HiSilicon PQ Tools

User Guide

Issue 00B03

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HiSilicon Technologies Co., Ltd.

Address: Huawei Industrial Base
Bantian, Longgang
Shenzhen 518129
People's Republic of China

Website: http://www.hisilicon.com

Email: support@hisilicon.com

About This Document

Purpose

This document instructs debugging personnel to adjust the picture quality and implement differentiated adjustment.

Related Version

The following table lists the product version related to this document.

Product Name	Version
Hi3518	V100R001C0XSPC0XX 3A

Intended Audience

This document is intended for:

- Technical support engineers
- Software development engineers

Change History

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made in previous issues.

Issue 00B03 (2014-03-27)

This issue is the third draft release, which incorporates the following changes:

Chapter 4 FAQs

Section 4.5 is added.

Issue 00B02 (2014-02-26)

This issue is the second draft release.

Issue 00B01 (2013-12-30)

This issue is the first draft release.

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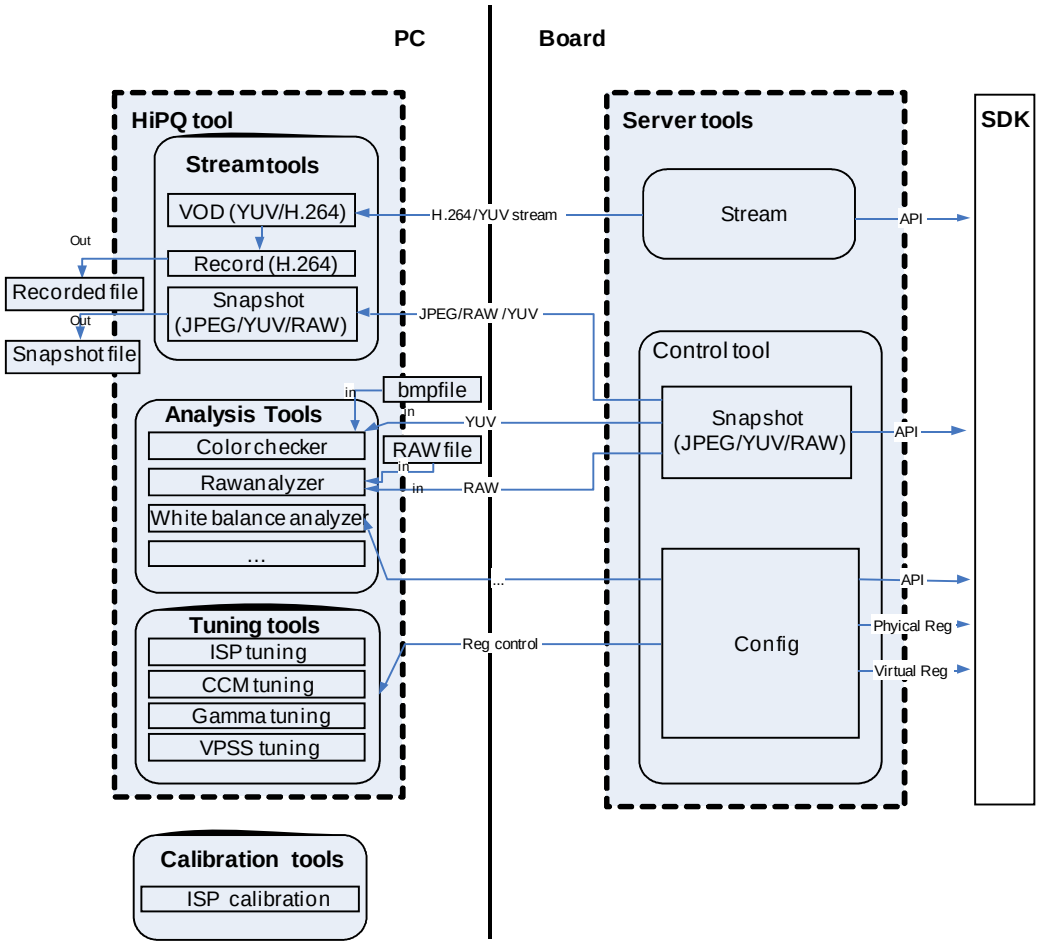
1 Introduction to the HiSilicon PQ Tools

1.1 Overview

The HiSilicon PQ Tools provides a series of professional picture quality adjustment tools such as the tuning tools, stream tools, and analysis tools.

Figure 1-1 shows the architecture of the HiSilicon PQ Tools.

Figure 1-1 Architecture of the HiSilicon PQ Tools



The HiSilicon PQ Tools is divided into the following parts by usage:

- Calibration tools: Automatically generate initial configurations for picture quality adjustment and adjust the new sensor. This tool is independent currently.
- Online tuning tools: Fine-tune parameters or adjust parameters in differentiated mode. The adjustment takes effect in real time and the picture effect can be viewed by previewing pictures.
- Analysis tools: Work with the online tuning tools to provide common data and charts and support real-time analysis during adjustment.
- Stream tools: Provide preview and video on-demand (VOD) tools, which are only for reference. You can use the VOD tools that are obtained after secondary development based on the HiSilicon SDK.

The HiSilicon PQ Tools is divided into tools on the PC and tools on the board by the tool delivery form. The tools on the PC include the online tuning tools, stream tools in the form of plug-ins, and analysis tools. The tools on the board include the ittb_control process and ittb_stream process that are independent of each other. The ittb_stream process is used to control the sensor, image signal processor (ISP), and video encoder (VENC) and transfer H.264, YUV, or JPEG streams. The ittb_control process is used to adjust parameters online.

1.2 Environment Preparations

1.2.1 Software and Hardware Requirements

The following describes the software and hardware requirements for using the HiSilicon PQ Tools:

- Hardware requirements
  - Board with the Hi3518A and Ethernet port
  - Desktop or portable computer
  - Network cable (the switches such as the router are required if the LAN is used)
  - Monitor of the computer running the HiSilicon PQ Tools with the resolution of 1024 (width) x 768 (height) or higher
- Software requirements

  Windows XP or later for the computer running the HiSilicon PQ Tools

1.2.2 Physical Connections

The HiSilicon PQ Tools is divided into client tools (tools on the PC) and server tools (tools on the board) that interact over the network. Physical connections can be established in either of the following ways:

- Connecting the computer to the board

  Connect the Ethernet port of the board to that of the computer by using the network cable.
- Using the local area network (LAN)
  - Connect the Ethernet port of the board to that of the router by using the network cable.
  - If a wired network is used, connect the Ethernet port of the computer to that of the router by using the network cable; if a wireless network is used, connect the computer to the wireless hotspot by following the current router settings or the network settings specified by the network administrator.

1.2.3 Installing and Running the HiSilicon PQ Tools on the Board

To burn the boot, kernel, and file system and configure the running environment of the HiSilicon PQ Tools on the board, perform the following steps (for details, see the *Description of the Installation and Upgrade of the Hi3518 SDK*):

Step 1 Decompress **Hi3518_ITTB_MPP2_VX.X.X.X.tgz** in the SDK, and copy the generated folder to the board or server.

Step 2 Start the HiSilicon PQ Tools on the board. For details, see section 3.2 "Configuring the Board to Support a New Sensor."

----End

NOTE

- The HiSilicon PQ Tools supports only the SDK of the 3A version. Check whether the SDK version is 3A before using the HiSilicon PQ Tools. For details about the 3A version, see the *3A HiISP Development Reference*.
- For details about the tools for the SDK of the non-3A version, see the *PC Tools User Guide*.

1.3 Installing the HiSilicon PQ Tools on the PC

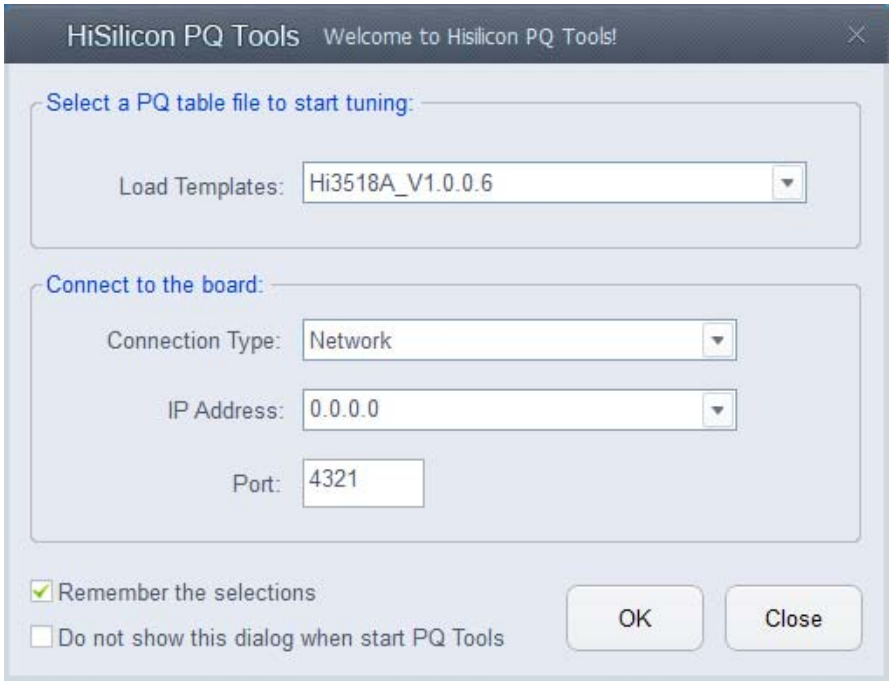
The HiSilicon PQ Tools for the PC is green software. Use the HiSilicon PQ Tools directly after decompressing the HiSilicon PQ Tools package in .zip format by using the WinRAR or WinZip to any directory with the write property.

1.4 Quick Start

1.4.1 Welcome Wizard

Each time you double-click **HiPQTools.exe**, the welcome wizard shown in Figure 1-2 is displayed when the HiSilicon PQ Tools starts, instructing you to rapidly create a picture quality (PQ) table and connecting the board.

Figure 1-2 Welcome wizard



If you want to adjust the picture quality on the welcome wizard, perform the following steps:

Step 1 Choose a PQ table template from **Load Templates** based on the name and version of the chip to be adjusted.

Step 2 Enter the IP address for the board in **IP Address**, enter the port number (**4321** by default) that is specified when the board program is running in **Port**, and click **OK**.

----End

The HiSilicon PQ Tools reads the selected template to generate a PQ table and automatically establishes a network connection between the computer and the board. If the network connection is successfully established, the HiSilicon PQ Tools automatically reads the values of adjustment items from the board.

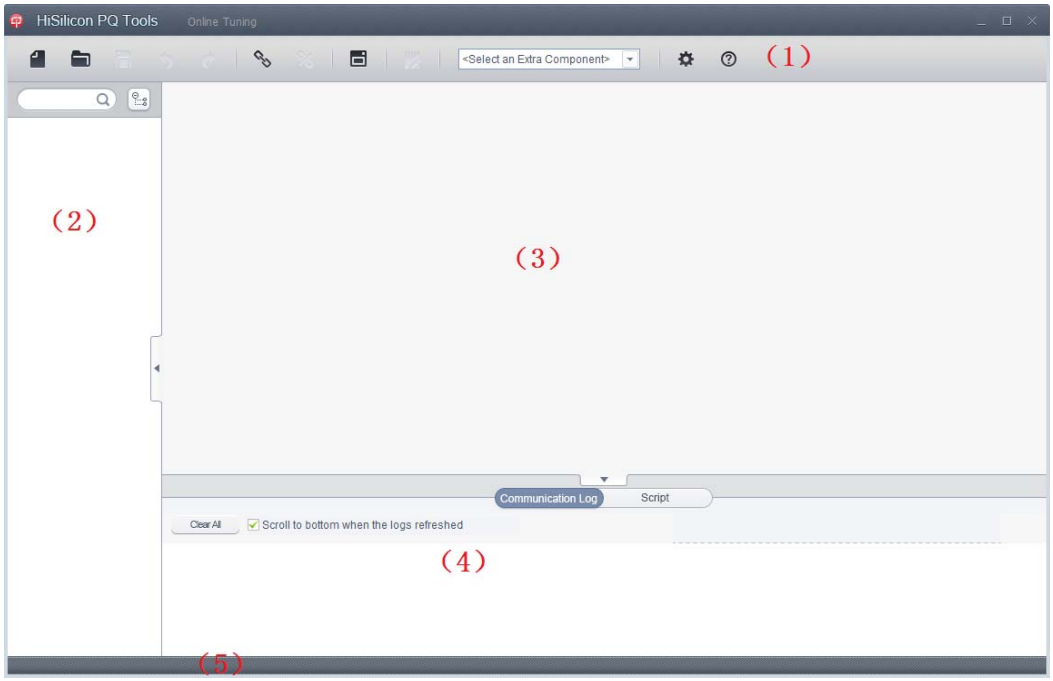
NOTE

- The HiSilicon PQ Tools remembers all entered information by default. If the information is used only for specified debugging and you do not want the HiSilicon PQ Tools to remember it, deselect **Remember the selections**.
- If you do not want the welcome wizard to be displayed with the HiSilicon PQ Tools, select **Do not show this dialog when start PQ Tools**. Then when the HiSilicon PQ Tools starts next time, the main graphical user interface (GUI) but not the welcome wizard is displayed.

