

FSK Bus Camera Development Guide

DWIN Technology Technical Document

1. Material Description

Smart screen UI kernel version: T5L_UI_DGUS2_V49_20220527 and above.

Camera UI kernel version: T5L_UI_FD200 FSK bus camera _20_20220527 and above. The camera program can be burned through a burner. There is a burning interface at one end of the camera.

DGUS software version: V7.639 and above.

Development guide: *T5L_DGUS Application Guide_V60*

2. Interface Description

The address of the bus camera interface in DGUS is 0x0100-0x2FFF.

Definition	Address	Length	Description
FSK interface control	0x100	2	D3: FSK bus control 0x00: bus off; 0x5A: bus on; 0xA5: reconfigure the bus (automatically turn to 0x5A after reconfiguration). D2: bus configuration .7 send broadcast command. 1: broadcast for one time and automatically clear after finishing. .6-.4: double-word length of the broadcast command. 0x01-0x07; .3-.0: the speed of configuring the bus. The slower the speed, the farther the communication distance. 0x00: 100Kbytes/S; 0x01: 200 Kbytes/S; 0x02: 400 Kbytes/S; 0x03: 600 Kbytes/S; 0x04: 1 Mbytes/S; 0x05-0xFF: undefined; D1: the waiting time for the bus to respond, 0x01-0xFF (Unit: .125mS) The DGUS screen as the host machine, polls FSK bus devices and will poll the next device if is not responded within the waiting time. D0: save; Write 0x00.
Broadcast commands data	0x101	14	D27-D0: broadcast command data. Commands sent by broadcast have the highest priority. The maximum issuing delay is one DGUS cycle. The first FSK device control interface. Each device occupies a fixed 32 bytes. Device interfaces can be allocated to different devices.
Device interface 1	0x110	16	D31: device switch .7=1 device on; .7=0 device off. .6-.5 save, write 0; .4-.0 represents the ID of the device, 0x00-0x1E.
Device interface 2	0x120	16	D30-D29: the DGUS screen reads the data of the bus device and writes to the double-word address, 0x0800-0xBFFF, 184KB. Format of the data saved to variable space: 0x5AA5+length in words of the data+data. D28: double-word length of the data issued to devices, 0x01-0x07. D27-D0: the data issued to devices.
	...		
Device interface 63	0x2F0	16	The 31st FSK device control interface.

That part of the address is used to define parameters related to FSK interfaces like opening and closing the bus, and

setting the start address of the display object of the corresponding camera. The data of that part of the address can be written over external serial commands (will not be saved when powered off) to realize the effect settings to the objects.

2.1 Display

The camera video display is realized by superimposing the display object with the 0x5A08 variable data JPEG icon. Match the VP address of the object and the storage space address of the device address corresponding to the camera and reserve enough space.

For example, display the 0# bus camera (ID=0x00) in position (16,16) and the window's size is 640*480. The variable space used starts from 0x1:0000 and reserves 40KB.

The configuration corresponding to the display object:

```

0 1 2 3 4 5 6 7 8 9 a b c d e f
00004080h: 5A 08 FF FF 00 07 00 00 00 10 00 10 02 80 01 E0 ; Z. ....€.?.
00004090h: FF 01 00 81 00 00 00 00 00 00 00 00 00 00 00 00 ; ..?.....
    
```

The device interface 2 is used by the 0# camera and the storage space starts from 0x010000. Corresponding configuration commands:

5A A5 06 82 01 20 (device interface 2) 80 (0#device on) 80 00 (double-word address of the data)

The storage space size is calculated according to 1 bit per pixel. For example, resolution 640*480 means $640 \times 480 / 8192 = 37.5$ KB. You can reserve 40KB of storage space.

Whether the camera screen is displayed or not is controlled by the interface address provided by DGUS. Pay attention to reserving the storage space. Calculate according to 1 bit per pixel. For example, resolution $640 \times 480 = 640 \times 480 / 8192 = 37.5$ KB. You can reserve 40 KB. Resolution $320 \times 240 = 320 \times 240 / 8192 = 9.4$ KB. You can reserve 10 KB.

2.2 Configuration

Realized by defining command through the D27-D0 of the device interface (or broadcast command data). D27 is the command. D26-D0 is the data. Commands are as follows.

Command	Data	Description
0x51	D26: configuration value of the camera. .7: horizontal mirror image control. 0: normal; 1: horizontal mirror image. .6: infrared light switch. 0: off; 1: on. .5-.0: save and write 0. D25:D24: horizontal resolution of the camera. Must be a multiple of 4. D23:D22: vertical resolution of the camera. Must be a multiple of 4.	Configuration value of the camera. Will not be saved when the power is off. The resolution should not exceed 64KB of storage space. (Slightly bigger than 800*600)
0x52	D26: configuration value of the camera. The same as 0x51. D25:D24: horizontal resolution of the camera. The same as 0x51. D23:D22: vertical resolution of the camera. The same as 0x51. D21: speed of the FSK bus interface (0x00-0x04).	Parameters configuration of the camera when power is on. Will be saved when power off. The factory configuration is 00 02 80 01 E0 0.

