DWIN Beauty Screen Development Guide

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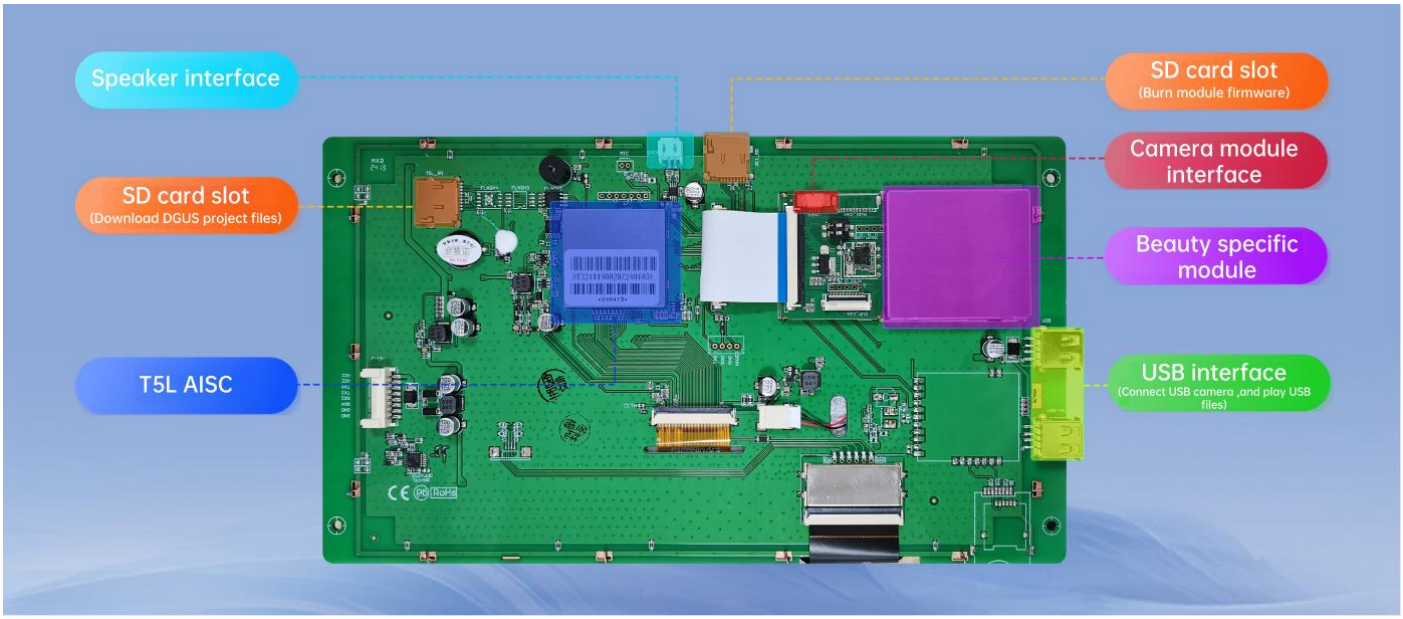
1. Product Overview

1.1 Application Introduction

The DGUS beauty screen mainly comprises of T5L ASIC and specialized beauty care module. T5L ASIC, as the main control chip running on standard DGUS software,it enables display of HD image captured by the camera.



Hardware interface diagram

1.2 Product Features

(1) The beauty screen is equipped with a “DWIN Magic Mirror” high-definition (5MP, 1080P) camera as the acquisition source. Leveraging state-of-the-art AI skin detection technology, the captured images are analyzed to provide a multi-dimensional assessment of skin quality. This includes the detection of wrinkles, blackheads, eye bags, dark circles, and hyperpigmentation.

(2) Skin magnification analysis: The USB camera enables up to 500x magnification, providing high-resolution images for detailed skin analysis. The system can capture 3-6 images for time-lapse comparison, with all images fully zoomable.

(3) Cloud synchronization view: Synchronize the screen data to the cloud via WeChat mini apps for an easier viewing of all pictures and analysis results. Please ensure a stable internet connection.

(4) Video Playback: Support video playback directly from USB drive and SD card.