1.4.2 Main GUI

Figure 1-3 shows the main GUI of the HiSilicon PQ Tools.

Figure 1-3 GUI



As shown in Figure 1-3, the main GUI is divided into the following areas by function:

- (1) Toolbar: Provides shortcuts of common operations.
- (2) PQ table panel: Displays all available adjustment items in the opened PQ table.
- (3) Adjustment area: Displays the adjustment page of the tree node you clicked on the left.
- (4) Advanced function area: Displays communication logs and allows you to enter and run scripts.
- (5) Status bar: Displays the information about operations.

1.4.3 Common Operations

1.4.3.1 Creating a PQ Table

To create a PQ table for picture quality adjustment, click  on the toolbar, choose a PQ table template from the **Select a template** drop-down box in the displayed **Create a new PQ Table** dialog box, and click **OK**.

Figure 1-4 Create a new PQ Table dialog box

After a PQ table is created, its tree structure is displayed in the PQ table panel. For details, see chapter 2 "GUIs and Functions."

1.4.3.2 Saving a PQ Data File

To save the current PQ table and the PQ data read on the board to a file, click on the toolbar, set the file name and save path in the displayed **Save As** dialog box, and click **Save**.

Then a .sav file is generated in the specified path. The file contains the structure of the PQ table.

1.4.3.3 Opening a PQ Data File

To open a saved PQ data file, click on the toolbar, select a file in the displayed **Open** dialog box, and click **Open**.

When the file is opened, its PQ table structure is read and then displayed in the PQ table panel.

1.4.3.4 Undoing and Redoing an Operation

To undo a debugging operation, click on the toolbar; to redo a canceled operation, click .

1.4.3.5 Connecting the Computer to a Board

To connect the computer to a board, click on the toolbar, enter the IP address for a board or choose the IP address for the board connected before from the **IP Address** drop-down box, enter a port ID in **Port**, and click **Connect**. See Figure 1-5.

Figure 1-5 Connect to the Board dialog box

If the board is successfully connected, is unavailable and is available.

1.4.3.6 Disconnecting the Computer from a Board

To disconnect the computer from a board, click on the toolbar.

1.4.3.7 Opening an Extra Plug-in or Program

The **Select an Extra Component** drop-down box lists all available extra plug-ins and programs. To open an extra plug-in or program, choose the required one from the drop-down box.

CAUTION

- The opened plug-in is closed when the HiSilicon PQ Tools is exited.
- Some extra programs require the network connection. If you open such a program and the HiSilicon PQ Tools does not connect to the board, the open operation is blocked.

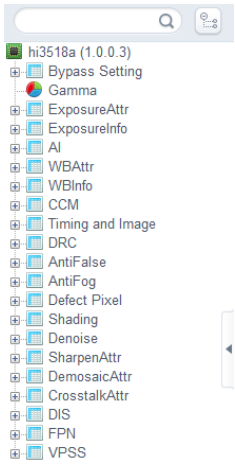
2 GUIs and Functions

2.1 GUIs and Functions of Online Tuning Tools

2.1.1 Opening the Tuning Tools GUI

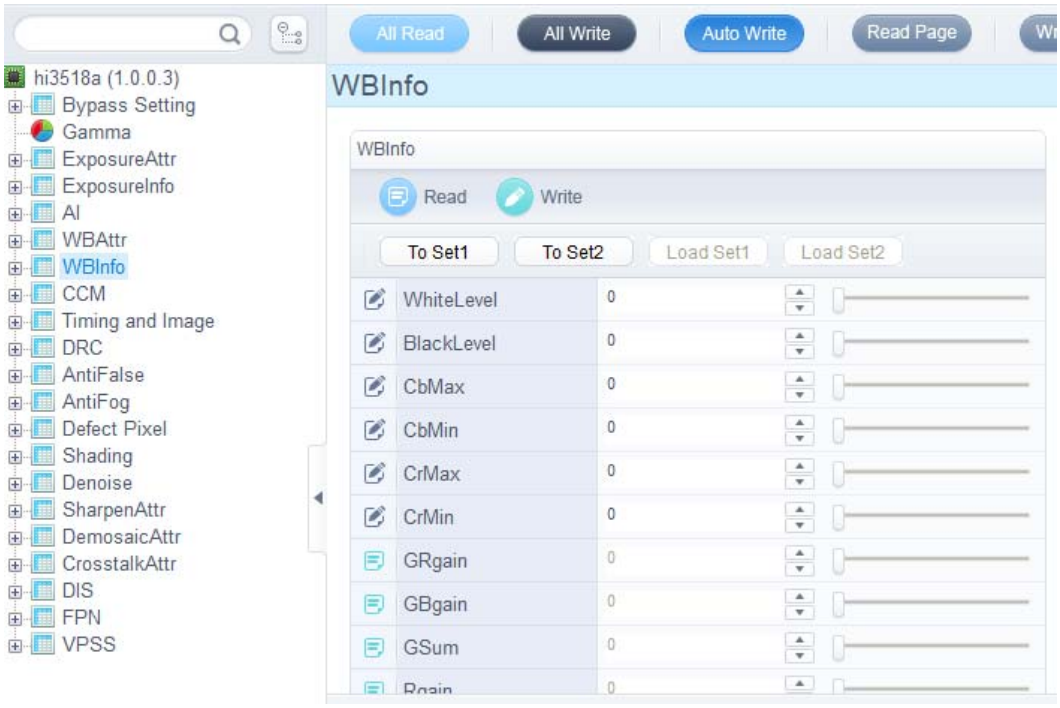
After a PQ table is created or a PQ data file is opened, the structure of the current PQ table is displayed in the PQ table panel on the left. See Figure 2-1.

Figure 2-1 PQ table for the Hi3518A



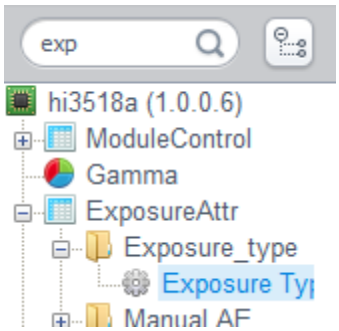
As shown in Figure 2-1, the nodes below **hi3518a (1.0.0.3)** indicate multiple adjustment pages in the PQ table that are organized by the PQ function. When you click a node, its contents are displayed in the adjustment area on the right. See Figure 2-2.

Figure 2-2 Opening an adjustment page of the PQ table



As shown in Figure 2-3, the search box allows you to rapidly search for adjustment items by keyword. Enter a keyword (non-case-sensitive) in the search box, and press **Enter** or click the magnifier icon. Then the HiSilicon PQ Tools locates the next field that contains the keyword and opens the corresponding adjustment page.

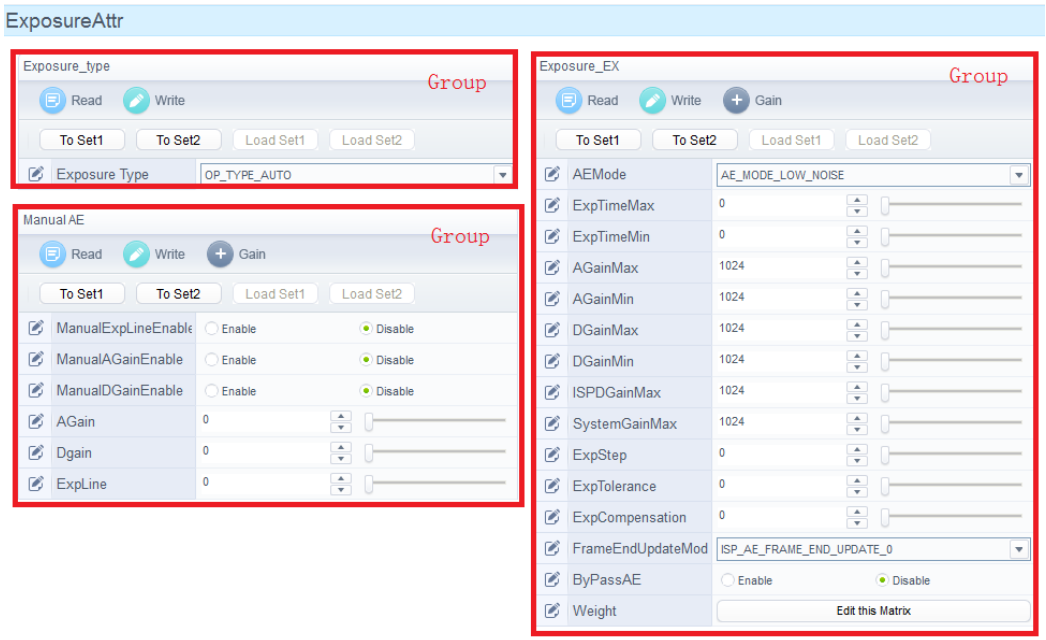
Figure 2-3 Search function



2.1.2 Adjusting Register and Algorithm Parameters

In the PQ table tree, the adjustment pages marked with indicate the register/algorithm parameter adjustment pages. Figure 2-4 shows the PQ GUI of the register/algorithm parameter adjustment page related to exposure.

Figure 2-4 PQ GUI of the register/algorithm parameter adjustment page related to exposure

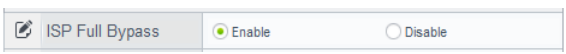


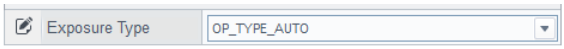
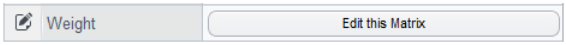
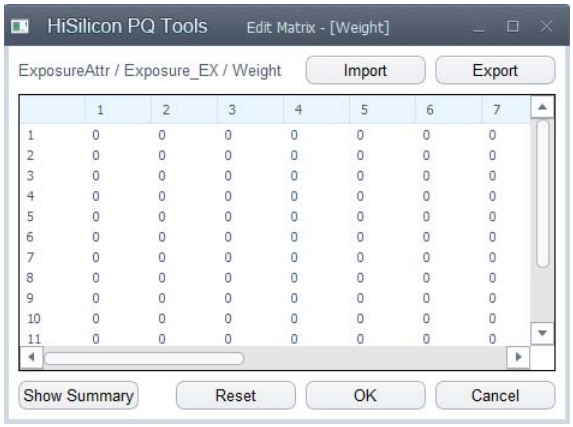
The algorithm parameters in each PQ GUI are grouped by function.

2.1.2.1 Viewing and Modifying Register and Algorithm Parameters

Each group contains register and algorithm parameters. The parameter marked with  indicates a parameter with the write property, and the parameter marked with  is read-only. The parameters are classified into five types by the internal form and value range and are displayed as different controls. See Table 2-1.

Table 2-1 Types of register and algorithm parameters

Type	Description	Control Operation
Value	The parameter is a real number with a specific value range.	The current value can be viewed in the text box. The value can be changed in any of the following ways: 1) Enter the value in the text box. 2) Click the arrow on the right of the text box. 3) Drag the slide label on the right. 
Boolean	The value is one of the two parameter values.	The parameter is viewed and set by using the check box. 

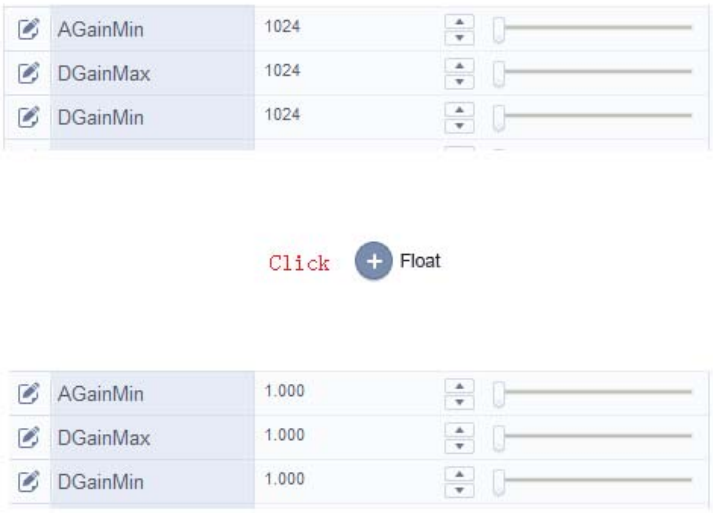
Type	Description	Control Operation
Enumeration	The parameter is an enumeration with three or more options.	The parameter is viewed and set by using the drop-down box. 
Matrix	The parameter is a multi-byte sequence.	The following button is displayed on the adjustment page:  After you click the **Edit this Matrix** button, the matrix values are listed in the table control in the displayed dialog box.  After changing the values, click **OK** to close the dialog box. If the matrix is read-only, the values in the table control cannot be changed, and the **View this Matrix** button is displayed.

