T5UID1_DGUSII Application Development Guide

Version 1.0

DWIN Technology

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Chapter 1 Quick Start

1.1 Overview

T5UID1 is DGUS II software platform running T5 CPU, it is designed for low cost and high resolution UI application.

Features:

(1) Dual core T5 CPU, GUI core and OS core both run at 250MHz and power consumption is extremely low.

(2) 128Mbytes NAND Flash, 64Mbytes for picture memory.

(3) Font memory is 64Mbytes at most, font file and audio file share the back half (32 Mbytes) of Font Space.

(4) 256×2.048 seconds 32KHz 16bit WAV audio player.

(5) 320Kbytes Nor Flash for user database.

(6) 128Kbytes variables space.

(7) Support upgrade of font, audio, icon and other software.

(8) Support JPEG image decompression and upgrade.

(9) 255 display variables per user interface at most.

(10) Support standard T5 DWIN OS platform and hardware customization. Interface of 20 IO, 6 UART, several AD and PWM can be expanded on hardware.

(11) 40mS DGUS cycle, UI is extremely smooth.

(12) Display variables can be turned on/off or modified to realize complicated display effect.

(13) Touch controls can be turned on/off or modified to realize complicated touch effect.

(14) Download files and configure hardware through SD card. The downloaded files will be counted and displayed for file check. The downloaded files can be encrypted.

(15) Support SD interface file reading and modification.

(16) Support connecting with DWIN WiFi module to directly connect to DWIN Cloud.

(17)Support adjustment of capacitive touch panel responsiveness, which make the thickness of front toughened glass is up to 6 mm.

1.2 Naming Rule

Product line code	DM	DWIN smart LCM product line
Color code	1 character	B=Single color D=256 color T=65K color(16bit) G=16.7M color or 262K(24bit or 18bit)
Resolution	5 digits	32240=320*240 48270=480*272 64480=640*480 80480=800*480 85480=854*480 80600=800*600 10600=1024*600 10768=1024*768 12720=1280*720 12800=1280*800 13768=1364*768 or 1366*768 19108=1920*1080
Classification	1 character	L=Simple application grade C=Commerce grade T=Industrial grade K=Medical grade Q=Automotive grade S=Harsh environment grade
Size	3 digits	022=2.2inch 024=2.4inch 028=2.8inch 035=3.5inch 040=4.0inch 043=4.3inch 047=4.7inch 050=5.0inch 056=5.6inch 057=5.7inch 064=6.4inch 070=7.0inch 080=8.0inch 084=8.4inch 090=9.0inch 097=9.7inch 101=10.1inch 104=10.4inch 121=12.1inch 150=15.0 inch 156=15.6inch 185=18.5inch
_	_	Separator
Attribute code	1 digit or character	0=Basic type 1=Basic type with a shell 2=Simulate video processing platform products 3=Android platform products 4=Digital video processing platform products A=DGUSII kernel product B=DGUSIII kernel product
ROM ID	1 digit	0-9 to distinguish between different hardware versions
LCD temperature grade	1 character	N=Normal Temperature W=Wide Temperature
TP category	1 or 2 character	N=Without Touch Panel TR=Resistive Touch Panel TC=Capacitive Touch Panel
Custom tag	Z+ number	Z01-Z99,Standard is blank
Extended memory mark	F+1 digit	F0=512MB F1=1GB F2=2GB F3=3GB,Standard is blank

1.3 Interface Definition and Wiring

PIN name	PIN type	PIN instruction	Socket type		
			CN1 PIN NUM.	CN2 PIN NUM.	CN3 PIN NUM.
VCC	P	Power supply input	1,2	1,2,3	1
TX4	O	Serial 4 output	3	4	2
TX2	O	Serial 2 output	4	5	3
RX2	I	Serial 2 input	5	6	4
RX4	I	Serial 4 input	6	7	5
GND	P	Ground	7,8	8,9,10	6

①I: INPUT, O: OUTPUT, P: POWER

②PCB pins of the same defined pins have been connected in parallel.

③CN1: Use 8 Pin 2.0 mm spacing patch socket;

CN2: Use 10 Pin 1.0 mm spacing FPC mount;

CN3: Additional 6 Pin 2.54 mm spacing through hole pad is provided.

④Serial port 2 is the communication protocol developed by DGUSII, please refer to the detailed description in Chapter 4 of this article;

T5 DGUS products are equipped with extended serial port, and it is UART4, and its configuration and communication need to be completed through DWIN OS program.

⑤In order to improve baud rate and facilitate connection to PC debugging, Some models of DWIN adopt TTL/RS232 compatible interface. Users can use 0Ωresistor or solder to directly short circuit. R232=0 (short circuit) selects TTL level input; R232=1(disconnect), selects RS232 level. As shown in figure 1.0, the place is marked by white silk screen. By default, the factory disconnects the 232 level, and selects the TTL level. That is OFF=232, ON=TTL.

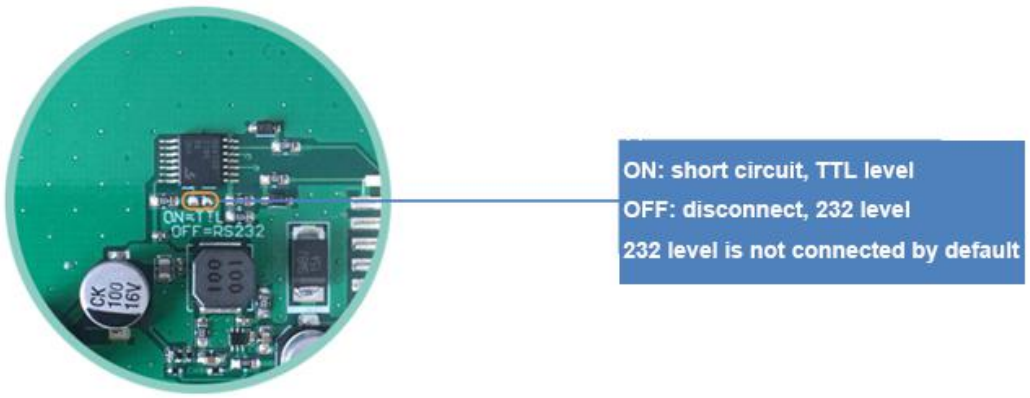


Figure 1.0 Level selection

1.3.1 10 Pin Interface

One-end of the different side FCC row line is connected to terminal block of the screen, and the other end is connected to the DWIN HDL662B adapter board, both blue side face up. One-end of the double-male USB cable is connected to the adapter board, and the other end is connected to the computer for communication.

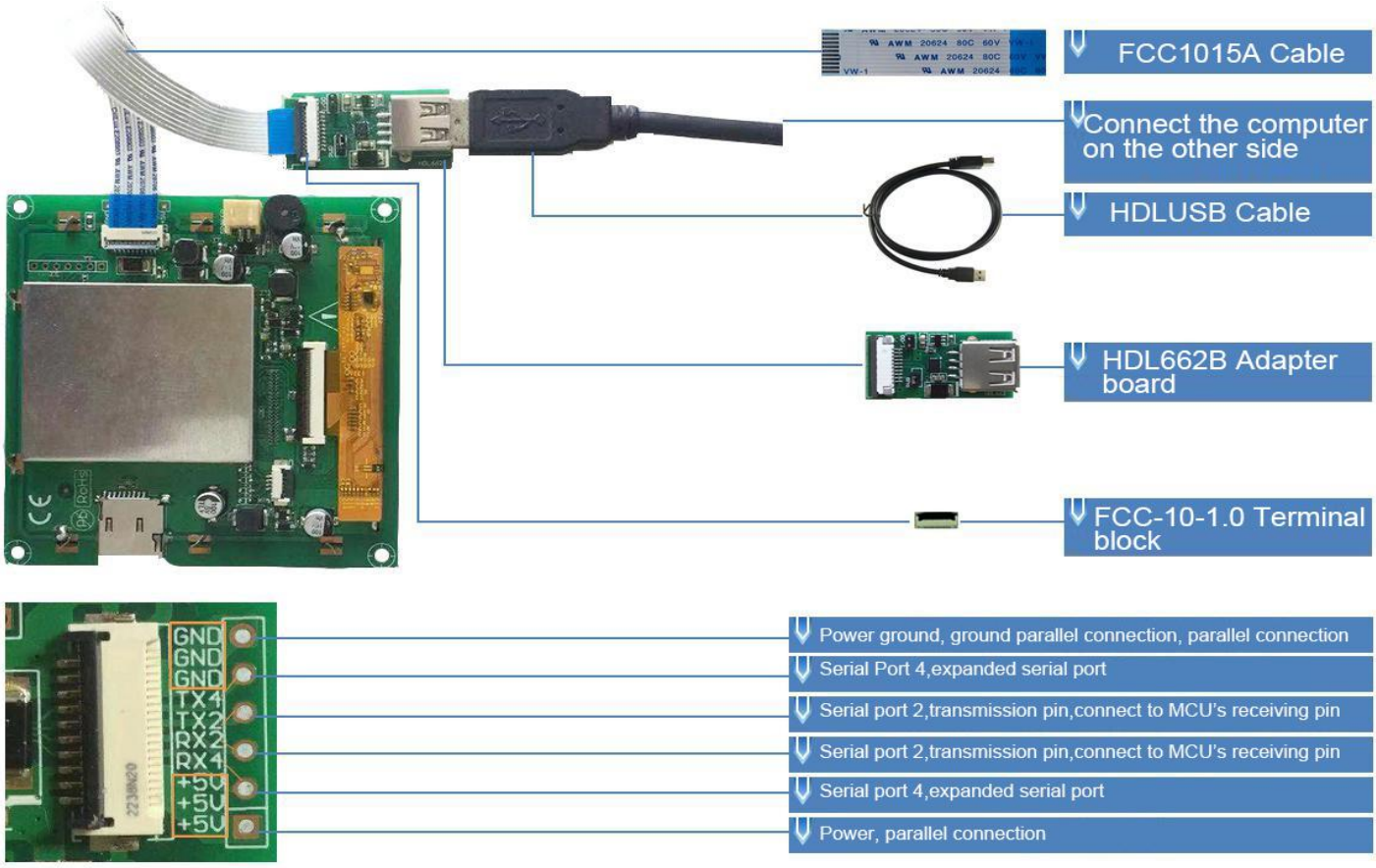


Figure 1.1 10 PIN interface definition and wiring description

1.3.2 8 Pin Interface

8 PIN interface of 2.0 mm space is as follow.

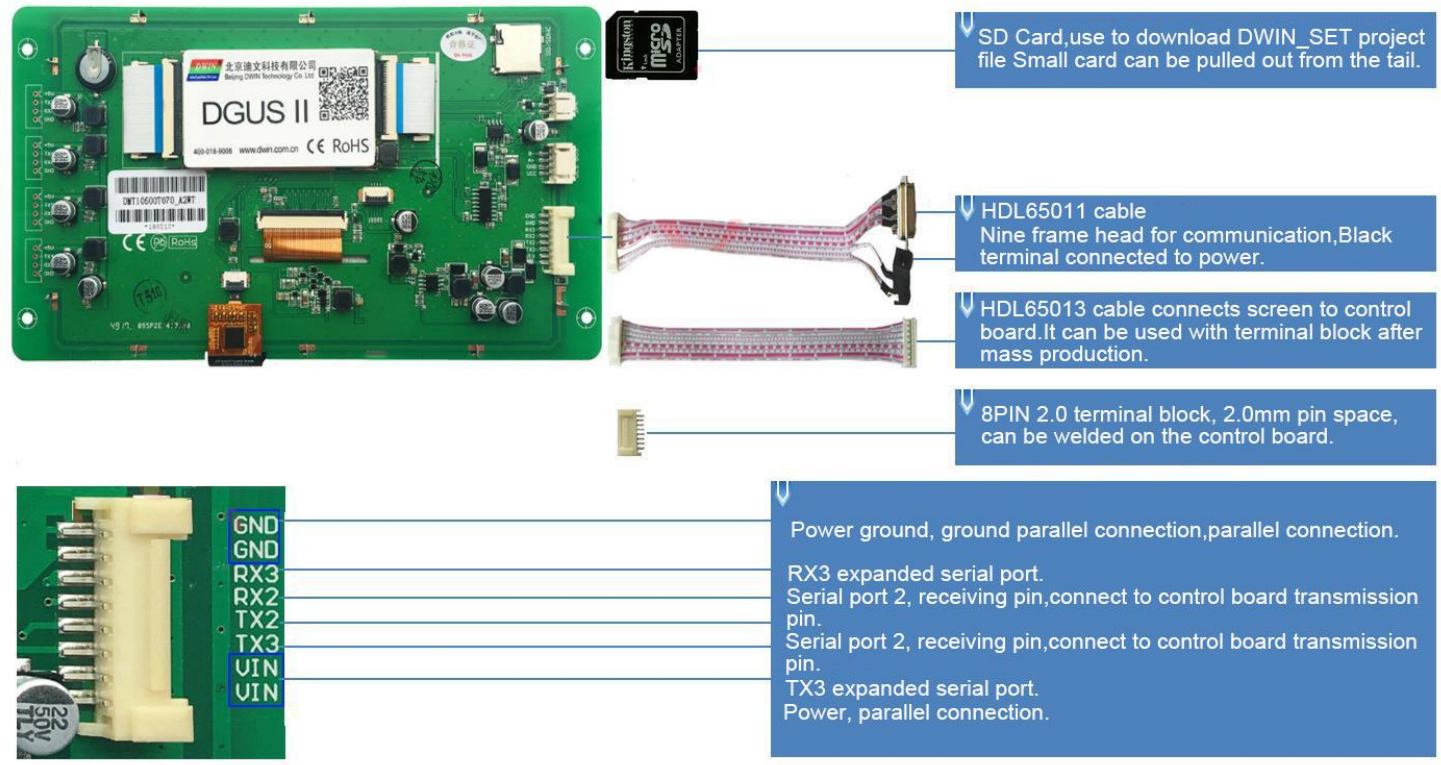


Figure 1.2 8 pin 2.0 interface definition and wiring description

1.4 Screen Power Supply

Confirm the screen voltage and power consumption according to the selection manual or data manual, and turn on the screen through the switching power supply. Switching power supply plays a very important role in the normal display of the screen. Too small voltage, unstable current, and low power may cause abnormal display phenomena such as flickering and black screens. Flickering is the most common phenomenon due to insufficient power supply.

1.5 Driver Installation

1.5.1 Serial Port Driver

DWIN serial port adapter board USB-to-UART chip has two types: XR21V1410 chip and CP2102 chip. According to the chip type, you can download from DWIN official website or consult 400 technical support to obtain and install the corresponding driver to facilitate DGUS screen communication.

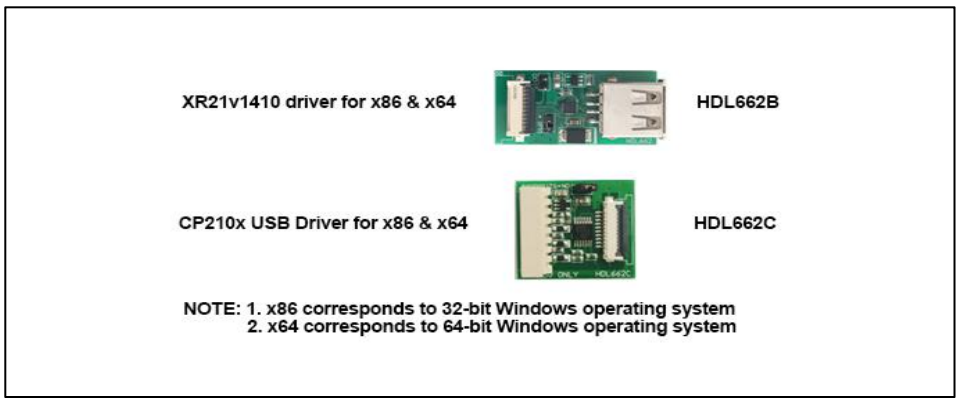


Figure 1.3 Serial port driver

Specific steps are as follows:

Step 1: Right-click “My Computer"; click “Property" at the bottom; click “Device Manager" at the top left, and the “Device Manager" operation box will pop up, right-click “USB Device" and select “Update Driver".

Step 2: Select “Next" in the pop-up window.

Step 3: Select the path of the serial port driver and complete the driver update.

Step 4: After the installation is complete, the port number corresponding to the driver can be viewed in the device manager.

1.5.2 Software Operating Environment Driver

Installation steps:Get the software running environment, double-click to install it.

Download DGUS_T5 development software from our official website http://www.dwin.com.cn/ or obtain it from 400 technical support.

1.6.1 New Project

Take the 720*720 resolution new variable data entry and display function as an example, the steps are broken down as follows:

Step 1: Prepare picture material that is consistent with the screen resolution, BMP format, 24-bit color, and the picture naming starts from 00.

Step 2: Download and open the corresponding version of the software.

Step 3: Load the picture.

Step 4: Interface configuration.

Step 5: Click to save and generate the project.

Step 6: Project preview.

The appearance of DMT10600C101-07WT standard product.

Chapter 2 Introduction to T5UID1 Development System

2.1 Introduction to T5UID1 Development System

DGUS development system is composed of DGUS screen and DGUS development software. DGUS is the abbreviation of DWIN Graphic Utilized Software. DGUS screen is based on configuration file to work, so the whole development process is the process that users complete variable configuration file with the help of PC DGUS development software.

（1）Variable programming

Users can make a table before the project, frame and plan the required variable address to facilitate the modification and maintenance of subsequent projects.

（2）Interface design

The simple interface can be made by yourself; the complex or beautiful interface can be made by professional artists. Icon image making is the same as image.

（3）Interface configuration

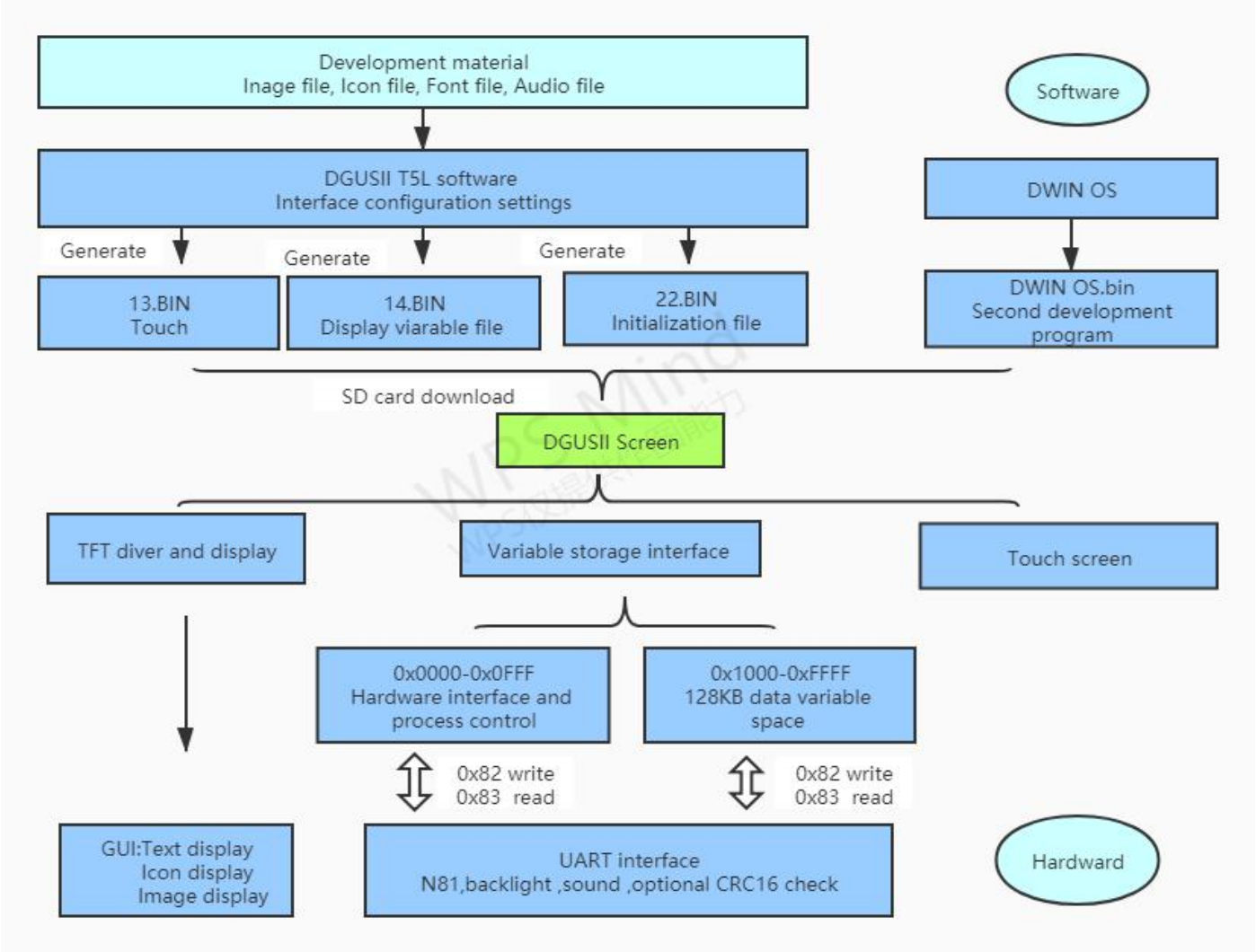
Configure the interface through the PC-side DGUSII software. After finishing the project, click "Save" and "Generate" in the "File" option in the upper left corner of the software to generate 13.BIN touch configuration file, 14.BIN display configuration file, and 22 .BIN variable initialization file.

