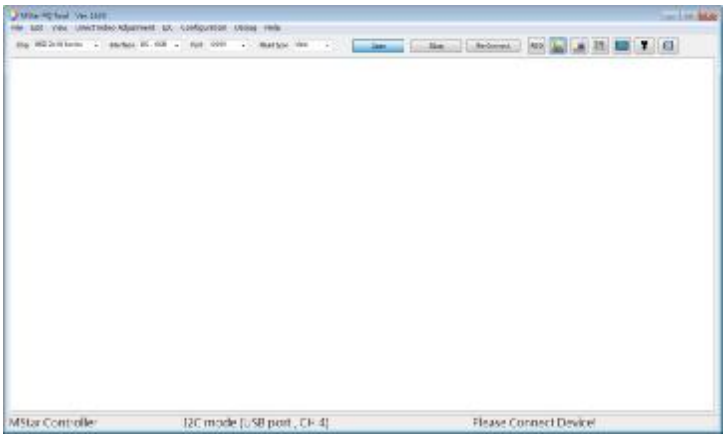


Figure 3: PQ Tool Start Form

The user can see the tool version in the tool's title; in Figure 4, it shows the tool version is Ver. 1630. The version will be updated every week to fix bugs, and the user can ask MStar Contact Window to update the latest version.

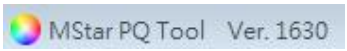


Figure 4: PQ Tool Version

Figure 5 shows the common controls of PQ tool. We will discuss about all of UI items in this chapter.

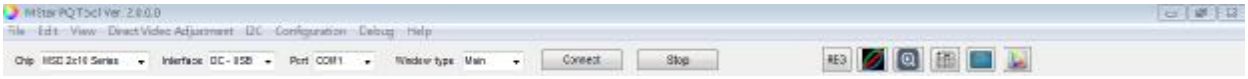


Figure 5: PQ Tool Main Tool Bar

u Chip Selection:

This option is type of IC selection (). When the user gets an IC and board, they should choose the correct chip series. If the user does not know how to choose, please ask MStar Support Window.

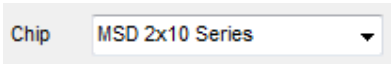


Figure 6: Chip Selection Box

u Debugging interface:

For now, we provide 3 types of connecting function in PQ tool, COM, I2C-USB, I2C-LPT respectively. I2C-LPT is rarely used now. We introduce the settings of "I2C-USB" and "COM" as follows.

1. I2C-USB:

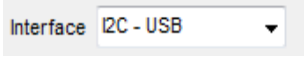


Figure 7: Debug Interface Select Box

Ø I2C Basic Settings: "I2C"à"Set I2C"

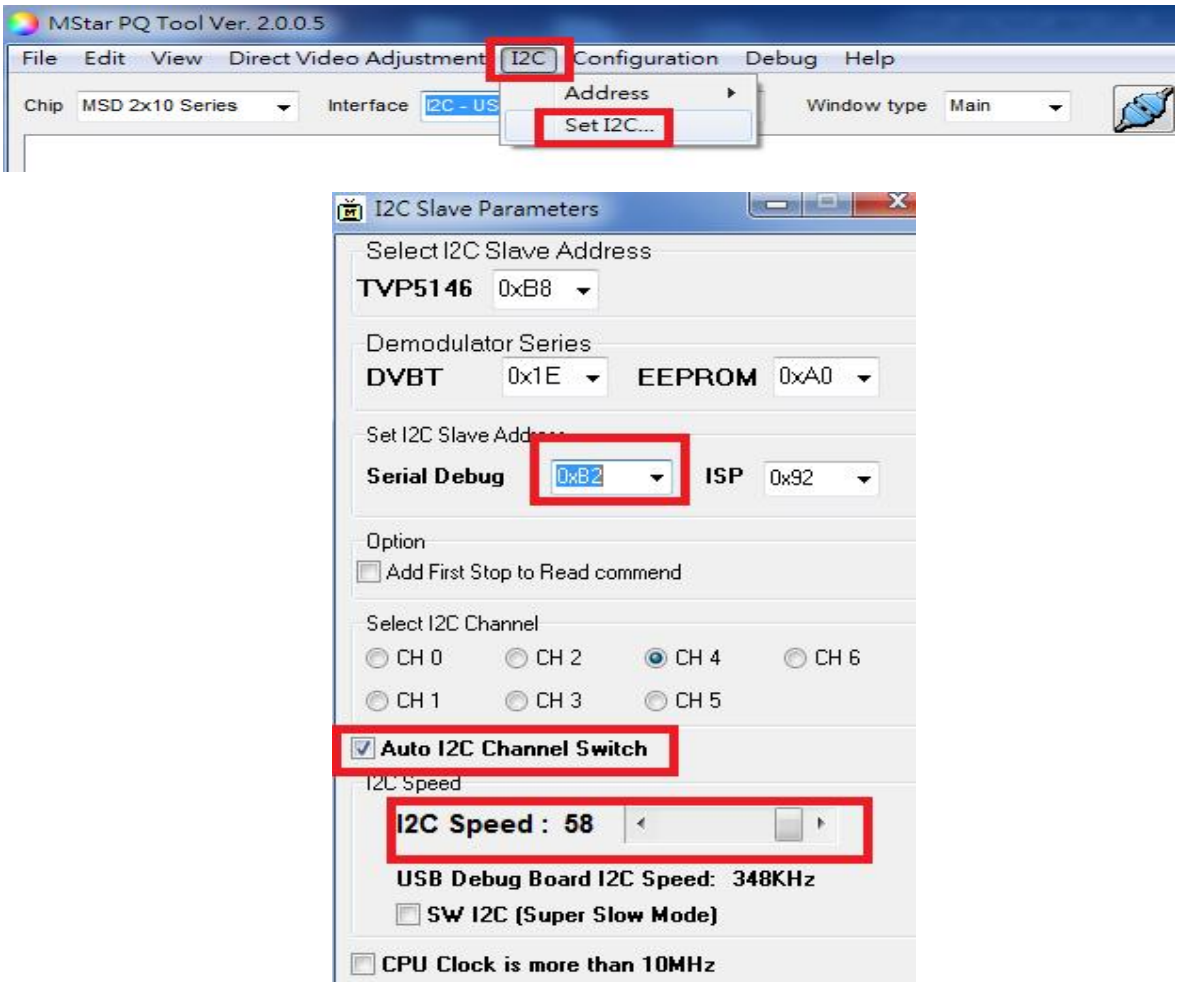


Figure 8: Debug Interface I2C Select Box

Serial Debug: The default is "0xB2" for SOC chips. If the connection fails, please try other option or ask MStar Support Window.

Auto I2C Channel Switch: By default, it is enabled.

I2C Speed: This value depends on computer speed; normally the default value is the maximum value. But if the value is read not smoothly or there is an error, please reduce the value.

2. COM:

This option is type of Comport series number selection. The user can check it in the "Device Manager" (My Computer **à** Properties (Right Click) **à** Hardware) on the computer. It would show the number of COM port.

Figure 9: Comport Selection Box

Right click on Port selection box, and the user can choose comport baud rate (). Normally the default value is "115200". Please try other option or ask MStar support window.

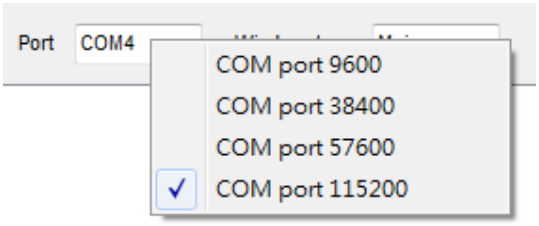


Figure 10: Comport Baud Rate Selection

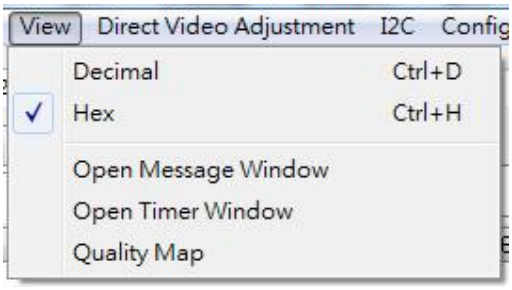
u Before Connection:

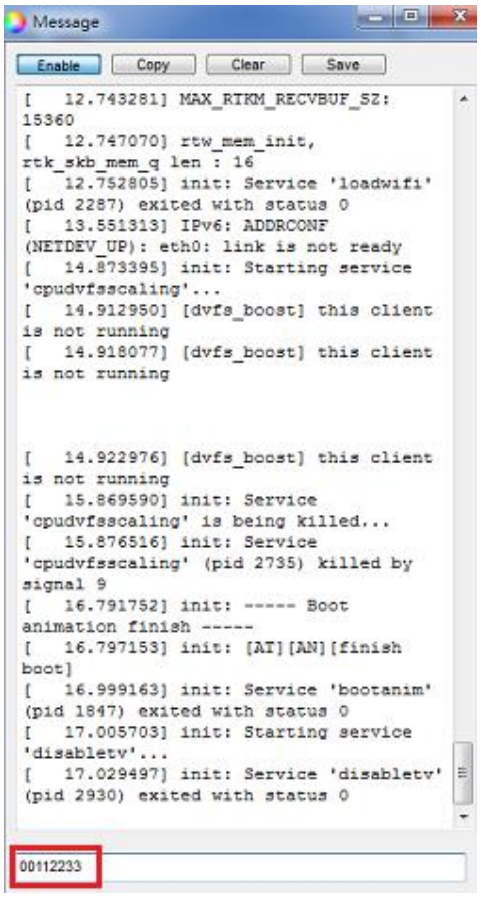
For OS system TV, if the user wants to connect by "I2C-USB", it will stop the message print to debug by tool. Please follow the processes step by step.

1. Connect COM port, switch interface to "COM" and set the correct "COM" settings as the description above, and click the button below to check it is connected or not.

If it connects well, the user can see "Connect Device Successful" message in the right-bottom of the tool window.

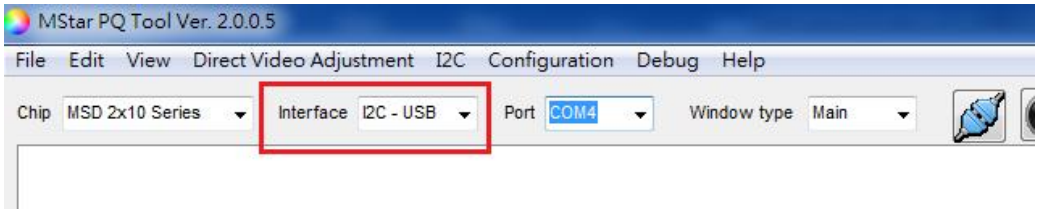
2. Open the "Message Window"



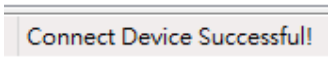


The user can type "00112233" in the "**Command send"** window and press "Enter" to stop print and start to use Tool.

3. Switch interface to "I2C-USB" and click the button below to check whether it's connected or not.



If it connects well, the user can see "Connect Device Succesful" message at the bottom right of the tool window.



u Register window select

Switch window type for Main or Sub window. This function is used for PIP/POP windows PQ adjustment. Some PQ functions can support individual PQ settings. The user can switch the windows by this selection.

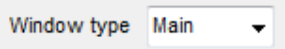


Figure 11: Window Type

u Device connection (Figure)

1. **Connect/Disconnect**: When you need to adjust Picture quality, please make sure Connect button is on click status.
2. **Stop**: In some cases, you may need to stop CPU, and then you also need to click the Stop button.