2.1.2.2 Changing the Floating Point Format

Some register/algorithm parameters (such as the gain parameter in the exposure parameter group) support the floating point format, which is more accurate than the value format.

Clicking  implements switching between the floating point format and the value format. See Figure 2-5.

Figure 2-5 Changing the floating point format



2.1.2.3 Reading Data from the Board

If the board is connected and 

in a group is clicked, the HiSilicon PQ Tools reads the values of all parameters in the group from the board and then displays the values.

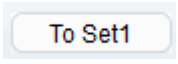
2.1.2.4 Writing Data to the Board

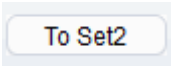
If the board is connected and 

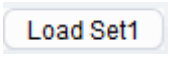
in a group is clicked, the HiSilicon PQ Tools writes the values of all parameters with the write property in the group to the board.

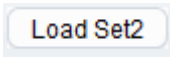
2.1.2.5 Caching and Restoring Data

The HiSilicon PQ Tools provides two groups of data cache spaces for each adjustment item group. You can temporarily store adjusted values in the spaces to perform restoration or comparison operations.

- Click 

or 

to temporarily store the adjusted values of a group.
- Click 

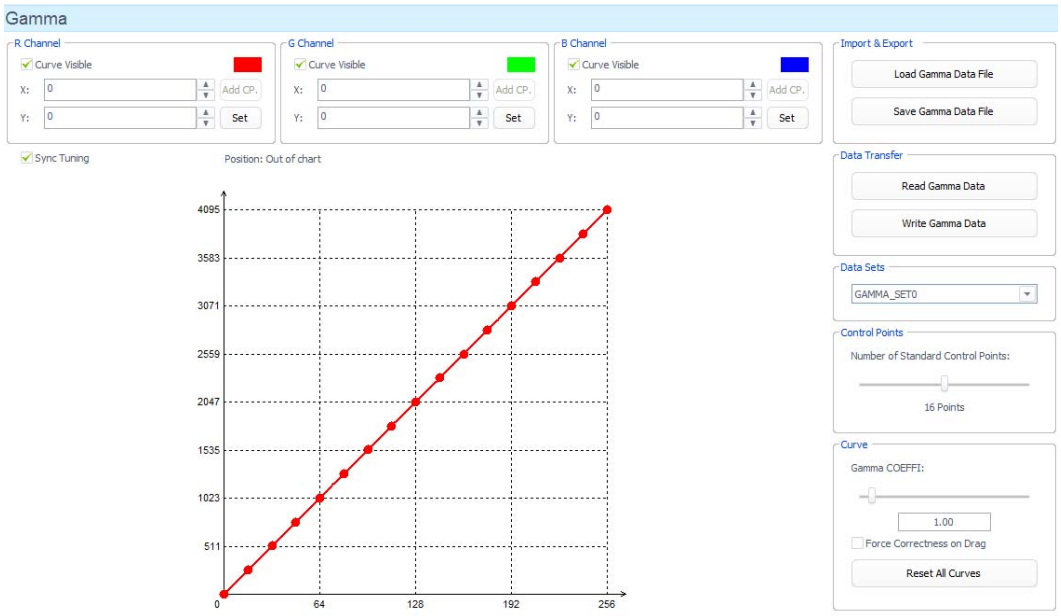
or 

to restore the values temporarily stored to a group.

2.1.3 Adjusting Visual Gamma Parameters

In the PQ table tree, the adjustment page marked with  indicates the visual gamma adjustment page. Figure 2-6 shows the GUI of the visual gamma adjustment page.

Figure 2-6 GUI of the visual gamma adjustment page



2.1.3.1 Adjusting the Gamma Curve

As shown in Figure 2-6, there is an RGB component curve in the gamma coordinate system in the lower part of the visual gamma PQ GUI. The curve has several control points for changing the curve trend.

When the pointer is moved onto a control point, the pointer is changed to ↕. In this case, dragging the point upwards or downwards changes the vertical position of the point.

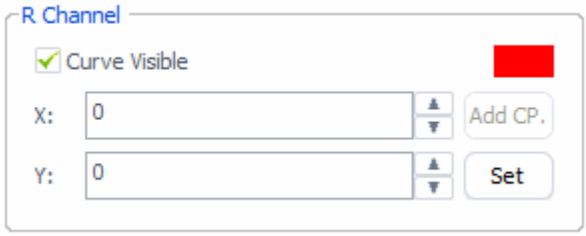
When the pointer is moved onto the curve and is changed to +, clicking the curve maps the current pointer position as a point on the curve and changes the point to a control point.

When the pointer is moved onto a control pointer, right-clicking the control point changes it to a common point. Note that the start and end control points of a curve cannot be changed to common points.

2.1.3.2 Advanced Control Functions of the Gamma Curve

As shown in Figure 2-6, there are curve group boxes in the upper part of the visual gamma PQ GUI for accurately controlling the curve. Figure 2-7 shows the R channel group box for controlling the gamma curve.

Figure 2-7 R channel group box



The following describes the options in Figure 2-7:

- Selecting **Curve Visible** displays the curve in the coordinate system, and deselecting **Curve Visible** hides the curve in the coordinate system.
- After entering a value in the **X** text box, you can view the vertical coordinate of the point on the curve corresponding to the horizontal coordinate.
- If the point defined by the values entered in the **X** and **Y** text boxes is not a control point, clicking **Add CP.** changes the point to a control point.
- If the point defined by the values entered in the **X** and **Y** text boxes is a control point, clicking **Set** after entering a new value in the **Y** text box changes the vertical coordinate of the current control point to the new value.

2.1.3.3 Switching the Gamma Dataset

The HiSilicon PQ Tools provides multiple gamma datasets for each gamma page. You can select a dataset from the **Data Sets** group box on the right. The operations such as editing, saving, or reading the curve, reading data from the board, or writing data to the board are valid only for the current dataset.

2.1.3.4 Reading, Writing, and Saving Gamma Data

You can save, read, or write gamma data in the **Import & Export** group box on the right.

- Clicking **Save Gamma Data File** saves the adjusted gamma data to a local file.
- Clicking **Load Gamma Data File** reads gamma data from a file and displays it as a curve based on the selected dataset.

Data can be saved as a file in floating-point or hexadecimal format. For each floating-point data segment, six decimal places are used.

2.1.3.5 Reading/Writing Gamma Data from/to the Board

You can read/write gamma data from/to the board in the **Data Transfer** group box on the right.

- Clicking **Read Gamma Data** reads gamma data from the board and displays them as a curve based on the selected dataset.
- Clicking **Write Gamma Data** writes the current gamma curve data to the board.

2.1.3.6 Auxiliary Gamma Functions

The gamma adjustment page shown in Figure 2-6 provides a series of auxiliary functions for facilitating gamma curve adjustment.

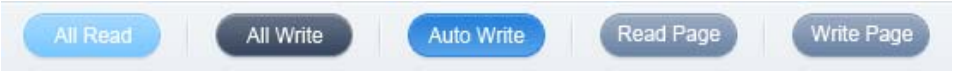
- If **Sync Tuning** is selected, when any of the three curves of the R/G/B components is dragged, the other two change synchronously, that is, the three curves are the same.
- Dragging the slide label in the **Control Points** group box sets the number of control points on each curve.
- Dragging the slide label or entering a coefficient in the text box of the **Gamma COEFFI** group box adjusts the gamma curve. The coefficient ranges from 0.01 to 20.00.
- If **Force Correctness on Drag** is selected, each time a control point is dragged, its maximum vertical coordinate must be less than or equal to the vertical coordinate of its right control point, and its minimum vertical coordinate must be greater than or equal to the vertical coordinate of its left control point.

- Clicking **Reset All Curves** resets all curves to the standard gamma curves with the coefficient of 1.00.

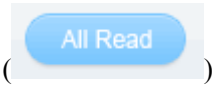
2.1.4 Reading and Writing Adjusted Data in Batches and Automatically Writing Data

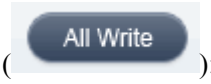
Each time a PQ table is created or a data file is opened, the read and write buttons shown in Figure 2-8 are displayed on the corresponding GUI.

Figure 2-8 Read and write buttons



All read and write operations are valid only when the board is connected. The following describes the read and write buttons:

- **All Read** button (

): Clicking this button reads the current values of all adjustment items in the PQ table from the board. After a PQ table is created (the automatic read function is disabled) or a .bin file is imported, an all read operation is recommended.
- **All Write** button (

): Clicking this button writes the temporarily stored values of all adjustment items in the PQ table to the board. When a .cfg data file is imported, you can use this function to import the data in the file to the board for viewing the picture effect.
- **Auto Write** button (

 indicates the disabled status, and 

 indicates the enabled status): If the auto write function is enabled, the value is written to the board each time after an adjustment item with the write property is modified. You are advised to enable this function to ensure that the adjusted value takes effect immediately.
- **Read Page** button (

): Clicking this button reads the current values of all adjustment items in the active GUI from the board. If the active GUI is a special page such as the gamma page, clicking this button reads data of this page.
- **Write Page** button (

): Clicking this button writes the temporarily stored values of all adjustment items in the active GUI to the board. If the active GUI is a special page such as the gamma page, clicking this button writes data to this page.

2.2 Advanced Functions

2.2.1 Register Modifier

You can change the register value at a specific address by using the register modifier. The register modifier allows you to read and modify the 32-bit physical or virtual registers.

Clicking  on the toolbar opens the register modifier shown in Figure 2-9.

Figure 2-9 Register modifier

To read the value of a register at a specific address, perform the following steps:

Step 1 Enter an address in the **Address** text box.

Step 2 Select **Physical** or **Virtual**.

Step 3 Click **Read**.

If the register value is successfully read, a value is displayed in the **Value** text box, and the bitwise register modification area on the right is marked based on the value.

----End

To write a value to a register at a specific address, perform the following steps:

Step 1 Enter an address in the **Address** text box.

Step 2 Select **Physical** or **Virtual**.

Step 3 Enter the value to be written in the **Value** text box or mark the bitwise register modification area on the right based on the value to be written.

Step 4 Click **Write**.

----End

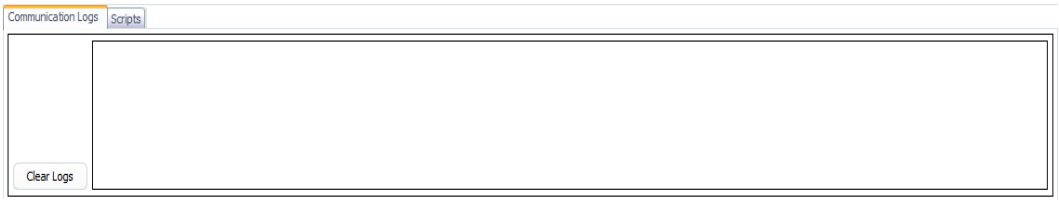
CAUTION

- The register address must be an integral multiple of 4; otherwise, it cannot be read and written.
- If an address has been used or defined, it can be read or written. If an address is not defined for a register type or its function is unknown, use this address with caution. After an address is filled, the register type (physical or virtual) must be selected. For example, 0x000A0004 is both a virtual register address and a valid physical address. However, the register at this physical address is invalid or the physical address is specified for another important function. If you select the physical register type and then read and write to this address, the program may crash or other exceptions may occur. Therefore, use such addresses with caution.

2.2.2 Communication Logs

After the board is connected, all data related to the interaction between the computer and the board is recorded as logs and displayed in the **Communication Logs** window. See Figure 2-10.

Figure 2-10 Communication Logs window



The logs that are recorded when the computer and board interact include the following information:

- Log created time
- Communication mode and parameters
- Communication contents (such as the adjustment item being read or written)
- Interaction status (including session startup and session answer)
- Error information if communication errors occur

Clicking **Clear Logs** clears displayed communication logs.

If the opened PQ table or the connection between the computer and the board is abnormal, a communication error may occur. In this case, locate and resolve the issues by following Table 2-2.