（4）Debugging

Put the required files into the DWIN_SET folder and download them to the screen through SD card. The sequence is: power off – insert SD card - power on - blue screen reading SD card content, download complete display “SD card process END!” ——Power off, exit SD card - power on.

（5）Finalized archive

After finalizing the version, put the configuration files, picture files, icons, fonts, etc. into the DWIN_SET folder, and then mass production can be downloaded through SD card.


Development material
Inage file, Icon file, Font file, Audio file
Software
DGUSII T5L software
Interface configuration settings
DWIN OS
Generate
Generate
Generate
13.BIN
Touch
14.BIN
Display viarable file
22.BIN
Initialization file
DWIN OS.bin
Second development
program
SD card download
DGUSII Screen
TFT diver and display
Variable storage interface
Touch screen
0x0000-0x0FFF
Hardware interface and
process control
0x1000-0xFFFF
128KB data variable
space
0x82 write
0x83 read
0x82 write
0x83 read
GUI:Text display
Icon display
Image display
UART interface
N81,backlight ,sound ,optional CRC16 check
Hardward

2.2 Features of T5UID1 Development System

Different from the traditional LCM which controls the display through time sequence or command, the DGUS screen adopts the direct variable drive display method. All the display and operations are based on the preset variable configuration file. Two different working methods lead to the user developing applications. The software architecture and the difficulty of secondary development are completely different.

In the DGUS development platform, it is developed through the use of controls. The attributes and methods of the defined data are encapsulated in the control, and the user only needs to configure and use the control on the PC side. DGUS has defined the controls required for common human-computer interaction functions. The software is easy to use and efficient. In some medium and small industrial automation project applications, when the entire system consists of relatively independent and fully functional components (such as supporting Modbus The user can directly use the DGUS as the host computer, use the 485 networks to form a network between the device and the DGUS screen, and directly develop users based on the secondary development platform carried on the DGUS screen. The main control runs directly on the DGUS screen, replacing the work of the user's CPU.

The T5UID1 platform stipulates that the refresh cycle of DGUS is 40ms, which means that in each cycle of 40ms, the contents of 13.BIN and 14.BIN must be read once. At present, the development platform of DGUS II already supports up to 255 variables on each page, which shows that DGUS II has very strong processing capabilities. At the same time, OS operation mode: real-time operation (1 8051 core runs GUI, 1 8051 core runs user code on DWIN OS platform), which is completely independent of the operation of DGUS. Therefore, developers do not need to worry about whether the two will affect each other when DGUS and DWIN OS are running at the same time in the system.

2.3 T5UID1 Software Processing Flow

T5UID1 development platform, the configuration of the touch operation of the touch screen is also stored in the 13.BIN file in the same way, and the characteristic attributes of the variables (characters, data) and various animations to be displayed are represented by codes and Stored in the 14.BIN file according to the address. The operations made in the development software of DGUS II are actually configuring the control of the display function or the control of the touch function. When power is supplied to the system to make it work, the system will call the 13.BIN file and 14.BIN file, so that the man-machine interface can run normally.

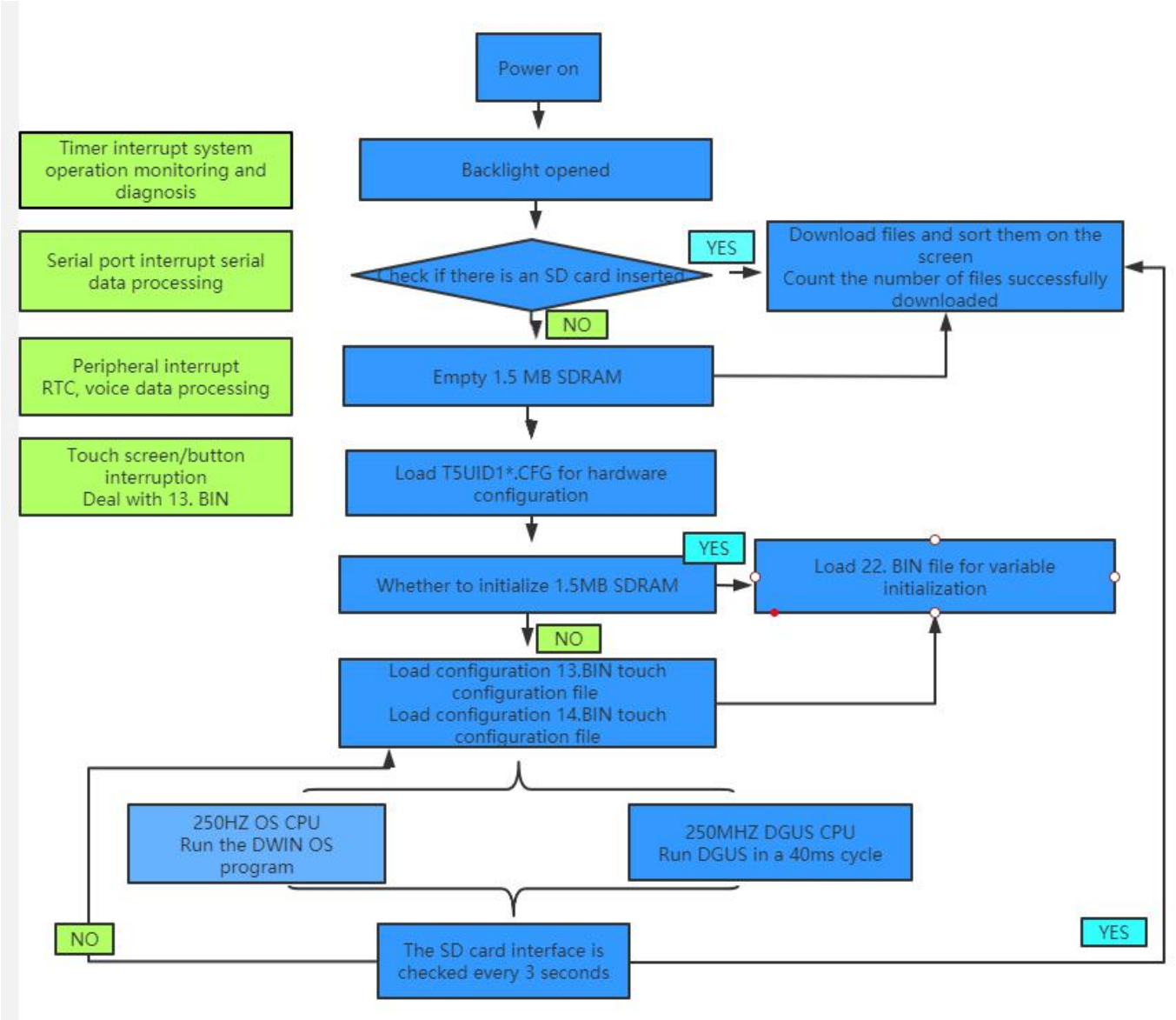


Figure 2.1 T5UID1 DGUS operation flow chart

2.4128MB FLASH Memory Allocation

128 Mbytes Flash, 64Mbytes is used as picture memory.

Maximum 64Mbytes font space, of which the last 32Mbytes font and music space are multiplexed.

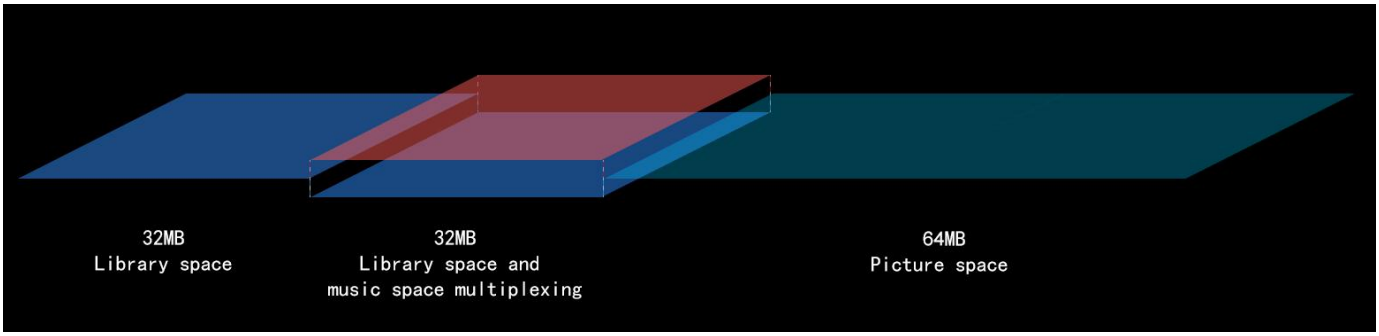


Figure 2.2 128 MB memory space diagram

2.5 RAM Memory Variable Address Space

The RAM space is fixed at 128KB, divided into 0x0000-0xFFFF subspace range, each variable corresponds to 2 bytes of the corresponding space, and each byte corresponds to 8 bits of the corresponding space. Among them, 0x0000-0x0FFF is the system variable interface address space, can not customize; 0x1000-0xFFFF variable storage space can use arbitrarily. If 8-channel curves are used at the same time, 0x1000-0x4FFF will be used as the curve buffer address. At this time, this part of the variable address cannot be used by other control keys. The use range of other control key addresses is: 0x5000-0xFFFF.

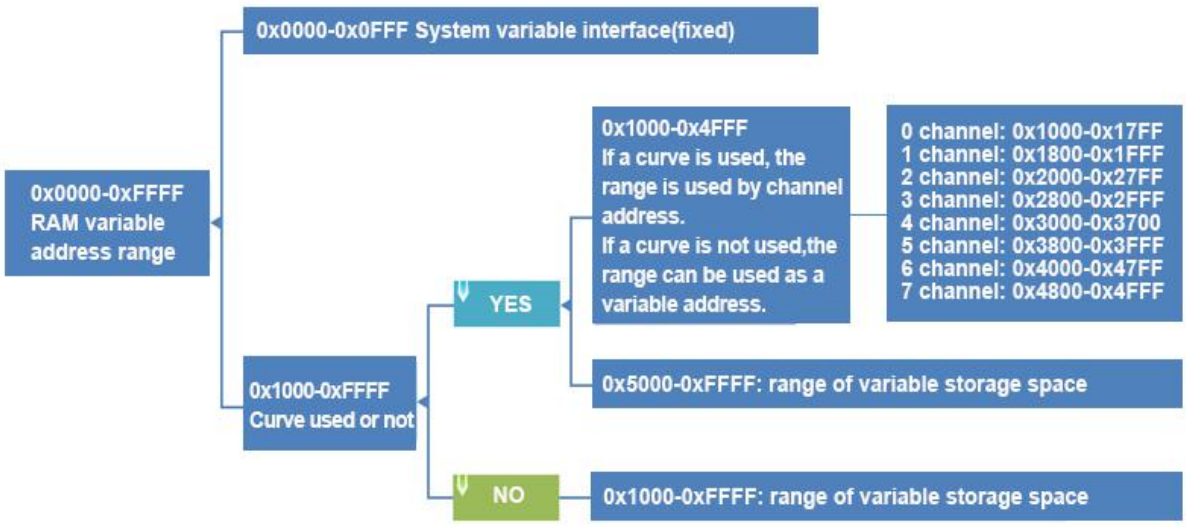


Figure2.3 Partition of RAM storage space

The variable address is the first address of the subspace that stores one or more variables in the RAM space, and the code of the display variable or the value of the state variable is stored in the space pointed to by the address.

For example, if the variable address of a text display control is set to 0x1000, and the text content displayed in the control is “Beijing DIWN Technology", the storage method in RAM space is shown in the figure below. It can be seen that 2 Bytes of content can be stored in each address.

If you change the characters displayed in the text display control, you only need to change the character code stored in the corresponding variable address. The data stored in the variable address can be modified by sending instructions and inputting on the touch screen. For example, to modify the text display control can be realized through the text entry control, just set the two controls to the same variable address. At the same time, you can also modify the value stored in the variable address by sending instructions. For detailed instructions, please refer to the variable display Control key part.

2.6 RAM Description Pointer Space

The description pointer is the first address of the subspace that stores the attribute of a variable in the RAM space. The space pointed to by the address stores the attribute values of the display variable, such as display coordinates, color, font size, etc. What needs to be pointed out is that the description pointer and the variable pointer share RAM space, and the space overlap should be avoided when assigning variable addresses.

Continue to explain in combination with the display text control. As below, according to the text display control instruction storage format table, the variable address, the upper left corner coordinates of the character display position, the character color, the upper left corner and the lower right corner of the text box are sequentially stored in the space pointed to by the text control description pointer. And other data. In the figure, 0x5000_H represents the high byte, and 0x5000_L is the low byte.

[Example] Send command: 5A A5 05 82 5003 F800 (Effect: The color of the character changes from olive green to red.)
5003: The storage address of the text color.
F800: Red code.
Examples of other description pointer applications are as follows (for more specific instructions describing pointer usage, please refer to the data variable display section in chapter 7.31 of this document):

Describe the pointer setting problem:

Features	Send instructions	effect
Change the data display position	**5A A5 07 82 5001 0000 0000**	The coordinates of the upper left corner of the character display position become (0,0).
Change the size of ASCII character dot matrix	**5A A5 05 82 500A 30 60**	Change the character dot matrix to 48*96. Note: The dot matrix values in both X and Y directions need to be modified.
Hidden characters	**5A A5 05 82 5008 0000**	Change the character length value to 0 to realize the hiding of characters.
Replace font file	5A A5 07 82 5009 003C 10 10	Call the No. 60 font, the font size is 16*16. That is, the character size is also changed after changing the font file.

(1) No curve display, 0X1000-0X7FFF can be used as a variable address range; 0X8000-0XFFFF can be used as a description pointer range. The distinction is to avoid conflicts caused by confusion of pointer addresses.

(2) There is curve display and all 8 channels are used. 0X1000-0X4FFF will be used as the curve buffer address. Users should not use this part of address as other variable addresses. 0X5000-0X7FFF can be used as the VP variable address range; 0X8000-0XFFFF can be used as SP describes the use of pointer intervals. In the application, the VP variable address and SP description pointer address range can be planned by users according to actual needs. Here, the division of VP variable address and SP description pointer address is only for recommended reference.

(3) The same display control key description pointer can be set to 10H addresses, and different types of display control keys can be set to 30H. The distinction is to avoid display conflicts caused by confusion of pointer addresses.

(4) If the display control keys of the same type are set to be the same, they can only be copied by Ctrl C + Ctrl V. Even if they are copied to other pages, the control keys can no longer change the font size and other attributes, and cannot move one pixel. Location, otherwise it will cause display abnormalities.

Chapter 3 SD Interface

3.1 Micro SD (TF) Card Format

T5UID1 displays all hardware parameter settings and data of the terminal, which can be completed through the SD/TF card interface on the screen, and the file must be in FAT32 format.

SD cards sold by non DWIN factories often have to be formatted under DOS system. Otherwise, the download phenomenon is usually just that the number of downloaded files is 0 after the blue screen, or the display terminal fails to recognize that the card cannot enter the download interface normally. Format as follows:**Step 1: start 》 run 》 enter command (enter CMD for win7 system) to enter DOS system;**

Step 2: input the command: format/q g:fs:fat32/a:4096 (Note: q is followed by a space). Click enter after input.

Where g is the disk number of SD card displayed on the user's computer, and the corresponding disk number of different users is not fixed (for example, h, i can be replaced)

Note: the format operation after right clicking SD card cannot be completely formatted into FAT32 format. Generally, only SD card with size range of 1-16G is supported.

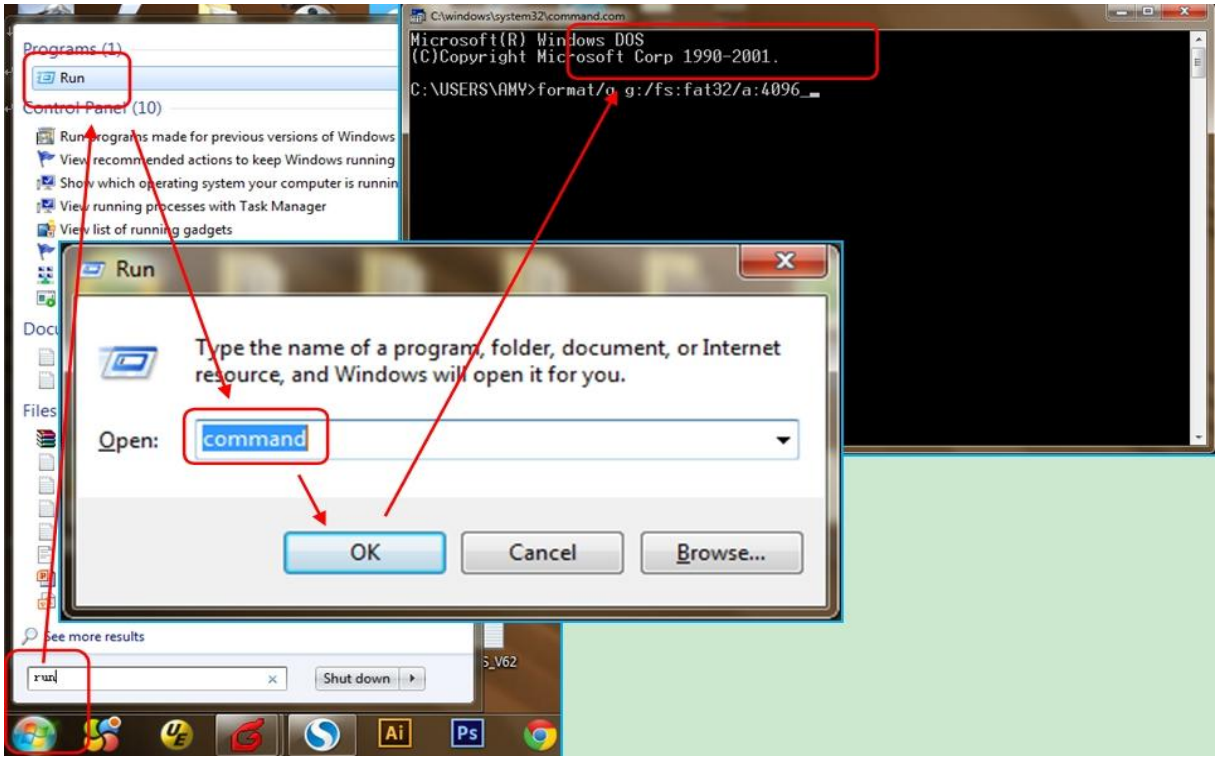


Figure 3.1 SD card formatting steps

3.2 SD Card Interface Download Method

During the download process of the SD card, please be sure to maintain the normal power supply. Power failure in the middle may cause a black screen abnormality. When the core file is updated, it is recommended to update and download separately.