2. Product Selection

2.1 Beauty Screen Selection Table

Model	Size	Resolution	LCD Type	Touch Type	Color	Operating voltage (V)	Operating Temperature (℃)	Video Playback	Skin Analysis
DT321X190020 Z240103C	7.0	800*480	TN	Capacitive touch	24 bit,16.7M	6~15	-20~70	×	√
DT321X190020 Z240103D	8.0	800*600	TN	Capacitive touch	24 bit,16.7M	6~15	-20~70	×	√
DT321X190020 Z240103E	10.1	1024*600	IPS	Capacitive touch	24 bit,16.7M	6~15	-20~70	×	√
DT321X190020 Z240103H	15.6	1920*1080	IPS	Capacitive touch	24 bit,16.7M	12~36	-10~60	×	√
DT321X190020 Z240103K	10.4	1024*768	TN	Capacitive touch	24 bit,16.7M	7~36	-20~70	√	×
DT321X190020 Z240103L	10.1	1024*600	IPS	Capacitive touch	24 bit,16.7M	6~15	-20~70	√	×
DT321X190020 Z240103M	15.6	1920*1080	IPS	Capacitive touch	24 bit,16.7M	12~36	-10~60	√	×
DT321X190020 Z240103N	8.0	800*600	TN	Capacitive Touch	24 bit,16.7M	6~15	-20~70	√	×

* K/L/M/N models come with the screen only, without camera, Wi-Fi or other accessories.

3. System Variable Interface

A portion of the variable address space is already allocated to the beauty screen function. As a result, these addresses are unavailable for use in DGUS development. The beauty screen is primarily controlled through variable address 0x0600.

0x0000-0x0FFF: System variable addresses, reserved for the DGUS system.

0x1000-0x2FFF: Dedicated to the basic display logic of the beauty screen. Specifically, 0x1100-0x17FF stores the analysis results from the magic mirror, 0x1800-0x18FF displays flag bits, and 0x2800-0x2FFF displays QR code data. The remaining addresses are reserved for future use (only applicable in versions with magic mirror analysis).

0x7000-0xFFFF: Allocated for image storage expansion, typically enabled by default.

Should you need to modify the address listed above, it will require an update to the underlying code. Please reach out to your dedicated sales engineers for assistance.

3.1 Basic Function Interface for Beauty screen

Setting different key values for the 0x0600 variable address enables the basic functions of the beauty screen, as shown in the table below.

Note

(1) The respective flag bits detailed in the table can be configured through either the factory-provided lib file or the screen configuration settings. Configurations applied via the lib file are persistently stored after power-off once flashed. Utilizing screen configuration requires a one-time Flash write operation via the interface specified in the table below, and the changes will take effect upon system reboot.

(2) Checking the flag bit (as described in the table) means: if the flag bit is 0x5A, jump to the corresponding page.

Key value	Functional classification	Description
0x5A01	Magic Mirror Analysis	Take a photo.Then it will switch to transition page 19. Once the data returns, it will switch to page 21.
0x5A02	Magic Mirror Analysis	Upload the photo. Upon photo upload, the system will verify the user's authentication status (determining if it's a personal or business account) and switch to transitory page 22. If not authenticated, it will switch to page 23 and display a payment QR code. If authenticated, it will switch to page 24, upload the photo, and then switch to the "Magic Mirror Result" page 27 once the processing is complete.
0x5A03	Magic Mirror Analysis	Return from”Take a photo”, and the camera will automatically restart.
0x5A04	Magic Mirror Analysis	When switching from “Magnifying Glass” mode to “Magic Mirror Analysis” mode, the magnifying glass camera will be turned off and the magic mirror analysis camera will be activated. The system will then switch to transition page 18. Once the analysis results are ready, it will switch to page 20.