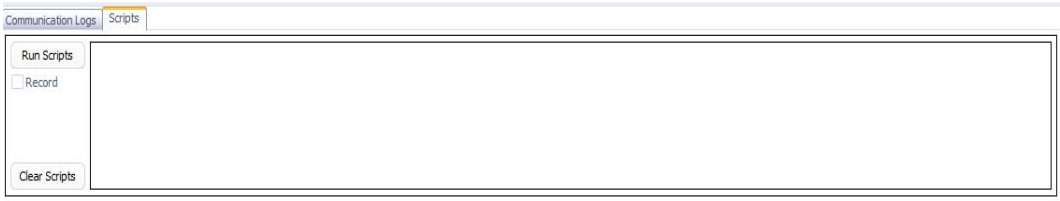
Table 2-2 Common communication errors

Error Message	Description
Cannot connect to the board.	Symptom: The board fails to be connected. Solution: Check the connection between the computer and the board.
Device not matched.	Symptom: The device corresponding to the opened PQ table mismatches the connected board. Solution: Change a PQ table.
Version not matched.	Symptom: The device corresponding to the opened PQ table matches the board, but the version of the board program mismatches the PQ table. Solution: Change a PQ table.
Failed to receive response from the board.	Symptom: No response is received from the board. Solution: Check the network connection and the running status of the board program.

2.2.3 Scripts and Batch Processing

The HiSilicon PQ Tools allows you to set register and algorithm parameters in batches by running scripts. Click **Scripts** to open the **Scripts** window. See Figure 2-11.

Figure 2-11 Scripts window



You can enter a script in a line in the text box in the following format:

```
set (<Adjustment page name> / <Adjustment group name> /
<Adjustment item name>) <Value>
```

CAUTION

- For the register and algorithm parameters in non-matrix form, enter only one decimal or hexadecimal value in **<Value>**.
- For the register and algorithm parameters in matrix form, enter multiple required decimal or hexadecimal values in **<Value>** and use commas (,) to separate them.

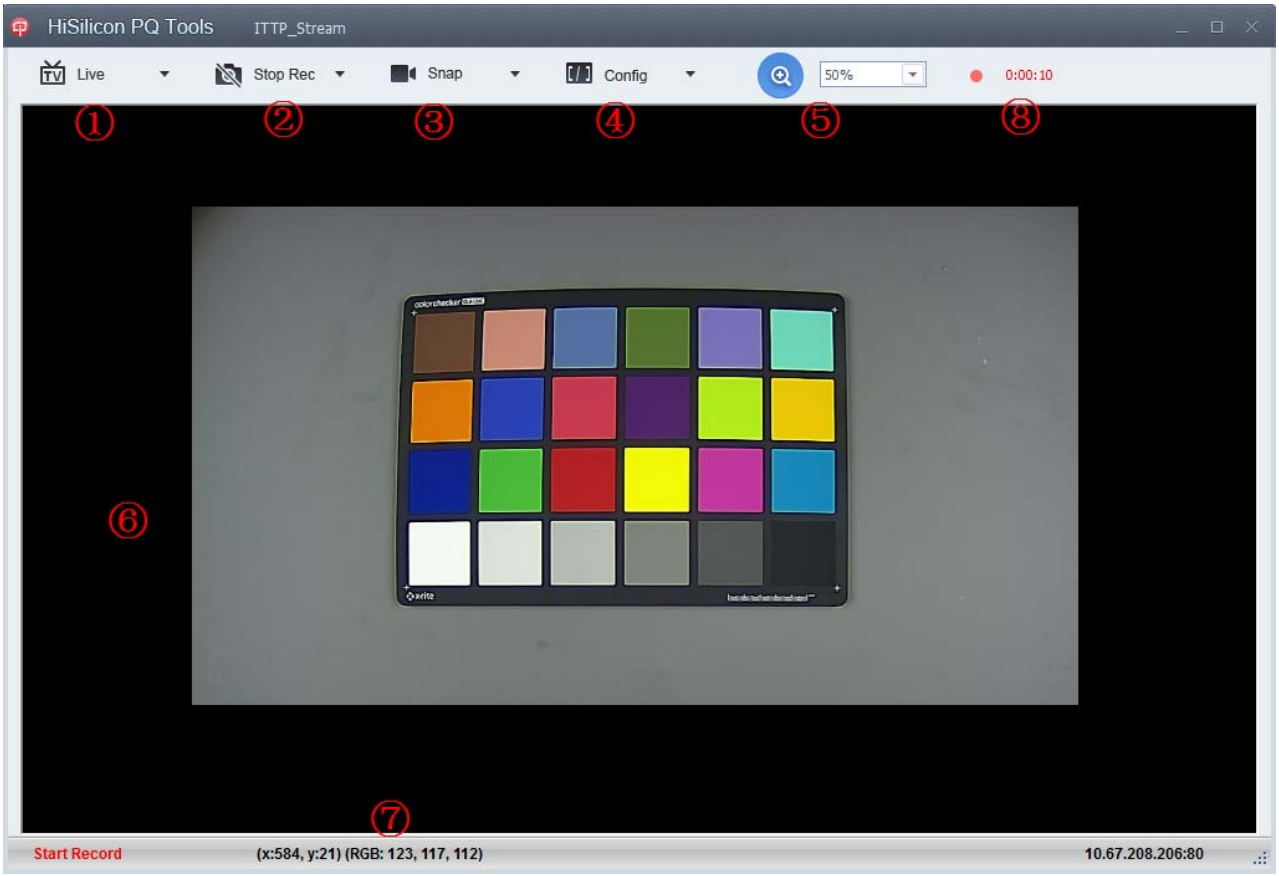
After entering scripts, click **Run Scripts**. Then the HiSilicon PQ Tools runs the scripts line by line and set the specified register and algorithm parameters.

If **Record** is selected, scripts are automatically recorded, and a script in the format of set (<Adjustment page name> / <Adjustment group name> / <Adjustment item name>) <Value> is generated and displayed in the text box each time a register or algorithm parameter is modified.

2.3 Stream Tools GUI and Functions

After the ITTP_Stream starts, the main GUI shown in Figure 2-12 is displayed.

Figure 2-12 Main GUI



The following describes the functions of buttons or areas on the main GUI:

NOTE

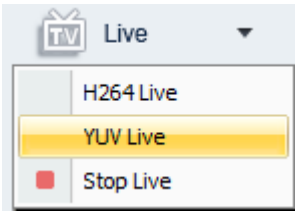
For details about functions, see the following sections.

- (1) Preview
- (2) Record
- (3) Snapshot
- (4) Sensor parameter setting
- (5) Preview window scale
- (6) Video preview window
- (7) Current information
- (8) Recording duration

2.3.1 Preview

The preview menu shown in Figure 2-13 (numbered 1 in Figure 2-12) is used to select the preview mode or stop previewing. Two preview modes (H.264 live mode and YUV live mode) are supported.

Figure 2-13 Preview menu



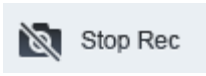
When the ITTP_Stream starts, it connects to the board whose IP address is entered in the main GUI. The connection status is displayed in the lower left corner (numbered 7 in Figure 2-12). The video is displayed in the preview window (numbered 6 in Figure 2-12) after successful connection.

NOTE

- The H.264 live mode is selected by default when a video starts to play.
- The YUV images are processed by the ISP.

The **Preview Window Scale** drop-down box (numbered 5 in Figure 2-12) allows you to select a scale. The scale of 30%, 50%, 80%, or 100% is supported. If the video window is too large, drag the scroll bar or drag the lower right corner of the preview window.

2.3.2 Record

The record menu (numbered 2 in Figure 2-12) allows you to start or stop recording. Figure 2-14 shows the record menu. If you choose **Record** > **Start Record** when the video is being played normally, recording starts, the **Record** button is changed to 

, and the **Start Record** menu is changed to **Stop Record**. The recording duration is displayed in the area numbered 8 in Figure 2-12. If you choose **Record** > **Stop Record**, recording stops, the **Record** button is restored, and the recording duration disappears.

To set a save path for the recorded video, choose **Record** > **Setting**, select a save path in the displayed **Setting** dialog box shown in Figure 2-15, and click **OK**.

NOTE

Recording is not supported in YUV live preview mode.

Figure 2-14 Record menu

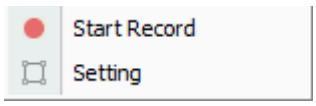


Figure 2-15 Setting a save path for the recorded video

2.3.3 Snapshot

Snapshots can be taken from the video in RawData, JPEG, or YUV format.

RawData Snapshot

CAUTION

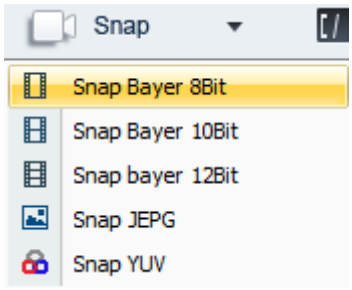
RawData snapshots are not processed by the ISP.

To take a RawData snapshot in 8-bit, 10-bit, or 12-bit format and send back data, choose **Snap** (numbered 3 in Figure 2-12) > **Snap Bayer 8Bit** (**Snap Bayer 10Bit** or **Snap Bayer 12Bit**), as shown in Figure 2-16.

NOTE

Select the RawData snapshot format based on the application scenario. For example, select the 12-bit format for parameter correction and select the 8-bit format for fault location.

Figure 2-16 RawData snapshot menu



CAUTION

Previewing must be paused when RawData snapshots are taken. When you click the **Snap** button, a dialog box shown in Figure 2-17 is displayed, asking you whether to pause previewing for snapshot.

Figure 2-17 Whether to pause previewing for snapshot

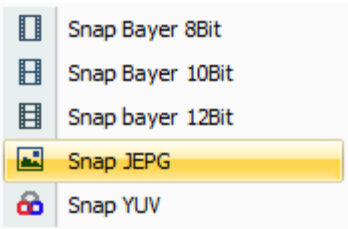
If you click **OK**, previewing stops and a dialog box is displayed, asking you to select a save path and enter a file name. Then snapshots are taken. The snapshot information is displayed in the area numbered 7 in Figure 2-12.

During snapshot, the snapshot menu is unavailable until snapshot taking is complete.

JPEG Snapshot

To take JPEG snapshots in the background, choose **Snap** > **Snap JPEG**. The video on-demand is not affected. See Figure 2-18.

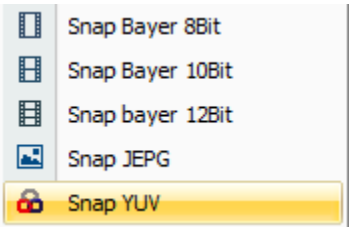
Figure 2-18 JPEG snapshot menu



YUV Snapshot

To take YUV snapshots in the background, choose **Snap** > **Snap YUV**, as shown in Figure 2-19. The video on-demand is not affected. The YUV snapshots are processed by the ISP but are not encoded.

Figure 2-19 YUV snapshot menu



2.3.4 Setting Sensor Parameters

The **Config** option (numbered 4 in Figure 2-12) allows you to dynamically set sensor parameters. When **Config** is clicked, the **Config** dialog box shown in Figure 2-20 is displayed.

Figure 2-20 Config dialog box

The following describes the items on Figure 2-20:

- Browse

  This button allows you to manually select a configuration file on the PC.
- Send_Port

  This text box allows you to specify the ID of the port for transferring the configuration file.
- Send

  This button allows you to send the selected configuration file to the board. Then the configuration takes effect after the board is restarted.

CAUTION

The format of the configuration file sent to the board must be consistent with the template format.

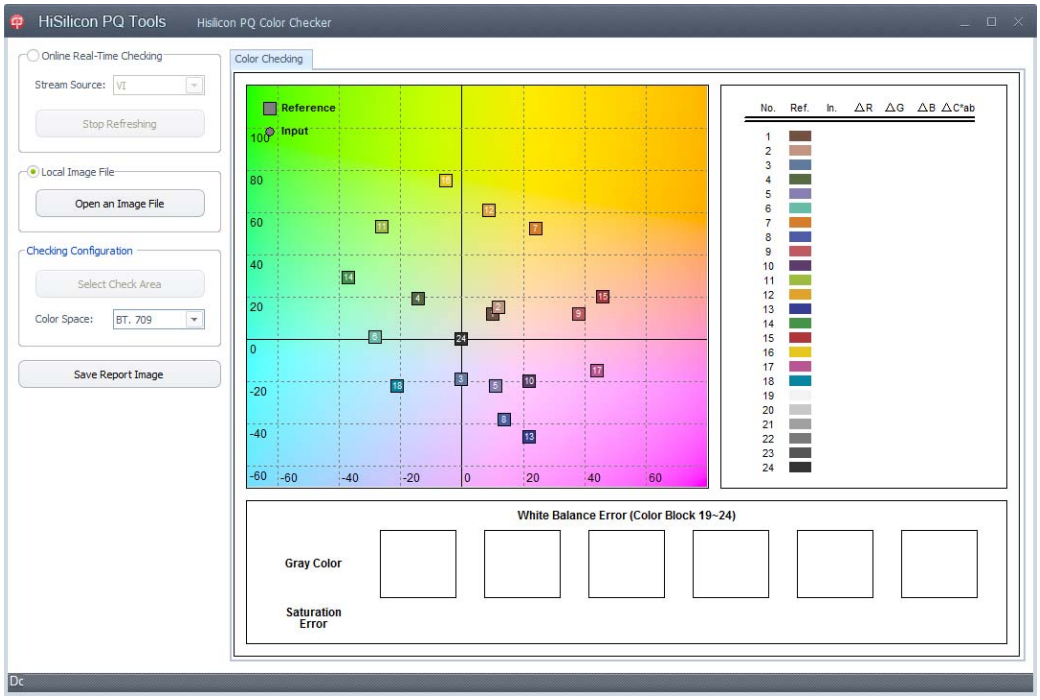
2.4 Analysis Tool GUIs and Functions

2.4.1 Color Checker

2.4.1.1 GUI

Choose **HiPQ Color Checker** from the **Select an Extra Component** drop-down box in the main GUI of the HiSilicon PQ Tools. The **HiSilicon PQ Color Checker** window shown in Figure 2-21 is displayed.