The process of generating the contents of the DWIN_SET folder is as follows.

①Create a DWIN_SET folder in the SD card update directory.

② Put the pictures, fonts, configuration files, etc. that need to be downloaded in the DWIN_SET folder.

③When the LCD terminal is powered on, it detects that the SD card is inserted, and it will recognize whether there is a DWIN_SET named file in the root directory of the SD card. If the file name exists in the SD card, the LCD terminal will copy and download the relevant file content in the file that meets the format requirements. To FLASH. Other folders under the DWIN_SET folder cannot be read normally.

④When the blue screen download list indicates that the download has been completed, power off the terminal, pull out the SD card, and then power on again to enter the normal working mode.

DWIN standard model screen, if not specially customized or with download encryption function,
will only recognize DWIN_ SET is the name of the folder. Other named folders will not be recognized.
Users can also name the folder they want to back up to another name. The download will not be affected.

3.3 Download File Description

3.3.1 Download File Type

File type	Naming rule	Description
Program file	T5UID1*.BIN T5OSV*.BIN	GUI underlying program Underlying kernel firmware application
DWIN OS program	DWINOS*.BIN	DWIN OS program, the code must start from 0x1000.
NOR Flash data base	ID+（optional）filename.LIB	Each ID corresponds to 2KWords memory with ID range from 0 to 79. The database is located in on-chip NOR Flash, with a size of 160KWords. It can be used to save user data or DWIN OS program library files.
Font file	Font ID+（optional）filename. BIN/DZK/HZK Font ID 00-255	Font ID: 00-47; ASCII font uses DGUS 0# font. The factory product has been pre-downloaded. TS3 font extraction software generation.
DGUS input method file	12*.BIN	Fixed storage in 12 font location
DGUS touch control file	13*.BIN	Fixed storage in 13font location, cannot over 256KB
DGUS variable file	14*.BIN	Fixed storage in 14 font location, cannot over 256KB, must be in DGUS II format
DGUS variables initialization file	22*.BIN	Fixed storage in 22 font location. Load the variable space of 0x2000-0x1FFFF address content initialization 0x1000-0xFFFF.
ICON file	Font ID+ (optional) filename. ICO	Generated by DWIN tool software and saved in the font space.
Wave file	Font ID+ (optional) filename. WAE	Must be in DGUSII format, generated using DWIN special tools.
BMP ICON file	Picture storage ID+(optional) filename.BMP	Download must use 24bit true color format. To Unlike other DGUS screens, pictures are not displayed during downloading to increase the download speed.
Hardware configuration file	T5UID1*.CFG	Configure CRC on, baud rate modification, touch panel sound control, touch upload mode, display direction, etc.

Almost 256 font files, each font file almost 256KB,maximum 64Mbytes font files.

Almost 256 music, one music 128Kbyes,maximum 32Mbytes music file space.

Music file space and 128 font file storage space are overlapping,each font file space occupies 2 music storage space locations.

The downloaded file must be placed in the DWIN_SET folder in the root directory of the SD card, and must be a 4KB sector, FAT32 format SD or SDHC card.

The DGUS screen will immediately check the SD interface every time it is powered on, and then check whether there is a card in the SD interface every 3 seconds.

3.3.2 Generation of Download Files

From the T5UID1 development system, we learned that when developing a project through the T5UID1 screen, the material files that need to be prepared include pictures, icon libraries, font libraries, etc. T5UID1 uses the file number when calling the material file. Therefore, when naming the material files, they should start with Arabic numerals, and other Chinese and English or punctuation can be added after the serial number as annotations.

3.3.2.1 ICO Font File

(1) The maximum resolution of the pictures in the icon library does not exceed 1024*1024 pixels, and the software will automatically compress to 1024*1024 resolution if it exceeds;

(2) The picture file needs to be in BMP format, and the picture must be in 24-bit color;

(3) The pictures should be named in order with the beginning of Arabic numerals.

In the FLASH storage space, a single font space is 256KB in size.When a single icon library file exceeds 256KB, it is necessary to strictly calculate the interval occupied by the icon library, otherwise it may cause a conflict in the position of the icon interval and cause display abnormalities.

3.3.2.2 Font File

DGUS support multiple international font codes:8-bit, ASCII, GBK, GB2312, UNICODE.DGUS screen has been pre-installed with ASCII code 0# font library at the factory, which contains all ASCII characters with dot matrix size of 4*8~64*128. The user can directly call the 0# font library to realize the display of numbers, letters and symbols. When you need to use other coded fonts, you need to generate them through the font generator.DGUS support BIN,DZK,HZK three Font files.

3.3.2.3 22. Bin Start Variable File

The initial value of the variable address is 0 by default when it is powered on. If you need to set an initial value other than 0, you need to turn on the power-on load 22 file function. The user configures the CFG file 0x08.5 bit to turn on the power-on load 22 file initialization variable Space is enough.

22.bin can be directly generated by the DGUS tool software, and the initial value in the 22.bin can be configured in the DGUS software. When the configuration file is generated, the initial value can be automatically written into the 22.bin. At the same time, users can also manually edit the value of 22 files with software such as UltraEdit. DGUS variable address is in word (Word), 22.bin is edited by UltraEdit and other software to open the display is in byte (Byte), when modifying the variable address 0x2000 word initial value, you should address the 22.bin 0x4000 byte address in order to correctly modify.

When editing 22.bin, you need to copy them on the desktop and edit them separately, and then put them into the DWIN_SET folder after the modification is completed. The modification under the original project will overwrite and modify the 22.bin that have been modified before the edited project is saved and generated.

3.3.2.4 System Configuration

T5UID1 *.CFG hardware configuration file is in binary data format and can be edited by software such as UltraEdit. The description is shown in the following table:

Type	Address	Length	Definition	Description
Identification Code	0x00	4	0x54 0x35 0x44 0x31	Fixed content.
Format Flash	0x04	2		Write 0x5AA5 to format NAND Flash.
System Clock Calibration	0x06	2		0x06: write 0x5A to enable system clock calibration 0x07:write 0xA5 is UART calibration mode. During the calibration process, set UART2 as 115200bps and 8N1 mode, send more than 30 0x55 data packages every 30 mS. Write 0xAA is RTC calibration mode. Apply the RTC hardware to calibrate. It is already be calibrated before sale.
System Configuration	0x08	1	System_Config 1	.7: data auto-uploading. 0=off, 1=on. .6: display control number. 0=64 control/page, 1=128 control/page. .5: initialize via 22.bin file. 1=on 0=off .4: SD interface status. 1=on 0=ban .3: touch tone. 1=on 0=off .2: backlight system standby control. 1=on 0=off .1-.0: display direction 00=0° 01=90° 10=180° 11=270°
	0x09	2	UART2 Baud Rate	Baud rate set value=7833600/real Baud rate. 115200bps, set value=0x0044. Set value is 0x03E7 at most.
Standby Backlight	0x0B	1	LED_Set_En	0x5A=enable standby backlight.
	0x0C	4	LED_Idle_Set	0x0C=Normal brightness 0x0D=Standby brightness 0x0E:0F=Lighting time, 5mS. At the same time, the normal brightness set by 0x0C is also the boot brightness value.
LCD Configuration	0x10	2	Display_Config_En	0x5AA5=The display configuration is valid, and the factory has been configured, and the user does not need to configure it.
	0x12	1	PCLK_PHS	Data latch phase: 0x00=PCLK Falling edge, 0x01=PCLK Rising edge
	0x13	1	PCLK_DIV	Pixels clock PCLK frequency set,PCLK frequency (MHz)=500/PCLK_DIV.
	0x14	1	H_W	
	0x15	1	H_S	
	0x16	2	H_D	Horizontal resolution of LCD (X direction).
	0x18	1	H_E	
	0x19	1	V_W	
	0x1A	1	V_S	

	0x1B	2	V_D	Vertical resolution of LCD (Y direction).
	0x1D	1	V_E	
	0x1E	1	TCON_SEL	0x00=do not configure TCON.
	0x1F	1	Reserved	0x00.
Boot Setting	0x20	1	PIC_Power_On_En	0x5A= enable this configuration.
	0x21	2	PIC_Power_On	ID of page to display when power on.
	0x23	1	Music_Power_On_En	0x5A= enable this configuration.
	0x24	3	Music_Power_On	Start-up music: 0x24=music ID, 0x25=memory block number that music file cover, 0x26=volume. 0x25=0x00, no start-up music.
Touch screen setting	0x27	1	TP_Set_En	0x5A= enable this configuration. Not for user.
	0x28	1	TP_Mode	TP mode. .7-.4 (high 4bit), TP type: 0x0*=resistance touch panel. 0x1*=Capacitive touch panel (driver: GT911, GT9271, GT9110). 0x2*=FT6336 drives IC capacitive touch screen. .3-.0 (low 4bit), TP mode: .3 reserved, write 0. .2 X axis data: 0=0 to Xmax, 1=Xmax to 0; .1 Y axis data: 0=0 to Ymax, 1=Ymax to 0; .0 X, Y exchange: 0=XY, 1=YX .
	0x29	1	TP_Sense	TP sensitivity: 0x00-0x1F, 0x00 is lowest, 0x1F is highest. Default value is 0x14.
TCON configuration	0x2A	1	TCON_Set_En	0x5A: enable configuration once. Already set before sale.
	0x2B	1	TCON_Set	Tcon set. 0x00: do not config TCON.
System Configuration2	0x2C	1	System_Config2 (default value is 0x00)	.7: Music playback/buzzer sound selection, 1=buzzer sound 0=music playback. .6: CRC checker for UART2. 1=on, 0=off. .5: reserved, write 0.
	0x2D	3	Reserved	Write 0x00
SD download check	0x30	2	SD_Check_En	0x5AA5=enable download file check via SD interface.
	0x32	1	.LIB file	0x00-0xFF
	0x33	1	.BIN font file	0x00-0xFF, OS program is not include.
	0x34	1	.DZK font file	0x00-0xFF
	0x35	1	.HZK font file	0x00-0xFF
	0x36	1	.ICO icon file	0x00-0xFF
	0x37	1	.WAV file	0x00-0xFF
	0x38	2	.BMP file	0x0000-0xFFFF
	0x3A	6	Reserved	0x00
SD encryption	0x40	2	SD_Encrypt_En	0x5AA5=enable SD encryption once. 0x5AAA=disable SD encryption. Folder name returns to DWIN_SET. The encrypted setting is saved in Flash, and will not be clear.
	0x42	1	Length of Folder name	0x01-0x08

	0x43	8	Folder name	8 ASCII characters at most (only 0-9, a-z, A-Z, and -, _). If folder name include invalid characters, default DWIN_SET will be used.
	0x4B	5	Reserved	0x00
	0x50	32	Decode key	
Undefined	0x70	16	Reserved	0x00

Attention:part of green background must be configured.

Display Configuration Reference:

3.3.3 Download File Process

The DWIN_SET folder is the only recognizable named folder name on the screen, which contains all the files that will eventually be downloaded to the screen.It has “13 touch Config.bin”,“14variable Config.bin”, “22_Config.bin".When creating a new project, the software will automatically generate a series of files, among which “DWprj.hmi" is the only editing program recognized by the DGUS software. This file cannot be renamed or deleted.

3.4 RAM Storage Space

The RAM space is fixed at 128KB, which is divided into the range of 0x0000-0xFFFF subspace, and the size of each subspace is 1 word.

Variable storage space	Size	Space scope	Description
System variable interface	8KB	0x0000-0x0FFF	system variable interface definition
User variable interface	32KB	0x1000-0x4FFF	User curve buffer space
	88KB	0x5000-0xFFFF	User defined variable address(*VP) and description pointer (* SP) spaces

size_resolution	T5UID1.CFG display configuration (HEX format)													
	0x12	0x13	0x14	0x15	0x16	0x17	0x18	0x19	0x1A	0x1B	0x1C	0x1D	0x1E	0x1F
2.4_240*320（IPS）	00	50	0A	14	00	F0	0A	02	02	01	40	02	05	00
2.8_240*320A	00	50	0A	14	00	F0	0A	02	02	01	40	02	03	00
2.8_240*320B	00	50	10	20	00	F0	20	02	0E	01	40	08	01	00
3.5_320*240	00	46	1E	14	01	40	40	03	0F	00	F0	10	02	00
3.5_320*480	00	2C	0A	04	01	40	0A	02	02	01	E0	02	04	00
3.5_320*480（IPS）	00	2C	0A	04	01	40	0A	02	02	01	E0	02	06	00
4.3_480*272	00	30	29	02	01	E0	02	0A	02	01	10	02	00	00
5.0_480*272	00	30	29	02	01	E0	02	0A	02	01	10	02	00	00

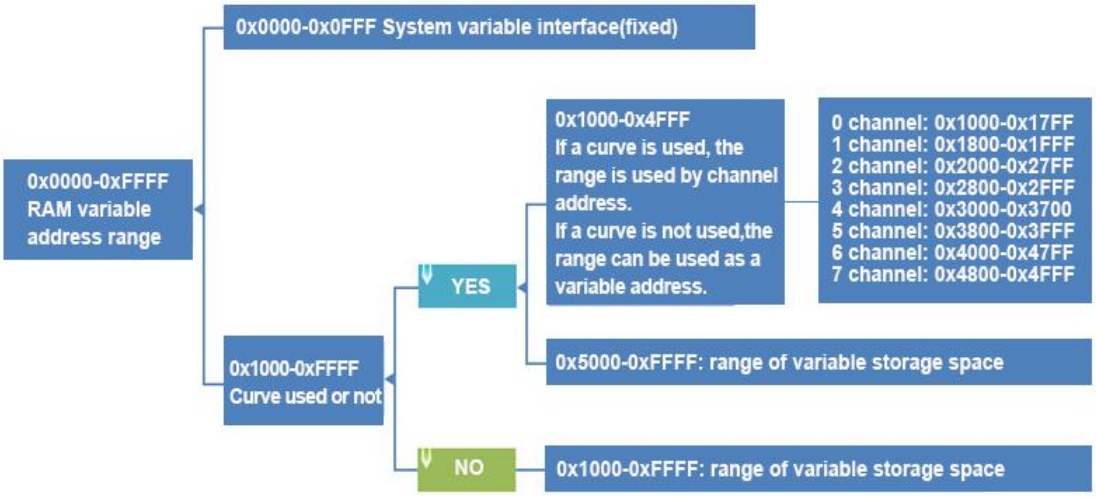


Figure3.2 Partition of RAM storage space

Chapter 4 UART2 Serial Communication Protocol

DGUS screen adopts asynchronous, full-duplex serial port (UART), the serial port mode is 8n1, that is, each data transmission uses ten bits, including 1 start bit, 8 data bits, and 1 stop bit. 232/TTL communication and mainboard T/R input and output signal cross-wiring, the ground wire must be connected; 485 communication 485+ connects to A+, 485- connects to B-.

All commands or data of the serial port are in hexadecimal (HEX) format. For word (2 bytes) data, the high byte first (MSB) method is always used, such as 0x1234 first to transmit 0x12. The maximum data length that can be transmitted in a DGUS cycle depends on the complexity of the user interface; it is recommended that customers do not send more than 4KB (approximately equal to 230400-691200bps baud rate continuous transmission) data to the DGUS screen in a DGUS cycle.

4.1 Data Frame Structure

UART 2 can be used for system debug, whose mode is fixed at 8N1. Baud rate can be set, data frame is consisting of 5 parts.

CRC checker can be turn on/off at 0x2C.6 in T5UID1.CFG.

Data Block	**1**	**2**	**3**	**4**	
Definition	Frame	Data length	Instruction	Data	CRC (optional)
Data Length	2	1	1	Max249 Bytes	
Description	0x5AA5	Command+data+CRC	0x82/0x83		CRC-16(x16+x15+x2+1)
Example (without CRC)	5A A5	04	83	00 10 04	
Example (with CRC)	5A A5	06	83	00 10 04	25 A3

4.2 UART2 Debug Interface Commands

Description of UART2 instruction:

Instruction	Data	Description
0x80	Send: Register Page (0x00-0x08) + Register Address(0x00-0xFF) + Data to write	Write data string into register.
	Answer: 0x4F 0xaB	Answer of write instruction.
0x81	Send: Register Page(0x00-0x08) + Register Address (0x00-0xFF) + Data Length to Read (0x01-0xFB)	Read data from register.
	Answer: Register Page (0x00-0x08) + Register Address (0x00-0xFF) + Data Length + Data	Answer of read instruction.
0x82	Send: Start Address of SRAM (0x0000-0xFFFF) + Data to Write	Write data in to SRAM. Do not write data into space reserved for system.
	Answer: 0x4F 0xaB	Answer of write instruction.
0x83	Send: Start Address of SRAM (0x0000-0xFFFF) + Data Length to Read (0x01-0x7D)	Read data form SRAM.Appoint length data.
	Answer: Start Address of SRAM + Data Length (word) + Data	Answer of read instruction.
	DGUS II screen have128KBvariable storage,mainly for variable data storage,operating by word addressing.	

Attention:DGUS **II have replaced** common hardware operate register with system variable pointer connector access instructions . System reserved space interview is not required.

Definition of Register page:

Register page ID	Definition	Description
0x00-0x07	Data Register	256 per group, R0-R255
0x08	Port Register	DR0-DR255 See 3.4 section of DWIN OS development guide based on T5 for more.

4.2.1 Write VPS (0x82)

Write the value 2 in VP 0x 1000:5A A5 05 82 1000 0002

5A A5: Frame Header

05: Data Length

82: Write VPS

1000 : RAM Address（2bytes）

0002: Data（2bytes）

4.2.2 Read VPS(0x83)

Read the value in VP 0x 1000:5A A5 04 83 1000 01

5A A5: Frame Header

04: Data Length

83: Read VPS

1000: RAM Address

01: Number of VPS (words) to read.

Answer from LCM:5AA5 0683 1000 01 0002

0002: Value in RMA address 1000

4.2.3 Touch the Button to Return to the Serial Port Data (0x83)

Return to the VP 0x1001, key value 0x0002:

5A A5 06 83 1001 01 0002

5A A5: Frame Header

04: Data Length

83: Read VPS

1001: RAM Address（2 bytes）

01: 1 Length Data

00 02: Key Value 0002

4.2.4 Command Enable Check

5A A5 05 82 5420 0064: Check format: CRC-16,check content: 82 5420 0064, check result: 0x4C0F. The high and low bits of some verification tools are opposite, and the high and low bits of some verification tools are opposite to 0x0F4C, so the high and low bits need to be reversed. So the command with checksum is: 5A A5 07 82 5420 0064 4C0F.

Chapter 5 System Variable Interface

5.1 System Variable Interface

Data with same background color in table need to be update at the same time.and rewriting must be completed at one time.

System variable address range: 0x0000-0x0FFF.