Figure 12: Connect Button

u PQ program shortcut:

The shortcut of the program can directly open the relate PQ programs

1. Register reader
2. Gamma
3. Quality map

Figure 13: PQ Tool Programs Shortcuts

u PQ program status:

1. Tool status
2. Debug Interface status
3. I2C linking status

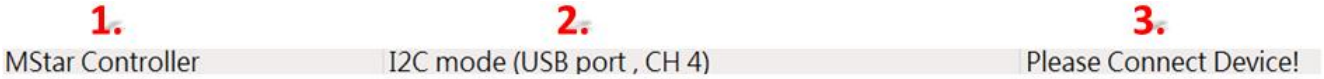


Figure 14: PQ Tool Status

u View:

1. **Decimal**: Unit to decimal. The hot key is "Ctrl + D"
2. **Hex**: Unit to hexadecimal. The hot key is "Ctrl + H"
3. **Open Message Window:**

   Comport message window. COM connection is needed. After selecting the correct Comport, the user can key in commands to the target board

   I. **Enable**: Enable Uart

   II. **Copy**: Copy message to clipboard

   III. **Clear**: Clean message window

   IV. **Save**: Save message to .txt

   V. **Command send**: Press "Enter", and send command to target board

Figure 15: Comport Message Window

4. **Open Time Window**: Timer to record.
5. **Quality map**: Open Qmap related functions, details as depicted in 4.5.

Figure 16: View Options

u Direct Video Adjustment:

Direct Video Adjustment is most commonly used to adjust display picture color quality. The details of each PQ program will be discussed in the next chapter.

Figure 17: Direct Video Adjustment

4. INTRODUCTION OF PQ ADJUSTMENT PROGRAMS

4.1. Before PQ Tuning: White Balance and Signal Adjustment

White Balance Adjustment include GAMMA/RGB Gain/RGB offset Adjustment

4.1.1.1. Method for Changing Node Value: (Ref. Figure 7)

1. Scroll or fine tune the vertical bar (No.5 & No.6).
2. Adjust the node in chart coordinate by mouse(Ref. 4.1.1.4)
3. Change the value in the grid (No.2, Ref. 4.1.1.3).

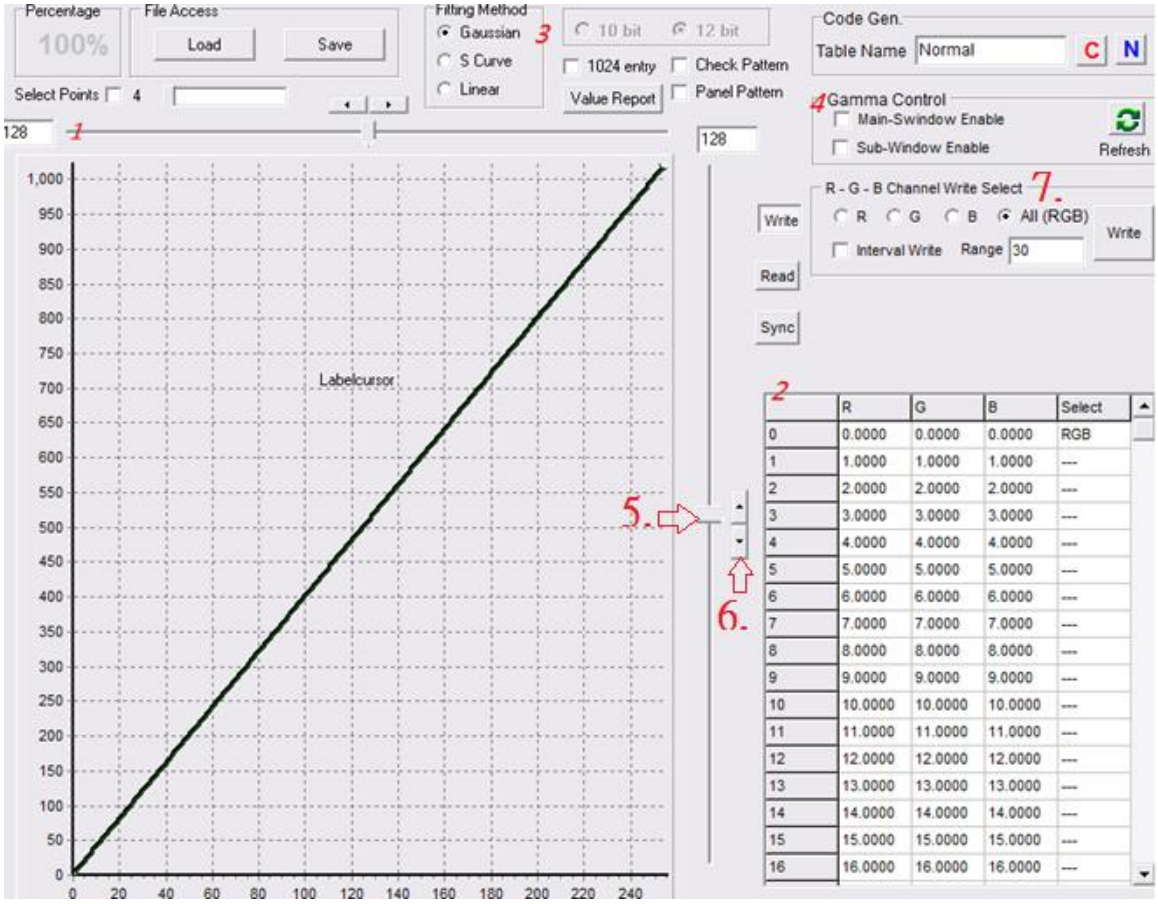


Figure 7: Gamma Chart

4.1.1.2. Auto-Select Points: (Ref Figure 8)

Figure 8: Auto-Select Points

a. Select points: Enable to select the nodes depending on the "select point bar" selected.

b. Select points bar: There are node numbers 4, 8, 16, 32, 64, 128, and 256 for choice. The user can set different bar values for different color channel. (No.7 in Figure 7) If the user select all channels, RGB selected points bar value will be changed to the same value.

c. Fine tune: Fine-tune the horizontal bar.

d. Horizontal Bar: When the user scrolls the horizontal bar, the value in the vertical bar is also changed depending on the grid value.

"Select points" is used to adjust the fixed points. The user cannot add new nodes when enabling "select points". If the user needs to add new nodes, disable "select points" first.

4.1.1.3. Adjust Curve Values by Grid

	R	G	B	Select
0	0.0000	0.0000	0.0000	RGB
1	1.0000	1.0000	1.0000	---
2	2.0000	2.0000	2.0000	---
3	3.0000	3.0000	3.0000	---
4	4.0000	4.0000	4.0000	---
5	5.0000	5.0000	5.0000	---

Figure 9: Gamma Values String Grid

a. Select the cell of grid by mouse or keyboard.

b. If "R" column is selected, Red Channel is selected. If "G" column is selected, Green Channel is selected. If "B" column is selected, Blue Channel is selected.

c. Add or delete nodes in "Select" column. For example, if the user wants to add nodes for RGB, input the "RGB". If the user wants to add nodes only for G, the user can input"-G-". If the user wants to delete all nodes, the user can input "---".

4.1.1.4. Adjust Curve Value by Node in Chart

After adding nodes in the chart, the user can drag the node in chart directly. Select the channel first. If all channel value is the same, the user can select "All" channel to control all channel values in the same time.

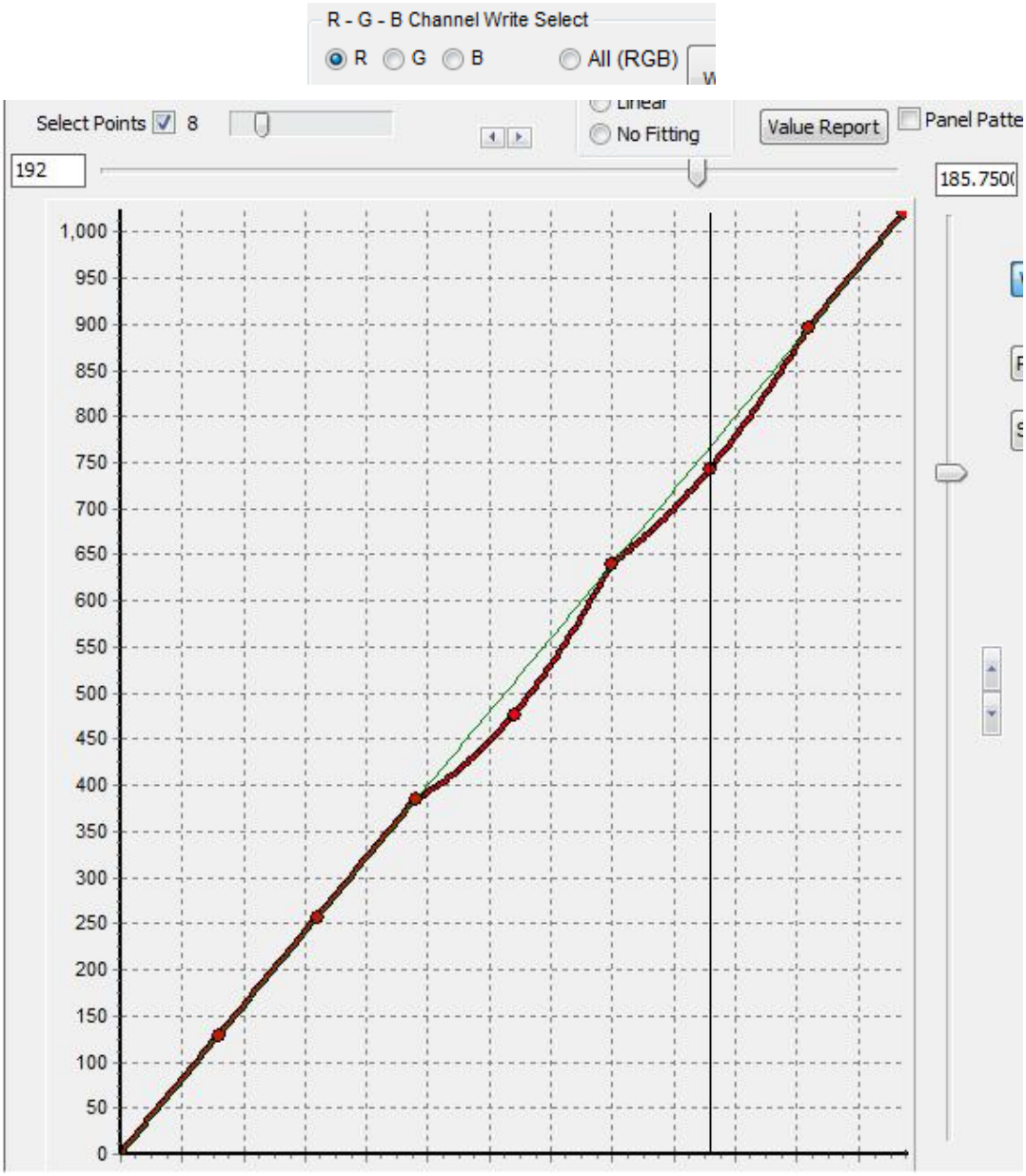


Figure 10: Adjust by Node in Chart

The user also can resize the resolution of chart by dragging a window in the chart.