Figure 2-21 HiSilicon PQ Color Checker



The **Color Checker** window displays the following analysis data:

- Comparison chart of the position and distance of coordinates in the L*a*b* matrix for the standard color and sample color
- R/G/B component difference between the standard color and the sample color as well as the L*a*b* color space distance (ΔC*ab) when the luminance is not considered
- L*a*b* color space distance (ΔE*ab) when the luminance is considered, including only the maximum value, minimum value, and average value
- White balance error analysis

The color checker supports color analysis on the BT.709, SRGB, BT.601N, and BT.601C color spaces. To change a color space, choose one from the **Color Space** drop-down box in the **Checking Configuration** group box on the left.

2.4.1.2 Selecting a Data Source

The color checker supports online color analysis when the board is connected and can read a local picture for color analysis.

To implement online color analysis, perform the following steps:

Step 1 Focus the camera on a standard PANTONE 24-color chart.

Step 2 On the main GUI of the HiSilicon PQ Tools, open a PQ table (ensure that the chip model and version match the board).

Step 3 Connect the HiSilicon PQ Tools to the board.

Step 4 On the main GUI of the color checker, select **Online Real-Time Checking**.

Step 5 Select a data source (**VI** or **VPSS**) from the **Stream Source** drop-down box.

----End

To analyze the color of a local picture, perform the following steps:

Step 1 On the main GUI of the color checker, select **Local Image File**, and click **Open an Image File** to select a local picture.

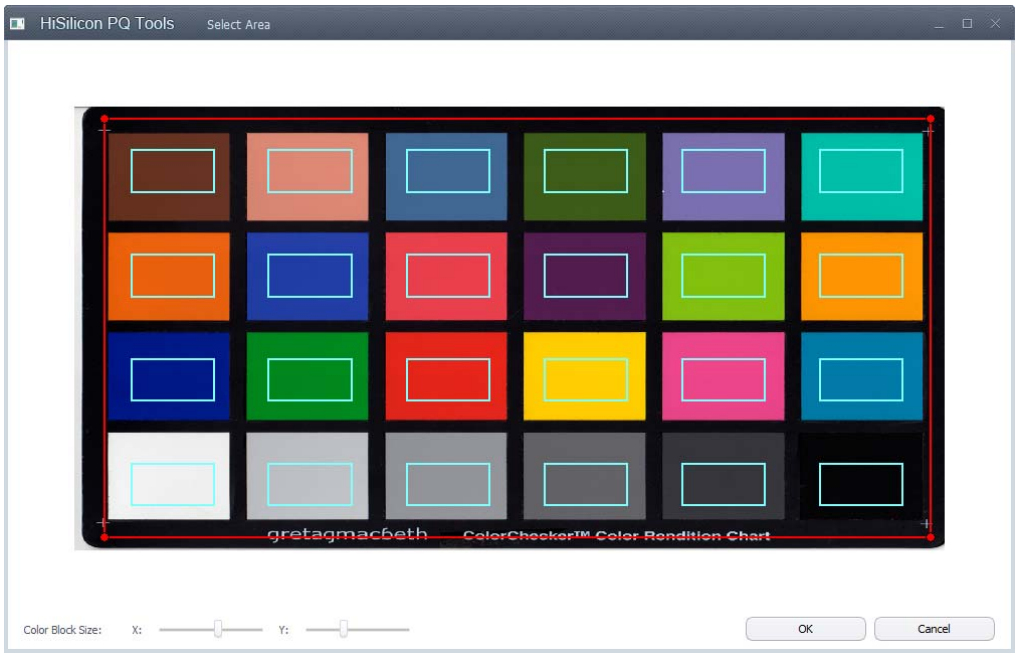
Step 2 Select the picture of a PANTONE 24-color chart.

----End

2.4.1.3 Selecting the Sampling Areas of 24 Colors

When a picture is obtained from the board or a local picture is opened, the window for selecting the sampling areas of 24 colors is displayed. See Figure 2-22.

Figure 2-22 Window for selecting the sampling areas of 24 colors

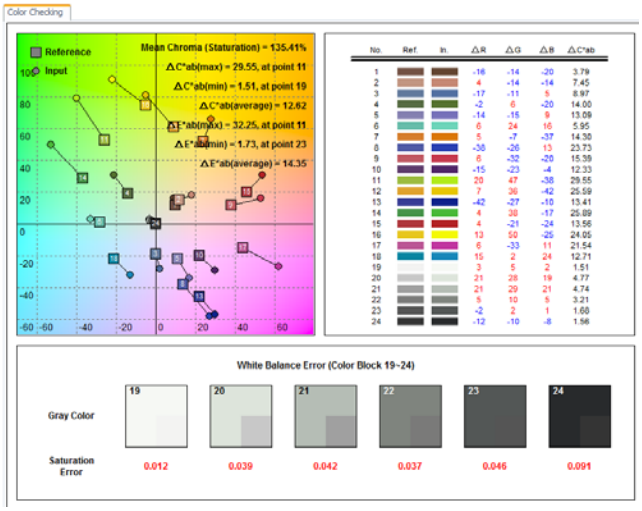


Drag the red rectangle until the small blue rectangles fall within the 24 color blocks, which implements the optimal color sampling effect. In **Color Block Size** on the lower part,

dragging the slide label in **X** adjusts the length of the blue rectangles, and dragging the slide label in **Y** adjusts the width of the blue rectangles.

After adjustment, click **OK**. Then the color analysis results shown in Figure 2-23 are displayed.

Figure 2-23 Color analysis results



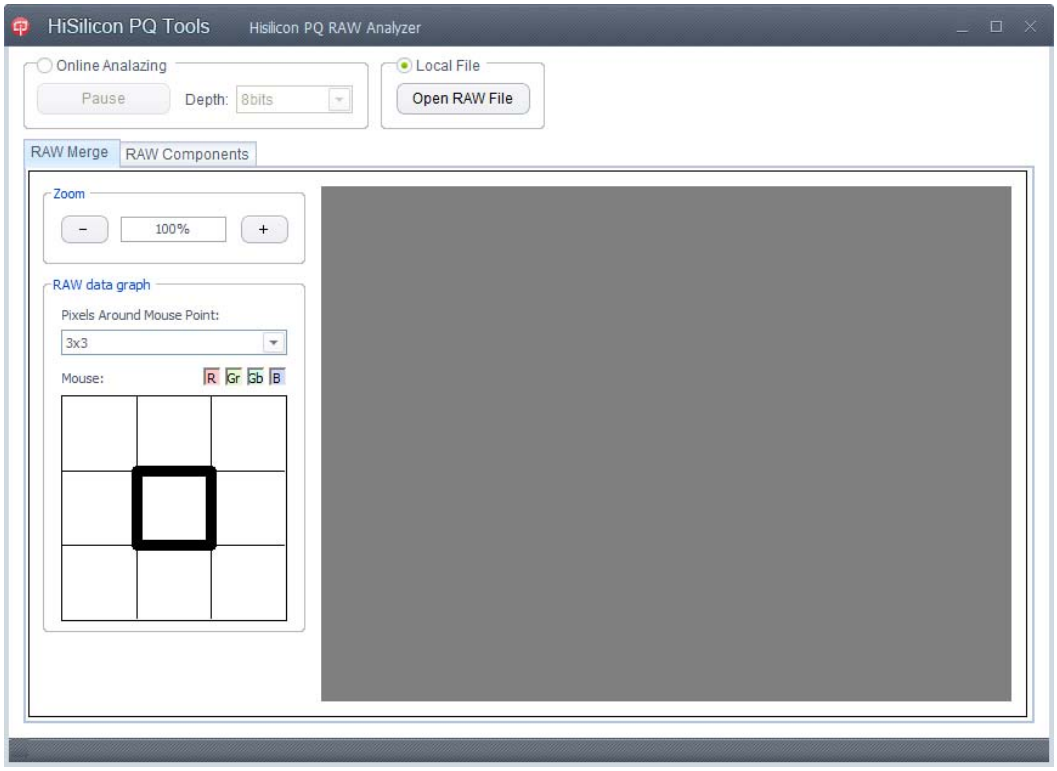
To select the sampling areas of 24 colors again, click **Select Check Area** in the **Checking Configuration** group box on the left of the color checker.

2.4.2 RAW Analyzer

2.4.2.1 GUI

Choose **HiPQ RAW Analyzer** from the **Select an Extra Component** drop-down box in the main GUI of the HiSilicon PQ Tools. The **HiSilicon PQ RAW Analyzer** window shown in Figure 2-24 is displayed.

Figure 2-24 HiSilicon PQ RAW Analyzer



The RAW analyzer allows you to view the component and luminance of each point on the opened picture. To view an entire picture, click **RAW Merge**; to view a component, click **RAW Components**.

2.4.2.2 Selecting a Data Source

The RAW analyzer supports online data analysis when the board is connected and can read a .raw local file for data analysis. The HiSilicon .raw files and common .raw files are supported.

To implement online data analysis, perform the following steps:

Step 1 On the main GUI of the HiSilicon PQ Tools, open a PQ table (ensure that the chip model and version match the board).

Step 2 Connect the HiSilicon PQ Tools to the board.

Step 3 On the main GUI of the RAW analyzer, select **Online Analyzing**.

Step 4 In the **Operations** group box, set the depth and pattern of the obtained picture (which can also be modified during online analysis).

----End

To open a HiSilicon .raw file, perform the following steps:

Step 1 On the main GUI of the RAW analyzer, select **Local File Analyzing**.

Step 2 Click **Open RAW File** to select a .raw file.

----End

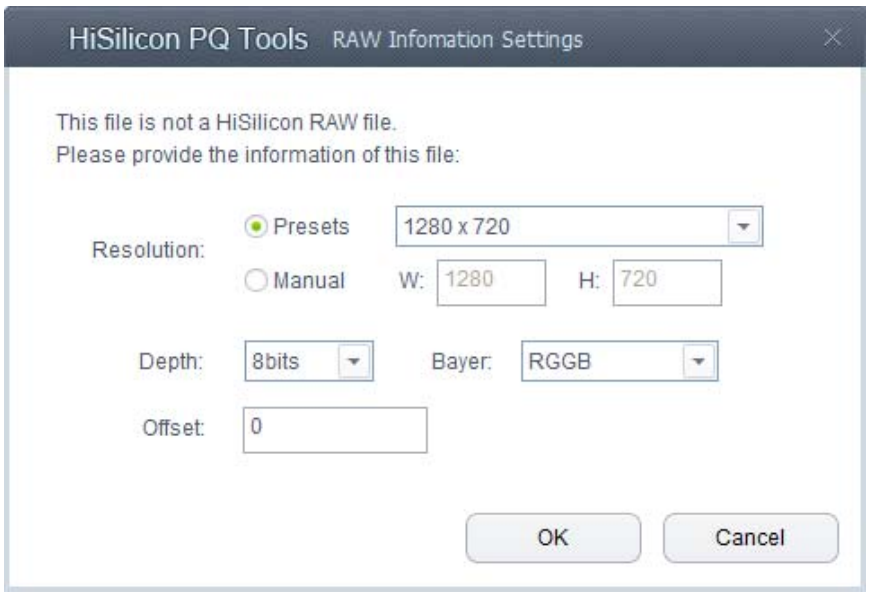
To open a common .raw file, perform the following steps:

Step 1 On the main GUI of the RAW analyzer, select **Local File Analyzing**.

Step 2 Click **Open RAW File** to select a .raw file.

Step 3 In the displayed **RAW Information Settings** dialog box, specify the resolution, depth, component pattern (Bayer), and header offset of the file.