VP	Definition	R/W	Length (Word)	Description
0x00	Reserved	W	4	T5 CPU ID, each T5 CPU has an unique ID.
0x04	System_Reset	W	2	Writing 0x55AA 5AA5 resets the T5 CPU once. E.g.5A A5 07 82 00 04 55 AA 5A A5 Reset T5 chip, clear all data, that is equivalent to power off for restarting.
0x06	OS_Update_CMD	W	2	D3: write 0x5A to enable DWIN OS once (write into 1MB Nor Flash), clear after operation. D2: File type 0x10: DWIN OS program must start from 0x1000, update 28KB at every time. 0xA5: 8051 code, update 64KB at every time. D1:0: Start address of SRAM to save program to update, it must be even. E.g: This instruction is used for downloading and updating the user OS program. "DWIN OS Build" PC software has integrated the function of downloading the os.bin file into the screen through serial port 2 after compilation.
0x08	NOR_FLASH_RW_CMD	W	4	D7: Mode. 0x5A=read 0xA5=write, clear after operation. D6:4: Start address of Nor Flash. Must be even. 0x000000-0x03:FFFE, 256KWords. D3:2: Start address of SRAM. Must be even. D1:0: Data length to read/write. Must be even. E.g.(1) Write the data 0x12345678 to the variable storage space 0x1002:5A A5 07 82 10 02 12 34 56 78 (2)Store 2-word data of variable storage space 0x1002 address into Nor Flash database header address 0x000002:5A A5 0B 82 0008 A5

				000002 1002 0002 (3) Read data from Nor Flash database 0x000002 to variable storage space address 0x2000:5A A5 0B 82 0008 5A 000002 2000 0002. After reading and storing the database with OS, it is necessary to judge whether the D7 address has been automatically cleared. If the D7 address has not been cleared, no operation will be carried out until it is cleared for other operations. Otherwise, logic disorder will occur. If the serial port is used for instruction reading and storage operation, other instructions can be sent after appropriate delay.
0x0C	Reserved		3	
0x0F	Ver	R	1	Application software version. D1 stands for GUI version, D0 stands for DWIN OS version. E.g:5A A5 04 83 000F 01 return: 5A A5 06 83 000F 01 1110 (11 is GUI software version, 10 is DWIN OS software version) Application: (1)When using a display terminal, due to the control system, display terminal start time inconsistent (depending on the user's power supply capacity and electricity rate), to ensure that the control system of a start sending data display terminal received correctly and carry out the corresponding functions and commands, so need to confirm whether the display terminal has the normal operation, the user can be identified by this directive; (2)In the process of debugging need to know whether the system version, configuration and so on is correct, you can also send this instruction to read. (3)The transmission and response of this instruction is often used to verify that the communication between the computer serial port and the serial screen is normal.
0x10	RTC	R	4	D7=Year (0-0x63) D6=month(0-0x0C), D5=day(0-0x1F), D4=week(0-0x6), D3=hour(0-0x17), D2=minute(0-0x3B), D1=second(0-0x3B), D0 undefined. Data format is HEX. If there is no RTC on hardware, user can write RTC data. E.g.Write: 5A A5 0B 82 0010 13 0A 01 00 0B 0C 0D 00 Text RTC display 2019-10-0111:12:13 SUN, The first two digits of the year are automatically identified; The week is displayed in English, and the system will convert automatically. Read: 5A A5 04 83 00 10 04

				Answer: 5A A5 0C 83 00 10 04 13 0A 01 00 0B 0C 0D 00
0x14	PIC_Now	R/W	1	Display current page ID E.g.Read: 5A A5 04 83 0014 01 Answer: 5A A5 06 83 00 14 01 0007 (0007 is page 07)
0x15	GUI_Status	R	1	GUI status feedback: 0x0000=free, 0x0001=processing 13.bin and 14.bin. The operation state feedback is in millisecond unit level, which is generally applied in special cases. The user can judge whether the GUI kernel is occupied by the DWIN OS program.
0x16	TP_Status	R	4	D7: 0x5A=touch screen data is updated, OS is clear. D6:Touch panel status. 0x00=release, 0x01=first press, 0x02=lift, 0x03=pressing D5:D4=X coordinate D3:D2=Y coordinate D1:D0=0x0000. D7:0x5A=touch panel data is updated. Others=touch panel coordinates not updated After reading the data, the user can write ≠ 0x5A as a mark. As long as the user does not touch, the mark will not be updated D6:touch panel status. 0x00=release, 0x01=first press, 0x02=lift, 0x03=pressing D5:D4=X coordinate D3:D2=Y coordinate D1:D0=0x0000. E.g.Read: 5A A5 04 83 0016 03 Answer: 5A A5 0A 83 00 16 03 5A 02 02 55 00 E5 Read the coordinates of the touch Write: 5A A5 05 82 0016 0000 reset touch panel data update mark. Usually, DWIN OS program can be used to deal with the judgment of whether to touch, long press, short press and other operations.
0x1A-0x2F	Reserved	R	22	Undefined
0x30	VCC_Now		1	Current 3.3V Voltage AD value, Voltage=AD value*4800/65532 mv.
0x31	LED_Now		1	D1: 0x5A : backlight brightness value, AD0-AD7 instant value has updated. D0: Current backlight brightness value, 0x00-0x64. E.g. Read: 5A A5 04 83 0031 01 Answer: 5A A5 06 83 00 31 01 5A 64

0x32	AD0-AD1 Instantaneous value		2	Instantaneous value of AD0-AD3, 1 word per AD. Voltage=AD value*4800/65532 MV. Hardware support is needed.
0x34-0x79	Reserved		64	Undefined
0x7A	LCD_HOR	R	1	Horizontal resolution of the screen E.g.Read: 5AA5 04 83 007A 01 Answer: 5A A5 06 83 00 7A 01 01 E0 (0x01E0 is horizontal resolution)
0x7B	LCD_VER	R	1	Vertical resolution of the screen E.g. Read:5AA5 04 83 007B 01 Answer:5A A5 06 83 00 7B 01 01 10 (0x0110 is vertical resolution)
0x7C	Folder Name		4	8 ASCII characters at most, like DWIN_SET. Read- only.
0x80	System_Config	R/W	2	D3: Undefined, write 0x00. D2: Touch panel sensitivity configuration, read-only. D1: Touch panel mode configuration, read-only. D0: Set system status. .7: Reserved, write 0. .6: Display control number. 0=64 control/page, 1=128 or 256 control/page, read-only. .5: Loading 22.bin to initialize SRAM. 1=Load 0=Not load, read only. .4: SD port status. 1=On 0=Ban, read and write. .3: Touch tone control. 1=On 0=Off, read and write. .2: Standby backlight control. 1=On 0=Off, read and write. .1-.0: display direction 00=0° 01=90° 10=180° 11=270°, read and write. E.g.Read: 5A A5 04 83 0080 02 Answer: 5A A5 08 83 00 80 02 00 14 10 38 Read commands are typically used to view the screen .CFG configuration . D0 can change the configuration. CFG file 0x05 address, for example, the next two instructions are on the corresponding.4= 1.5 =1, touch panel sound control off or on, can be applied to the touch button of the buzzer “mute” function. Note: write instruction is not saved after power off. Write: 5A A5 07 82 0080 5A 00 00 30 Write: 5A A5 07 82 0080 5A 00 00 38

				Set standby backlight. D3= brightness when system running, 0x00-0x64; When backlight standby control is off, D3 can be used for brightness adjustment via instruction. D2= brightness when system standby, 0x00-0x64; D1:0=wait time /5mS.
0x82	LED_Config	R/W	2	E.g.1. When CFG address 0x05 is configured to turn on backlight standby control of touch panel: 5A A5 07 82 0082 6432 03E8, 10 seconds after the screen backlight automatically reduced to 0x32 brightness. 5A A5 07 82 0082 2020 03E8, direct instruction control backlight brightness 0x20 brightness, and backlight screen saver brightness is consistent with standby. Note: the first physical touch on the touch panel after a certain period of time is to wake up the backlight function of the screen saver. Even if the brightness is the same as the setting value of standby brightness, “additional first awakening touch and click operation" is still needed after a certain period of time. 2. When CFG address 0x05 is configured with backlight standby control over touch panel: 5A A5 05 82 0082 32 00, direct instruction control backlight brightness is 0x32brightness.
0x84	PIC_Set	R/W	2	D3: 0x5A = enable page operation once, clear after CPU operation. D2: Processing mode 0x01=page switch (display the selected picture). 0x02=save page (save background of current page to picture memory). D1:D0: picture ID.
				E.g. 5A A5 07 82 0084 5A01 0001, Display the 01 serial number picture under the background picture ICL file (If the serial number picture ID of the sending instruction does not exist, the instruction operation judgment will not take effect.)
0x8A	PWM2_Set	R/W	4	PWM2 set.
0x8E	PWM3_Set	R/W	4	PWM3 set.
0x92	PWM0_Out	R/W	1	D1:D0=PWM0 output high level width, 0x0000-PWM0 precision.

0x93	PWM2_Out	R/W	1	D1:D0=PWM2 output high level width, 0x0000-PWM2 precision. Hardware support is needed.
0x94	PWM3_Out	R/W	1	D1:D0=PWM3 output high level width, 0x0000-PWM3 precision. Hardware support is needed.
0x95	PWMV1_Out	R/W	1	D1:D0=PWMV2 output ratio,0x0000-0x3E8 ,output and 50Hz input pin pulse synchronization Hardware support is needed.
0x96	PWMV2_Out	R/W	1	D1:D0=PWMV2 output ratio,0x0000-0x3E8 ,output and 50Hz input pin pulse synchronization Hardware support is needed.
0x97-0x9B	Reserved	Reserved	5	Undefined
0x9C	RTC_Set	W	4	D7:D6=write 0x5AA5 to enable RTC setting once; D5:D0=year, month, day, hour, minute, second, all in HEX format.When RTC valid and only when hardware setup.
0xA0	Music_Play_Set	R/W	2	Music player setting:D3: Starting section of music to play, 0x00-0xFF. D2: Section number, 0x01-0xFF. Clear after DGUS operation. D1: Volume, unit: 1/256. D0: Return the rest section numbers of music to play, 0x00-0xFF. D3:D2 both write 0x00 to stop music playing. E.g.Start play: 5A A5 07 82 00A0 05 74 FF 00 Stop play: 5A A5 05 82 00 A0 00 00
0xA2	BMP_Download	W	4	D7: 0x5A = enable once writing data in SRAM to picture buffer. D6:D5: Starting address of SRAM, must be even. D4:D3: Data length, unit: word. Must be even. D2:D1:D0: Picture buffer address, 0x000000-0x0257FF, 150Kwords.
0xA6	JPEG_Download	W	4	D7: 0x5A = enable JPEG picture/icon download operation once, clear after CPU operation. D6: download mode 0x01=Display JPEG picture on current page. (it will be covered when switch page). 0x02=Save JPEG picture to picture memory. (Operating backstage). D5:D4: starting address of SRAM to save JPEG file, must be even. 64Kbytes per JPEG file at most. D3:D0: 0x01 mode: D3:D2= top left corner coordinate of picture displayed on background. 0x02 mode: D3:D2= picture ID,0x0000-0x00F0. The resolution of JPEG picture must not exceed screen resolution, set coordinate as 0° display. (for 90° display, users need to rotate picture

				and coordinate in advance.)
	E.g:02 mode Theory:As D2 platform download mode 01 not support, only use 02 mode download to picture storage area that not influence Engineering practical application interface,use common picture control,shear the picture to display from picture storage area.Operate: 1,Prepare composite picture(1024*600 white background)(400*400picture),picture format JPG/JPEG,64KB max. 2,Engineering allocation basic graphics display control,the area can pull full screen. Need attention x,y coordinates, size:W:400,H:400.variable pointer follow reserved set,as latter JPEG data will use 8000H up,advise use under 8000H pointer. Input Picture data into 8000H variable pointer through the serial port ,64K max, variable pointer FFFFH max. Serial port instructions (82 input) can receive maximum data length is 256 bytes,data need divided into multiple packages to download update. 8000H+ variable pointer saved one picture data,use under instructions can update picture into picture buffer cache. 5A A5 0B 82 00A6 5A02 8000 0064 0000 , 64 :photo ID:100 5A A5 15 82 3000 0006 0001 0064 0000 0000 0190 0190 0000 0000 0006: Shear instruction 0001: Number of packets 0064: Page ID 0000 0000 0190 0190:Clipped image area（0,0）~（400,400） 0000 0000:Paste into start coordinates of the current basic graphics control（0,0）			
0xAA	Nand Flash_RW_CMD	W/R	6	D11: 0x5A= enable once read/write font library (64Mbytes) operation, clear after operation. D10: operation mode, 0x01= read font library, 0x02=update font library. When D10=0x01 D9: font ID, 0x40-0x7F, 128Kwords per font, 16Mbytes at most. D8:D6: starting address in font, unit: word. 0x00 00 00-0x01 FF FF. D5:D4: starting address of SRAM to write data, must be even. D3:D2: data length to read, unit: word. Must be even. D1:D0: undefined,write 0x00. When D10=0x02 Update font file (font library, icon, audio). D9: font ID, 0x00-0xFF. 128Kwords per font, 64Mbytes at most. D8:D6: starting address of font file, word. 0x00 00 00-0x01 FF FF. D5:D4: starting address of SRAM to save updating data, must be

				even. D3:D2: data length, word, must be even. D1:D0: undefined, write 0x00.
	E.g:Download 22.bin font file:①22.bin font data sent to start variable pointer 0x8000,Serial port instructions (82 input) can receive maximum data length is 256 bytes,data need divided into multiple packages to download update. (divided 22.bin into 32KBytes data send with the order:22.bin file is 56K,needs divided into two 32K data send(the second data not have 32K,so need complement 00.) Use each data send 128 bytes,start variable pointer place with the order according to 0x8000,0x8040,0x8080.0XBFC0. ◆5A A5 83 82 80 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ◆5A A5 83 82 80 40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ◆5A A5 83 82 BF 80 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ◆5A A5 83 82 BF C0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 file data send way same as D1 platform,but font update instructions is different:D10=0x02 update file data D9: Font ID,0x00-0xFF,each font128Kwords,maximum64Mbytes. D8:D6: font data start pointer,define according to word ,0x00 00 00-0x01 FF FF D5:D4: data write into font first pointer of the data variable space, must be even number D3:D2: data length ,define according to word,must be even number D1:D0: undefined, write0x00. ②After first data 32K send update font instruction:5A A5 0F 82 00 AA 5A 021600 00 0080 0040 0000 00 ③Follow the ahead format send second 32K DA data,when completed send font instruction after second data 32K send update font instruction: 5A A5 0F 82 00 AA 5A 021600 40 0080 0040 0000 00			

0xB0	Touch Control interface	W	36	0xB0: 0x5AA5= enable accessing touch control interface once. Clear after CPU operation. 0xB1: Page ID of touch control. 0xB2: High byte: touch control ID (set in DGUS II development software), 0x00-0xFF; Low byte: touch control code, 0x00-0x7F. 0xB3: Access mode 0xB4-0xD3: data to modify of mode 0x02, 0x03. Mode 0x0000: turn off this touch control. Mode 0x0001: turn on this touch control. Mode 0x0002: Read this touch control and write it to SRAM that 0xB4 pointing to. Mode 0x0003: update current touch control with data that 0xB4 pointing to, the format and data length must be the same. E.g.5AA5 0B 82 00B0 5AA5 0001 0905 0000 (close the 9th touch file on page 0001. 05 represents the command code, 0000 represents to turn off the touch control.)Basic touch control cannot be turned on/off. If it is ranked in PC software, it does not need to be counted as effective touch number. If you need to change the specific properties of the touch, you need to use mode 03 to replace the 0xb4 prewritten touch file in the property configuration of the 13bin file. Search for the key words of 0xB0 in the DWIN forum, with detailed post description.
0xD4	TP operation simulation	W		0xD4: 0x5AA5=enable the operation once, clear after operation. 0xD5: press mode. 0x0001=press, 0x0002=release, 0x0003=keep pressing, 0x0004=touch (press+release) 0xD6: X coordinate of press position. 0xD7: Y coordinate of press position. After simulating mode 0x0001 and 0x0003, must simulate 0x0002. (x,y) coordinate of TP must be set as 0°, CPU will auto-rotate coordinate. E.g.5AA5 0B 82 00D4 5AA5 0004 00EE 008F (0004 is click, press + lift,00EE 008F (283,143) coordinates, Press mode 0x0001= press; 0x0002= release; 0x0003= continue pressing 0x0004=click After applying the simulated lift modes 0x0001 and 0x0003, there must be a simulated lift mode of 0x0002.

				(after "touch panel sound control" is enabled, touch panel operation simulation will also trigger the touch panel buzzer) (after "touch panel backlight standby control" is enabled, touch panel operation simulation will also wake up backlight)
0xD8	Background drawing instruction 1 interface		4	D7: 0x5A means instruction 1 is valid, the CPU is cleared after the operation, and the host computer must query 0x00 before sending; D6: CMD_ID, the command code of command 1; D5:D4: PAGE_ID, the valid page ID of command 1; 0xFFFF means all pages are valid; D3:D2: The first address of the variable storage space for storing instruction 1 data. It must be an even number, and the maximum data is 4KB. D1:D0: Data_Pack_Num, the number of valid data packets of instruction 1.
0xDC	Background drawing instruction 2 interface		4	The definition of background drawing command 1 is the same as 0xD8.
0xE0	Memory CRC check		2	D3: Write 0x5A to perform a memory CRC check, and clear it after CPU operation. D2: memory type selection 0x00=font 0x01=picture 0x02=DWIN OS code 0x03=Nor database (LIB file) D1:D0: Data interface. ❊When the user starts CRC Font verification mode: D1=start font ID (256KB for each font); D0=number of 4KB blocks to be verified, 0x00-0xFF. Picture verification mode: D1:D0=Picture ID. OS code verification mode: D1:D0=Starting from 0x1000, the byte length of OS code that needs to be verified, 0x0001-0x7000. Nor database verification mode: D1:DO=Nor database ID, 4KB data is fixed every time. ❊After the CRC check is completed The returned CRC value.
0xE2	SD card read and write interface		8	SD card interface status detection, read and write operation interface.

0xEA-0xFF	Reserved		22	Undefined.
0x100-0x2FF	Reserved		512	
0x300-0x37F	Dynamic curve interface	R/W	128	0x300-0x30F: feedback 8 channel of curve buffer (read only), 2 words per channel. High word: pointer of data (0x0000-0x07FF); Low word: data length of curve buffer (0x0000-0x0800). Write 0x0000 to hide curve. 0x310-0x311: enable writing curve buffer. D3:D2: 0x5AA5= enable writing curve buffer, clear after operation. D1: The number of data block, 0x01-0x08. D0: Undefined, write 0x00. 0x312-0x37F: The data block to send to curve buffer, 16bit unsigned number. Single data block defines as channel ID (0x00-0x07)+data word length(0x01-0x6E)+data. After adopting dynamic curve displaying, from 0x1000, setting data buffer for each curve,as per 2Kwords aisle. While dynamic curve display is enabled, data buffer is start from 0x1000, and 2Kwords every buffer. CH0 buffer is 0x1000-0x17FF, CH1 buffer is 0x1800-0x1FFF, etc. Free buffer can be used for user variable area. User can also rewrite curve buffer data, then modify pointer and data length in 0x300-0x30F to make sure the curve display right.
0x380-0xFFF	Reserved		128	Undefined
0x400-0x4FF	Network communication interface		256	Wi-Fi and other Internet communication equipment application control interface.
0x500-0x57F	Video surveillance application interface		128	Video surveillance application control interface such as camera.
0x580-0x5FF	Digital Video Application Interface		128	Digital video application control interface such as streaming media playback.
0x600-0xEFF	Reserved		2304	Reserved

0xF00	Variable change indication		2	After setting the variable to change the automatic upload function, this function is enabled. D3=5A means there is a variable change. D2: D1=variable memory pointer D0=variable length (words).
0xF02-0xFFF	Reserved		254	Reserved

0x1000-0xFFFF SRAM is for user use.

5.2 Background Drawing Instruction

Serial number	instruction（CMD_ID）	Data Format	Description
1	0x01	The data packet format is (x0, y0, x1, y1, Color).	The specified color fills the specified area.
2	0x02	The data packet format is(x,y,Color).	Set point.