Enlarge Size: Press the left button of the mouse and drag from Left to Right

Recover to Original Size: Press the left button of the mouse and drag from Right to Left

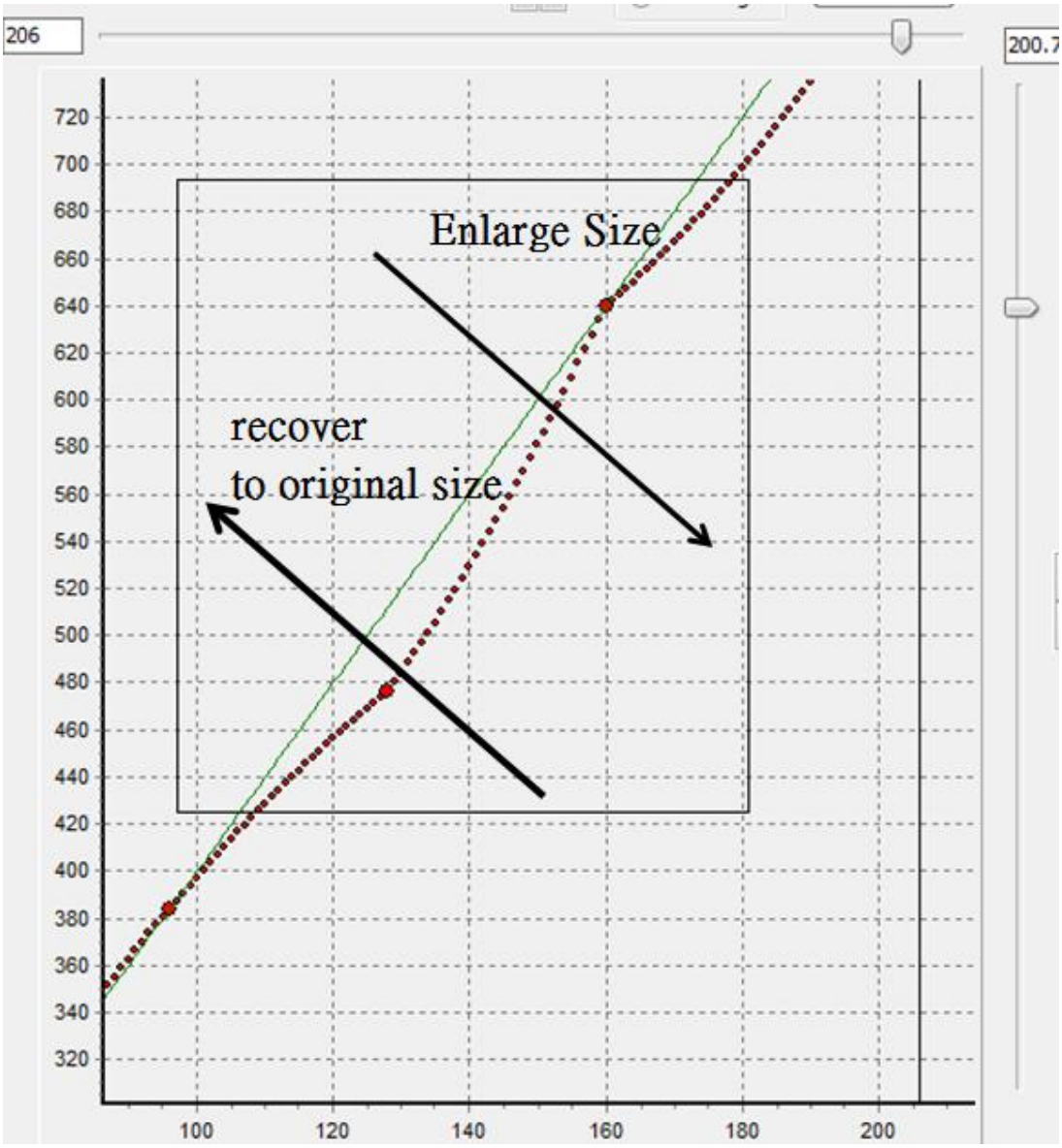


Figure 11: Enlarge Size Chart

4.1.1.5. Selected Functions-Fitting/Entry and Value Bits Selection/Check Pattern

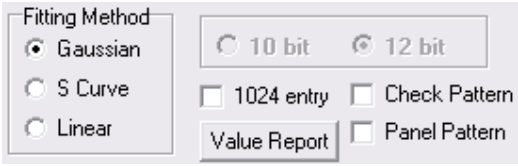


Figure 12: Gamma Function Selection

a. 1024 entry: If the chip supports 1024 entry, the user can enable it to change grid entry number and horizontal bar value to 1024.

b. Fitting Method: The default value is Gaussian curve.

Gaussian: The value changes from previous nodes to the next nodes when the nodes value is changed. And the fitting value is based on Gaussian curve.

S Curve: The value changes from previous two nodes to the next two nodes when the nodes value is changed. And the fitting value is based on Gaussian curve.

Linear: The value changes from previous nodes to the next nodes when the nodes value is changed. And the fitting value is based on linear curve.

c. Check Pattern: Select this function to show the test pattern in TV set. This pattern shows the real result of current gamma table value. If the user scrolls the horizontal bar, they can check the white balance of different gray level. If the user enables "Gamma ON", the gamma result can be checked. If the user wants to change the white balance, they can change the value and select "Interval Write" function in "Write Select" area. This function is not supported by all chips. If the chip does not support this function, the function will be blocked from view.

d. Panel Pattern: Select this function to show panel internal test pattern in TV set. If the user scrolls the horizontal bar, they can check the white balance of different gray level. RGB value is changed by curve value. The user does not need to write the new curve after adjustment and can check the result immediately.

4.1.1.6. Selected Functions-Code Gen/gamma Enable/Read/Write Curve Selections

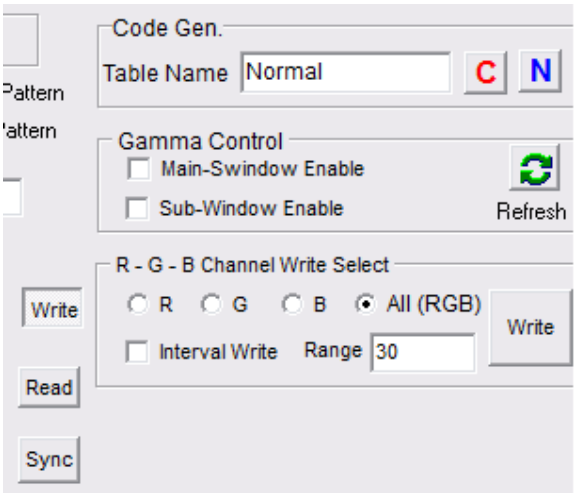


Figure 13: Gamma Function Selection

a. Code Gen: Save the gamma curve result as "Compress" code or "Normal" code. The type of code is clicked depending on SW request.

b. Gamma Control: Main/Sub Gamma Enable/Disable.

c. R-G-B Channel Write Select: Click left side "Write" button to show "R-G-B Channel Write Select" menu. If the user selects "R" or "G" or "B" channel, the selected color curve is shown in coordinate map. And "select points bar" and "horizontal bar" are changed to previous settings. The user can use related adjustment function in this menu.

d. Write: Click right side "Write" button, and the gamma curve value is written from 0 to 255. If "Interval

Write" is selected, the gamma curve value is written from current position-(1/2*Range) to current position+(1/2*Range).

e. Read: Click left side "Read" button to show "R-G-B Channel Read Select" menu. Click right side "Read" button, and the gamma curve value is read from 0 to 255. However, the related adjustment function is not available in this menu.

f. Sync: After reading RGB Gamma curve, click "Sync" to copy Gamma curve to "R-G-B Channel Write Select" menu. And then the user can adjust the curve in write menu.

4.1.2 White Balance: RGB Gain/Offset

[Tool Path]: "Direct Video Adjustment" **à** "Y Level" **à** "Y Level". It can control Pr-Gain/Offset, Post-Gain/Offset and Comb Gain/Offset.

4.1.2.1. Pr-Gain Offset (before Gamma function)

1. **Pr-Gain Enable** : Activate Pr-Gain function
2. **Pr-Offset Enable** :Activate Pr-Offset function
3. **R-Gain :**Adjust Pre Gamma R Gain
4. **G-Gain :**Adjust Pre Gamma G Gain
5. **B-Gain :**Adjust Pre Gamma B Gain
6. **R-Offset** :Adjust Pre Gamma R Offset Setting
7. **G-Offset**: Adjust Pre Gamma G Offset Setting
8. **B-Offset** :Adjust Pre Gamma B Offset Setting

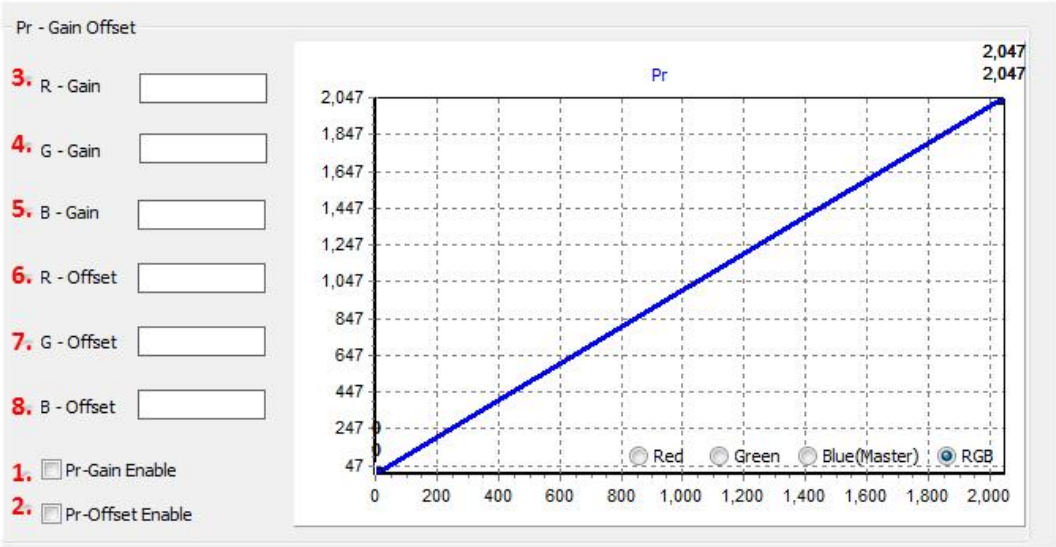


Figure 14: Pre Gain-Offset Adjustment

4.1.2.2. Post-Gain Offset (after Gamma function):

1. **Pr-Gain Enable** : Activate Post-Gain function
2. **Pr-Offset Enable** :Activate Post -Offset function
3. **R-Gain :**Adjust Post Gamma R Gain
4. **G-Gain :**Adjust Post Gamma G Gain

5. **B-Gain :**Adjust Post Gamma B Gain
6. **R-Offset** :Adjust Post Gamma R Offset Setting
7. **G-Offset**: Adjust Post Gamma G Offset Setting
8. **B-Offset** :Adjust Post Gamma B Offset Setting

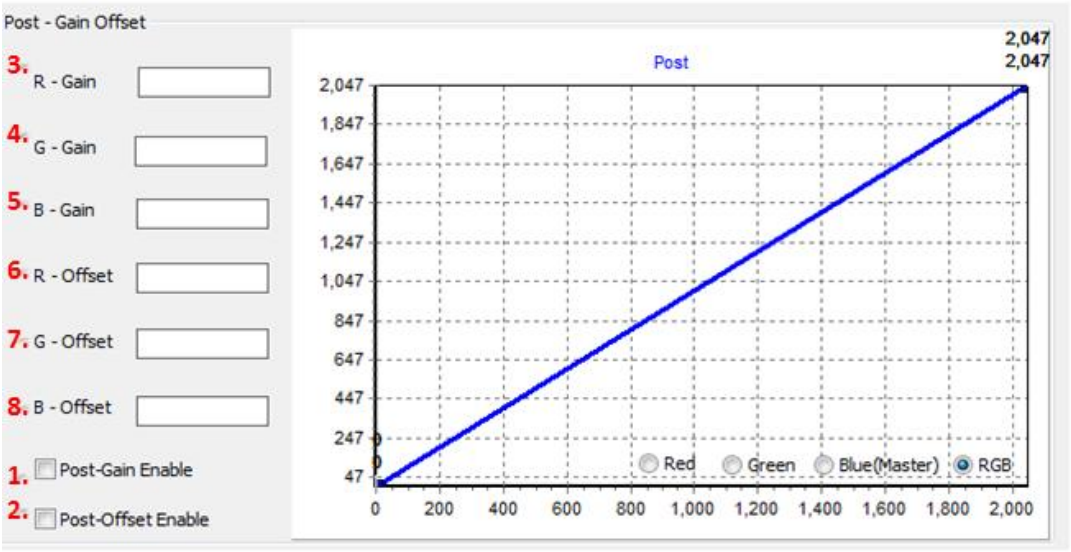


Figure 15: Post-Gain Offset

4.1.3 YCbcr to RGB CSC: Color Enhancement

4.1.3.1. Color Adjustment in R'G'B' Color Space

This tool (Figure 160) is used to rotate the color gamut by the matrix. The control procedure is as follows.