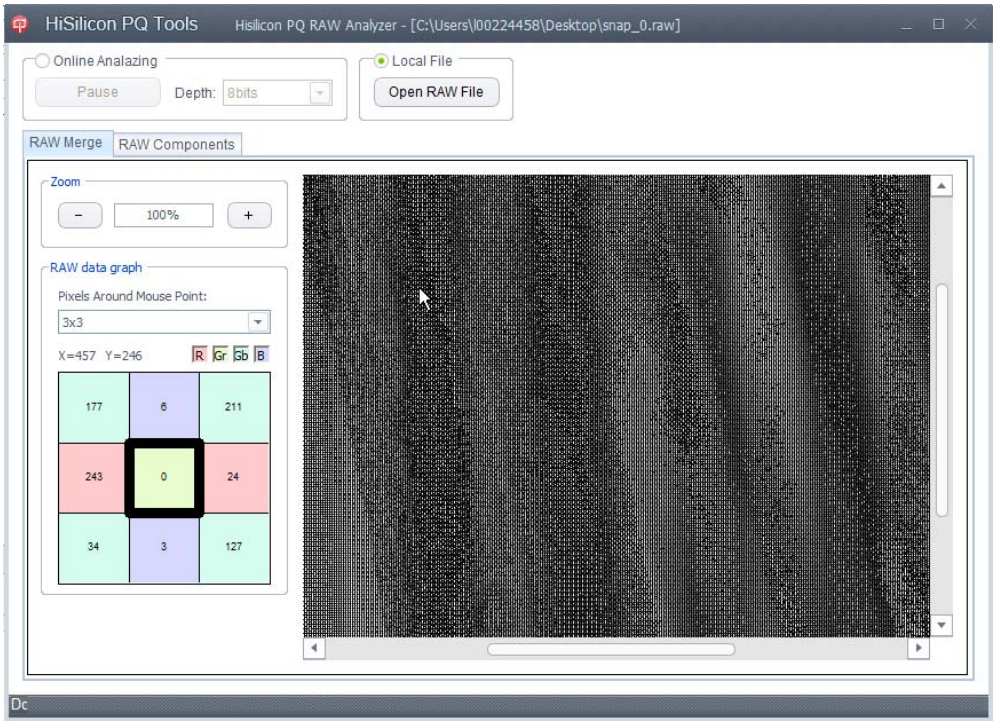
Figure 2-25 Setting a common .raw file



Step 4 Click **OK**.

The RAW analyzer displays the .raw picture, as shown in Figure 2-26.

Figure 2-26 Displaying the . raw picture



----End

2.4.2.3 Obtaining Analysis Data

After a .raw picture is displayed, if you move the pointer onto the picture, you can view the component and luminance values of the pointer position (called target point) and surrounding points. If points are difficult to select due to the default picture size, zoom in or zoom out on the picture in any of the following ways:

- Click the picture to zoom in on the picture (the point clicked is centered in the enlarged picture) or right-click the picture to zoom out on the picture.
- In the **Zoom** group box, click + or – to zoom in or zoom out on the picture based on the configured scaling ratio.
- In the text box of the **Zoom** group box, enter a scaling ratio.

The analysis data is displayed in the left **Raw Data Graph** group box shown in Figure 2-27.

Figure 2-27 Analysis data graphic

The data in the black square indicates the luminance of the target point, and the data in other squares indicates the luminance of the points around the target point.

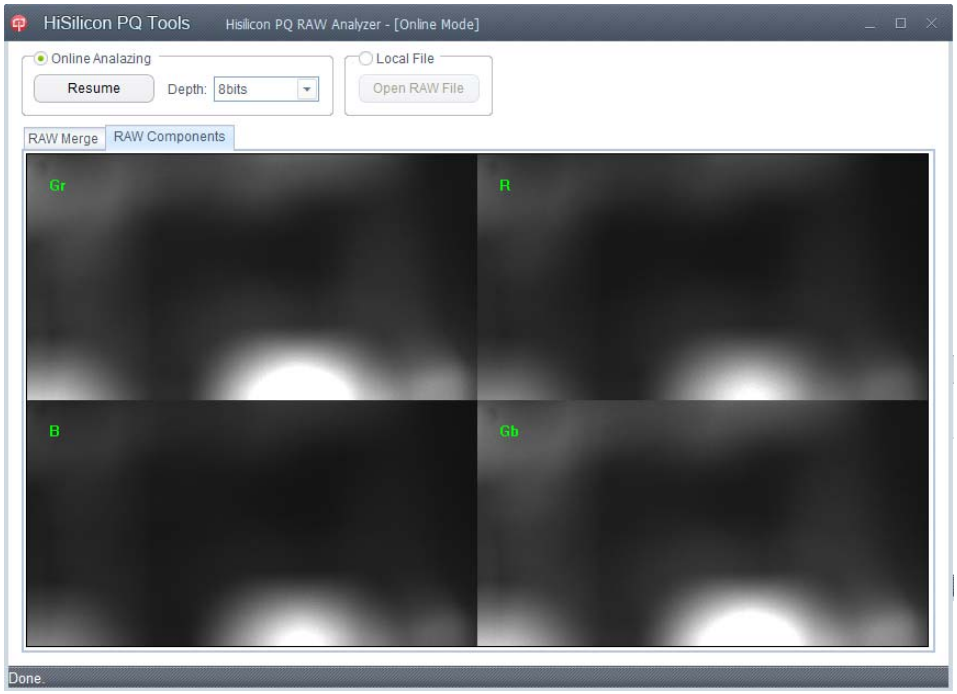
The background color of each square indicates the component to which a point belongs, which is illustrated above the analysis data graphic.

To set the number of points around the target point in the graphic, choose a value from the **Analyze Size** drop-down box.

2.4.2.4 Viewing Picture Components

On the main GUI of the RAW analyzer, click **RAW Components** to view picture components. See Figure 2-28.

Figure 2-28 Viewing picture components

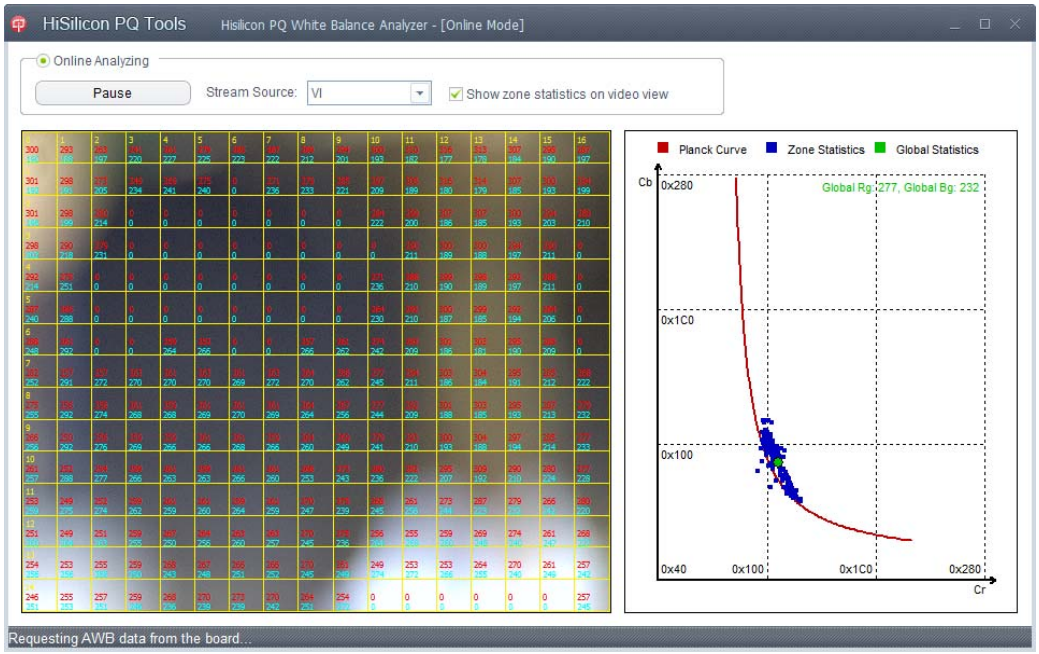


2.4.3 White Balance Analyzer

2.4.3.1 GUI

Choose **HiPQ White Balance Analyzer** from the **Select an Extra Component** drop-down box in the main GUI of the HiSilicon PQ Tools. The **HiSilicon PQ White Balance Analyzer** window shown in Figure 2-29 is displayed.

Figure 2-29 HiSilicon PQ White Balance Analyzer



The white balance analyzer provides white balance statistics for the picture quality personnel.

2.4.3.2 Online Analysis by Connecting the HiSilicon PQ Tools to the Board

The white balance analyzer supports only online analysis by connecting the HiSilicon PQ Tools to the board. Perform the following steps:

Step 1 On the main GUI of the HiSilicon PQ Tools, open a PQ table (ensure that the chip model and version match the board).

Step 2 Connect the HiSilicon PQ Tools to the board.

Step 3 Focus the camera on the target analysis area.

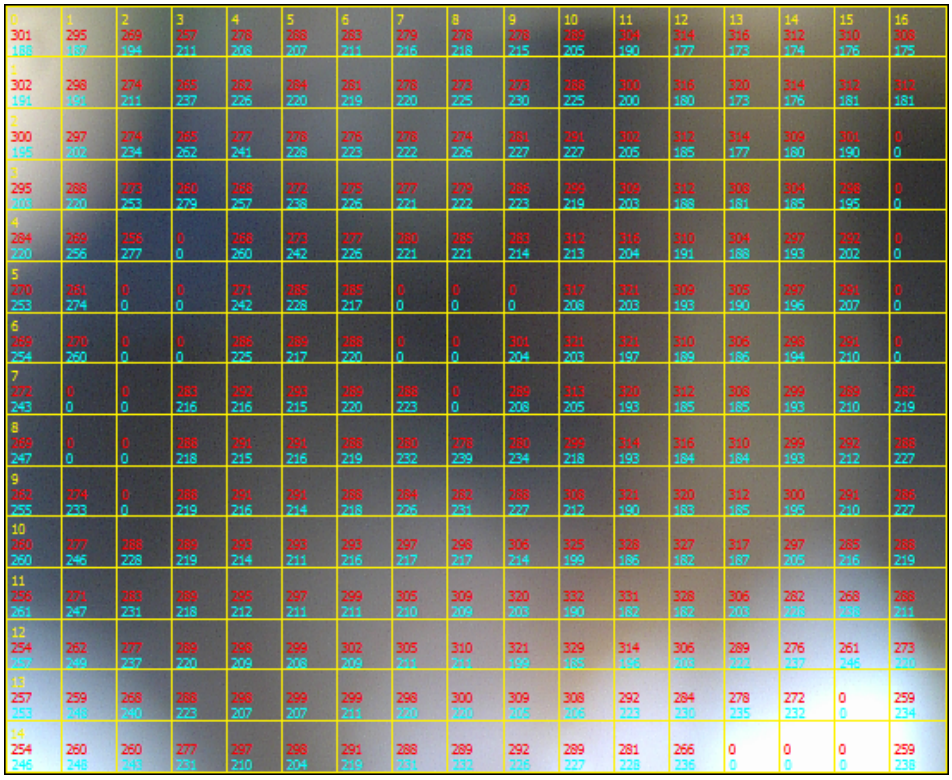
----End

After the board is connected, the white balance analyzer requests the picture and statistical data from the board.

2.4.3.3 Viewing the Statistics of the Real-Time Picture and Zones

On the **Manual WB Effect** tab page, the white balance analyzer displays the picture currently captured by the camera, as shown in Figure 2-30.

Figure 2-30 Statistics of the picture and zones



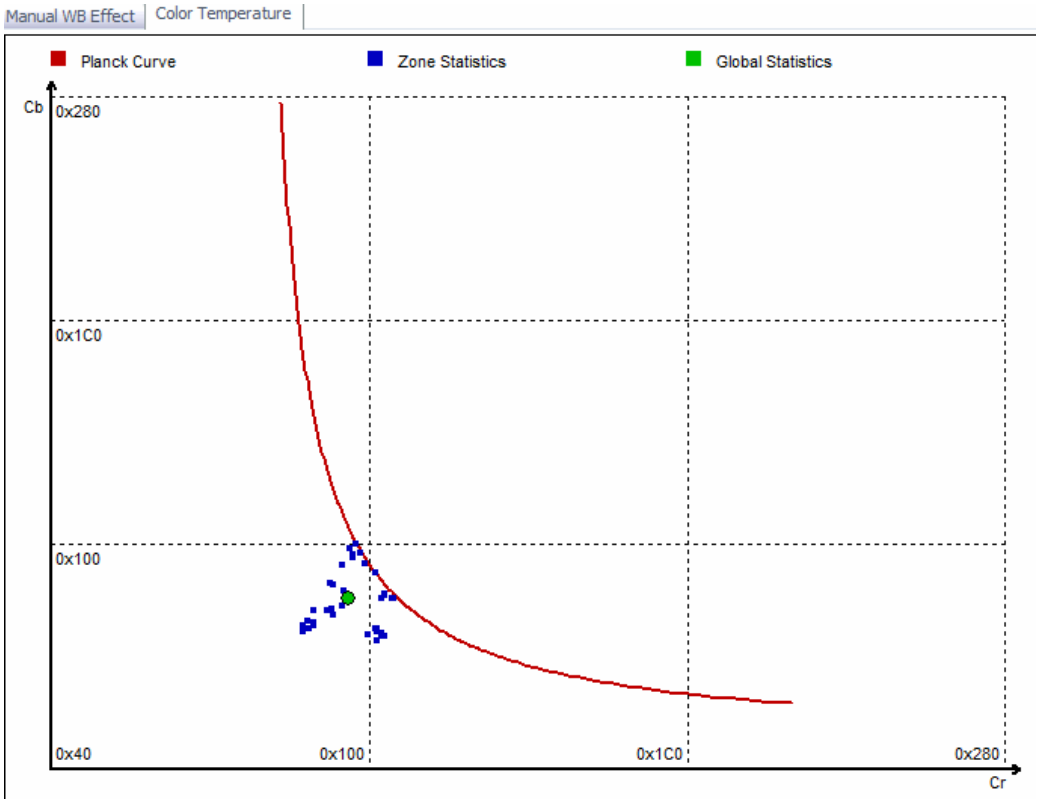
A picture is divided into 17 x 15 zones. Each zone displays the statistics of the current picture. The data in red indicates **ZoneRg**, and the data in green indicates **ZongRb**.