Example: Fill the area (128, 128) (256, 256) with red.
5A A5 0D 82 30 00 00 80 00 80 01 00 01 00 F8 00 5A A5 0B 82 00 D8 5A 01 00 00 30 00 00 01

5.3 SD Card Read and Write Interface (0x0E2-0x0E7)

definition	address	length	Description
SD card interface status	0x0E2	4	D3=0x5A means SD card is detected; D2:D0=boot sector position.
0x0E4	0x0E4	1	High byte=0x5A Start an SD card operation. After CPU processing, the feedback result: 0xA5=operation successful, 0x00=operation failed. Low byte = operation instruction, 0x00-0x04:0x00: Read the SD root directory file and folder information; the root directory must be read once after inserting the card. 0x01: Return from the current directory to the previous directory. 0x02: Enter the specified number directory data in the current directory. 0x03: Read the specified block length data starting from the specified number of files in the current directory and the specified (block) position. 0x04: Update the data of the specified block length to the file with the specified number and the specified (block) position in the current directory. The 0x04 command can only rewrite the content of the designated area of the selected file, and cannot add content.
SD card read and write interface	0xE5	1	High byte = the number of the selected file or directory in the current directory page, 0x01-the length of the directory and file in the directory. This parameter is invalid for 0x00, 0x01, 0x05, 0x06 commands, and any value can be written. Low byte = the number of 4KB data blocks for file read and write, 0x01-0x10, up to 64KB read and write at a time (data buffer should be set to the corresponding size).This parameter is invalid for 0x00, 0x01, 0x02, 0x05, 0x06 commands, and any value can be

			written.
	0xE6	2	0x00, 0x01, 0x02 instructions: invalid, any value can be written. 0x03, 0x04 instructions: The read data is at the pointer position of the file storage, 4Bytes, the lower 12bit is 0 (aligned to 4KB), and the maximum is 4GB.
	0xE8	1	The file is read and written, the pointer of the read and write data stored in the variable memory must be an even number; it can be modified according to the application software. This parameter is invalid for 0x00, 0x01, 0x02 commands, and any value can be written.
	0xE9	1	The pointer of the directory data stored in the variable memory must be an even number, occupying a fixed space of 4KB, and the root directory must be read again before changing. The directory storage structure is as follows:D0: The number of valid directory (file) items, 0x00-0x7F, up to 127 directory item data. D1-D31: undefined, reserved. D32-63: The first directory (file) item information, which directly corresponds to the FAT32 short file directory item data, each piece of information is 16 words. D64: The second directory (file) item information. D4064: The 127th directory (file) item information.

FAT32 short file directory item data description:

initial address	Number of bytes	Definition	Remarks
0x00	8	file name	2E 20 20 20 20 20 20 20 means the current directory. 2E 2E 20 20 20 20 20 20 means the upper level directory. File names exceeding 8 bytes will be abbreviated.
0x08	3	extension name	Extensions exceeding 3 bytes will be abbreviated.
0x0B	1	Attributes	.0: 0=read and write 1=read only .4:1=Directory record .5: 1=document record The host can distinguish files and directories with attribute byte &0x20, 0x00=directory, 0x20=file.
0x0C	1	System reservation	
0x0D	1	10mS bit of creation time	
0x0E	2	Creation time	
0x10	2	Creation date	
0x12	2	Last visit date	
0x14	2	File starting cluster number is 16bit high	LSB mode
0x16	2	Last modified time	
0x18	2	Last modified date	
0x1A	2	Low 16bit of file starting cluster number	LSB mode
0x1C	4	File length	LSB mode,as 5000 bytes are stored as 0x88 0x13 0x00 0x00.

5.4 Network Interface

definition	address	length	Description
Network interface	0x400	1	0x5AA5 indicates that the network communication interface is enabled.
RMA alarm	0x401	3	D5- D4: 0x5AA5 means to start uploading the designated RMA space data to the server immediately, and clear it after processing. D3- D2: RMA variable memory word address to be uploaded. D1- D0: The length of the RMA variable memory word to be uploaded (currently the maximum is 4KBytes).
retain	0x404	12	Retain
Device description	0x410	1	High byte: 0x5A means the device description is valid. Low byte: the encoding method and length of the device description text. .7- .6: Coding mode 0x00=UNICODE 0x01=GBK, GBK is recommended. .5- .0: Description text length 0x00-0x34.
	0x411	2	Device manufacturer ID, DWIN factory assigned, 0xFFFF:0000-0xFFFF:FFFF segment is reserved. After adding a device on the DWIN Cloud platform, it will be automatically generated by the platform.
	0x413	1	The classification of each manufacturer's equipment is classified according to the DWIN classification standard equipment. After adding a device on the DWIN Cloud platform, it will be automatically generated by the platform.
	0x414	2	A single device number under each type of device. After adding a device on the DWIN Cloud platform, it will be automatically generated by the platform.
	0x416	26	Device description text, up to 52Bytes.
Device Description (RMA mapping)	0x430	1	The time interval for RMA to automatically refresh the server, 0x0000-0xFFFF, the unit is 0.1 second.
	0x431	1	RMA (mapped to the variable memory of the server) reads the starting address and word address of the space. It cannot be read if it exceeds the boundary.
	0x432	1	RMA read space size, the unit is 128Words, currently the maximum is 2KBytes, 0x0000 means reading is prohibited.
	0x433	1	The start address of the RMA write space can overlap with the read space, and cannot be written beyond the boundary.
	0x434	1	RMA write space size, the unit is 128Words, currently the maximum is 2KWords, 0x0000 means writing is prohibited.
	0x435	3	Retain
Device Description (Remote upgrade)	0x438	1	The remote upgrade interface is enabled, 0x5AA5 means that the device opens the remote upgrade interface, and the system will automatically detect Buffer.
	0x439	1	The package timeout timer configuration for remote upgrade, the unit is 0.1 second.
	0x43A	4	Definition of the first remote upgradeable space (aligned to 4KB) of the device:D7: 0x5A means the remote upgrade space is enabled. D6-D3: 32bit starting address of the upgradeable space (lower 12bit is 0), the maximum is 4GB. D2-D0: The size of the upgradeable space, the unit is 4KB, and the maximum is 4GB.

	0x43E	4	The second remote upgradeable space definition of the device.
	0x442	4	The third space definition of the device can be upgraded remotely.
	0x446	4	The fourth space definition of the device can be upgraded remotely.
	0x44A	2	Remote upgrade Buffer interface definition:D3: 0x5A means the remote upgrade buffer is valid. D2: Upgrade mode 0x00=The communication terminal is responsible for checking the data CRC, and the error frame is notified to the host to resend. D1: The number of buffers that can be used for remote upgrades, 0x01-0x10, up to 16. D0: The high byte (word address) of the starting address of Buffer0, the low 8bit of the address is 0x00. Each Buffer occupies a fixed space of 2304 words (0x900), and the sequence goes to the back. Definition of a single buffer (the first 512 bytes are the control interface, and the next 4KB is the data): D0: 0x5A means to start a remote upgrade of this buffer, and the CPU will clear it after processing. D1: Remote upgrade space selection, 0x00-0x03, one of the 4 remote upgrade spaces. D2-D5: Write the target address of the remote upgrade space, the lower 12bit is 0 (aligned to 4KB). D6-D7: Data byte length, 0x0001-0x0FFF. D8-D9: Data CRC checksum. D10-D511: reserved. D512: Start of data, up to 4096 bytes.
	0x44C	4	Retain
Communication equipment description	0x480	16	D31: 0x5A means that the communication device description data is valid. D30: The encoding method and length of the device description text. .7- .6 Code: Code method 0x00=UNICODE 0x01=GBK, GBK is recommended. .5- .0 Description: The length of the text is 0x00-0x14. D29: Communication equipment category 0x01=WiFi D28: Communication equipment status, bit definition .7 Equipment working status 0=Configuring 1=Normal; .6-.3 Undefined, write 0; .2- .0 Signal quality, 0x00-0x07 has a total of 8 levels, 0x00 means the worst, 0x07 means the best. D27-D20: 8Bytes communication device MAC address, low bit (D20) aligned. D19-D0: Description of the communication device in text format, up to 20Bytes. Use hexadecimal, and the description information is the corresponding ASCII code character.
communication device	0x490	8	Restart the WIFI module to be effective D15-D14: Reserved for baud rate setting. Currently 921600bps is fixed and cannot be set. D13-D9: reserved. D8: WIFI module switch Debug firmware 5A means valid. D7:D0: The WIFI module type identification information defaults to "DWD100".
Network Configuration (WiFi_Config)	0x498	4	D7: Write 5A to indicate the start of WIFI network configuration, the network configuration is completed, the value is cleared to 0. D6: 0x5A means to start the network name and password to connect to the router (the

			network name and password are stored in 0x4B0) D7-D6, as long as you start it once, after completion, D7-D6 will be cleared at the same time. Both of the Internet access methods cannot be started at the same time. If both are 5A, the one-key network configuration will take precedence. D5: Network time 5A means the screen comes with RTC (0x9C); 5B means RTC library RTC (0xF430) D4-D2: reserved. D1: The WIFI module is automatically upgraded. 5A means enable. D0: Soft reset. 5A Start reset, reset to 0 after reset.

Chapter 6 Touch Variable Configuration Description (13.BIN)

The touch configuration file is stored in the 13.BIN file, which is composed of N touch commands configured according to the page, and each touch command occupies a fixed storage space of 16, 32, or 48 bytes. A touch command is composed of 6 parts, as shown in the following table:

Definition	Length (bytes)	Description
Pic_ID	2	Picture ID
TP_Area	8	Upper left corner (Xs, Ys) and lower right corner (Xe, Ye) of control button area.
Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
Pic_On	2	Button press effect page, 0xFF** means no button press effect.
TP_Code	2	Touch key code: 0xFF** = Invalid. 0xFE** = Normal Control. Auto-Send Data enabled for this Control. 0xFD** = Normal Control. Auto-Send Data disabled for this Control.
TP_FUN	32	Touch key code:0xFF** = Invalid. 0xFE** = Normal Control. Auto-Send Data enabled for this Control. 0xFD** = Normal Control. Auto-Send Data disabled for this Control. Other Values = Basic Touch Control. High byte and Low byte are ASCII Code characters. The function button of 0xFE** can be set by CFG file 0x05.4 whether to upload or not. The function button of 0xFD** always prohibits automatic upload after the variable is changed. Others represent the touch key code, expressed in ASCII; for example, 0x0031 represents the button “1".

6.1 List of Touch Functions

No.	Function Code	Function	Data Length (Word)	Description
01	00	Variable Data Input	1/2/4	Input integer, fixed-point decimal via touch panel. The inputted data will be saved to variable space that user define.
02	01	Popup Window	1	Touch to active a popup window, return menu item key code of the window.
03	02	Increment Adjustment	1	Touch button to do add/minus with variables. The adjustment step and range can be set. Set adjustment from 0 to 1 circularly, user can get the checkbox effect.
04	03	Slide Adjustment	1	Slide to adjust variable data. The adjustment range can be set.
05	05	Return Key Value	1	Return key code when touch the button on touch panel and write key code in variable space that VP point to. Support bit variable return.
06	06	Text Input	127 at most	Input ASCII character or GBK Chinese character, support cursor and edit during input process. (VP-1) space is reserved to save input status and inputted data length.
07	08	Return data based on touch status	User define	Return data to space that VP pointing to, the rule between data and touch status is set forward. Combining data auto-uploading function, the data can be returned to UART.
08	0A	Slide Adjust (gesture)	2	Adjust variable data based on slide range on X axis or Y axis within selected area. Combining data window to realize rolling adjustment. VP space is reserved, the data is saved in space that (VP+1) pointing to.
09	0B	Page Sliding (gesture)	None	Scrolling touch screen along X-axis to realize page scrolling. The next page and scrolling area can be set. Display control will move along gesture. When page sliding control and other touch controls are stacked, user can set page sliding control at highest priority to insure the sliding effect.
10	0C	Slide Icon Selection	4	Fit display variable(JPEG icon panning display) to achieve icon page sliding selection

Remarks:

1. Refer to DWIN DGUS Development Guide for detailed description.
2. Touch configuration file (13*.BIN) can not be more than 32Kbytes.
3. The touch control interface is 0x00B0, user can operate touch control via UART or DWIN OS to nest or group functions.

6.2 Variable Data Input (0x00)

Address	Definition	Length(byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (Xs, Ys), lower right corner (Xe, Ye).
0x0A	Pic_Next	2	Target switch page, 0xFF** means no page switch
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE00, variable data input key code.
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer
0x13	V_Type	1	Return variable type: 0x00=2bytes:Integer: -32768 to 32767; Unsigned integer: 0 to 65535 0x01=4bytes:Long integer: -2147483648 to 2147483647 Unsigned long integer: 0 to 4294967295 0x02=*VP high byte, unsigned number: 0 to 255 0x03=*VP low byte, unsigned number: 0 to 255 0x04=8bytes, extra long integer: -9223372036854775808 to 9223372036854775807
0x14	N_Int	1	Integer digits. For example, enter 1234.56, N_ Int=0x04
0x15	N_Dot	1	Decimal digits. For example, enter 1234.56, N_ Int=0x02
0x16	（x,y）	4	Display location: right alignment, （x,y）is the upper right coordinate of the string input cursor. Undefined when use assembly keyboard（KB_Source=0x0F）
0x1A	Color	2	Display color Undefined when use assembly keyboard（KB_Source=0x0F）
0x1C	Lib_ID	1	ASCII Font position, default 0x00 Undefined when use assembly keyboard（KB_Source=0x0F）
0x1D	Font_Hor	1	Font size .0x00 means black, otherwise it is white Undefined when use assembly keyboard（KB_Source=0x0F）
0x1E	Cusor_Color	1	Cursor color. Undefined when use assembly keyboard（KB_Source=0x0F）
0x1F	Hide_En	1	0x00:The entered text is displayed as *; other values are displayed according to the entered content.
0x20	0xFE	1	0xFE
0x21	KB_Source	1	0x00=Current page; 0x01=Other page; 0x0F=Assembly keyboard
0x22	PIC_KB	2	The page ID where the keyboard is located is valid only if KB_Source is not equal to 0x00. Assembly keyboard（KB_Source=0x0F） = assembly function file number
0x24	AREA_KB	8	Keyboard area coordinates: upper left coordinate (Xs, Ys), lower right coordinate (Xe,Ye) Valid only if the keyboard is not on the current page, KB_Source

			does not equal 0x00.
0x2C	AREA_KB_Position	4	The upper-left coordinate of the position the keyboard displays on the current page, only if the keyboard is not on the current page or the assembly keyboard.
0x30	0xFE	1	0xFE
0x31	Limits_En	1	0xFF:indicates that input range restriction is enabled and out of the range is invalid (equivalent to cancellation); Other values indicates that the input has no range limit.
0x32	V_min	4	Enter lower limit, 4 bytes (long integer or unsigned long integer).
0x36	V_max	4	Input upper limit, 4 bytes (long integer or unsigned long integer).
0x3A	Return_Set	1	0x5A: During entry, Return_VP address is loaded with Return_Data and automatically restored after completion. 0x00: data is not loaded during entry Function of loading data: it is mainly used in combination with SP (description pointer) modification of variable display to realize automatic marking of multi-parameter input process, such as modifying font color, size, launching a (bit) variable icon or area anti-color. It can also be used as the mark bit of input process to realize special requirements with DWIN_OS development.
0x3B	Return_VP	2	Load data VP address during entry
0x3D	Return_Data	2	Data is loaded into Return_VP during entry
0x3F	Translucent	1	The background transparency setting of the picture in the pop-up keyboard area. Range: 0x00~0xFF.

Info

Effective code of data input are 0x0030-0x0039, 0x002E(.), 0x002D(+/-), 0x00F0(ESC), 0x00F1(confirm), 0x00F2(backspace).

6.3 Pop-up Menu (0x01)

Opens a keyboard in a pop-up window-style.The pop-up menu selection function is to click to trigger a pop-up menu and return to the key code of the menu item. The drop-down menu can also use this command. Valid key codes during input: 0x0000-0x00FF, among which 0x00FF means cancel (that is, return without selecting parameters). Only basic touch control keys can be used on the pop-up menu.The transparency can be set.

Address	Definition	Length(byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x0A	Pic-Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE01, pop-up window key code.
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer
0x13	VP_Mode	1	0x00: Write 0x00** key code to the VP (integer) 0x01: Write 0x01**key code to high byte of the VP(VP_H) 0x02: Write 0x02**key code to low byte of the VP(VP_L) 0x10-0x1F: Write the lowest bit of ** (1bit) to specific bit of VP(0x10 corresponds to VP.0, 0X1F corresponds to VP.F)
0x14	Pic_Menu	2	Page ID of the menu
0x16	Area_Menu	8	Menu area: upper left coordinate (Xs, Ys), lower right coordinate (Xe, Ye).
0x1E	Menu_Position_x	2	Upper left corner x-coordinate of the current page
0x20	0xFE	1	0xFE
0x21	Menu_Position_Y	2	Upper left corner y-coordinate of the current page
0x23	Translucent	1	The transparency setting. Range:0x00~0xFF.
0x24	NULL	12	Write 0x00

6.4 Incremental Adjustment (0x02)

Used to adjust the data value. Click the button to perform +/- operation on the specified variable, and set the step length and upper and lower limits.

Address	Definition	Length(byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x0A	Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE02, incremental adjustment key code
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer, returned data is defined by VP_ Mode
0x13	VP_Mode	1	0x00: Adjust the VP(integer) 0x01: Adjust high byte of the VP(1-byte unsigned integer, VP_H) 0x02: Adjust low byte of the VP(1-byte unsigned integer, VP_L) 0x10-0x1F: Adjust the specific bit of VP(0x10 corresponds to VP.0, 0x1F corresponds to VP.F), range:0-1.
0x14	Adj_Mode	1	0x00= - - others=++
0x15	Return_Mode	1	0x00: Disabled. The value stops changing when max. or min. values are reached. Other Values: Enabled. The value loops around the range when it reaches max. or min. values.
0x16	Adj_Step	2	0x0000-0x7FFF
0x18	V_Min	2	Minimum value accepted by the control: 2-bytes integer(When VP_Mode is 0x01 or 0x02, only low byte is effective)
0x1A	V_Max	2	Maximum value accepted by the control: 2-bytes integer(When VP_Mode is 0x01 or 0x02, only low byte is effective)
0x1C	Key_Mode	1	0x00: Continuous. The value is changed while the user holds it. 0x01: One-Step. The value is changed once per touch.
0x1D	NULL	3	Write 0x00

6.5 Slide Adjustment (0x03)

Used to implement a sliding button that dynamically changes the content of a VP.

Address	Definition	Length(byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x0A	Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE03, slide adjustment key code
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer
0x13	Adj_Mode	1	High 4bit defines the VP_Mode:0x0*: Adjust the VP(integer) 0x1*: Adjust high byte of the VP(1-byte unsigned integer, VP_H) 0x2*: Adjust low byte of the VP(1-byte unsigned integer, VP_L) Low 4bit defines the slider mode:0x*0: Horizontal. 0x*1: Vertical.
0x14	Area_Adj	8	Sliding Area: (Xs,Ys) (Xe,Ye) .Should be equal to "Touch Area".
0x1C	V_Begin	2	Minimum value accepted by the control.
0x1E	V_End	2	Maximum value accepted by the control.

6.6 Return Key Value (0x05)

Return key value is return the setting value to corresponding address.

Address	Definition	Length(byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x0A	Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE05
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer
0x13	TP_Mode	1	0x00: Write 0x00** key code to the VP (integer) 0x01: Write 0x01**key code to high byte of the VP(VP_H) 0x02: Write 0x02**key code to low byte of the VP(VP_L) 0x10-0x1F: Write the lowest bit of ** (1bit) to specific bit of VP(0x10 corresponds to VP.0, 0X1F corresponds to VP.F)
0x14	Key_Code	2	Return value
0x16	NULL	10	Write 0x00

Return data format:

5A A5 06 83 5436 01 0001

Meaning:0x5A5A:Frame header;

0x06:Data length;

0x83: Read command;

0x5436: VP;

0x01: Word length of Return data;

0x0001:Return 0001 key value.

6.7 Text Input (0x06)

Opens a keyboard for alphanumeric (text) values input. It uses terminator characters (0xFF) to signal end of text.ASCII input mode pop-up keyboard transparency can be set.

Input text keyboard key value is shown in the table : The key code is the key value that is not defined by the basic touch made on the keyboard. The low byte of the two-byte key code represents the normal key code, and the high byte represents the uppercase key code.For example:0x61→a,0x41→A,0x31→1.Key code of the text keyboard must less than 0x80(ASCII code),0x0D key code input transform into0x0D 0x0A;0x00 and 0xFF key code disable.