0x5D	D26: register data array that needs to be modified, 0x01-0x00. D25:D0: register data. Two bytes per group (address: data) and up to 13 groups.	Camera debugging commands. (Users do not use.)
0x5F	D26: bus address of the configured camera, 0x00-0x1E. The factory configuration is 0x00.	Bus address configuration of the camera. The camera will restart after configuration.

There is no need to write or distribute the data that is not used in configuration.

Command to set the resolution of 0# camera in device interface 2 to 640*480 and horizontal mirror image:

5AA5 0D 82 01 20 80 80 00 02 (only transmit two double-words) 51 (camera configuration command) 80 (horizontal mirror image) 02 80 01 E0

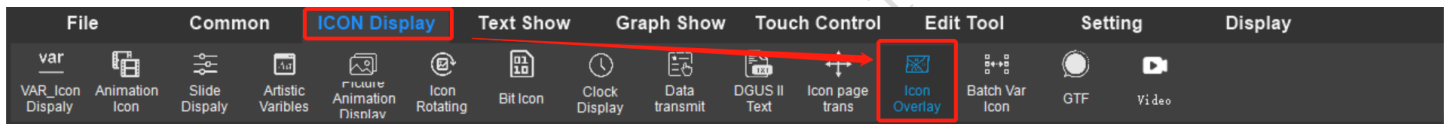
The configuration part is about how commands control the camera and can be used to set the camera ID, mirror image on and off, infrared light switch, resolution and the speed of the bus interface.

3. Project Settings

Take the following configuration as an example.

The maximum resolution of video display is set to 640*480. 4 cameras are displayed. The resolution of a single display is 320*240 when 4 cameras are displayed together. The resolution is 640*480 when single camera is displayed.

Choose the icon overlay object.



Settings when 4 cameras displayed together are as follows.



The parameters of the object in the first display area are as follows.

Address: 0x4000; ICON brightness: 255; Display Mode: FSK camera; Filter Set 0; JPG access format: reversed order; access page address: 0.

The parameters of the object in the second display area are as follows.

Address: 0x9000; ICON brightness: 255; Display Mode: FSK camera; Filter Set: 0; JPG access format: reversed

order; access page address: 0.

The parameters of the object in the third display area are as follows.

Address: 0xE000; ICON brightness: 255; Display Mode: FSK camera; Filter Set: 0; JPG access format: reversed order; access page address: 0.

The parameters of the object in the fourth display area are as follows.

Address: 0x3000; ICON brightness: 255; Display Mode: FSK camera; Filter Set: 0; JPG access format: reversed order; access page address: 1.

Before displaying the camera picture, the bus needs to be configured to be opened through interface address 0x0100. For example, here are some commands to configure the bus. The following data are in hexadecimal.

5A A5 07 82 01 00 A5 04 50 00 //re-configure the bus and turn on the detection of signal transmission.

01 00: FSK interface control address

A5: 0xA5=reconfigure the bus

04: the speed configuration of the bus. The slower the speed, the farther the communication distance.

0x04=1Mbytes/S

50: the waiting time for the bus to respond; 0x01-0xFF; Unit: 0.125mS.

00: save; write 0x00.

Description of double-word address in *T5L_DGUS Application Guide_V60*

Access page address (0x00-0x0F) and the *VP (variable address) together form a 20-bit variable pointer, taking 2 MB variable storage space.

That is,

The address of the object in the first display area is set to 0x4000 and the access page address is set to 0. The corresponding double-word address is 0x00 4000.

The address of the object in the second display area is set to 0x9000 and the access page address is set to 0. The corresponding double-word address is 0x00 9000.

The address of the object in the third display area is set to 0xE000 and the access page address is set to 0. The corresponding double-word address is 0x00 E000.

The address of the object in the fourth display area is set to 0x3000 and the access page address is set to 0. The corresponding double-word address is 0x01 3000.

The address above is double-word address. So, the serial control commands when controlling the camera pictures are as follows.

Display the No.0 camera picture in the first display area, use the device interface 0 for the No.0 camera and the storage location starts from 0x00 4000. Corresponding configuration command:

5A A5 06 82 01 20 80 20 00 //display the camera picture in the No.0 address

01 20: variable address of the device interface 2 defined in DGUS (The address of the device interface can be used freely within the range. It is recommended to use it only once in a project to avoid conflict.)