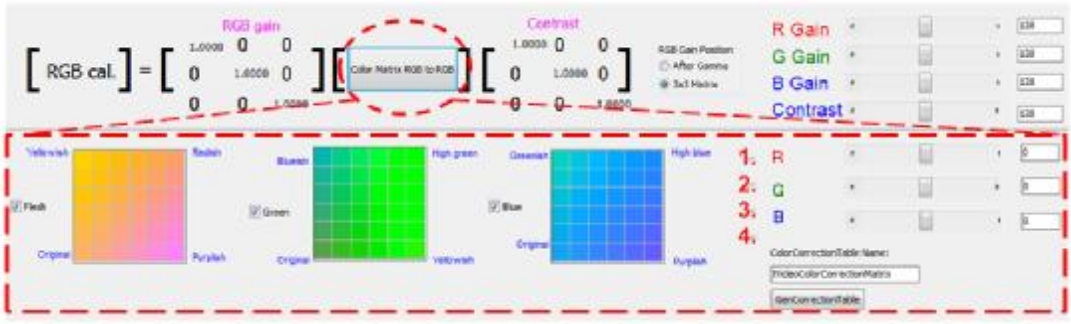


Figure 160: Color Matrix R'G'B'

1. Choose the gamut rotation level through three color palettes, Flesh/Green/Blue (toward up and right direction mean higher level). The R/G/B scroll bars can be used to adjust the R/G/B strength individually. Press "Download" (Figure 1) to load new settings into IC and check performance immediately.

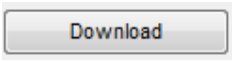


Figure 31: Download

2. When adjustment is finished, press the button "GenColorSpaceTable" (Figure 172) to generate ColorSettingTable.txt.

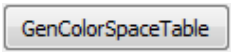


Figure 172: GenColorSpaceTable

3. Merge this file with software and check the final result.
4. Press "Reset" (Figure 183) and "Download" (Figure 1) to reset all adjustments back to the default values.

Figure 183: Reset

4.1.3.2. Sat/Hue Function

1. Sat: The adjustable range is from 0 to 255 and the default is 128 (x1).
2. Hue: The adjustable range is from 0 to 100 and the default is 50 (0 degree).

Figure 194: Sat/Hue Function

4.1.3.3. R/G/B Gain and Contrast Function

1. R Gain: The adjustable range is from 0 to 255 and the default is 128 (x1).
2. G Gain: The adjustable range is from 0 to 255 and the default is 128 (x1).
3. B Gain: The adjustable range is from 0 to 255 and the default is 128 (x1).
4. Contrast: The adjustable range is from 0 to 255 and the default is 128 (x1).
5. Color Matrix of R′G′B′

Figure 205: RGB Gain and Contrast Function

4.1.3.4. R/G/B Offset and CSC Matrix Function

Before adjustment, users have to press the button "Restore to UI Value" to get the original values from TV UI settings via UART port. After getting the correct values, users may start adjustment based on these. After changing the value through the scroll bar, new settings will be loaded into IC immediately.

1. R Offset: The adjustable range is from 0 to 255 and the default is 128 (0).
2. G Offset: The adjustable range is from 0 to 255 and the default is 128 (0).
3. B Offset: The adjustable range is from 0 to 255 and the default is 128 (0).
4. CSC matrix: Users can Select the matrix in the list or type any values in the matrix blank.

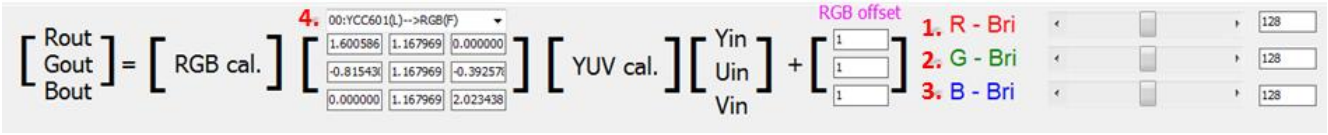


Figure 216: RGB Offset Function

4.1.3.5. Color Space

After choosing the matrix, the user may press Download to load new settings into IC and check performance immediately.

Press the button GenColorSpaceTable to generate ColorSpaceTable.txt. Merge this into software and check the final result.

4.2. Color Adjustment

4.2.1 16Win IBC

[Tool Path]: "Direct Video Adjustment" **à** " Color" **à** "Color" **à** "16Win IBC"

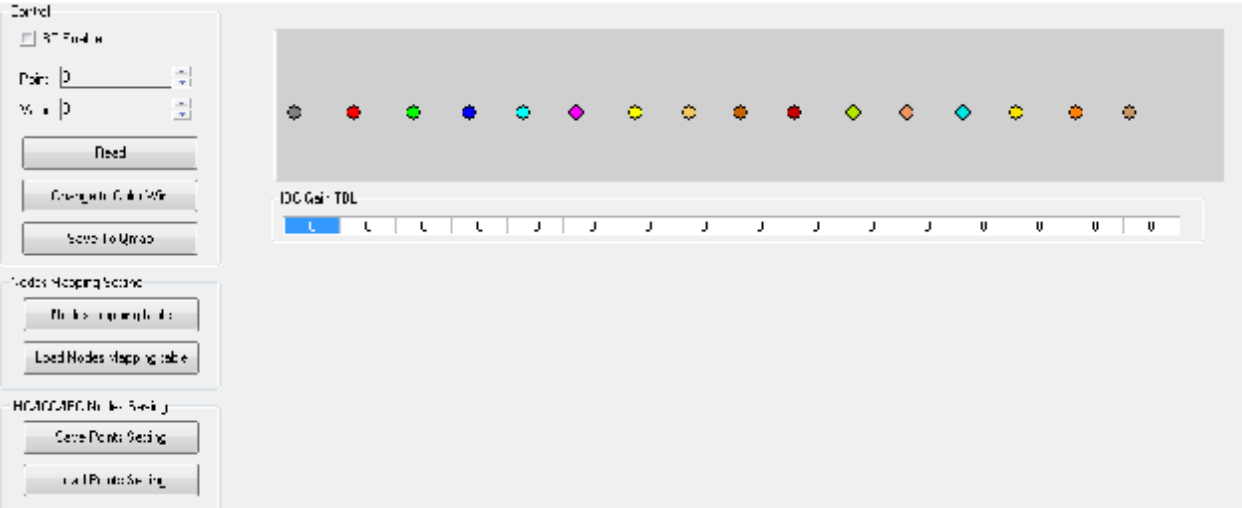


Figure 22: 16Win IBC

4.2.2 16WIN ICC_IHC

[Tool Path]: "Direct Video Adjustment" **à** " Color" **à** "Color" **à** "16Win ICC_IHC"

4.2.2.1. Function Explanation:

Press "Read All" button first to get the current IC settings before adjustment.

a. Y Mode

There are two control windows in this block: "4 Y Mode" and "Differ Y Position". When the user activates "ICC/IHC Y Mode Enable", Y level control window will be shown in this block. The user may drag scroll bar up/down in A/B/C/D positions to decrease/increase the Y level (Y level should be gradually increased from A -> D).

If the user enables ICC/IHC Y mode only (without Diff Color Mode), it means all color windows will refer to the same Y level settings in "4 Y Mode" page.

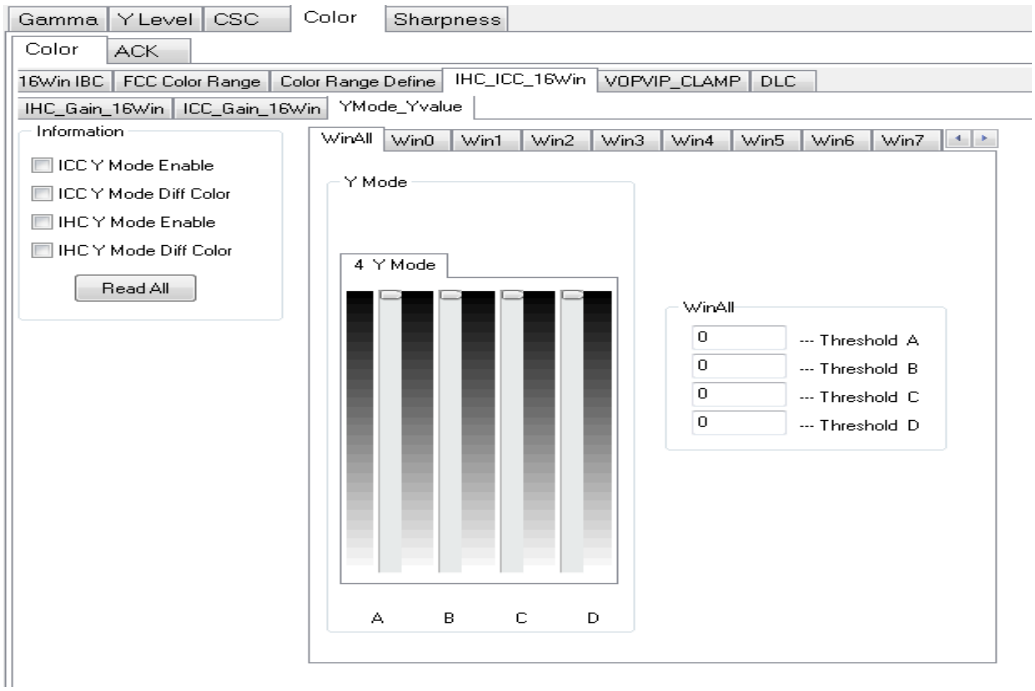


Figure 231: 16Win ICC_IHC-4 YMode

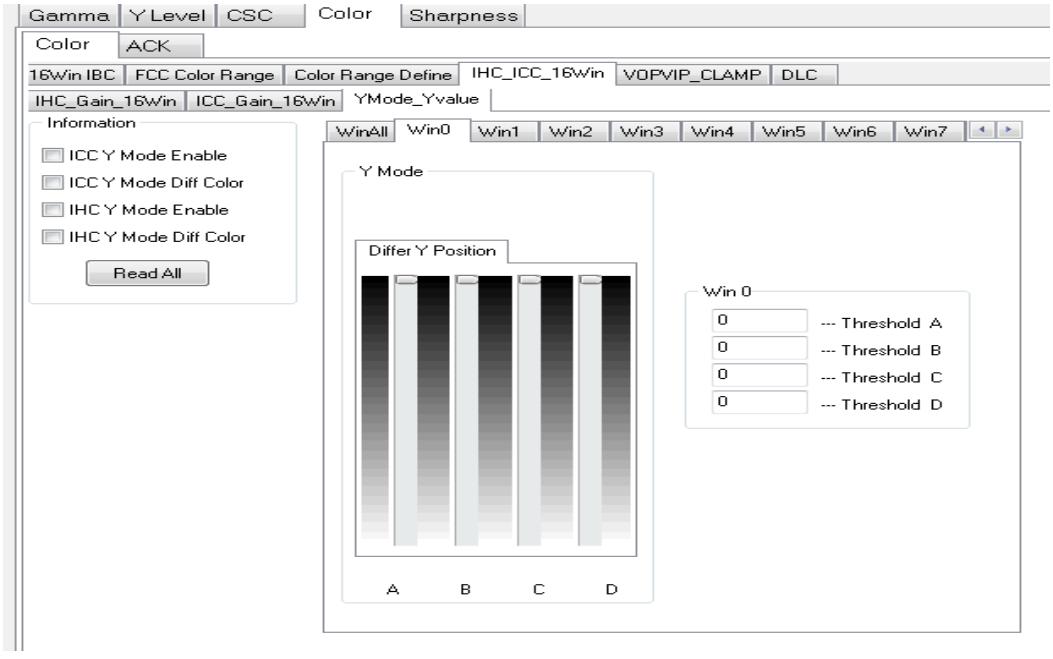


Figure 42: 16Win ICC_IHC- Differ Y Position Mode

If "ICC/IHC Y Mode Enable" and "ICC/IHC Y Mode Diff Color" are both activated, it means all color windows will refer to different Y level settings in "Differ Y Position" page.

Information

- ICC Y Mode Enable **à** Enable ICC Y Adaptive Mode function
- ICC Y Mode Diff Color **à** Enable ICC Y Adaptive Mode by different color function
- IHC Y Mode Enable **à** Enable IHC Y Adaptive Mode function
- IHC Y Mode Diff Color **à** Enable IHC Y Adaptive Mode by different color function

b. Debug

We may check the controlled range of each color windows on real image by this function. The controlled parts of image will become gray when the user enables this function. The two columns in this block represent IHC and ICC debug functions respectively.

IHC / ICC 16Win:

[Tool Path]: "Direct Video Adjustment" **à** "Color" **à** "Color" **à** "IHC_ICC_16Win"

4.2.2.2. IHC/ICC Gain 16Win switch

The original colorWin can be mapped to the new colorWin through mapping node function. Press Button "Change to ColorWin" (Figure) to switch between the original colorWin and the new colorWin.