Touch's "TP_Code" must be assigned to a code. For digit keys, use ASCII codes:

Code	Lowe r	Upper	Code	Lower	Upper	Code	Lower	Upper	Code	Lower	Upper
0x7E60	`	~	0x5171	q	Q	0x4161	a	A	0x5A7A	z	Z
0x2131	1	!	0x5777	w	W	0x5373	s	S	0x5878	x	x
0x4032	2	@	0x4565	e	E	0x4464	d	D	0x4363	c	C
0x2333	3	#	0x5272	r	R	0x4666	f	F	0x5676	v	V
0x2434	4	$	0x5474	t	T	0x4767	g	G	0x4262	b	B
0x2535	5	%	0x5979	y	Y	0x4868	h	H	0x4E6E	n	N
0x5E36	6	^	0x5575	u	U	0x4A6A	j	J	0x4D6D	m	M
0x2637	7	&	0x4969	i	I	0x4B6B	k	K	0x3C2C	,	<
0x2A38	8	*	0x4F6F	o	O	0x4C6C	l	L	0x3E2E	.	>
0x2839	9	(	0x5070	p	P	0x3A3B	;	:	0x3F2F	/	?
0x2930	0	)	0x7B5 B	[	{	0x2227	'	"	0x2020	SP	SP
0x5F2D	-	_	0x7D5 D	]	}	0x0D0D	Enter	Enter			
0x2B30	=	+	0x7C5 C	\	|						

For control keys, use these codes:

Code	Definition	Description
0x00F0	Cancel	Cancels the input, doesn't change any data.
0x00F1	Return	Completes the input, writing the value to the VP.
0x00F2	Backspace	Deletes the character to the left of the cursor.
0x00F3	Delete	Deletes the character to the right of the cursor.
0x00F4	Caps Lock	Caps Lock. Button Effect must be enabled for this function.
0x00F7	Left	Moves the cursor left. It is used to turn page during the GBK input.
0x00F8	Right	Moves the cursor right. It is used to turn page during the GBK input.

6.7.1 ASCII Input

ASCII input is used to input ASCII character,open DGUS,Click Basic Touch_Text Input, and use the mouse to select an area to set the function in the menu on the right. "ASCII text input" can be associated with the “text display" control key to display the entered characters.The 0# font library pre-installed by DWIN contains all ASCII code characters of 4*8-64*128 dot matrix. Input text characters in ASCII or GBK Chinese character text mode. The input process supports cursor movement and editing. It can be set in the (VP-1) position to save the input status and input length. The ASCII input mode pop-up keyboard transparency can be set.

Address	Definition	Length(byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (xs,ys), lower right corner (Xe,Ye).
0x0A	Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE06
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer
0x13	VP_Len_Max	1	Maximum text length, in words (two characters for each word). Range: [0x01,0x7B]. When the text is saved in the specific VP, it will add the 0xFFFF as terminator automatically at the ending of the text. Thus the variable space is actually VP_Len_Max+1
0x14	Scan_Mode	1	Input mode. 0x00: re-input, 0x01: modify existing text.
0x15	Lib_ID	1	Index in the FLASH memory of the ASCII Font to use. 0x00=default.
0x16	Font_Hor	1	Font width, in pixels.
0x17	Font_Ver	1	Font height, in pixels. When using "Lib_ID" = 0x00, it must be twice the Width.
0x18	Cursor_Color	1	Color of the input cursor. 0x00: Black Other Values: White.

0x19	Color	2	Text color.
0x1B	Scan_Area_Start	4	Upper-left coordinates of the area where the text will be displayed: (Xs, Ys).
0x1F	Scan_Return_Mode	1	0x55= saves the input end tag and valid data length at the * (vp-1) position. * (vp-1) high byte, input end mark: 0x5A means input end, 0x00 means idle or input state. * (vp-1) low byte, effective input data length, byte unit. 0x00= does not return the input end tag and data length.
0x20	0xFE	1	0xFE
0x21	Scan_Area_End	4	Lower-right coordinates of the area where the text will be displayed: (Xe, Ye).
0x25	KB_Source	1	Indicates if the keyboard image is in the same screen as this control. 0x00: Keyboard on current page. Other Values: Keyboard on another page.
0x26	PIC_KB	2	Page ID of the Screen used as image source for this control. It's the Page ID where the keyboard image is. Not used if "External_Keyboard" = 0x00.
0x28	Area_KB	8	Keyboard area coordinate: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x30	0xFE	1	0xFE
0x31	AREA_KB_Position	4	Upper-left coordinates of the pasting area of the keyboard. Not used if "External_Keyboard" = 0x00.
0x35	Display_EN	1	0x00=Normal display; 0x01=Characters displayed as asterisks(*)
0x36	Translucent	1	The transparency of the keyboard when it is not on the current page. Range: 0x00~0xFF.
0x37	NULL	9	Write 0x00

6.7.2 GBK Input

Used to input Chinese character text,open DGUS,Click Basic Touch_GBK input, and use the mouse to select an area to set the function in the menu on the right, "GBK text input" can be associated with the "text display" control key to display the entered characters.

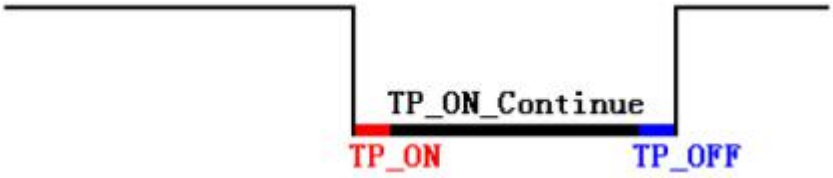
Address	Definition	Length (byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (xs,Ys), lower right corner (Xe,Ye).
0x0A	Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE06, GBK input key code.
0x10	0xFE	1	0xFE
0x11	*VP	2	Variable Pointer
0x13	VP_Len_Max	1	Maximum text length, in words (two characters for each word). Range: [0x01,0x7B]. When the text is saved in the specific VP, it will add the 0xFFFF as terminator automatically at the ending of the text. Thus the variable space is actually VP_Len_Max+1
0x14	Scan_Mode	1	Input mode. 0x00: re-input, 0x01: modify existing text.
0x15	Lib_GBK1	1	Index in the FLASH memory of the GBK Font to use after entry. 0x00=default.
0x16	Lib_GBK2	1	Index in the FLASH memory of the GBK Font to use before entry.
0x17	Font_Scale1	1	Lib_GBK1 font size,lattice number
0x18	Font_Scale2	1	Lib_GBK2 font size, lattice number
0x19	Cursor_Color	1	Color of the input cursor. 0x00: Black Other Values: White.
0x1A	Color0	2	Text color after entry
0x1C	Color1	2	Text color during entry
0x1E	PY_Disp_Mode	1	Input process, pinyin prompt and corresponding Chinese characters display:* 0x00= the pinyin prompt is displayed on the top, and the corresponding Chinese character is displayed on the bottom; The pinyin prompt and Chinese characters are displayed left-aligned, with Scan_Dis between the lines. * 0x01= pinyin prompt is displayed on the left, and corresponding Chinese characters are displayed on the right; Chinese prompt x position is Scan1_Area_Start+ x Font_Scale2+Scan_Dis.
0x1F	Scan_Return_Mode	1	0xAA= saves the input end tag and valid data length at the * (vp-1) position. * (vp-1) high byte, input end mark: 0x5A means input end, 0x00 means still in input. * (vp-1) low byte, effective input data length, byte unit. 0xFF= does not return the input end tag and data length.
0x20	0xFE	1	0xFE
0x21	Scan0_Area_Start	4	Upper-left coordinates of the area where the text will be displayed: (Xs, Ys).

0x25	Scan0_Area_End	4	Lower-right coordinates of the area where the text will be displayed: (Xe, Ye).
0x29	Scan1_Area_Start	4	Input process, Pinyin prompt text display area of the upper left coordinates.
0x2D	Scan_Dis	1	During the input process, the spacing of each character is displayed. Each line displays up to 8 characters.
0x2E	0x00	1	0x00
0x2F	KB_Source	1	Indicates if the keyboard image is in the same Screen as this Control. 0x00: Keyboard on current Screen. Other Values: Keyboard on another Screen.
0x30	0xFE	1	0xFE
0x31	PIC_KB	2	Page ID of the Screen used as image source for this control. It's the Page ID where the keyboard image is. Not used if "External_Keyboard" = 0x00.
0x33	Area_KB	8	Keyboard area coordinate: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x3B	Area_KB_Position	4	Upper-left coordinates of the pasting area of the keyboard.
0x3F	Scan_Mode	1	0x02= pinyin input method 0x03= phonetic input method.

The keys on the keyboard must be designed with Basic Touch Controls.

6.8 Synchrodata Return Touch Screen Press Status Data Return

Synchrodata return includes three status: first press, continuous pressing and loosen pressing.



The touch screen pressing state synchronous data return function is to click on the touch screen to return the data to the variable or serial port according to the regulations.

The T5L_DGUS II screen has only 01 mode,it can be used to replace the 02 mode of DGUS1,the new functions are added: frame header + data length + 83 and VP address + length + DATA. You can set two places in the PC software: VP1S can be set that use 22.Bin to initialize the address in the file, VP1T refers to the VP address after the 83 instruction.

Address	Definition	Length (byte)	Description
0x00	Pic_ID	2	Page ID
0x02	TP_Area	8	Area of the Control: upper left corner (Xs,Ys), lower right corner (Xe,Ye).
0x0A	Pic_Next	2	Target switch page ID after button press operation, 0xFF** means no page switch.
0x0C	Pic_On	2	Button press effect page, 0xFF** means no button press effect.
0x0E	TP_Code	2	0xFE08, synchrodata return key code.
0x10	0xFE	1	0xFE

0x11	TP_On_Mode	1	When the touch panel is pressed down for the first time, data return mode:0x00= no data is returned 0x01= read *VP2S pointing to LEN2 length data sent in DGUS serial protocol format to serial 2.
0x12	VP1S	2	Read the data in the address when first pressing.
0x14	VP1T	2	Write the data to the address when first pressing.
0x16	0x00	1	0x00
0x17	LEN1	1	Return data length in bytes. When TP_On_Mode=0x01, LEN1 must be even.
0x18	0xFE	1	0xFE
0x19	TP_On_Continue_Mode	1	When the touch panel is pressed down during continuous pressing, data return mode:0x00= no data is returned 0x01= read *VP2S pointing to LEN2 length data sent in DGUS serial protocol format to serial 2.
0x1A	VP2S	2	Read the data in the address when continuous pressing.
0x1C	VP2T	2	Write the data in the address when continuous pressing.
0x1E	0x00	1	0x00
0x1F	LEN2	1	Return data length in bytes. When TP_On_Continuous_Mode=0x01, LEN2 must be even.
0x20	0xFE	1	0xFE
0x21	TP_OFF_Mode	1	When the touch panel is loosen pressing, data return mode:0x00= no data is returned 0x01= read *VP2S pointing to LEN2 length data sent in DGUS serial protocol format to serial 2.
0x22	VP3S	2	Read the data in the address after loosen pressing.
0x24	VP3T	2	Write the data in the address after loosen pressing.
0x26	0x00	1	0x00
0x27	LEN3	1	Return data length in bytes. When TP_OFF_Mode=0x01, LEN3 must be even.
0x28	0x00	8	Reserved,write 0x00

6.9 Sliding Adjustment (0x0A)

Sliding adjustment can slide on the screen according to specific direction and return the corresponding value in real time.Cooperate with the data window to indicate and display variables, which can realize dynamic vertical scrolling adjustment.

Address	Definition	Length (byte)	Description
0x00	0xFE	1	0xFE
0x01	*VP	2	Variable pointer, return adjustment data. *VP reserved: *VP+1 return data: High byte: adjustment direction, 0x00=increase,0xFF= decrease; Low byte: adjustment size.
0x03	Adj_Mode	1	0x00 horizontal sliding;0x01vertical sliding
0x04	Step_Dis	1	Sensitivity,0x01-0xFF

6.10 Page Sliding（0x0B）

Setting the target and area of page switching, use to achieve page turning through sliding.

Address	Definition	Length (byte)	Description
0x00	0xFE	1	0xFE
0x01	Pic_Front	2	Previous page, 0xFF**=none.
0x03	Pic_Next	2	Next page, 0xFF**=none.
0x05	Pic_Area	4	Slide the Y coordinates of the upper right and lower right corners of the area.
0x09	Page turning sensitivity	1	Distance
0x0A	0x00	1	00
0x0B	Page turning sensitivity	1	Time
0x0C	0x00	4	00
0x10	The current page	2	Current page number

Chapter 7 Display Variable Configuration Function (14.BIN)

Description

Display Variables provide visual interaction to the users. They function as numeric, textual and graphic indicators. Display Variables are always associated to a memory address, and show the contents of such address in some human-readable form.

Caution Make sure to reserve enough VPS for each Display Variable. Consider their data sizes and their SP lengths (when SPS are used).

Serial Number	Definition	Data Length(bytes)	Description
1	0x5A	1	Fixed
2	Type	1	Variable type
3	*SP	2	The variable description file is loaded from Flash and stored in the address pointer of the data storage area.
4	Len_Dsc	2	The word length of the variable description content
5	*VP	2	The variable address is 0x0000-0xFFFF. For some variables that do not need to specify the address, just write 0x0000.
6	Description	N	Variable description content

7.1 List of Display Variable Functions

No.	Function code	Function	Data length (Word)	Description
1	0x00	Variable Icon	1	Icon display is related with a variable.When variable changes, icon switches accordingly. This function is used for dashboard, progress bar, etc. Support background overlay and opacity set.
2	0x01	Animation Icon	2	3 icon status corresponding to a variable: no display, display selected icon, animation icon. This function is used for alarm, etc. Support animation speed set.Support background overlay and opacity set.
3	0x02	Slider Icon	1	Slider icon is related with a variable. This function is used for display liquid level, dial, progress bar. Support background overlay and opacity set.
4	0x03	Word Art	1/2/4	Use word art icon to display data. Support background overlay and opacity set.
5	0x04	Image Animation	none	Auto play an image sequence at selected speed. This function is used in welcome page or screensaver.
6	0x05	Rotation Icon	1	Transform variable range to angle data which linear with variable. Then display icon at corresponding angle. This function is mainly used for dashboard.
7	0x06	Bit Variable Icon	3	Every bit (0/1) of one variable data stands a status, and the status can be displayed via static icon or animation. This function is used to display on/off state.
8	0x10	Variable Data	1/2/4	Display a variable in specified format (integer, decimal, unit, etc), font type, and font size.
9	0x11	Text	2K at most	Display character string in specified format (font library) at selected area.
10	0x12_00	Digital RTC	none	Display digital RTC in customized format.
11	0x12_01	Analog Clock	none	Display analog clock via rotation icon.
12	0x13	HEX Data	8 At most	Variable data display according to ASCII words by bytes HEX way between the user. Always used in timing display,es,0x1234 display 12:34.
13	0x14	Text Scroll	None	Text that storing in the variable space scrolling display on the screen specified area.
14	0x15	Data Window	2	Display variable data sequence in specified window, highlight the selected data. Combined this function with sliding adjustment or increment adjustment, data sequence can scroll with finger touch. The scrolling speed can be controlled via DWIN OS. The variable occupy 2 word space, (VP+1) space is reserved.
15	0x16	DGUSII Text(Text not have jag)	2K at most	Based on DGUS II font ,character string display in the text box display area appointed. Comparing 0x11 text display ,text display don't have jag,most languages display can direct change font.
16	0x20	Dynamic Trend	2K per	Display real-time curve via data from curve buffer (auto match). The display

		Curve	channel	area, central axis coordinates, display scale (zoom in/out), and curve direction of curve can be set.
17	0x21_01	Draw_Dot	User define	Dot set（x, y, color）
18	0x21_02	Draw_Line		Draw a line via dot connection (color, (x0, y0), …, (xn, yn))
19	0x21_03	Draw_Rectangle		Draw a rectangle. Color/area/size can be set.
20	0x21_04	Draw_ Fill Rectangle Area		Filling specified rectangle area with color. Color, area, size can be set.
21	0x21_05	Draw_Circle		Display entire arc. Color, area, size can be set.
22	0x21_06	Draw_Picture Copy&Paste		Copy a picture area and display it on current page.
23	0x21_07	Draw_Icon Display		Icon display. Icon library is optional.
24	0x21_09	Draw_ Frequency Spectrum		Display frequency spectrum (vertical line), line color and location can be set.
25	0x21_0A	Draw_Segment		Connect line segments. Endpoint and color can be set.
26	0x21_0B	Draw_Arc Display		Display arc. Radius, color and angle range can be set.
27	0x21_0D	Draw_XOR		Do XOR operation at selected rectangular area. Mainly used for highlight display.
28	0x24	Zone Scrolling	1	Loop shift of specified area, move direction can be set. Used for simple dynamic effect of flow chart and progress bar. The variable is occupied by system, user operation is forbidden.
29	0x25	QR Code Display	259 at most	Display QR code according to specified data.
30	0x26	Adjust brightness of selected area	1	Adjust the brightness of rectangular area to highlight or weaken background.

Remarks:

1.For more detailed function instruction, please refer to Development Guide of DWIN DGUS.

2.VP is a pointer, which points to the storage location of user variable memory space.

3.User can set SP (stack pointer) in DGUS tool, thus the configuration of display control will be write in to user variable memory space that the SP pointing to. User can operate configuration of display control via UART or DWIN OS to combine multi-controls.

7.2 Variables Icon

Used to show an Icon from an Icon Library. The current Icon is determined by the value of the VP.

7.2.1 Variable Icon Display (0x00)

The function of the variable icon display is to linearly correspond to a set of ICON icon display for the change range of a data variable. When the variable changes, the icon will automatically switch accordingly. It is mostly used for detailed dashboard and progress bar display. This display function is usually used with incremental adjustment and digital input. The instruction storage format is shown in the figure.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A00	2	
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000A	2	
0x06	0x00	*VP	2	Variable Pointer, integer.
0x08	0x01	（x,y）	4	Upper-left coordinates of the Icons to display
0x0C	0x03	V_Min	2	Minimum value. Values smaller than "V_Min" will show no Icons.
0x0E	0x04	V_Max	2	Maximum value. Values greater than "V_Max" will show no Icons.
0x10	0x05	Icon_Min	2	Icon associated to the V_Min.
0x12	0x06	Icon_Max	2	Icon associated to the V_Max.
0x14	0x07:H	Icon_Lib	1	Index in the FLASH memory of the Icon Library to use.
0x15	0x07:L	Mode	1	Display mode:0x00=transparency mode Others= background display

7.2.1.1 Command Example

①Display lower limit 0 corresponding Icon

5A A5058250120000

Meaningaa:0x5AA5:Frame header;

0x05:Data length;

0x82:write command;

0x5012:RAM address;

0x0000:Display lower limit 0correspondingIcon

②Display upper limit 0 corresponding Icon

5A A5 05 82 5012 0001

Meaning:0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x5012:RAM address;

0x0001:Display upper limit 0 corresponding Icon

③Do not display when exceed upper limit, lower limit

5A A5 05 82 5010 0002

Meaning: This command can hide the picture,over limit is0002

④SP hide, move icon

To hide and move the position, it is necessary to use the description pointer. For detailed explanation of the use of the description pointer, see the data variable display description pointer instruction part.

7.2.2 Animation Icon (0x01)

A fixed value data variable corresponds to three different icons to indicate the status:Do not show,Show fixed icon,Show animation icon.Mostly used for variable alarm prompts.The variable occupies 2 word positions, and the (VP+1) position is reserved for auxiliary animation display function. The serial port command can not participate in address access. When the variable is not equal to V_Stop or V_Start, no icon or animation is displayed. Support background overlay and transparency settings, animation speed can be set, icon ID cannot exceed 255 (0xFF).