Selecting or deselecting **Show zone statistics on video view** shows or hides zone statistics.

2.4.3.4 Viewing the Color Temperature Curve and Statistics Chart

On the **Color Temperature** tab page, the white balance analyzer displays the color temperature curve and statistics chart, as shown in Figure 2-31.

Figure 2-31 Color temperature curve and statistics chart



The red curve indicates the color temperature curve, the blue points indicate the statistics of zones, and the green point indicates the global statistics.

2.5 Parameter Descriptions

This section describes the APIs in the SDK corresponding to module parameters. For details, see the *HiISP Development Reference*.

2.5.1 Top Parameter

Table 2-3 lists the API corresponding to the top module.

Table 2-3 API corresponding to the parameter related to top

Functional Module	SDK API
Top	HI_MPI_ISP_Init

2.5.2 Gamma Parameter

Table 2-4 lists the APIs corresponding to the parameter related to gamma.

Table 2-4 APIs corresponding to the parameter related to gamma

Functional Module	SDK API
Gamma	HI_MPI_ISP_GetGammaTable HI_MPI_ISP_SetGammaTable

2.5.3 ExposureAttr Parameters

Table 2-5 lists the APIs corresponding to the parameters related to exposure attributes.

Table 2-5 APIs corresponding to the parameters related to exposure attributes

Functional Module	SDK API
Exposure_type	HI_MPI_ISP_SetExposureType HI_MPI_ISP_GetExposureType
Manual_AE	HI_MPI_ISP_SetMEAttr HI_MPI_ISP_GetMEAttr
Exposure_EX	HI_MPI_ISP_SetAEAttrEx HI_MPI_ISP_GetAEAttrEx
Slow FrameRate	HI_MPI_ISP_SetSlowFrameRate HI_MPI_ISP_GetSlowFrameRate
AntiFlicker	HI_MPI_ISP_SetAntiFlickerAttr HI_MPI_ISP_GetAntiFlickerAttr

2.5.4 ExposureInfo Parameters

Table 2-6 lists the APIs corresponding to the parameters related to exposure information.

Table 2-6 APIs corresponding to the parameters related to exposure information

Functional Module	SDK API
ExposureInfo	HI_MPI_ISP_SetExpStaInfo HI_MPI_ISP_GetExpStaInfo
QueryInnerStateInfoEx	HI_MPI_ISP_QueryInnerStateInfoEx

2.5.5 AI Parameter

Table 2-7 lists the APIs corresponding to the parameter related to automatic iris (AI).

Table 2-7 APIs corresponding to the parameter related to AI

Functional Module	SDK API
AI	HI_MPI_ISP_SetAIAttr HI_MPI_ISP_GetAIAttr

2.5.6 WBAttr Parameters

Table 2-8 lists the APIs corresponding to the parameters related to white balance (WB) attributes.

Table 2-8 APIs corresponding to the parameters related to WB attributes

Functional Module	SDK API
WB type	HI_MPI_ISP_SetWBType HI_MPI_ISP_GetWBType
AWB Alg type	HI_MPI_ISP_SetAWBAlgType HI_MPI_ISP_GetAWBAlgType
AdvAWBAttr	HI_MPI_ISP_SetAdvAWBAttr HI_MPI_ISP_GetAdvAWBAttr
AWBAttr	HI_MPI_ISP_SetAWBAttr HI_MPI_ISP_GetMEAttr
MWBAttr	HI_MPI_ISP_SetAEAttrEx HI_MPI_ISP_GetAEAttrEx
BlackLevel	HI_MPI_ISP_SetSlowFrameRate HI_MPI_ISP_GetSlowFrameRate

2.5.7 WBInfo Parameter

Table 2-9 lists the APIs corresponding to the parameter related to WB information.

Table 2-9 APIs corresponding to the parameter related to WB information

Functional Module	SDK API
WBInfo	HI_MPI_ISP_SetWBStaInfo HI_MPI_ISP_GetWBStaInfo

2.5.8 CCM Parameters

Table 2-10 lists the APIs corresponding to the parameters related to color correction matrix (CCM).

Table 2-10 APIs corresponding to the parameter related to CCM

Functional Module	SDK API
ColorTemp	HI_MPI_ISP_GetColorTemp
CCM	HI_MPI_ISP_SetCCM HI_MPI_ISP_GetCCM

2.5.9 Timing and Image Parameters

Table 2-11 lists the APIs corresponding to the parameters related to timing and image.

Table 2-11 APIs corresponding to the parameter related to timing and image

Functional Module	SDK API
Timing	HI_MPI_ISP_GetInputTiming
Image	HI_MPI_ISP_SetImageAttr HI_MPI_ISP_GetImageAttr

2.5.10 DRC Parameter

Table 2-12 lists the APIs corresponding to the parameter related to dynamic range compression (DRC).

Table 2-12 APIs corresponding to the parameter related to DRC

Functional Module	SDK API
DRC	HI_MPI_ISP_SetDRCAttr HI_MPI_ISP_GetDRCAttr

2.5.11 Anti-False Parameter

Table 2-13 lists the APIs corresponding to the parameter related to anti-false.

Table 2-13 APIs corresponding to the parameter related to anti-false

Functional Module	SDK API
AntiFalse	HI_MPI_ISP_SetAntiFalseColorAttr HI_MPI_ISP_GetAntiFalseColorAttr

2.5.12 Anti-Fog Parameter

Table 2-14 lists the APIs corresponding to the parameter related to anti-fog.

Table 2-14 APIs corresponding to the parameter related to anti-fog

Functional Module	SDK API
AntiFog	HI_MPI_ISP_SetAntiFogAttr HI_MPI_ISP_GetAntiFogAttr

2.5.13 Defect Pixel Parameter

Table 2-15 lists the APIs corresponding to the parameter related to defect pixel.

Table 2-15 APIs corresponding to the parameter related to defect pixel

Functional Module	SDK API
Defect Pixel	HI_MPI_ISP_SetDefectPixelAttr HI_MPI_ISP_GetDefectPixelAttr

2.5.14 Shading Parameters

Table 2-16 lists the APIs corresponding to the parameters related to shading.

Table 2-16 APIs corresponding to the parameter related to shading

Functional Module	SDK API
ShadingAttr	HI_MPI_ISP_SetShadingAttr HI_MPI_ISP_GetShadingAttr
ShadingTable	HI_MPI_ISP_SetShadingTable HI_MPI_ISP_GetShadingTable

2.5.15 Denoise Parameter

Table 2-17 lists the APIs corresponding to the parameter related to denoise.

Table 2-17 APIs corresponding to the parameter related to denoise

Functional Module	SDK API
Denoise	HI_MPI_ISP_SetDenoiseAttr HI_MPI_ISP_GetDenoiseAttr

2.5.16 SharpenAttr Parameter

Table 2-18 lists the APIs corresponding to the parameter related to sharpen attributes.

Table 2-18 APIs corresponding to the parameter related to sharpen attributes

Functional Module	SDK API
SharpenAttr	HI_MPI_ISP_SetSharpenAttr HI_MPI_ISP_GetSharpenAttr

2.5.17 DemosaicAttr Parameter

Table 2-19 lists the APIs corresponding to the parameter related to demosaic attributes.

Table 2-19 APIs corresponding to the parameter related to demosaic attributes

Functional Module	SDK API
DemosaicAttr	HI_MPI_ISP_SetDemosaicAttr HI_MPI_ISP_GetDemosaicAttr

2.5.18 CrosstalkAttr Parameter

Table 2-20 lists the APIs corresponding to the parameter related to crosstalk attributes.

Table 2-20 APIs corresponding to the parameter related to crosstalk attributes

Functional Module	SDK API
CrosstalkAttr	HI_MPI_ISP_SetCrosstalkAttr HI_MPI_ISP_GetCrosstalkAttr

2.5.19 DIS Parameters

Table 2-21 lists the APIs corresponding to the parameters related to digital image stabilization (DIS).

Table 2-21 APIs corresponding to the parameter related to DIS

Functional Module	SDK API
DISAttr	HI_MPI_ISP_SetDISAttr HI_MPI_ISP_GetDISAttr
DISInfo	HI_MPI_ISP_GetDISInfo

2.5.20 FPN Parameter

Table 2-22 lists the APIs corresponding to the parameter related to fixed pattern noise (FPN).

Table 2-22 APIs corresponding to the parameter related to FPN

Functional Module	SDK API
FPN	HI_MPI_ISP_QueryInnerStateInfoEx

2.5.21 VPSS Parameter

Table 2-23 lists the APIs corresponding to the parameter related to the video processing subsystem (VPSS).

Table 2-23 APIs corresponding to the parameter related to the VPSS

Functional Module	SDK API
GRP_PARAM	HI_MPI_VPSS_SetGrpParam HI_MPI_VPSS_GetGrpParam

3 Application Reference

3.1 Importing and Exporting HiSilicon PQ Tools Parameters

A configuration file can be imported to or exported from the HiSilicon PQ Tools, and HiSilicon PQ Tools parameters can be hardened on the board.

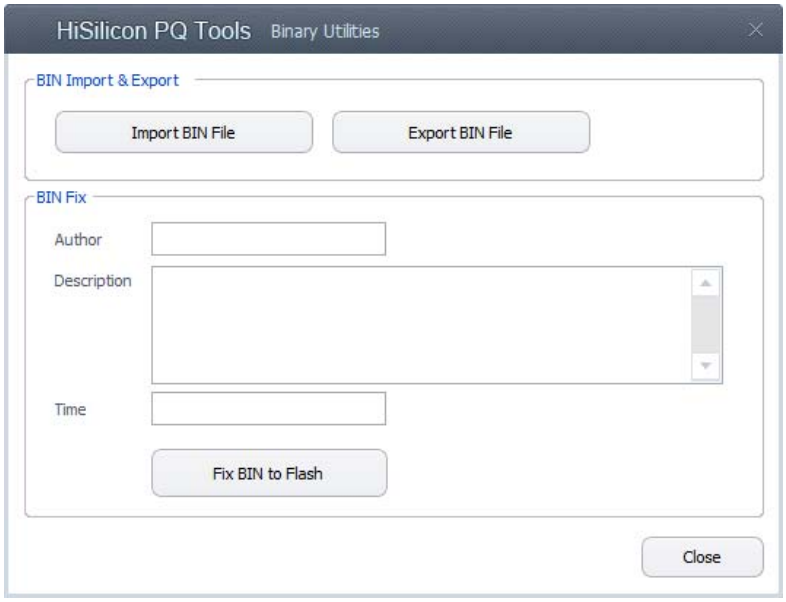
To import a parameter file to the HiSilicon PQ Tools or export the parameters used by the HiSilicon PQ Tools, save or open a .sav file by following section 2.4.3.2 "Online Analysis by Connecting the HiSilicon PQ Tools to the Board" and section 2.4.3.3 "Viewing the Statistics of the Real-Time Picture and Zones."

To import parameters to the board or export parameters from the board for backup, use the binary data processing function as follows:

Step 1 Import a .bin file to the board or export parameters from the board as a .bin file.

After the board is connected and a PQ table is opened, click  on the toolbar to open the **Binary Utilities** dialog box shown in Figure 3-1.

Figure 3-1 Binary Utilities dialog box



The **Binary Utilities** dialog box allows you to perform the following operations:

1. Export parameters from the board as a .bin file: Click **Export BIN File**, set a file name and save path, and click **Save** in the displayed **Save As** dialog box. Then the current parameters of the board are saved in the specified path.

CAUTION

The exported .bin file is dedicated for the board and can be opened only by importing it in the **Binary Utilities** dialog box.

2. Import a .bin parameter file to the board: Click **Import BIN File**, select a .bin parameter file, and click **Open** in the displayed **Open** dialog box. After the HiSilicon PQ Tools sends the imported file to the board, the parameters take effect immediately.
3. Harden parameters: Enter information in **Author**, **Description**, and **Time** in the **BIN Fix** group box, and click **Fix BIN to Flash**. Then the HiSilicon PQ Tools sends a hardening command to the board to write the current PQ parameters of the board to the flash memory.