Key value	Functional classification	Description
0x5A05	Magic Mirror Analysis	Return from the zoom in function of the magic mirror analysis result page.
0x5A06	Magic Mirror Analysis	Return from the QR code payment page.
0x5A07	Magic Mirror Analysis	Return from the request transitory page.
0x5A08	Magic Mirror Analysis	Enter the zoom in function of the magic mirror analysis result page. Go to page 28 if there's a picture.
0x5A09	Magic Mirror Analysis	Return from the switching page and go back to the previous mode.
0x5A10-0x5A20	Magic Mirror Analysis	Choose one magic mirror analysis result and activate playback if there's an image.
0xA501	Magnifying Glass	a) For factory project with "Magic Mirror Analysis" Activate the "Magnifying Glass" mode. Ensure the magic mirror analysis result camera is off before turning on the magnifying glass camera. This will switch to page 18. Once the result is returned, the page will switch to 50. b) For factory project with "Video Payback " Opening the "Magnifying Glass" mode directly will trigger a check of the magnifier main interface flag bit.
0xA502	Magnifying Glass	Take a screenshot. Capture the area indicated by the cursor. If there is already an image, it will be replaced.
0xA503	Magnifying Glass	Delete screenshot. Delete the picture indicated by the cursor.
0xA504	Magnifying Glass	Cursor moves to the left
0xA505	Magnifying Glass	Cursor moves to the right
0xA506	Magnifying Glass	a) For factory project with "Magic Mirror Analysis" Go to the magnifying glass details page, then switch to page 51. b) For factory project with "Video Playback" No more available.
0xA507	Magnifying Glass	Returning from the magnifying glass details page will trigger a check of the flag bit for the magnifying glass main interface.
0xA508	Magnifying Glass	Upload the screenshot to the cloud platform. The system will then switch to page 53. Once the upload is complete, it will return to page 50.
0xA509	Magnifying Glass	Switching from the magnifying glass page to the details page will trigger a check of the flag bit for the magnifying glass details page.
0xA50A	Magnifying Glass	a) Factory project with "Magic Mirror Analysis" Unavailable b) For Factory project with "Video Playback" Turning off the camera will trigger a check of the menu page flag bit.

Key value	Functional classification	Description
0xA510-0xA516	Magnifying Glass	Select a picture to zoom in.
0x50**	Magic Mirror Analysis	Zoom in on the picture shot by “Magic Mirror Analysis”. 0x5001: Move left 0x5002: Move right 0x5003: Move up 0x5004: Move down 0x5005: Zoom in 0x5006: Zoom out 0x5007: Reset
0x51**	Magic Mirror Analysis	Zoom in on the returned picture outputted by “Magic Mirror Analysis”. 0x5001: Move left 0x5002: Move right 0x5003: Move up 0x5004: Move down 0x5005: Zoom in 0x5006: Zoom out 0x5007: Reset
0x52**	Magnifying Glass	Zoom in on the picture shot by “Magnifying Glass”. 0x5001: Move left 0x5002: Move right 0x5003: Move up 0x5004: Move down 0x5005: Zoom in 0x5006: Zoom out 0x5007: Reset
0xAA07	WIFI Settings	Connect to WIFI: When connecting to Wi-Fi, the flag bit for the Wi-Fi connecting transition page is checked. Subsequently, upon successful establishment of the Wi-Fi connection, the Wi-Fi connection flag bit is checked.
0xAA08	WIFI Settings	Cancel WIFI connection: In the event of connection cancellation, the flag bit for the Wi-Fi scanning transition page is checked. Following the return of the result, the Wi-Fi scanning flag bit is checked.
0xAA09	WIFI Settings	Scan WIFI: When WIFI scanning is in progress, the WIFI scanning transition page flag is checked. The WIFI scanning flag will be checked after the result is returned.
0xAA12	WIFI Settings	Swipe up the page to Scan WIFI: Initiating a WIFI scan by swiping up the page will trigger a check of the WIFI scanning transition page flag. Once the results are returned, the WIFI scanning flag will be checked.
0xAA13	WIFI Settings	Swipe down the page to Scan WIFI: Initiating a WIFI scan by swiping down the page will trigger a check of the WIFI scanning transition page flag. Once the results are returned, the WIFI scanning flag will be checked.

Key value	Functional classification	Description
0xAF01-0xAF05	WIFI Settings	Five results will appear after each scan. Use “Page up” and “Page down” for selection.

Note:

(1) For models that don't come with Magic Mirror analysis from the factory, all addresses related to Magic Mirror analysis has been annotated. Please avoid using it.

(2) The transition page has been fixed during the design process. If you plan to develop your own project, please avoid using the transition page shown in the table. For further customization, please contact support team.