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A01	2	
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000D	2	
0x06	0x00	*VP	2	Variable Pointer. High word: Unsigned Integer(0x0000-0xFFFF). stores animation status Low word: Reserved
0x08	0x01	（x,y）	4	Upper-left coordinates of the Icons to display
0x0C	0x03	Reset_ICON_En	2	Indicates whether the animation should always start from the first frame when restarting. 0x0000: Animation continues from the last shown frame when reset. 0x0001: Animation starts from the first frame (“Icon_Start”) when reset.
0x0E	0x04	V_Stop	2	Value that stops the animation.
0x10	0x05	V_Start	2	Value that starts the animation.
0x12	0x06	ICON_Stop	2	Icon displayed when the animation is stopped.Range:0x0000-0x00FF
0x14	0x07	ICON_Start	2	Icon displayed at the first frame of the animation.
0x16	0x08	ICON_End	2	Icon displayed at the last frame of the animation.
0x18	0x09:H	ICON_Lib	1	Index in the FLASH memory of the Icon Library to use.
0x19	0x09:L	Mode	1	ICON display mode:0x00: Transparent background.

7.2.2.1 Command Example

①Turn on animation, loop mode

5A A5058256500001

Meaning:5A A5Frame header;

05:Data length;

82:Write command;

6540:RAM address;

0001:write start animation value set value 1.

②Turn off animation,loop mode

5A A5 05 82 5650 0000

③Sequential animation,stand-alone play mode

5A A5 05 82 5430 0001 Animation display mode need to set stand-alone play.

④Play in reverse order animation,stand-alone play mode

5A A5 05 82 6540 0000Animation display mode need to set stand-alone play.

⑤To hide, move, change animation icon frame number,hide, move the position, need to use in the descriptive pointer, see the data variable display command part.

7.2.3 Slider Display (0x02)

The slider display function is to correspond the change range of a data variable to the change of the display position of an icon (slider). It is mostly used for the indication of liquid level, dial and progress meter.Support background overlay and transparency settings.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A02	2	
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000C	2	
0x06	0x00	*VP	2	Variable Pointer.
0x08	0x01	V_Begin	2	Minimum value accepted by the control.
0x0A	0x02	V_End	2	Maximum value accepted by the control.
0x0C	0x03	x_Begin	2	Minimum position of the slider, when its value equals “V_Begin". X coordinate for horizontal sliders, Y coordinate for vertical sliders.
0x0E	0x04	x_End	2	Maximum position of the slider, when its value equals “V_Begin". X coordinate for horizontal sliders, Y coordinate for vertical sliders.
0x10	0x05	ICON_ID	2	Index of the Icon in the Icon Library that will be used as the Slider handle.
0x12	0x06	Y	2	Position of slider icon in the secondary axis.

				Y coordinate for horizontal sliders, X coordinate for vertical sliders.
0x14	0x07:H	x_adj	1	Icon position offset adjustment on the primary axis, in pixels. Offset in the X axis for horizontal sliders, and in the Y axis for vertical sliders.
0x15	0x07:L	Mode	1	Slider mode. 0x00: Horizontal 0x01: Vertical.
0x16	0x08:H	ICON_Lib	1	Index in the FLASH memory of the Icon Library to use.
0x17	0x08:L	ICON_Mode	1	ICON display mode:0x00: Transparent background. Other Values: Opaque background
0x18	0x09:H	VP_Data_Mode	1	Value Memory Size. 0x00: *VP points to the VP(integer). 0x01: *VP points to the High Byte of the VP(VP_H). 0x02: *VP points to the Low Byte of the VP(VP_L).

7.2.3.1 Command Example

0x82command write data conforming to the set variable type to the variable pointer.E.g: 5A A5 05 82 00A1 000A

7.2.4 Artistic Variables (0x03)

Works like a Numeric Display, using Icons instead of Fonts. Typically used when you need to display numeric information that needs an anti-aliased look. It uses fixed-point integer values.Support background overlay and transparency settings.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A03	2	
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x0009	2	
0x06	0x00	*VP	2	Variable Pointer.
0x08	0x01	（X,Y）	4	Start display position: Upper-left coordinates of the Icons to display in Left- alignment mode or Upper-right coordinates of the Icons to display in Right-alignment mode.
0x0C	0x03	ICON0	2	Icon corresponding to digit 0. The Icon Library must follow this indexing order: [0123456789-.].
0x0E	0x04:H	ICON_Lib	1	Index in the FLASH memory of the Icon Library to use.
0x0F	0x04:L	ICON_Mode	1	0x00: Transparent background. Other Values: Opaque background
0x10	0x05:H	Integer_Digits	1	Number of digits to the left of the decimal separator.
0x11	0x05:L	Decimal_Digits	1	Number of digits to the right of the decimal separator.
0x12	0x06:H	VP_Mode	1	Value Memory Size. 0x00: 16-bit Integer(2 bytes). Range: -32768 ~ 32767 0x01: 32-bit Integer(4 bytes). Range: -2147483648 ~ 2147483647 0x02: 8-bit Unsigned Integer in High Byte of the VP. Range: 0 ~ 255 0x03: 8-bit Unsigned Integer in Low Byte of the VP. Range: 0 ~ 255 0x04: 64-bit Integer(8 bytes). Range: -9223372036854775808 ~ 9223372036854775807 0x05: 16-bit Unsigned Integer(2 bytes). Range: 0 ~ 65535 0x06: 32-bit Unsigned Integer(4 bytes). Range: 0 ~ 4294967295 0x07: float point number(4 bytes) 0x08:double float point number(8 bytes)
0x13	0x06:L	Alignment	1	0x00: Left- alignment. 0x01: Right- alignment.

7.2.4.1 Command Example

5A A5 05 82 57000002

Meaning:0x5A A5:Frame header;

0x05:Length data;

0x82:write command;

0x 5700: RAM address;

0x 0002: Display data2,write data to the variable pointer.

7.2.5 Image Animation (0x04)

Used to create an animation of Screens. Can be implemented via serial communication as a series of Screen jumps.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A04	2	
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x0005	2	
0x06	0x00	0x0000	2	0x0000
0x08	0x01	Pic_Begin	2	Page ID of the first animation frame.
0x0A	0x02	Pic_End	2	Page ID of the last animation frame.
0x0C	0x03:H	Frame_Time	1	Time spent in each animation Screen. Range: 0x00-0xFF, in 8 ms steps.

7.2.5.1 Command Example

5A A5 07 82 00845A010000

Meaning:0x5A A5:Frame header;

0x07:Data length;

0x82:Write command;

0x 0084: System variable interface address,fixed switching pages address;see the list of system variable interfaces;

0x 5A01: Fixed.High byte 0x5A:start page processing once,CPU cleared after processing;

Low byte 0x01: page switching,Display the picture specified in the picture storage area to the current background page;see the list of system variable interfaces;

0x 0000: Page ID,switching page number.

7.2.6 Icon Rotation (0x05)

Used to show an Icon that pivots around a given rotation center, based on the value of the VP. Typically used in radial graphs, like speedometers and dials.

SP Address	Definition	Length (bytes)	Description	SP Address
0x00		0x5A05	2	0x5A05.
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000C	2	0x000C.
0x06	0x00	*VP	2	Variable Pointer.
0x08	0x01	ICON_ID	2	Index of the Icon in the Icon Library that will be rotated (usually a dial needle).
0x0A	0x02	ICON_XC	2	Center of rotation on the Icon. X coordinate.
0x0C	0x03	ICON_Yc	2	Center of rotation on the Icon. Y coordinate.
0x0E	0x04	XC	2	Center of rotation on the Screen. The center of rotation of the Icon is placed in this point, and pivots around it. X coordinate.
0x10	0x05	YC	2	Center of rotation on the Screen. The center of rotation of the Icon is placed in this point, and pivots around it. Y coordinate.
0x12	0x06	V_Begin	2	Minimum value.
0x14	0x07	V_End	2	Maximum value.
0x16	0x08	AL_Begin	2	Minimum angle, associated to "V_Begin". Given in 0.5° steps. Range: 0-720(0x000-0x2D0), which is equivalent to 0° to 360°.
0x18	0x09	AL_End	2	Maximum angle, associated to "V_End". Given in 0.5° steps. Range: 0-720(0x000-0x2D0), which is equivalent to 0° to 360°.
0x1A	0x0A:H	VP_Mode	1	Value Memory Size. 0x00: *VP points to the VP (integer). 0x01: *VP points to the High Byte of the VP (VP_H). 0x02: *VP points to the Low Byte of the VP (VP_L).
0x1B	0x0A:L	Lib_ID	1	Index in the FLASH memory of the Icon Library to use.
0x1C	0x0B	Mode	1	0x00: Transparent background. Other Values: Opaque background

7.2.6.1 Command Example

5A A5 05 82 54380000

Meaning:0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x5438:RAM address;

0x0000:Data 0;Icon pointer points to 0 degrees on the dial.

5A A5 05 82 54380064

Meaning:

0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x5438:RAM address;

0x0064:Data 100;Icon pointer points to 100 degrees on the dial.

5A A5 05 82 543800C8

Meaning:

0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x5438:RAM address;

0x00C8:Data 200;Icon pointer points to 200 degrees on the dial.

7.2.7 Bit Variable Icon (0x06)

Used to show fixed and/or animated Icons, according to a bit flag value on the VP. The value of each bit represents the state of a single Icon, and many Icons can be shown, in different states, based on the VPC. Typically used to display several alarms at once, or to implement bar graphs.

<table>
<tr><th>Address</th><th>SP Address</th><th>Definition</th><th>Length (bytes)</th><th>Description</th></tr>
<tr><td>0x00</td><td></td><td>0x5A06</td><td>2</td><td>0x5A06</td></tr>
<tr><td>0x02</td><td></td><td>*SP</td><td>2</td><td>Parameter Pointer.
0xFFFF: Disables SP (no run-time modification).</td></tr>
<tr><td>0x04</td><td></td><td>0x000C</td><td>2</td><td>0x000C</td></tr>
<tr><td>0x06</td><td>0x00</td><td>*VP</td><td>2</td><td>Variable Pointer.</td></tr>
<tr><td>0x08</td><td>0x01</td><td>*VP_AUx</td><td>2</td><td>Auxiliary Variable Pointer. 2 words. User can not use them, should be allocated right after VP.</td></tr>
<tr><td>0x0A</td><td>0x02</td><td>Act_Bit_Set</td><td>2</td><td>Indicates which bits are displayed.
0b1: Active bit.
0b0: Inactive bit.</td></tr>
<tr><td>0x0C</td><td>0x03:H</td><td>Display_Mode</td><td>1</td><td>The following table describes what icons are shown when each bit value is either 0 or 1.
<table>
<tr><th rowspan="2">Mode</th><th colspan="2">Bit Value</th></tr>
<tr><th>0</th><th>1</th></tr>
<tr><td>0x00</td><td>ICON0S</td><td>ICON1S</td></tr>
<tr><td>0x01</td><td>ICON0S</td><td>None</td></tr>
<tr><td>0x02</td><td>ICON0S</td><td>Animation:ICON1S-ICON1E</td></tr>
<tr><td>0x03</td><td>None</td><td>ICON1S</td></tr>
<tr><td>0x04</td><td>None</td><td>Animation:ICON1S-ICON1E</td></tr>
<tr><td>0x05</td><td>Animation:ICON0S-ICON0E</td><td>ICON1S</td></tr>
<tr><td>0x06</td><td>Animation:ICON0S-ICON0E</td><td>None</td></tr>
<tr><td>0x07</td><td>Animation:ICON0S-ICON0E</td><td>Animation:ICON1S-ICON1E</td></tr>
</table></td></tr>
<tr><td>0x0D</td><td>0x03:L</td><td>Move_Mode</td><td>1</td><td>Bit icons arranged mode.
0x00: Horizontal, no space reserved for inactive bits.
0x01: Vertical, no space reserved for inactive bits.
0x02: Horizontal, space reserved for inactive bits.
0x03: Vertical, space reserved for inactive bits.</td></tr>
<tr><td>0x0E</td><td>0x04:H</td><td>Icon_Mode</td><td>1</td><td>ICON display mode:0x00: Transparent background.
Other Values: Opaque background.</td></tr>
<tr><td>0x0F</td><td>0x04:L</td><td>Icon_Lib</td><td>1</td><td>Index in the FLASH memory of the Icon Library to use.</td></tr>
<tr><td>0x10</td><td>0x05</td><td>ICON0S</td><td>2</td><td>Modes 0, 1, 2; Bit value = 0; Icon shown.
Modes 5, 6, 7; Bit value = 0: First icon in animation mode.</td></tr>
<tr><td>0x12</td><td>0x06</td><td>ICON0E</td><td>2</td><td>Modes 5, 6, 7; Bit value = 0: Last icon in animation mode.</td></tr>
<tr><td>0x14</td><td>0x07</td><td>ICON1S</td><td>2</td><td>Modes 0, 3, 5; Bit value = 1; Icon shown.
Modes 2, 4, 7; Bit value = 1: First icon in animation mode.</td></tr>
<tr><td>0x16</td><td>0x08</td><td>ICON1E</td><td>2</td><td>Modes 2, 4, 7; Bit value = 1: Last icon in animation mode.</td></tr>
<tr><td>0x18</td><td>0x09</td><td>（x,y）</td><td>4</td><td>Upper-left coordinates of the Icons to display</td></tr>
<tr><td>0x1C</td><td>0x0B</td><td>DIS_MOV</td><td>2</td><td>The size reserved for each Icon, in pixels.</td></tr>
<tr><td>0x1E</td><td>0x0C</td><td>Reserved</td><td>2</td><td>0x00</td></tr>
</table>

7.2.7.1 Command Example

①16 bits fully open 5A A5 05 82 6000 FFFF

Meaning:

0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x 6000:RAM address;

0x FFFF:1111 1111 1111 1111 All of 16 bits write 1,FFFF.

②16 bits all off

5A A5 05 82 6000 0000

Meaning:

0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x 6000:RAM address;

0x0000:All of 16 bits write 0.

③Open NO. 0 and NO. 3

5A A5 05 82 6000 0009

Meaning:

0x5AA5:Frame header;

0x05:Data length;

0x82:Write command;

0x 6000:RAM address;

0x 0009:NO.0 and NO.3 write 1,0000 0000 0000 1001,0x0009.

7.3 Text Variables

7.3.1 Data Variables (0x10)

Used to display numeric information. It uses fixed-point integer values.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A10	2	0x5A10
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000D	2	0x000D
0x06	0x00	*VP	2	Variable Pointer
0x08	0x01	X,Y	4	Upper-left coordinates of the text to display.
0x0C	0x03	COLOR	2	Text color.
0x0E	0x04:H	Lib_ID	1	Index in the FLASH memory of the ASCII Font to use.
0x0F	0x04:L	Font_Width	1	Font width, in pixels.
0x10	0x05:H	Alignment	1	0x00: Left-alignment. 0x01: Right-alignment. 0x02: Center- alignment.
0x11	0x05:L	Integer_Digits	1	Number of digits to the left of the decimal separator.
0x12	0x06:H	Decimal_Digits	1	Number of digits to the right of the decimal separator.
0x13	0x06:L	VP_Mode	1	Value Memory Size. 0x00: 16-bit Integer (2 bytes). Range: -32768 ~ 32767 0x01: 32-bit Integer (4 bytes). Range: -2147483648 ~ 2147483647 0x02: 8-bit Unsigned Integer in High Byte of the VP. Range: 0 ~ 255 0x03: 0x03: 8-bit Unsigned Integer in Low Byte of the VP. Range: 0 ~ 255 0x04: 64-bit Integer (8 bytes). Range: -9223372036854775808 ~ 9223372036854775807 0x05: 16-bit Unsigned Integer (2 bytes). Range: 0 ~ 65535 0x06: 32-bit Unsigned Integer (4 bytes). Range: 0 ~ 4294967295
0x14	0x07:H	Len_unit	1	Length of text to append after the digits, in characters. range 0-11.
0x15	0x07:L	String_Unit	Max 11	Text to append after the digits. ASCII code.

7.3.1.1 Data Variables Application Command Example

RAM address rage:0x1000-0xFFFF,command data is hexadecimal format.

（1）Display integer data 100

5A A5 05 82 5420 0064

Meaning:

0x5A 0xA5:Frame header;

0x05:Data length, as 82 53 00 00 64 these 5 bytes

0x82:Write command;

0x5420:RAM address;

0x 0064:Data 100.Integer range:-32768 to 32767,use 2 bytes.

（2）One command display 3 data at the same time,address must continuous.

5A A5 09 82 53000064 0063 0062

Meaning:

0x5A 0xA5:Frame header;

0x09:Data length, means the number of bytes that contain data after 0x09;

0x82:Write command;

0x5300:RAM address;

0x 0064 Data 100（Mapping 0x5300 address）;

0x0063 Data 99（Mapping 0x5301 address）;

0x0062 Data 98（Mapping 0x5302 address）.

（3）Display long integer data100

5A A5 07 82 54220000 0064

Meaning:

0x5A 0xA5: Fixed frame header;

0x07:Data length;

0x82:Write command;

0x5422:RAM address;

0x 0000 0064 long integer data 100.long integer range-2147473648 to 2147483647,use 4 bytes,bit-filling 00.

（4） Display very long integer data 100

5A A5 0B 82 54240000 0000 0000 0064

Meaning:

0x5A 0xA5: Fixed frame header;

0x0B:Data length;

0x82:Write command;

0x5424:RAM address;

0x 0000 0000 0000 0064 Data 100. very long integer data range:-9223372036854775808 to 9223372036854775807,use 8 bytes,bit-filling 00.

（5）Display single precision floating point data 99

5A A5 07 82 542842C6 0000

Meaning:

0x5A 0xA5: Fixed frame header;

0x07:Data length;

0x82:Write command;

0x5428:RAM address;

0x 42C6 0000 single precision floating point 99,can be converted by floating point conversion tool.

（6）Display double-precision floating -point number data 99

5A A5 0B 82 542B 4058C000 0000 0000

Meaning:

0x5A 0xA5: Fixed frame header;

0x0B:Data length;

0x82:Write command;

0x542B:RAM address;

0x4058 C000 0000 0000 double-precision floating -point number 99, can be converted by floating point conversion tool.

（7）Display integer type data -100

5A A5 05 82 5300FF9C

Meaning:

0x5A 0xA5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x5300:RAM address;

0x FF9C negative number 100. Negative number's complement:Sign bit:1,the remaining bits are the original code of the absolute value of the number, inverted bit by bit; then the whole number is increased by 1. Input -200, return 5A A5 06 83 68 20 01 FF 38, returned data 0xFF38 is input data -200.

（8）Display 2 decimal places

Send 5A A5 05 82 5300 0064　Display 1.00.

The software data variable display control key sets the integer digit to 1, the decimal digit to 2. Click Save, and after generating, the 14.BIN display file will be downloaded to the screen.

（9）Change data color

5A A5 05 82 9003F800

Meaning:

0x5A 0xA5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x9003:SP address offset by 3 bits ;

0x F800:Color code.

This instruction 0x9000 is the basic address of the description pointer, and all attribute offsets are performed on the basis of this address. Here, the 0x9000 address is not fixed. 0x9003 is 0x9000 describing the meaning of offsetting 3 addresses based on the pointer address. For the offset address, please refer to the SP description pointer offset in the data variable display instruction storage format table. The vertical column of attributes

marked with red can be used to offset the data. Attribute, 0x03 address is used to change the data color.

To change the attributes of the attribute box, you need to use the description pointer, such as coordinates, color, font location, integer digits, decimal digits, font size, dot matrix, etc.

（10）Change data coordinate

5A A5 07 82 90010064 0064

Meaning:

0x5A 0xA5: Fixed frame header;

0x07:Data length;

0x82:Write command;

0x 9001:SP address offset by 1 bit based on 0x 9000;for the offset address, please refer to the SP description pointer offset in the data variable display instruction storage format table;

0x 0064 0064:Data offset to（100,100）coordinate points.