Step 2 Harden configurations to the flash memory.

Harden the .bin file: Click  on the toolbar to open the **Binary Utilities** dialog box. Enter information in **Author**, **Description**, and **Time** in the **BIN Fix** group box, and click **Fix BIN to Flash**. Then the board generates a .bin file in the specified save path based on the current parameters of the board. You can configure the .bin file. There is a **config.cfg** file in the directory where the board program is located. The **[Fix]** and **[Export]** items in **config.cfg** indicate the path of the .bin file to be hardened and the path of the .bin file exported from the board respectively. You can enter paths and file names in **[Fix]** and

[Export]. For example, if **fixfile.bin** is entered in **[Fix]**, the current path is the path of the .bin file to be hardened, and the file to be hardened is **fixfile.bin**.

----End

3.2 Configuring the Board to Support a New Sensor

Modify the corresponding parameters in the configuration files in the release package, and make the modifications take effect on the board.

WARNING

The format of the modified configuration files must be the same as that of the configuration files in the release package.

Use either of the following methods for the modified parameters to take effect:

- Open the specified configuration file on the board.

  Run the **HiIspTool.sh** script in the following format:

  `./HiIspTool.sh` *Service to be started Service start mode Configuration file name*

  For example, to start all services, run the following command:

  `./HiIspTool.sh -a -p filename`

  To start the ittb_control, run the following command:

  `./HiIspTool.sh -c`

  To start the stream tools, run the following command:

  `./HiIspTool.sh -s -p file`

  To obtain help information, run the following command:

  `./HiIspTool.sh -h`

WARNING

All configuration files are written to the **configs** folder of the release package of the HiSilicon PQ Tools.

TIP

If **Filename** is left blank, the default configuration file is used. The path of **filename** is specified in the **[SensorConfig]** field in the **config.cfg** file of the release package.

- Send the configuration file on the PC.

Step 1 Start the tool on the board by running one of the following commands over the serial port:

- **./HiIspTool.sh -a –s** (for starting all services)

- **./HiIspTool.sh –s –s** (for starting only the VOD service)

Step 2 Start the tool on the PC.

Choose **HTTP_Stream** on the main GUI of the HiSilicon PQ Tools, click **config**, click **Browse** to select a sensor configuration file, and then click **Send**.

----End

3.3 Using an External VOD Tool

The tool on the board is started based on the configuration in the **./HiIspTool.sh** script. Before using an external VOD tool, you need to modify the script.

The script is divided into two parts:

- Preparations

```
killall ittb_stream; #Kill the ittb_stream process.
killall ittb_control; #Kill the ittb_control process.
DLL_PATH=${LD_LIBRARY_PATH}:${PWD}/libs; #Specify a library path.
export LD_LIBRARY_PATH=${DLL_PATH}#Export the library.
```

NOTE

- **LD_LIBRARY_PATH** indicates the name of the Linux environment variable that is used to specify a path excluding the default path when the shared library (dynamic link library) is searched. The specified path is searched before the default path.
- The HiSilicon PQ Tools uses the compiled dynamic libraries that are stored in the **libs** folder of the release package. When a function is performed, the corresponding dynamic library is linked. If the dynamic library does not exist in the default path **/lib** or **/usr/lib**, **LD_LIBRARY_PATH** needs to be specified.

- Run the following script to run the executable program:

```
./ittb_control &
```

The VOD tool of the HiSilicon PQ Tools must be masked before the external VOD tool is used. You can use only ittb_control by running **./HiIspTool.sh –c**.

TIP

If **LD_LIBRARY_PATH** has been set for the external VOD tool, run ittb_control directly.

3.4 Replacing the 3A Algorithm

You can change the value corresponding to an address by configuring the .xml file. To replace the 3A algorithm, update the address and format options of the 3A algorithm in the .xml file (for details, see section 3.5 "Adding Adjustment Options for Physical Registers"), and import the configured .xml file by using the HiSilicon PQ Tools.

3.5 Adding Adjustment Options for Physical Registers

The following 15 parameter adjustment options are provided in the released .xml file. If you want to add options, enter them in the format of the existing options in the .xml file.

- **Page Name**: current page name
- **Group Name**: module name
- **IsEntirety**: Its value is **TURE** or **FALSE**. **TURE** indicates that the entire group of a module is read and written, which applies only to the scenario of calling APIs. Select **FALSE** when adding physical registers and virtual registers.
- **Field Name**: register names
- **Type**: For the common value, set **Type** to **virtual** or **physical** (not indicating the physical or virtual register); for two values (such as enable and disable), set **Type** to **bool**; for the enumeration, set **Type** to **list**; for the matrix, set **Type** to **matrix**.
- **Parameter**: Set it only when **Type** is **list**.
- **Radix**: **10** (decimal value on the GUI) or **16** (hexadecimal value on the GUI)
- **Signed**: signed or unsigned data
- **Address**: register address . It is the most important option, and a correct register address is required.
- **AddressType**: register type (physical or virtual register). Enter **Physical** here.
- **BitRange**: register bit range. For example, 0−3 indicate bits 0−3 of the start address.
- **ValueRange**: value range of register parameters
- **Options**: register attribute (read/write or read-only)
- **DisplayCalc**: formula for the conversion calculations for some parameters. Left this option blank if no conversion calculation is required.
- **Description**: parameter description that is displayed on the GUI

After you add register adjustment options and set the preceding 15 options in sequence, the new options are displayed on the GUI when the HiSilicon PQ Tools runs.

Figure 3-2 shows the DRC parameter adjustment GUI, and Figure 3-3 is the corresponding .xml file.

Figure 3-2 DRC parameter adjustment GUI

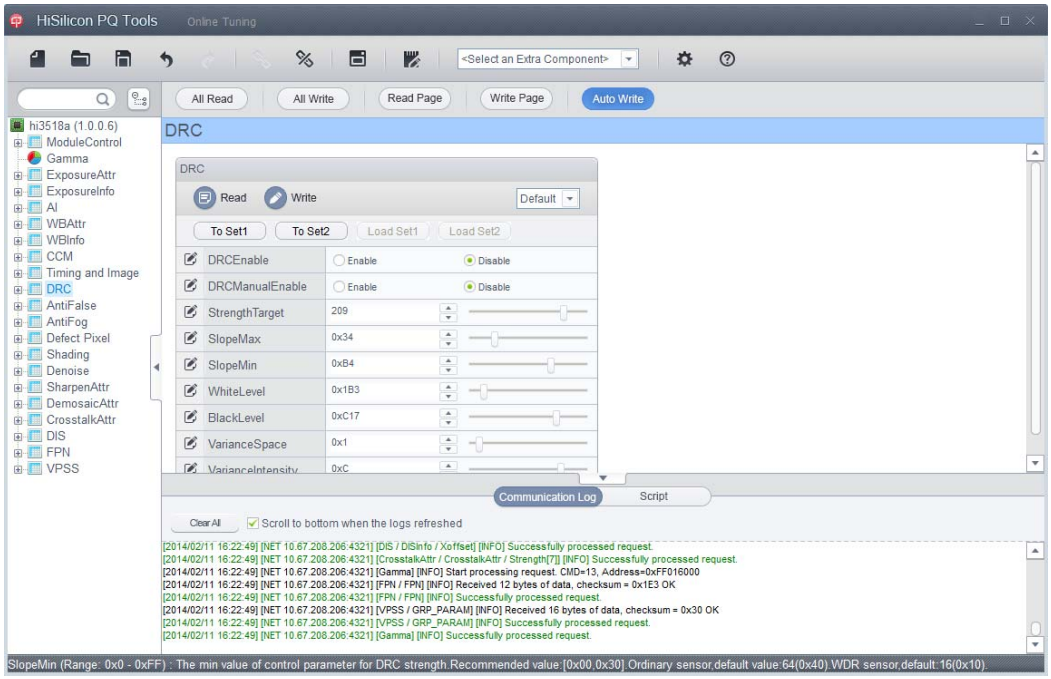


Figure 3-3 .xml configuration file of DRC parameters

4 FAQs

4.1 What Do I Do If the HiSilicon PQ Tools Version and .xml File Version Mismatch?

[Symptom]

The HiSilicon PQ Tools on the board end can be properly started. However, when the board is connected after an .xml file is opened, a message is displayed, indicating that the HiSilicon PQ Tools version on the board end and the .xml file version mismatch.

[Cause Analysis]

The version of the HiSilicon PQ Tools on the board end is later than the .xml file version.

[Solution]

Check the SDK version and update the .xml file based on the HiSilicon PQ Tools corresponding to the current SDK version.

4.2 What Do I Do If the ITTP_Stream GUI Is Overlaid with the Main GUI of the HiSilicon PQ Tools?

[Symptom]

If a PQ parameter is set on the main GUI of the HiSilicon PQ Tools after the ITTP_Stream is started, the ITTP_Stream GUI is overlaid with the parameter adjustment GUI.

[Cause Analysis]

The pin on top function of the ITTP_Stream is not set.

[Solution]

Right-click the toolbar of the ITTP_Stream, and choose **Window Top** from the shortcut menu.

4.3 How Do I Tailor the Tool Package on the Board?

[Symptom]

When the entire tool package is loaded to the board, the board space is insufficient.

[Cause Analysis]

The tool package needs to be tailored.

[Solution]

Do as follows:

- Tailor configuration files: Delete the configuration files that are not required from the **configs** folder.
- Tailor library files: Delete the sensor libraries that are not required from the **libs** folder. For example, if there is the **libstdc++.so.6** file in both **/lib** and **/usr/lib**, delete it from the **libs** folder.
- Tailor functions: Tailor the VOD function.
  - Delete the **configs** folder.
  - Delete the **ittb_stream** executable file.
  - Delete **cacert.pem**, **privkey.pem**, **webserver.conf**, and **StartControl.sh**.

4.4 How Do I Set Associated Parameters?

[Symptom]

Some parameters are associated with others. For example, the maximum value of parameter A may depend on the current value of parameter B in the same group. However, the maximum value of parameter A displayed on the GUI is always the maximum value of parameter B currently. You need to ensure that the adjusted value of parameter A is less than or equal to the current value of parameter B. Otherwise, the picture quality is affected. For details about the value range and description of variables, see their tips on the GUI.

[Cause Analysis]

Table 4-1 lists all associated parameters.

Table 4-1 Associated parameters

Corresponding Functional Module	Corresponding SDK API	Associated Parameter
Exposure_EX	HI_MPI_ISP_SetAEAttrEx HI_MPI_ISP_GetAEAttrEx	**ExpTimeMin** and **ExpTimeMax** **AGainMin** and **AGainMax** **DGainMin** and **DGainMax**
ExposureInfo	HI_MPI_ISP_SetExpStaInfo HI_MPI_ISP_GetExpStaInfo	**ExpHistThresh[0]** **ExpHistThresh[1]** **ExpHistThresh[2]** **ExpHistThresh[3]** Their values must meet the following condition: **ExpHistThresh[0]** < **ExpHistThresh[1]** <

Corresponding Functional Module	Corresponding SDK API	Associated Parameter
		ExpHistThresh[2] < **ExpHistThresh[3]**.
WBInfo	HI_MPI_ISP_SetWBStaInfo HI_MPI_ISP_GetWBStaInfo	**WhiteLevel** and **BlackLevel** **CbMin** and **CbMax** **CrMin** and **CrMax**
CCM	HI_MPI_ISP_SetCCM HI_MPI_ISP_GetCCM	**HighColorTemp** **MidColorTemp** **LowColorTemp** The maximum value of **MidColorTemp** is **HighColorTemp** minus 400, and the maximum value of **LowColorTemp** is **MidColorTemp** minus 400.
Denoise	HI_MPI_ISP_SetDenoiseAttr HI_MPI_ISP_GetDenoiseAttr	**ThreshTarget** and **ThreshMax**
SharpenAttr	HI_MPI_ISP_SetSharpenAttr HI_MPI_ISP_GetSharpenAttr	**StrengthMin** and **StrengthTarget**

For details about associated parameters, see the *HiISP Development Reference*.

[Solution]

Set associated parameters by following Table 4-1 and the *HiISP Development Reference*.

4.5 What Do I Do If the Out-of-Memory Issue Occurs on the Board?

[Symptom]

When the ITTP_Stream, HiPQ Color Checker, HiPQ RAW Analyzer, and HiPQ White Balance Analyzer are running and data is read and written by clicking the **All Read** and **All Write** buttons, the out-of-memory issue occurs on the board.

[Cause Analysis]

The DDR memory is insufficient.

[Solution]

Allocate a larger space for the OS. For details about how to allocate the DDR space, see the *Description of the Installation and Upgrade of the Hi3518 SDK*.