(3) Upon powering on, the factory project with magic mirror analysis will switch to the magnifying glass main page, while the factory project with video playback will switch to the configured menu page.

(4) The following are fixed number of special pages.

a) Factory projects with magic mirror analysis:

Magic mirror analysis main page: 20

Magic mirror analysis confirmation page: 21

WIFI scan page : 25

WIFI connection page : 26

Magic mirror analysis result page: 27

Store page: 29

Magnifying glass main page: 50

Magnifying glass detail page: 51

Magnifying glass thumbnail enlargement page: 52

b) Factory project with video playback:

Magic mirror analysis result page: 27

The following pages are configurable:

WIFI scan page: 25

WIFI connection Page: 26

Magic mirror analysis result page: 27

Store page: 29

Magnifying glass main page: 50

Magnifying glass detail page: 51

Magnifying glass thumbnail enlargement page: 52

Video playback page: 61

Video full-screen playback page: 62

3.2 Application Interface for Video Playback

Video playback function is achieved through variable address 0x0600 (refer to table below). The program scans the "VIDEO" directory for video files and the "MUSIC" directory for audio files. It is imperative that video/audio files are saved in correct named directory, otherwise audio and video files may not play properly.

Key value	Functional classification	Description
0x0001	Video Playback	Scroll down the video playlist. It needs to be queried before flipping pages.
0x0002	Video Playback	Scroll up the video playlist. It needs to be queried before flipping pages.
0x002b	Video Playback	Query videos from internal flash storage
0x002a	Video Playback	Query videos from U-disk driver
0x0020	Video Playback	Query videos from SD card
0x000d	Video Playback	Pause
0x0013	Video Playback	Resume playback
0x0004	Video Playback	Pause
0x0021-0x0025	Video Playback	Select the 1st to 5th video for playback
0x011A	Flash Control	Trigger a one-time unified Flash write of parameters located after address 0x0580. If dealing with screen settings, this step is required.

3.3 Other Application Programming Interfaces

For the functions of other system variable interfaces for beauty screens, please refer to the following table.

VP address	Definition	Remark
0x0580	Resolution setting	0x0000: 1920*1080 0x0001: 1024*600 0x0002: 800*600 0x0003: 800*480 0x0004: 1024*768 This setting is for the screen resolution. Specific display settings are configured for different resolutions. Other values are invalid and factory-set, please do not modify them.
0x0581	Frequency division factor setting	Range: 7-12 This setting is for the frequency division factor. It is recommended to use divide-by-7 for 2K resolution and divide-by-12 for other resolutions. It's preset at factory mode and please don't modify it arbitrarily.
0x0582	Image quality setting	Range: 50-85. Higher photo quality requires more storage space. Suggested value: 80.
0x0583	Quantity of screenshots	1-6.
0x0584	Camera format	0x0000: Default 0x0001: yuyv 0x0002: NV21 0x0004: mjpeg Configure based on supported resolutions and formats. By clicking "Debug Camera", you can view the supported formats and resolutions. Based on the results, select a suitable camera format.
0x0585	Camera resolution	0x0000: 1920*1080 0x0001: 1024*600 0x0002: 800*600 0x0003: 800*480 0x0004: 640*480 0x0005: 320*240 0x0006: 1280*720 By clicking "Debug Camera" to view the supported formats and resolutions. Select a suitable camera resolution based on the results.
0x0586	Display height of the Video Page	This setting is used for configuring the main interface display position of the video page.
0x0587	Display width of the Video Page	
0x0588	The X-coordinate of the top vertex of the video page	