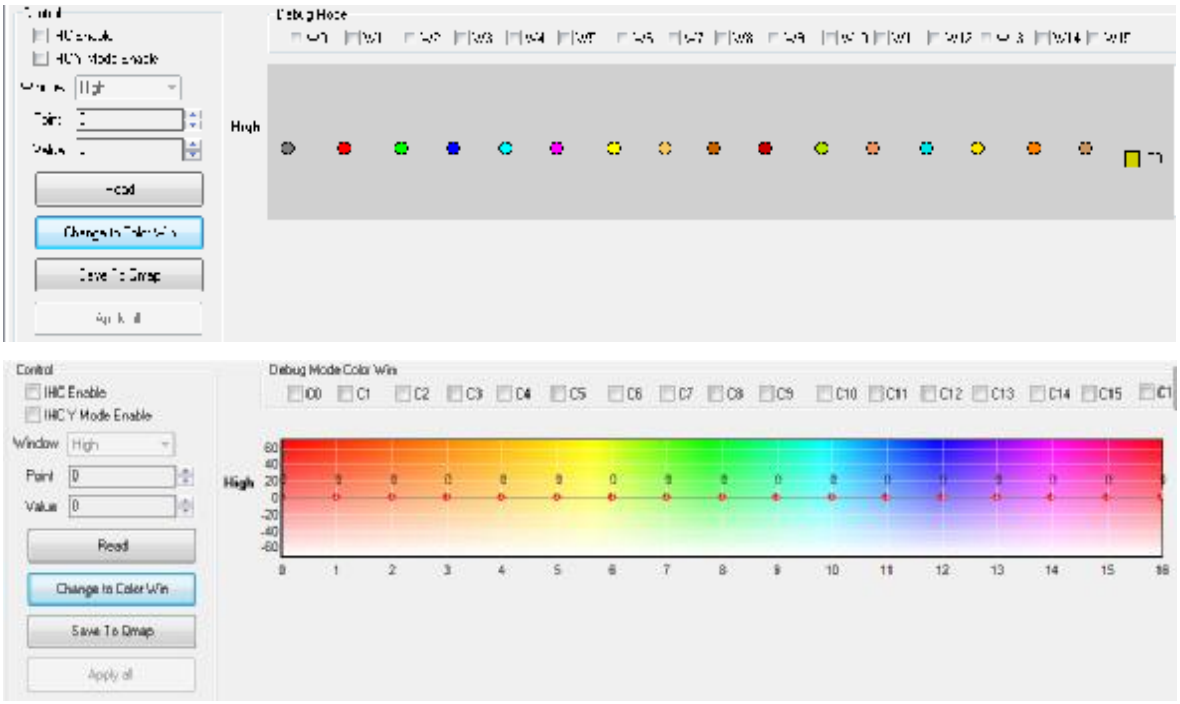


Figure 43: 16Win IHC/ICC

4.2.2.3. IHC/ICC Node Mapping

Press button "Nodes mapping table" to modify node mapping method to the original or the new colorWin. And press button "Update Mapping" to refresh the node-mapping method and write the mapping setting to

"pqSetting.ini" file. Similarly, you can load specifically node-position setting by pressing the button "Load Nodes Mapping table". And you can read all setting by pressing the button to Load All Setting.

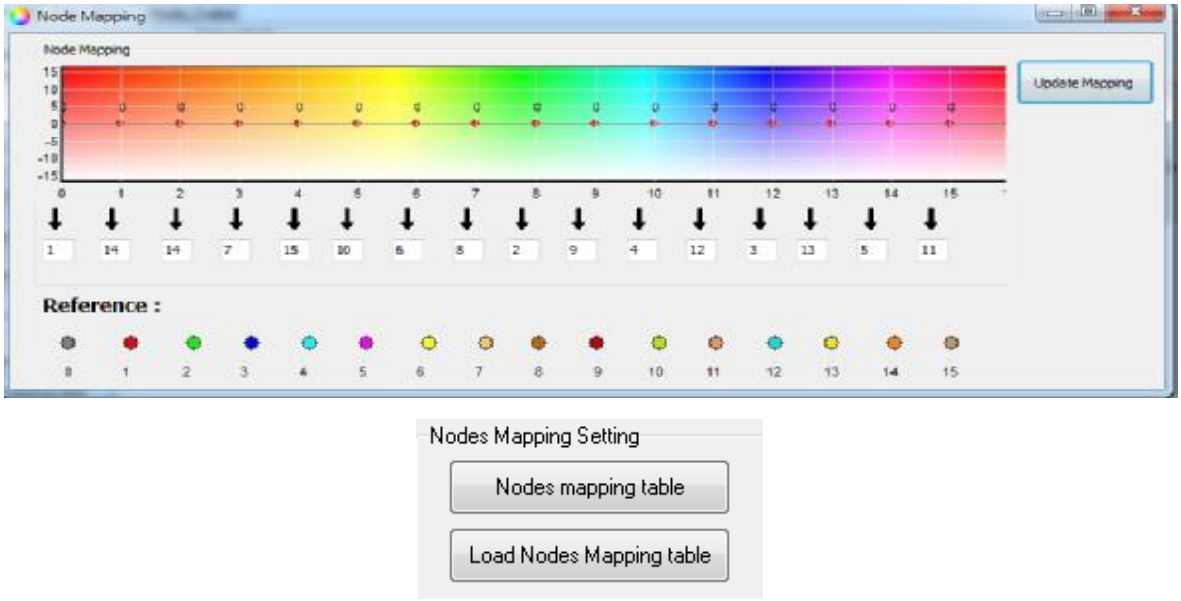


Figure 44: Node Mapping

4.2.2.4. Save All IHC/ICC /IBC Position Setting

Press button "Save Points Setting" (Figure 5) to save only IHC/ICC/IBC node-position setting into "pqSetting.ini".Similarly, you can read specifically node-position setting by pressing the button "Load Points Setting". And you can read all setting by pressing the button to Load All Setting.

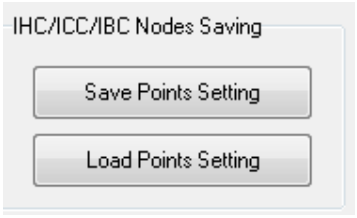


Figure 45: IHC/ICC/IBC Node Saving Function

4.2.3 FCC: Fresh Color Correction Function Control

[Tool Path]: "Direct Video Adjustment" **à** "Color" **à** "Color" **à** " FCC Color Range"

[Function Explanation]:

Click the "FCC_refresh" button to get the current status before adjustment.

Region 1~9: Enable to activate FCC control windows

Test 1~9: Enable means to activate FCC test mode. Test mode only works when the corresponding window is activated. When Test mode is enabled, the color region covered by its FCC window will become "Gray".

Full Range (0~0x3FF): Enable means to activate Full Range control. Tool will judge whether the current IC supports this mode or not. If not, this item will be gray out.

Fix Boundary: Enable means to activate Fix-Boundary mode when adjusting FCC target. It will shift Cb/Cr boundary settings automatically to maintain relative positions between boundary and the target when moving Cb/Cr target. But only the ICs with Full Range function can support this mode.

Cb/Cr Target: To define the approaching point of all color within the FCC window. The range is from 0~255 for FCC and 0~1023 for Full Range FCC respectively.

Cb/Cr Down/Up: To define the Cb/Cr Down/Up distance from target. The range is from 0~3 for FCC. 0/1/2/3 means real 4/8/16/32 value in Cb/Cr domain. The range is from 0~1023 for Full range FCC. This value is exactly Cb/Cr value.

Strength: To define how close the color within the FCC window moves toward target. Larger value means it is closer to the target. The range is from 0~15.

***Note*:** Cb/Cr Target and the Range the user input of each FCC window will be shown on the Color coordinates diagram.

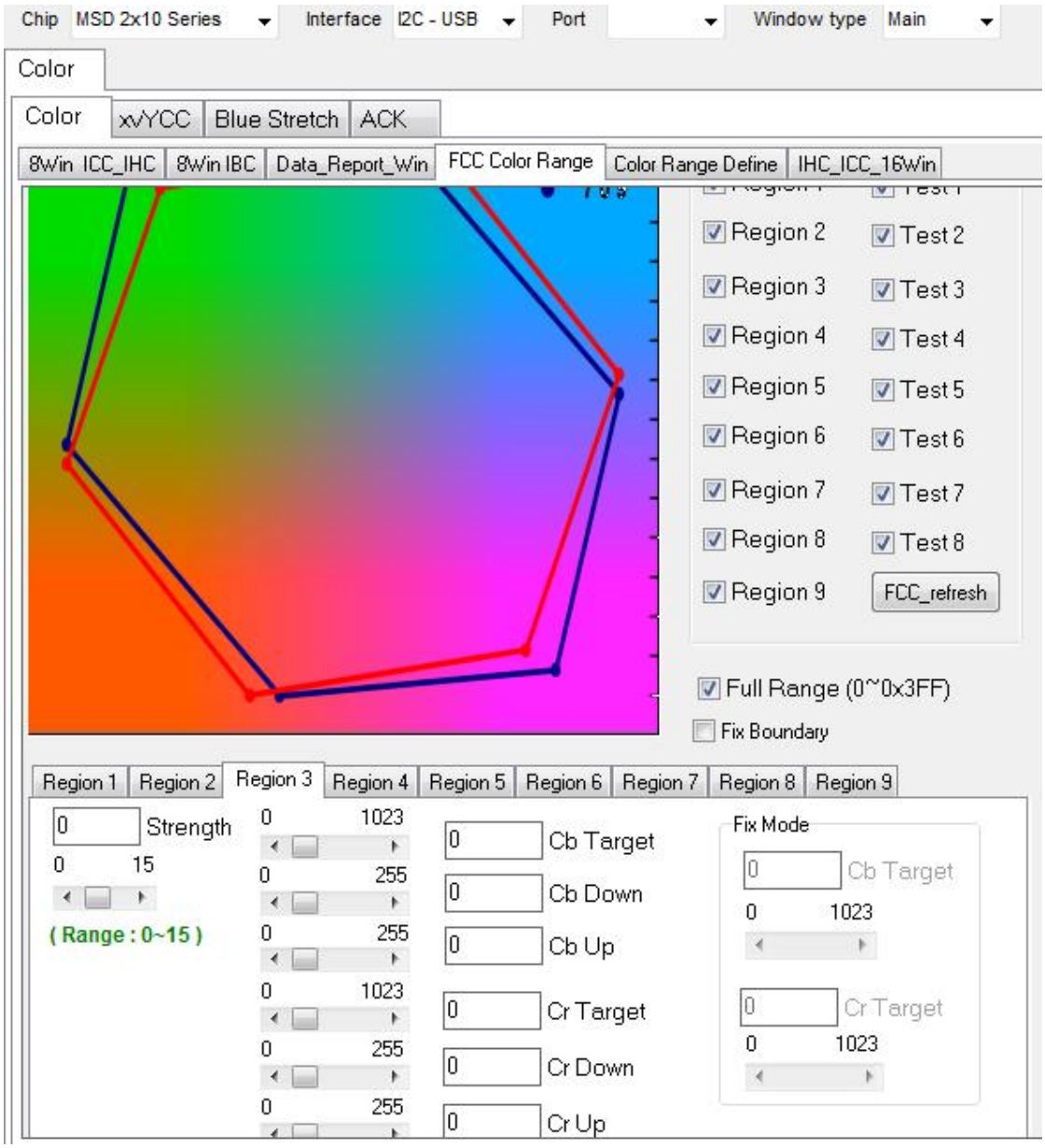


Figure 46: FCC FunctionContrast

4.3. Contrast

4.3.1 DLC

[Tool Path]: "Direct Video Adjustment" **à** "Color" **à** "DLC"

If the user wants to fine-tune DLC to enhance contrastPlease use Refresh to get values and keydown to write access.