80: turn on No.0 device (.7=1, device on; .7=0, device off; .6-.5, save and write 0; .4-.0 represents the device ID, 0x00-0x1E)

20 00: double-word address for data storage (Note: 0x2000 here is a word address. Corresponding 0x00 4000 is a

double-word address. The conversion method is to divide 0x00 4000 by 2 which is equal to 0x00 2000 and reserve the last 16 bits.

Display the No.1 camera picture in the first display area, use the device interface 3 for the No.1 camera and the storage location starts from 0x00 9000. Corresponding configuration command:

```
5AA5 06 82 01 30 81 4800 //display the camera picture in the No.1 address
```

01 30: variable address of the device interface 3 defined in DGUS (The address of the device interface can be used freely within the range. It is recommended to use it only once in a project to avoid conflict.)

81: turn on No.1 device (.7=1, device on; .7=0, device off; .6-.5, save and write 0; .4-.0 represents the device ID, 0x00-0x1E)

48 00: double-word address for data storage (Note: 0x4800 here is a word address. Corresponding 0x00 9000 is a double-word address. The conversion method is to divide 0x00 9000 by 2 which is equal to 0x00 4800 and reserve the last 16 bits.

To modify the camera ID:

The factory configuration of the FSK bus camera ID is 0x00. If you need to display multiple cameras at the same time, you need to manually set the ID of the camera to distinguish different cameras. At this time, you also need to use the interface provided by the system.

Assume that the camera whose ID needs to be set is a product just shipped from the factory (the camera ID is 0 at this time). Use the device interface 2 defined by DGUS. The data storage address is 0x00 4000. When the bus is on, the command to modify the camera ID to 1 is as follow.

```
5AA5 09 82 0120 80 2000 01 5F 01 //configure camera ID 1
```

01 20: variable address of the device interface 2 defined in DGUS (The address of the device interface can be used freely within the range. It is recommended to use it only once in a project to avoid conflict.)

80: turn on No.0 device (.7=1, device on; .7=0, device off; .6-.5, save and write 0; .4-.0 represents the device ID, 0x00-0x1E)

20 00: double-word address for data storage (Note: 0x2000 here is a word address. Corresponding 0x00 4000 is a double-word address. The conversion method is to divide 0x00 4000 by 2 which is equal to 0x00 2000 and reserve the last 16 bits.

01: transmit only one Chinese character

5F: the command

01: configured camera bus address, 0x00-0x1E (The camera will restart after configuration.)

Parameters description when modifying the ID of the camera:

To use the FSK camera, you need to define the parameters of the camera (mainly about the setting of the camera resolution. The horizontal and vertical resolution of the camera must be multiples of 4.)

Configure the 0# camera resolution of the device interface 2 as 640*480. Horizontal mirror images. The data storage address is 0x00 4000. The corresponding configuration command when the bus is on:

```
5AA5 0D 82 01 20 80 20 00 02 51 80 02 80 01 E0
```

01 20: variable address of the device interface 2 defined in DGUS (The address of the device interface can be used freely within the range. It is recommended to use it only once in a project to avoid conflict.)

80: turn on No.0 device (.7=1, device on; .7=0, device off; .6-.5, save and write 0; .4-.0 represents the device ID, 0x00-0x1E)

20 00: double-word address for data storage (Note: 0x2000 here is a word address. Corresponding 0x00 4000 is a double-word address. The conversion method is to divide 0x00 4000 by 2 which is equal to 0x00 2000 and reserve the last 16 bits.

02: transmit only two Chinese characters

51: the command to configure the camera

80: horizontal mirror images

02 80: the horizontal resolution of the camera, 0x02 80 = 640

01 E0: vertical resolution of the camera, 0x01 E0 =480

Configure the 1# camera resolution of the device interface 3 as 640*480. Horizontal mirror images. The data storage address is 0x00 9000. The corresponding configuration command when the bus is on:

5A A5 0D 82 01 30 81 48 00 02 51 80 02 80 01 E0

01 20: variable address of the device interface 2 defined in DGUS (The address of the device interface can be used freely within the range. It is recommended to use it only once in a project to avoid conflict.)

81: turn on No.0 device (.7=1, device on; .7=0, device off; .6-.5, save and write 0; .4-.0 represents the device ID, 0x00-0x1E)

48 00: double-word address for data storage (Note: 0x2000 here is a word address. Corresponding 0x00 4000 is a double-word address. The conversion method is to divide 0x00 9000 by 2 which is equal to 0x00 4800 and reserve the last 16 bits.

02: transmit only two Chinese characters

51: the command to configure the camera

80: horizontal mirror images

02 80: the horizontal resolution of the camera, 0x02 80 = 640

01 E0: vertical resolution of the camera, 0x01 E0 =480