0x0589	The Y-coordinate of the top vertex of the video page	
0x058A	Display height for the “magnifying glass” interface	This setting is used for configuring the main interface display position of the “magnifying glass”.
0x058B	Display Width for the “magnifying glass” main interface.	
0x058C	The X-coordinate of the top vertex of the “magnifying glass” main interface.	
0x058D	The Y-coordinate of the top vertex of the “magnifying glass” main interface.	
0x058E	Display height of the magnifying glass detail page	This setting is used for configuring the display position of the “magnifying glass” detail page.
0x058F	Display Width of the magnifying glass detail page	
0x0590	The X-coordinate of the top vertex of the magnifying glass detail page	
0x0591	The Y-coordinate of the top vertex of the “magnifying glass detail page	
0x0592	Display height of the magnifying glass enlargement page	This setting is used for configuring the display position of the “magnifying glass” enlargement page.
0x0593	Display Width of the magnifying glass enlargement page	
0x0594	The X-coordinate of the top vertex of the magnifying glass enlargement page	
0x0595	The Y-coordinate of the top vertex of the magnifying glass enlargement page	
0x0596	Thumbnail display height	used for setting the thumbnail display height
0x0597	Thumbnail display width	used for setting the thumbnail display width
0x0598	X-coordinate of the first thumbnail	used for setting the X-coordinate of the first thumbnail
0x0599	Y-coordinate of the first thumbnail	used for setting the Y-coordinate of the first thumbnail
0x059A	X-coordinate of the second thumbnail	used for setting the X-coordinate of the second thumbnail
0x059B	Y-coordinate of the second thumbnail	used for setting the Y-coordinate of the second thumbnail

0x059C	X-coordinate of the third thumbnail	used for setting the X-coordinate of the third thumbnail
0x059D	Y-coordinate of the third thumbnail	used for setting the Y-coordinate of the third thumbnail
0x059E	X-coordinate of the fourth thumbnail	used for setting the X-coordinate of the fourth thumbnail
0x059F	Y-coordinate of the fourth thumbnail	used for setting the Y-coordinate of the fourth thumbnail
0x05A0	X-coordinate of the fifth thumbnail	used for setting the X-coordinate of the fifth thumbnail
0x05A1	Y-coordinate of the fifth thumbnail	used for setting the Y-coordinate of the fifth thumbnail
0x05A2	X-coordinate of the sixth thumbnail	used for setting the X-coordinate of the sixth thumbnail
0x05A3	Y-coordinate of the sixth thumbnail	used for setting the Y coordinate of the sixth thumbnail.
0x05A4	Menu page settings	The high byte 0x5A indicates page switching is enabled, and the low byte is the page number.
0x05A5	Magnifying glass main page settings	
0x05A6	Magnifying glass detail page settings	
0x05A7	Hot-pluggable page settings	
0x05A8	Magnifying glass enlargement page settings	
0x05A9	Video page settings	
0x05AA	Magnifying glass upload page settings	
0x05AB	Set the address for the user phone number within the WeChat Mini Program.	This sets the address for the user phone number within the WeChat Mini Program, requiring a space of 0x10 word addresses.
0x05AC	Set the address for the username within the WeChat Mini Program.	This sets the address for the username within the WeChat Mini Program, requiring a space of 0x10 word addresses.
0x05AD	Address settings for WeChat Mini Program QR codes	Address settings for WeChat Mini Program QR codes, requiring 0x80 word address in length.
0x05AE	IP address settings	IP address settings, requiring 0x10 word address in length.
0x05AF	MAC address settings	MAC address settings, requiring 0x10 word address in length.
0x05B0	Address settings for the WeChat Mini Program store QR codes	Address settings for the WeChat Mini Program store QR codes, requiring 0x80 word address in length.

0x05B1	QR code address settings for synchronous screen display	This sets the QR code address for synchronous screen display, requiring 0x80 word address in length.
0x05B2	Address settings for offline login QR code	This sets the offline login QR code address, requiring 0x80 word address in length.
0x05B3	Start address settings for camera support parameters	This sets the starting address for camera support parameters, requires 0x20 word address in length.
0x05B4	Reserved	-
0x05B4	Reserved	-
0x05B6	83 instruction flag settings based on 82 instruction return	0 = disabled. When writing with the 82 command, the 83 command is not returned. Any other value indicates the return.
0x05B7	Reserve	-
0x05B8	WIFI scan page settings	The high byte 0x5A indicates page switching is enabled, and the low byte is the page number.
0x05B9	WIFI connection page settings	The high byte 0x5A indicates page switching is enabled, and the low byte is the page number.
0x05BA	Transition page settings for WIFI connection page	The high byte 0x5A indicates page switching is enabled, and the low byte is the page number.
0x05BB	Transition page settings for WIFI connection page	The high byte 0x5A indicates page switching is enabled, and the low byte is the page number.
0x05BC	Settings for the animated icon on the transition page	This flag relates to the animated icon shown on the transition page. It is recommended to keep it at 1 under normal circumstances and not alter it unless specifically required.
0x05BD	Settings for store page	The high byte 0x5A indicates page switching is enabled, and the low byte is the page number.
0x05BE	Start address settings for the WIFI scan result	This space holds 5 results, with each result using 0x10 words of addressable memory.