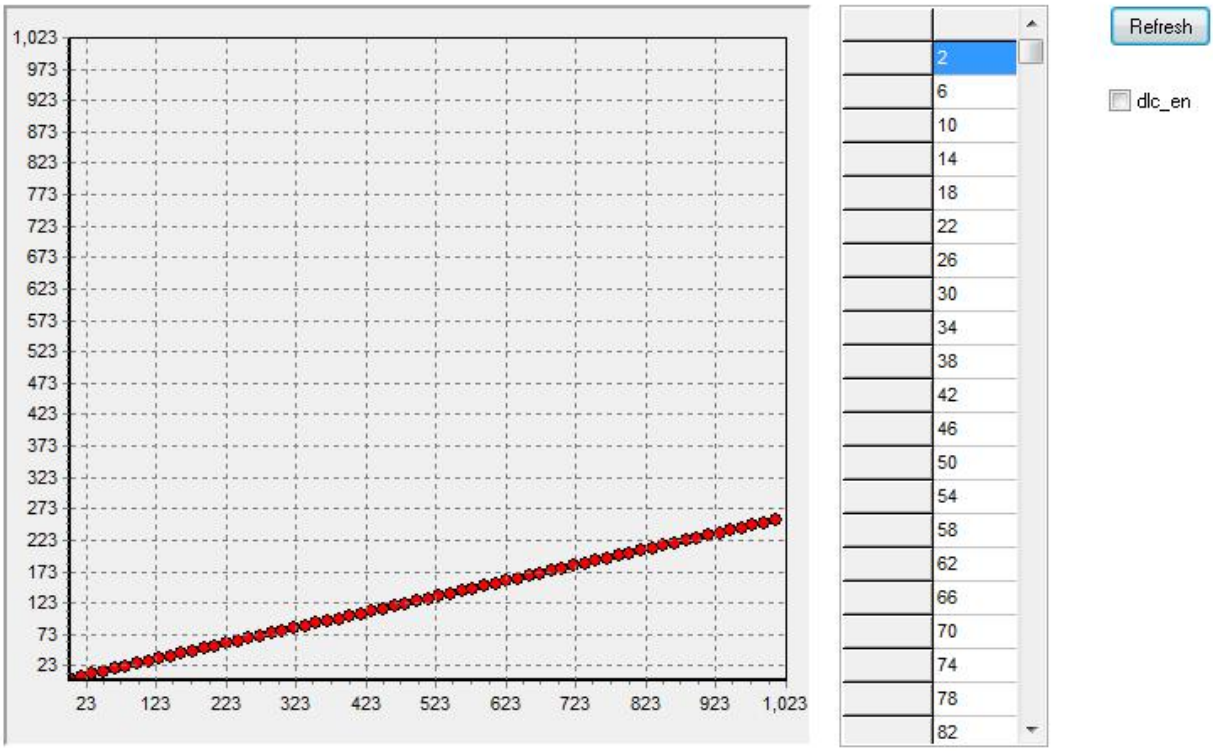


Figure 47: DLC

4.3.2 VIP/VOP Y, CB and CR Clamp

If the user wants to Clamp VIP/VOP Y, CB and CR Values .Please use Y, CB and CR Max/Min values to set values.

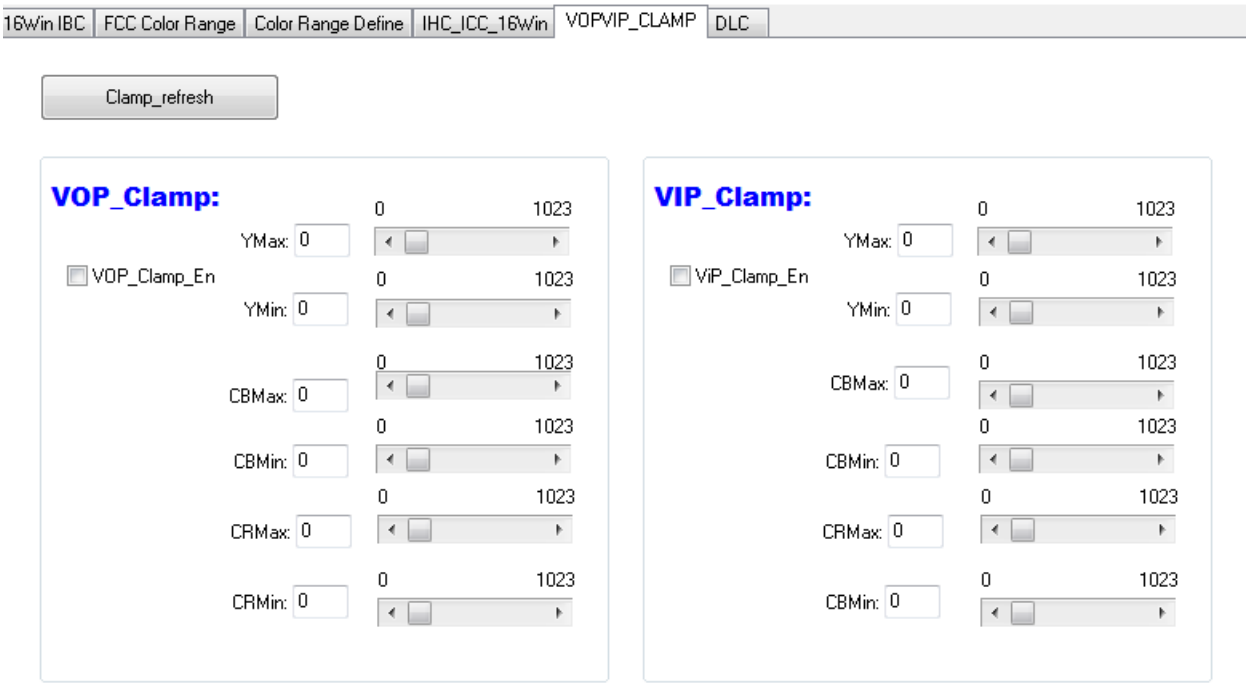


Figure 48: VOP/VIP Y,CB and CR Clamp

4.4. Sharpness

4.4.1 Peaking Band Gain/Overshoot/Undershoot/Coring

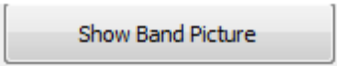
[Tool Path]: "Direct Video Adjustment" **à** "Sharpness" **à** "HWB Band"

Band Definition:

a. B01~B04 are for Horizontal Peaking. B01 is for highest frequency response and B04 is for lowest frequency response

b. B05, B08 are for Vertical Peaking. B05 is for higher frequency response and B08 is for lower frequency response

c. B06, B07 are for Diagonal Peaking. B06 is for higher frequency response and B07 is for lower frequency response

The user can click 

to understand the definition of each band.

1. Click "Peaking_Band_refresh" button to get the HVD Band current status.

Figure 49: Peak Band Refresh

2. B01~B08 Gain control range is from 0~63. Larger value means stronger sharpness. B01~B08 Positive Edge control range is from 0~255. It can reduce the brighter border (overshoot) around the object edge which is along with the strong sharpness setting. Larger value means narrower white border and weaker sharpness.
3. B01~B08 Negative Edge control range is from 0~255. It can reduce the darker border (undershoot) around the object edge which is along with the strong sharpness setting. Larger value means narrower black border and weaker sharpness.
4. B01~B08 Coring control range is from 0~255. It can prevent noise from being enhanced by each peaking band, but it will also reduce peaking level a little bit. "0" means turning off. Larger value means stronger coring and weaker sharpness.

5. B01_Enable~B08_Enable is to active B01~B08 peaking band

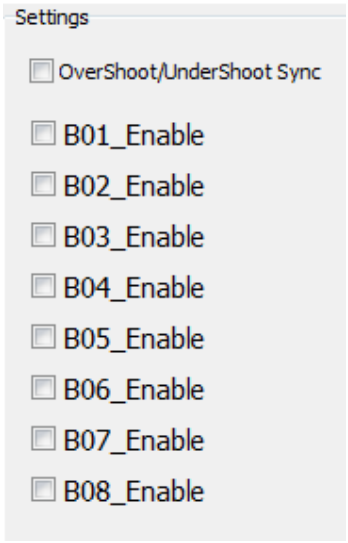


Figure 50: Peaking Band Enable

6. Click "Overshoot/Undershoot Sync" to make overshoot and undershoot synchronize the same values. Adjust "Overshoot" values, and then "Undershoot" values would be changed, and vice versa.

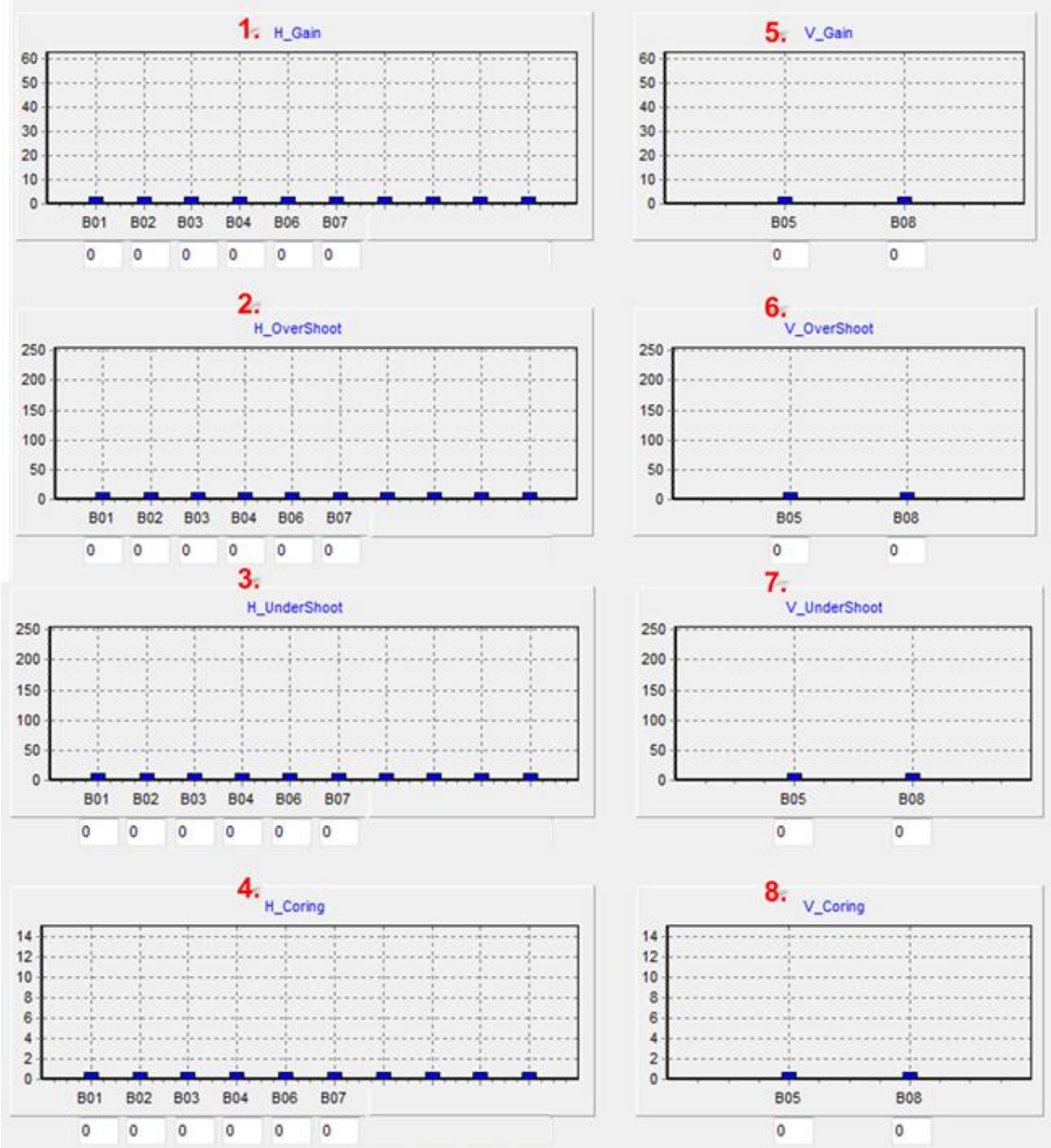


Figure 51: HVB Band Adjustment

4.4.2 Peaking Dering

[Tool Path]: "Direct Video Adjustment"**à** "Sharpness"**à** "Peaking_Dering"

1. **Refresh:** Click "Peaking_Dering_refresh" button first

   If the current chip supports V-Dering, V-Dering command window will show.

   If the current chip doesn't support V-Dering, we will see H-Deing command window only.

   Then click "Peaking_Dering_refresh" button to get the current status.

2. **Peaking_H_Dering**

   - Int control range is from 0~3. Larger value means smaller effective width from the object edge.
   - Bright gain range is from 0~15. It controls the de-ring strength of brighter border (overshoot) around object edge. Larger value means stronger de-ring
   - Dark gain range is from 0~15. It controls the de-ring strength of darker border (undershoot) around object edge. Larger value means stronger de-ring.

3. **Peaking_V_Dering**

   - Int control ranges for VDR1 and VDR2 are from 0~1 and 0~2 respectively. The larger value means smaller effective width from the object edge.
   - Bright gain range is from 0~15. It controls the de-ring strength of brighter border (overshoot) around object edge. Larger value means stronger de-ring
   - Dark gain range is from 0~15. It controls the de-ring strength of darker border (undershoot) around object edge. Larger value means stronger de-ring.

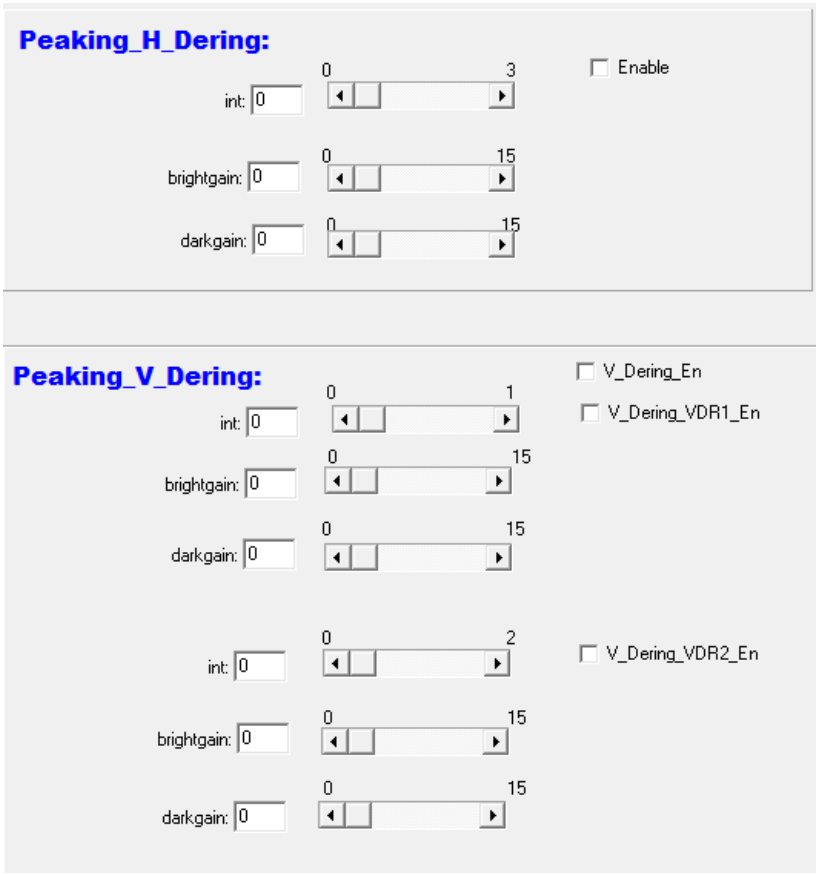


Figure 52: Peaking Dering

4.5. Qmap

4.5.1 Open Quality Map Function and Load Excel file

a. [Tool Path] View **à** Quality Map(Open Quality Map Function)

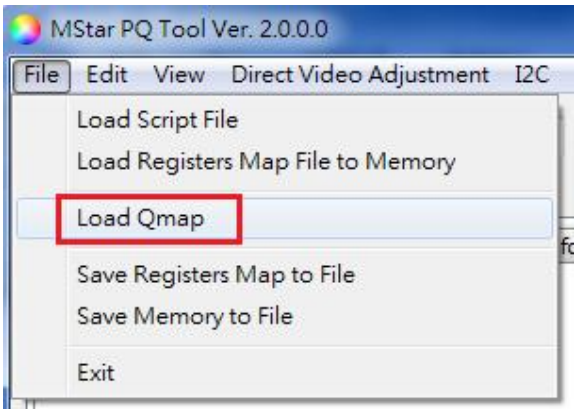


Figure 53: Open Qmap Funciton

b. Load the Excel Qmap file：[Tool Path] File **à** Load Qmap

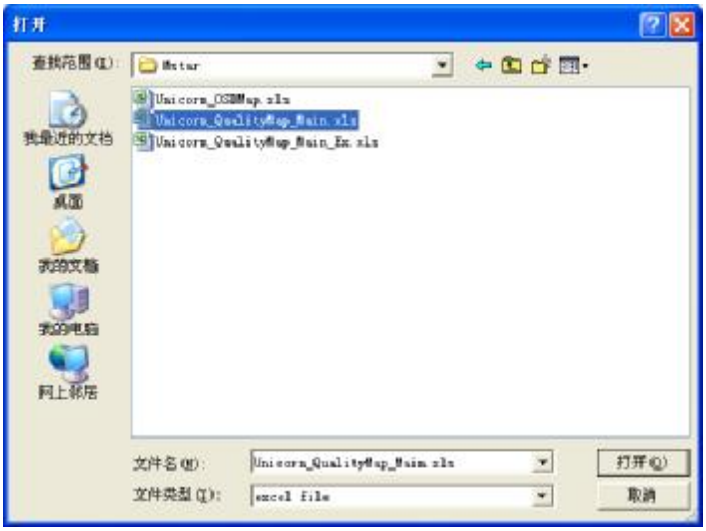


Figure 54: Load Qmap Excel

4.5.2 Load/Download the Current Settings on Quality Map Page

a. Select IP name: The user can select the IP name in the list.

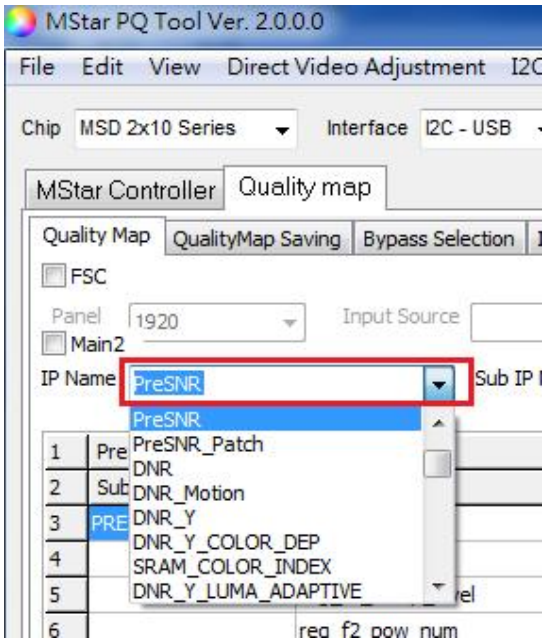


Figure 55: Select IP Name

The user also can key in the "key work" in the IP name to find the IP function easily and fast.

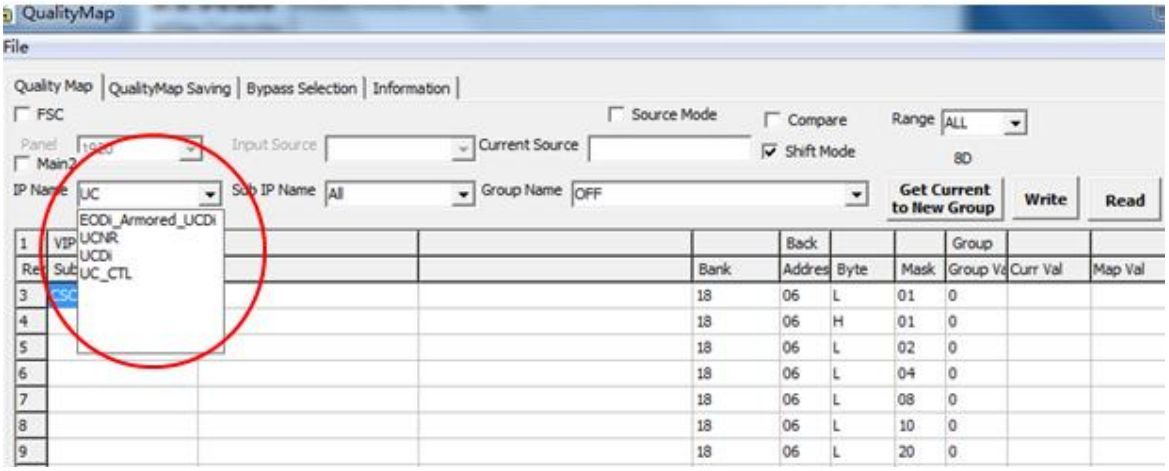


Figure 56: Search IP Name by Typing Keyword

b. Click "Read" to read the current IP settings.

c. Select "group name" and click "Write" to write the group settings to the chip temporarily. The user can see and check the performance under the group settings.

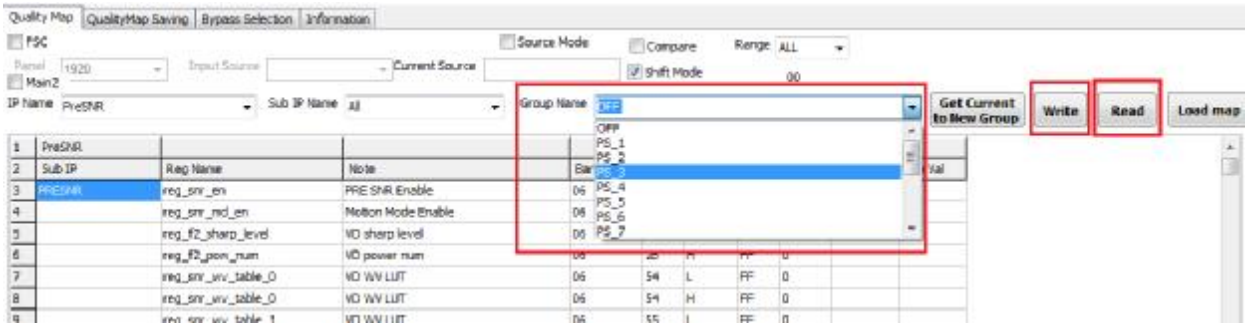


Figure 57: Select Group Name

4.5.3 Change the Current Settings and Write to Quality Map Excel

1. Click "QualityMap Saving" and Select Panel and Source. If the user wants to save the current PQ settings into Qmap, the user can select "Manual Gen to Excel" or "Auto Gen".
2. Select Panel and input timing in combo Box of "Panel" and "Source", the settings group name would be shown in "original" column.

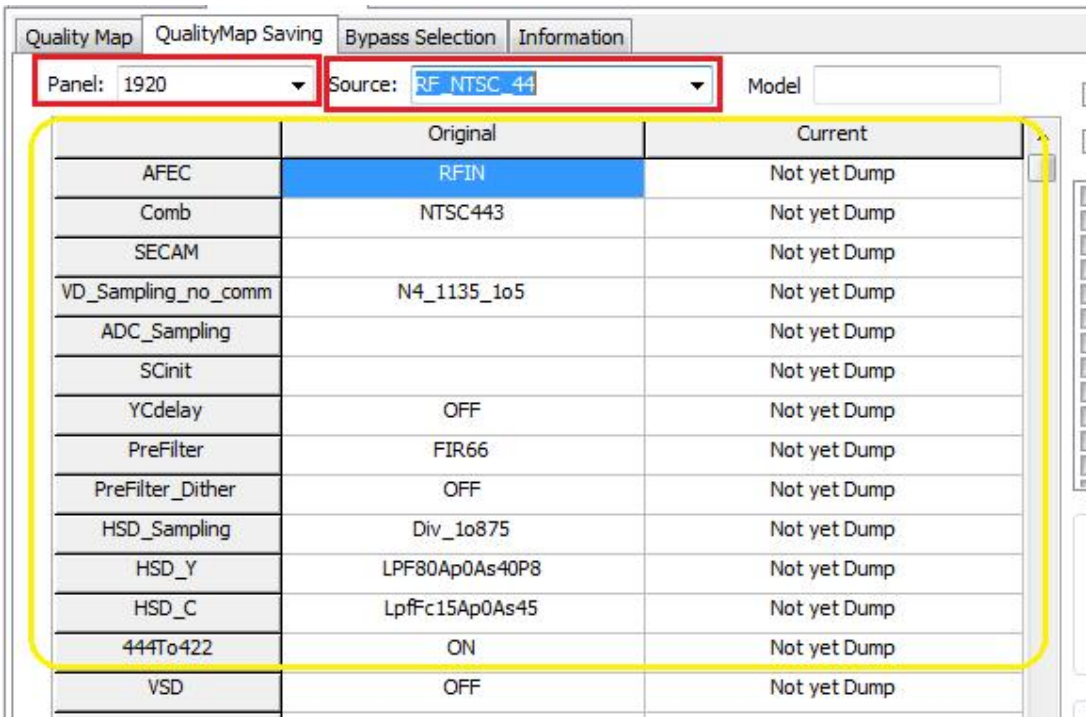


Figure 58: QualityMap Saving Function

3. [Open Excel] & [Close Excel]: After Loading the Excel, the excel file will open internally. If the user wants to check the Excel, don't open and close the Excel file directly to avoid error messages in the process. Just click [Open Excel] button to check the Excel and click [Close Excel] button after finishing checking the Excel.