4. Serial Port Protocol

The beauty screen product offers two serial ports (UART2 and UART4) for external connectivity. UART2 is preconfigured to use the DWIN 82/83 protocol and allows the Baud Rate and CRC check to be configured via the CFG file. UART4 allows users to analyze and customize protocols based on specific requirements. UART2 is preset with the default configuration of 115200, 8N1, indicating the Baud Rate of 115200, 8 data bits, no check bit, and 1 stop bit.

4.1 Communication Data Frame

Data block	1	2	3	4	5

Definition	Frame header	Data length	Command	Data	CRC verification (optional)
Data length	2	1	1	N	2
Description	0x5AA5	Including commands, data, and verification	0x82/0x83		
Example (without verification)	0x5AA5	04	83	00 10 04	
Example (with verification)	0x5AA5	06	83	00 10 04	25 A3

4.2 Interface Instruction Description

Command	Data	Description	Response
0x82	Variable space first address (0x0000-0xFFFF) + the written data	Write data to a specified address in the variable space	None
0x83	Variable space first address (0x0000-0xFFFF) + read data in word length (0x01-0x7D)	Read the specified length data from the specified address in the variable space	Start address of variable space + Variable data in word length + the read variable data

4.3 Commands Instance

(1). Scan WIFI

82 command: 5A A5 05 82 06 00 AA09

Command meaning: Frame Header Command length 82 (Write variable space) System variable address Command content

Description: This command is used to scan WIFI, the demo will switch page automatically after execution.

(2). Read the first result of the scanned WIFI

83 command: 5A A5 04 83 19 00 10

Command meaning: Frame header Command length 83 (Read variable space) System variable address Read data length (in words)

Returned command: 5A A5 0* 83 19 00 DATA

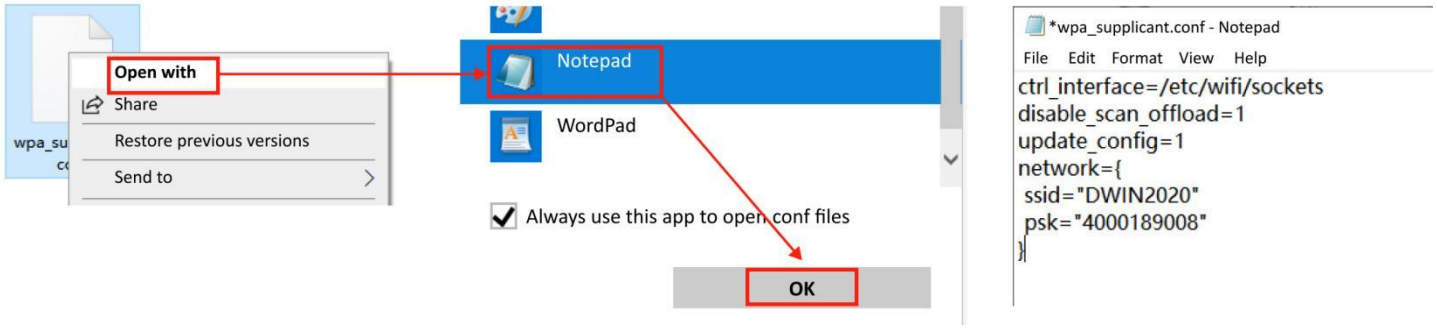
Command meaning: Frame header Command length 83 (Read variable space) System variable address The returned SSID result of WIFI

Description: This command can read the first scanned SSID information of WIFI.

5. Common Questions

1. How to connect to the WIFI network?

Method 1: Use Notepad to open the "wpa_supplicant. conf" file on the USB disk, fill in your written WIFI name (SSID) and password in the following format, save the file, and make sure to place it in the root directory of the USB disk. After the screen is powered on, the file parameters will be automatically read and WIFI configuration will be performed.




```
ctrl_interface=/etc/wifi/sockets
disable_scan_offload=1
update_config=1
network={
  ssid="WIFI name"
  psk="WIFI password"
}
```

Method 2: Manually search for and connect to Wi-Fi through the beauty screen interface. After entering the Wi-Fi password, proceed with network configuration and connection.

2. Why does the screen get stuck in an animation after clicking?

Upon powering on the screen, the system will boot up and automatically open the default camera after a "beep" sound. You can proceed with the operation once it’s complete.

3. Why can’t the camera be activated?

Please check if the camera is connected properly. If the issue persists after reconnecting the camera, try restarting the device.

4. Why can't the picture of face analysis move around when zoomed in?

You can't move the image at the original size. You must zoom in first before you can move it. The more you zoom in, the more you can move it.

5. Why is it stuck on the camera switch animation?

Check if the other camera is properly connected.

6. Why does the face photo keep failing to upload?

(1) Please make sure to face the camera directly and center your face on the screen, ensuring that both ears are visible.

(2) Please check your network connection and try reconnecting.

7. Why does facial analysis have no result for a long time?

The facial analysis process typically requires 15-20 seconds to complete.

8. Why can't I find WIFI in the search?

Ensure that the WIFI antenna is securely connected to the specified antenna port on the dedicated beauty device module. Avoid connecting it to the chip port on the motherboard. Please refer to the image below.

9. Why can't I find the WIFI I want to connect to?

You can try selecting any of the listed Wi-Fi networks, deleting it, and then manually entering the name of the network you want to connect to. Alternatively, you can refresh the Wi-Fi list.

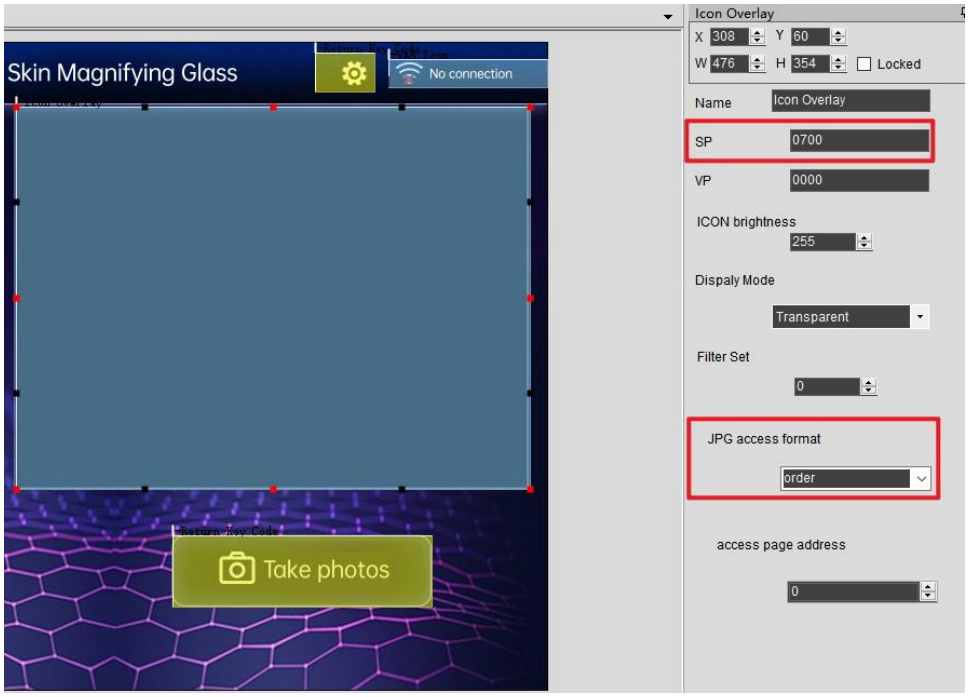
Only the 15 strongest Wi-Fi signals are displayed.

10. How to use the WeChat Mini App?

After connecting to the internet, A QR code will automatically display in the home page. Scan the code to enter the Magic Mirror Mini Program, and you could view your usage history.