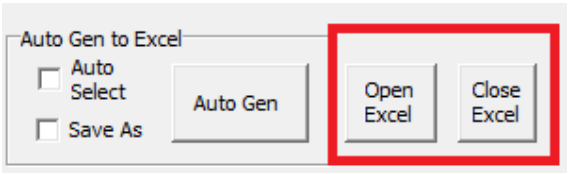


Figure 59: QualityMap Saving Function-Open/Close Excel

4.5.3.1. Manual Gen to Excel:

Process sequence is [Select IP Name] **à** [Dump Reg] **à** [Insert New Group] **à** [Replace Current Source] **à** [Save To Excel]

a. Select the IPs that the user wants to change or ALL IP.

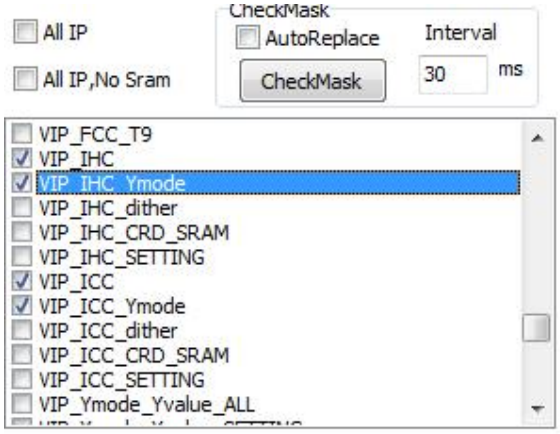


Figure 60: QualityMap Saving-IP Select

b. **Dump Reg** (no.1 in Figure): to read the current settings. If the group setting is the same as one of the existing setting groups, the group name will be updated as the name of the old one in "Current" column (no.2 in Figure).

If the group setting is a new one, the group default name will be set as NewIP_[Sheetname]0 automatically, and the following new group settings will be named as NewIP_[Sheetname]1, 2, 3 and so on .

VIP_Peaking	ON	ON
VIP_Peaking_band	RF_NTSC	RF_NTSC
VIP_Peaking_Pcoring	S42_1	S42_1
IP_Peaking_Pcoring_ad_(	OFF	OFF
VIP_Peaking_gain	0x28	NewIP_VIP_Peaking_gain0
VIP_Peaking_gain_ad_C	OFF	OFF
VIP_Post_SNR	S6	S6

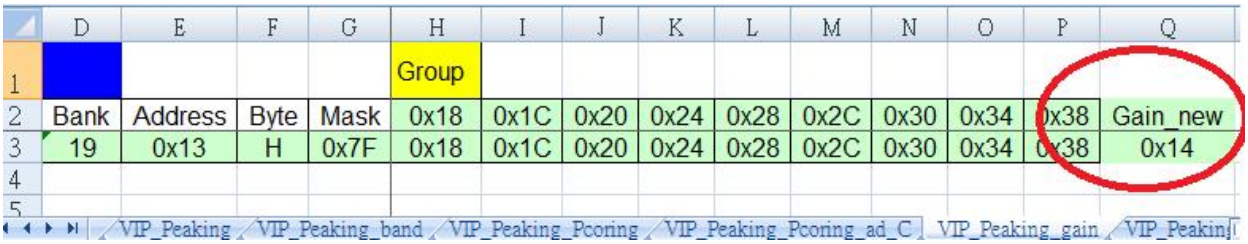
Figure 61: QualityMap Saving-group Name Auto

The user can change the name of the new group settings in "Current" column directly. If the user wants to change the group name, just double click the cell in the grid and input the new name. The group name will be changed.

VIP_Peaking	ON	ON
VIP_Peaking_band	RF_NTSC	RF_NTSC
VIP_Peaking_Pcoring	S42_1	S42_1
IP_Peaking_Pcoring_ad_(	OFF	OFF
VIP_Peaking_gain	0x28	Gain_new
VIP_Peaking_gain_ad_C	OFF	OFF
VIP_Post_SNR	S6	S6

Figure 62: QualityMap Saving-group Name Change

Click "Insert New Group" (no.3 in Figure). If the group setting is a new one, the new settings would be written to the IP in Excel directly. The new group settings are added in every IP page in Excel. If the current setting is a new group, the settings are added in the last column in every IP page in Excel.

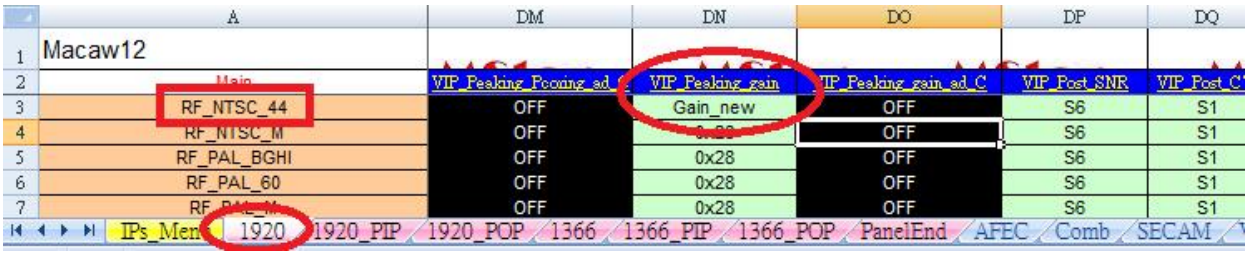


	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1					Group									
2	Bank	Address	Byte	Mask	0x18	0x1C	0x20	0x24	0x28	0x2C	0x30	0x34	0x38	Gain_new
3	19	0x13	H	0x7F	0x18	0x1C	0x20	0x24	0x28	0x2C	0x30	0x34	0x38	0x14
4														
5														

VIP_Peaking / VIP_Peaking_band / VIP_Peaking_Pcoring / VIP_Peaking_Pcoring_ad_C / VIP_Peaking_gain / VIP_Peakin

Figure 63: QualityMap Saving-Excel Group Name Change

c. Click "Replace Current Source" (no.4 in Figure). If there are new group names in selected IP, it would replace the group name settings in current source in current panel page.



	A	DM	DN	DO	DP	DQ
1	Macaw12					
2	Main	VIP_Peaking_Pcoring_ad_C	VIP_Peaking_gain	VIP_Peaking_gain_ad_C	VIP_Post_SNR	VIP_Post_C
3	RF_NTSC_44	OFF	Gain_new	OFF	S6	S1
4	RF_NTSC_M	OFF	0x28	OFF	S6	S1
5	RF_PAL_BGHI	OFF	0x28	OFF	S6	S1
6	RF_PAL_60	OFF	0x28	OFF	S6	S1
7	RF_PAL_M	OFF	0x28	OFF	S6	S1

IPs_Mem / 1920 / 1920_PIP / 1920_POP / 1366 / 1366_PIP / 1366_POP / PanelEnd / AFEC / Comb / SECAM

Figure 64: QualityMap Saving -Excel Replace Current Settings

d. Click "Save" (no.5 in Figure) to replace the original Qmap Excel file, or Click "Save As" to new name of Qmap Excel file.

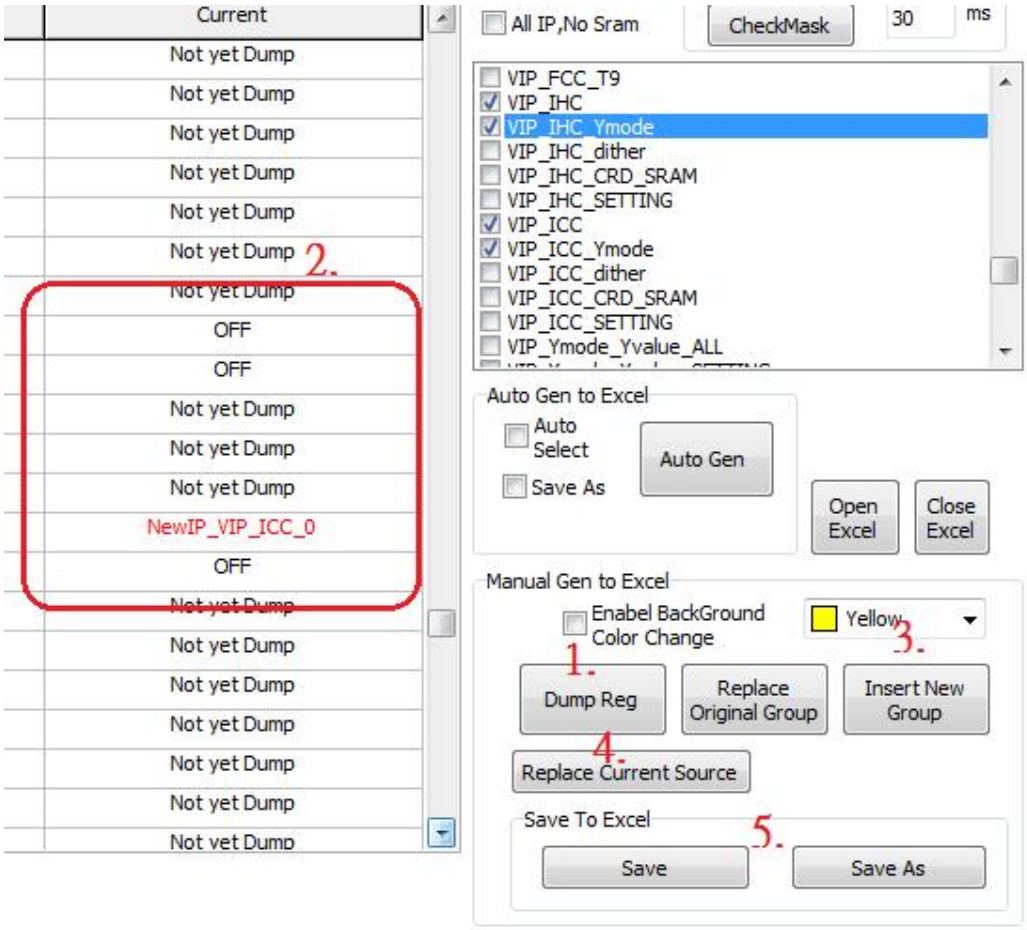


Figure 65: QualityMap Saving–Manual Generation Excel Process

4.5.3.2. Auto Generation

a. Auto Select: Select IPs that the user wants to change or ALL IP. "Auto Select" to select IPs which are often changed. The user can add or delete IPs base on "Auto Select".

b. Save As: Enable it to input new file name of Qmap. After program run finishes, filename input diagram will appear. If the user doesn't select this, it would save as the original file name.

c. Auto Gen: Click "Auto Gen", and the program will run "Dump Reg", "Insert New Group", "Replace Current Source" and "Save" automatically.

d. It will take a few minutes to finish settings comparison; therefore, please wait patiently. If the process is finished, a message "Auto Gen Excel Done!!" will appear. The Qmap with new settings will be saved automatically.

   The group name will be updated in the source of panel page. The group name will be updated as NewIP_[Sheetname]0. 1.2 and so on.

Figure 66: QualityMap Saving–Auto Gen Excel Done Message