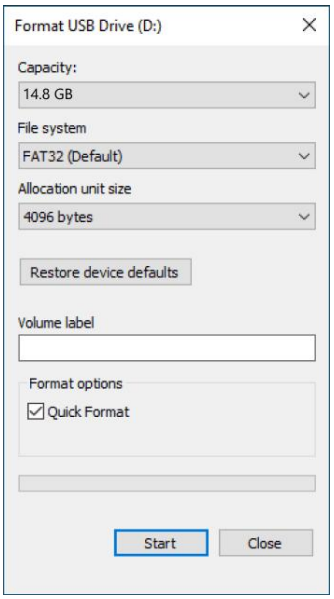
11. How to set up camera control?

Use the icon overlay control. Please refer to the image below for variable addresses and parameter settings. Do not modify them without authorization.

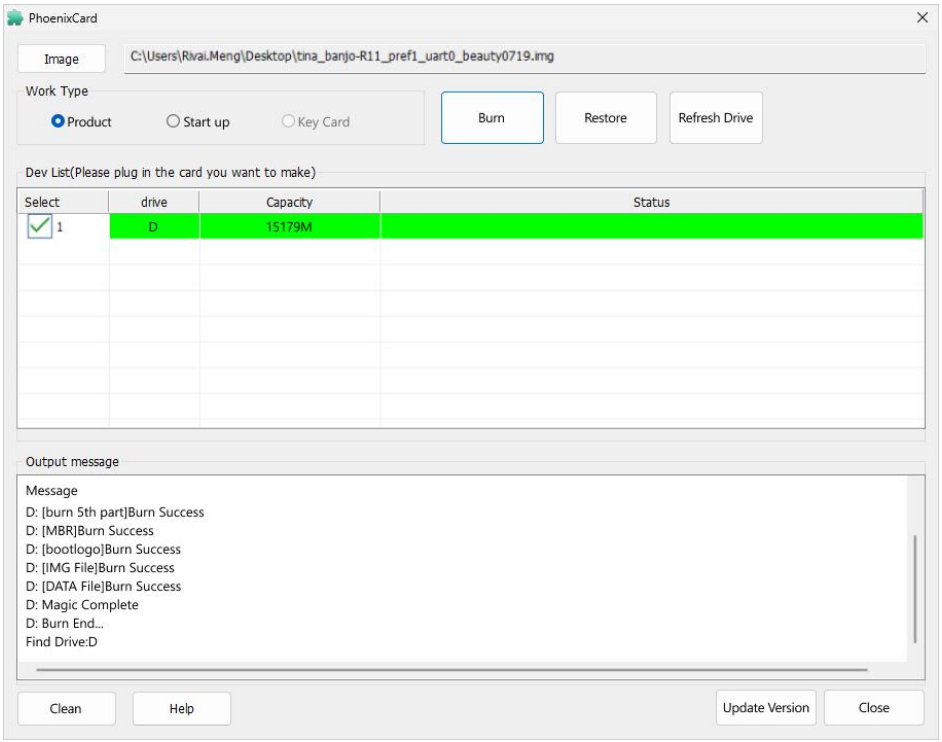


12. How to update the firmware of the beauty module?

Step 1: Format the SD card used as a flashing card. The parameter settings are shown in the following image.



Step 2: Open the flashing tool "PhoenixCardv4.2.8". Select the firmware storage path, “Product”, and ”Burn” in sequence. Please wait patiently for the flashing process to complete.



Step 3: Remove the SD card, insert it into the module's firmware flashing slot, power on and wait 3-5 minutes for the flashing process to finish.

13. What should be noted when storing audio and video files?

When saving audio and video files to the USB drive or SD card, they should be stored in the root directory folder. As shown in the image, video files need to be saved in the "VIDEO" folder, and audio files need to be saved in the "MUSIC" folder.

6. Revision Records

Version	Revise Date	Content	Editor
1.0	August 25, 2024	First Edition	Joyce Jiang
1.5	May 14, 2025	Updated descriptions regarding the newly added beauty screen functions.	Joyce Jiang

Please contact us if you have any questions about the use of this document or our products,or if you would like to know the latest information about our products:

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Thank you all for continuous support of DWIN,and your approval is the driving force of our progress!