（11）Change font size

5A A5 05 82 90040028

Meaning:

0x5A 0xA5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x 9004:SP address offset by 4 bits based on 0x 9000;

0x 0028:High bytes 0x 00:Font 0 location,write 0x 00,Low bytes 0x 28:Font size.

（12）Change the integer digits to 3 digits

5A A5 05 82 90050003

Meaning:

0x5A 0xA5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x 9005:SP address offset by 5 bits based on 0x 9000;

0x 0003:High bytes 0x 00: Align left ,Low bytes 0x 03:integer digits.

（13）Change the decimal place to 3 digits

5A A5 05 82 90060200

Meaning:

0x5A 0xA5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x 9006:SP address offset by 5 bits based on 0x 9000;

0x 0200:High bytes 0x 02:Decimal places,Low bytes 0x 00;Data type is integer.

（14） Power-on do not display data 0,hide data 0

Set variable pointer:0x5300,description pointer :0x9000

Method 1:Hide

Hide data variable display:5A A5 05 82 9000FF00

Meaning:

0x5A A5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x 9000: SP;

0x FF00:Hide data.

Display data after hide:5A A5 05 82 90005300

Meaning:

0x5A A5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x 9000: SP; 0x 5300:RAM address.

Change data value:5A A5 05 82 5300 0062

Meaning:

0x5A A5: Fixed frame header;

0x05:Data length;

0x82:Write command;

0x 5300:RAM address;

0x 0062:Display data 98.

Method 2:Use description pointer change the coordinate position.

5A A5 07 82 900102D0 02D0

Meaning:

0x5A A5: Fixed frame header;0x07:Data length;0x82:Write command;

0x 9001:SP address offset by 1 bit based on 0x 9000;

0x 02D0 02D0:（720,720）coordinate points.

With the help of cross-border does not show. Such as 720*720 resolution screen, change the display coordinates of the upper left display to (720*720) cross-border hidden, and the normal display will move back to the original coordinates.

7.3.2 Text Display (0x11)

The text display function is to display the character string in the specified text box display area according to the specified format (decided by the selected font).This function is usually used in conjunction with the text entry function.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A11	2	0x5A11
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000D	2	0x000D
0x06	0x00	*VP	2	Variable Pointer
0x08	0x01	（X,Y）	4	Upper-left coordinates of the text to display.
0x0C	0x03	Color	2	Text color.
0x0E	0x04	(Xs,Ys)(Xe,Ye)	8	Upper- left coordinates and lower-right of the area where the text will be displayed.
0x16	0x08	Text_Length	2	Maximum text length, in bytes (characters), stop display when data is 0x0000 or 0xFFFF.
0x18	0x09:H	Font0_ID	1	Index in the FLASH memory of the Font to use, for encoding modes0x01 - 0x04.
0x19	0x09:L	Font1_ID	1	Index in the FLASH memory of the Font to use, for encoding modes0x00 and 0x05, and other non-ASCII fonts for encoding modes0x01 -0x04.
0x1A	0x0A:H	Font_x_Dots	1	Font width, in pixels. Must be even. In encoding modes 0x01 -0x04, must be twice the Width.
0x1B	0x0A:L	Font_Y_Dots	1	Font height, in pixels.
0x1C	0x0B:H	Encode_Mode	1	Character spacing mode is defined by bit7:0: Automatic spacing. 1: Fixed spacing. Font encoding is defined by bits 6 to 0:0x00: 8 bit. 0x01: GB2312. 0x02: GBK. 0x03: BIG5 0x04: SJIS 0x05: UNICODE.
0x1D	0x0B:L	HOR_Dis	1	Spacing between characters, in pixels.
0x1E	0x0C:H	VER_Dis	1	Spacing between lines, in pixels.
0x1F	0x0C:L	Reserved	1	0x00

7.3.2.1 Command Example

①Display “North12AB"

5A A5 09 82 5020 B1B1 3132 4142

Meaning:

0x5A A5:Frame header;

0x09:Data length;

0x82:Write command;

0x5020:RAM address;

“North" word of the ASCII code

0x 3132:“12”ASCII code;

0x 4142: “AB"ASCII code.ASCII code can be converted by an ASCII conversion tool .

②Wrap display

5A A5 05 82 5023 0D0A

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8073:Start wrap display from this address ;

0x 0D0A :Newline ASCII code, “AB"ASCII code.ASCII code can be converted by an ASCII conversion tool .

③Clear text display

5A A5 07 82 5020 2020 2020

Meaning:

0x5A A5:Frame header;

0x07:Data length;

0x82:Write command;

0x 5020:RAM address;

0x 20:Space ASCII code,2020 clear one data of the address .From 5020 address start clean 2 data of the address.

④Change the text color

5A A5 05 82 8803 F800

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8803:The description pointer 0x8000 base address is offset by 3 bits to change the color; the offset address is detailed in the SP description pointer offset in the text display instruction storage format table; the description of the use of the pointer is shown in the 7.3.1 data variable display section.

0x F800:Color value

⑤Hide text display

Method 1: Hide

5A A5 05 82 8800FF00

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8800:Description pointer ;

0x FF00:Hide the text

Display after hide:5A A5 05 82 88008070

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8800:Description pointer;

0x 8070:RAM address;

Method 2:Modify coordinates

5A A5 07 82 880102D0 02D0

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8801:SP 0x 8000 basic address offset 1bit to change display coordinates;

0x 02D0 02D0:（720,720）coordinates points, move beyond the border to the place that can't see.

Display after hide:

5A A5 07 82 88010064 0064

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8801:SP 0x 8000 basic address offset 1bit to change display coordinates;

0x 0064 0064:（100,100）coordinates points, move beyond the border to the place that can see it.

Method 3:Display length change 0000

5A A5 05 82 88080000

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8808:SP 0x 8000 basic address offset 1bit to change display bytes length;

0x 0000:Display 0 bytes data.

Display after hide:5A A5 05 82 88080064

Meaning:

0x5A A5:Frame header;

0x05:Data length;

0x82:Write command;

0x 8808:SP 0x 8000 basic address offset 1bit to change display bytes length;

0x 0064:Display 0 bytes data.

7.3.3 RTC Display

(1)Text RTC Display

Used to display current date and/or time, in digital format. Uses the internal RTC.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A12	2	0x5A12
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000D	2	0x000D
0x06	0x00	0x0000	2	0x0000
0x08	0x01	(X,Y)	4	Upper-left coordinates of the text to display.
0x0C	0x03	Color	2	Text color.
0x0E	0x04:H	Lib_ID	1	Index in the FLASH memory of the ASCII Font to use.
0x0F	0x04:L	Font_Width	1	Font width, in pixels.
0x10	0x05	String_Code	MAx16	Display format string. Use ASCII characters and the Field Codes on the following table. E.g. Current time =2012-05-02 12:00:00 Wednesday, Y-M-D H: Q: S 0x00, will display“2012-05-02 12:00:00”.M-D W H: Q 0x00, will display “05-02 WED 12:00”.

(2)Dial Clock RTC Display

Used to display current time, in analog format (a radial clock). Uses the internal RTC.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A12	2	0x5A12
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000D	2	0x000D
0x06	0x00	0x0001	2	0x0001
0x08	0x01	（X,Y）	4	Center of rotation on the Screen. The center of rotation of the Icon is placed in this point, and pivots around it.
0x0C	0x03	Icon_Hour	2	Index of the Icon showing the Hour hand. 0xFFFF: none.
0x0E	0x04	Icon_Hour_Central	4	Center of rotation on the Hour Icon.
0x12	0x06	Icon_Minute	2	Index of the Icon showing the Minute hand. 0xFFFF: none.
0x14	0x07	Icon_Minute_Central	4	Center of rotation on the Minute Icon.
0x18	0x09	Icon_Second	2	Index of the Icon showing the Second hand. 0xFFFF: none.
0x1A	0x0A	Icon_Second_Central	4	Center of rotation on the Second Icon.
0x1E	0x0C:H	Icon_Lib	1	Index in the FLASH memory of the ASCII Font to use.
0x1F	0x0C:L	Reserved	1	0x00

7.3.3.1 Dial clock RTC display application command example

Display time:11:12:13,October 1,2050

5A A5 0B 82 009C5A A532 0A 01 0B 0C 0D

Meaning:

0x5A A5:Frame header;

0x0B:Data length;

0x82:Write command;

0x009C:RAM address;the address is fixed,can not defined by yourself,see in the system variable interface list 0x9C address define;

0x5AA5:Start RTC set once,see in the system variable interface list 0x9C address define;

0x32 Year,0x0A Month,0x01 Day,0x0B Hour,0x0C Minute,0x0D Second.

7.3.4 HEX Data (0x13)

Used to display numeric information in hexadecimal format, with optional digit separators.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A13	2	0x5A13
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000D	2	0x000D
0x06	0x00	*VP	2	Variable Pointer. The data will be displayed in HEX format when half-byte data is greater than 0x9, e.g. 0x32: display 32, 0xBF: display BF.
0x08	0x01	（X,Y）	4	Upper-left coordinates of the text to display.
0x0C	0x03	Color	2	Text color.
0x0E	0x04:H	Mode	1	.7: BCD encoded switch. 0= off. 1= on. .6-.4: reserved. .3-.0: Byte numbers to be displayed, 0x01 - 0x0F.
0x0F	0x04:L	Lib_ID	1	Index in the FLASH memory of the Font to use.
0x10	0x05:H	Font_x	1	Font width, in pixels.
0x11	0x05:L	String_Code	MAX15	Sequence of characters (ASCII) representing the separators for this Hex Display. The current value (contained on VP) will be shown in hexadecimal, and after each byte, a separator character is inserted. Special characters: 0x00 (blank), 0x0D (new line).

7.3.4.1 Command Example

5A A5 07 82 5434 10 11 12 13

Meaning:

0x5A A5:Frame header;0x07:Data length;0x82:Write command;

0x5434:RAM address;0x10 11 12 13 :BCD code.send data is display

7.3.5 Roll Text (0x14)

Text scroll function is the variable data scroll display in the specified area with the specified direction .

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A14	2	0x5A14
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000B	2	0x000B
0x06	0x00	*VP	2	Text Variable Pointer. First three VP must be reserved. Text is saved after the 3rd VP and ended with 0x00 or 0x0F.
0x08	0x01:H	Rolling_Mode	1	0x00: from left to right.
0x09	0x01:L	Rolling_Dis	1	Rolling space in a DGUS cycle, in pixel.
0x0A	0x02:H	Adjust_Mode	1	0x00: Left-alignment. 0x01: Right-alignment. 0x02: Center- alignment. Rolling will stop when the text length smaller than textbox.
0x0B	0x02:L	Reserved	1	0x00
0x0C	0x03	Color	2	Text color.
0x0E	0x04	Xs Ys Xe Ye	8	Upper- left coordinates and lower-right of the area where the text will be displayed.
0x16	0x08:H	Font0_ID	1	Index in the FLASH memory of the Font to use, for encoding modes0x01 - 0x04.
0x17	0x08:L	Font1_ID	1	Index in the FLASH memory of the Font to use, for encoding modes0x00 and 0x05, and other non-ASCII fonts for encoding modes0x01 -0x04.
0x18	0x09:H	Font_X_Dots	1	Font width, in pixels. Must be even. In encoding modes 0x01 -0x04, must be twice the Width.
0x19	0x09:L	Font_Y_Dots	1	Font height, in pixels.
0x1A	0x0A:H	Encode_Mode	1	Character spacing mode is defined by bit7:0: Automatic spacing. 1: Fixed spacing. Font encoding is defined by bits 6 to 0:0x00: 8 bit. 0x01: GB2312. 0x02: GBK. 0x03: BIG5 0x04: SJIS 0x05: UNICODE.
0x1B	0x0A:L	Text_Dis	1	Spacing between characters, in pixels.
0x1C	0x0B:H	Reserved	4	0x00

7.3.5.1 Command Example

5A A5 13 82 6013 BBB6D3ADC0B4B5BDB5CFCEC4BFC6BCBC

Meaning:0x6013:RAM address+3,can not direct use 0x6010;

0xBBB6D3ADC0B4B5BDB5CFCEC4BFC6BCBC, “Welcome to DWIN Technology"ASCII code.

7.3.6 Data Window (0x15)

The data window indicator displays the data variables in a specified display window, highlighting the selected values. Combined with the touch screen sliding or incremental adjustment, the data can be scrolled and displayed. The speed can also be controlled by DWIN OS. The variable occupies 2 word positions, (VP+1) position is reserved.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A15	2	0x5A15
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x 000C	2	0x000C
0x06	0x00	*VP	2	Variable Pointer, two words. The second one is reserved.
0x08	0x01	V_MIN	2	Minimum value.
0x0A	0x02	V_MAX	2	Maximum value.
0x0C	0x03:H	Integer_Digits	1	Number of digits to the left of the decimal separator.
0x0D	0x03L	Decimal_Digits	1	Number of digits to the right of the decimal separator.
0x0E	0x04:H	Data_Num	1	Display data amount
0x0F	0x04L	Mode	1	0x01: display invalid zero. 0x02: display positive(+). 0x04: cyclic data.
0x10	0x05	（x,y）	4	Center coordinates.
0x14	0x07	Adjust_step	2	Step length.
0x16	0x08:H	Font_x_Dots	1	Font width of unselected data, in pixels
0x17	0x08:L	Font_Y_Dots	1	Font height of unselected data, in pixels.
0x18	0x09	Color	2	Text color unselected.
0x1A	0x0A:H	Font_x_Dots	1	Font width of unselected data, in pixels
0x1B	0x0A:L	Font_Y_Dots	1	Font height of unselected data, in pixels.
0x1C	0x0B	Color	2	Text color selected.
0x1E	0x0C	Reserved		0000

7.3.6.1 Command Example

5A A5 05 82 56520064

Meaning:

0x 5A A5:Frame header;

0x 05:Data length;

0x 82:Write command;

0x5652:RAM address;

0x0064:Write data 100 to variable address.

7.3.7 DGUSII Text Display (text display without aliasing) (0x16)

Based on the DGUS II font library, the character string is displayed in the designated text box display area. Compared with the 0x11 text display, the main reason is that the displayed text is not jagged, and the multi-language display directly changes the font library.

7.3.7.1 Command Example

①Display “North12AB"

5A A50982 6050B1B1 3132 4142

Meaning:

0x 5A A5:Frame header;

0x 09:Data length;

0x 82:Write command;

0x6050:RAM address;

0x B1B1: “North" word of the ASCII code;0x 3132:“12”ASCII code;0x 4142: “AB"ASCII code.ASCII code can be converted by an ASCII conversion tool ,can be obtained from 400 technical support.

7.4 Graphical Variables

7.4.1 Real Time Curve (trend graph) (0x20)

The real-time curve (trend graph) display function is to combine the 0x84 command to write the curve buffer data to automatically match and display the real-time curve (trend graph). The display area can be specified, and the center axis coordinates and the display scale (zoom in/out) are controllable.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A20	2	0x5A20
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x000B	2	0x000B
0x06	0x00:H	Mode	1	0x00: display from right side to left side. Others: display from left side to right side.
0x07	0x00:L	0x00	1	Reserved
0x8	0x01	Xs,Ys Xe,Ye	8	Upper-left coordinates and lower-right coordinates of the curve. Do not display when data is out of range.
0x10	0x05	Y_Central	2	Y center of the curve.
0x12	0x06	VD_Central	2	The corresponding value of 'Y_Central', which is the mean value of the maximum data and minimum data.
0x14	0x07	Color	2	Curve color
0x16	0x08	MUL_Y	2	Vertical Zoom. Range: 0x0000-0x7FFF.
0x18	0x09:H	CHANEL	1	Channel of the curve. Range: 0x00-0x07.
0x19	0x09:L	Dis_HOR	1	Horizontal Increment. Range: 0x01-0xFF.

7.4.1.1 Command Example

Form7.1 Real Time Curve system variable interface address definition

System variable interface read/write address	Instructions
0x300-0x30F	Status feedback of 8 channels of curve buffer (recommended for users to read only), each channel occupies 2 words, The storage pointer position of the high word storage curve data (0x0000-0x07FF), The effective data length of the low word storage curve buffer (0x0000-0x0800). Writing 0x0000 to the effective data length of the curve buffer will cause the curve to not be displayed. E.g: 5A A5 05 82 0301 0000 curve 0 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 0303 0000curve 1 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 0305 0000curve 2 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 0307 0000curve 3 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 0309 0000curve 4 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 030B 0000curve 5 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 030D 0000curve 6 channel will clear the curve, if you rewrite the point, the value will be restored; 5A A5 05 82 030F 0000curve 7 channel will clear the curve, if you rewrite the point, the value will be restored;
0x310-0x311	The curve buffer data write start. D3:D2:0x5AA5 Start the curve buffer write operate,CPU cleared after process. D1:Data block number,0x01-0x08. D0:Undefined,write0x00.
0x312-0x37F	Write data block of the curve buffer,data is 16 bit unsigned number.Single data block number defined as data channel ID（0x00-0x07）+Data word length（0x01-0x6E）+Data.

①0x00 Channel display data 0 and1000

5A A5 0D 82 03105AA50100000200000 03E8

Meaning:

0x 5A A5:Frame header;

0x 0D:Data length;

0x 82:Write command;

0x0310:The curve buffer data write start.,system variable hardware interface curve fixed address;

0x5AA5:Start the curve buffer write operate,CPU cleared after process.

0x0100:High bytes 0x01curve data block used several channel,low bytes undefined,write0x00;

0x0002:High bytes0x00:0 channel,low bytes 0x02:data length number,2 words length data,0x0000,0x03E8;

0x0000:Display data 0,0x03E8:Display data 1000.

②0x06 Channel display data 0 and1000

5A A5 0D 82 03105AA50100060203E8 0000

③0x07 Channel display data 0 and1000:

5A A5 0D 82 03105AA50100070200000 03E8

④0x00 and 0x07 Channel display data 0 and1000

5A A5 13 82 03105AA50200000200000 03E80702000 03E8

Meaning:

0x 5A A5:Frame header;

0x 12:Data length;

0x 82:Write command;

0x0310:The curve buffer data write start.,system variable hardware interface curve fixed address;

0x5AA5:Start the curve buffer write operate,CPU cleared after process.

0x0200:High bytes 0x02curve data block used several channel,if one command write 8 channel,this byte need change 08,low bytes undefined,write0x00.

0x0002:High bytes 0x00:0 channel,low bytes 0x02:data length number,0x0000,0x03E8;

0x0000:Display data 0,0x03E8:Display data 1000.

0x0702:High bytes 0x07:7 channel,low bytes 0x02:data length number,0x0000,0x03E8;

0x0000:Display data 0,0x03E8:Display data 1000.

Two curves of the channel and data length write separately.

⑤0x06 and 0x07channel display two crossing curves are displayed from left to right.

Command 1:5A A5 13 82 03105AA50200060200000 03E80702 03E8 0000

Meaning:command 1 is a crossing curve,two curves maximum and minimum set the opposite,In order to see the effect of the cross display in the middle of the curve frame. The cross curve is actually two different channel curves, so you need to make two curve boxes to set different channels.

Command 2:5A A5 13 82 03105AA50200060200064 01F40702 01F4 0064

Meaning:The setting screen of the software from right to left is displayed from left to right from the beginning. After the curve box is full, write instruction 2 again, and then you will see that the curve is displayed from right to left.

⑥0x00-0x078 channels displayed all together.5A A5 37 82 0310 5AA5 08000002 0000 03E8 0102 0000 03E80202 0000 03E8 0302 0000 03E80402 0000 03E80502 0000 03E80602 0000 03E80702 0000 03E8

T5DGUS curve 8 channel display,in total 8 channels,each channel can put 2048 words.

After enabling dynamic curve display, starting from 0x1000, establish a data buffer for each curve according to 2Kwords per channel.

CH0 buffer zone is 0x1000-0x17FF,CH1 buffer zone is 0x1800-0x1FFF,

CH2 buffer zone is 0x2000-0x27FF,CH3 buffer zone is 0x2800-0x2FFF,

CH4 buffer zone is 0x3000-0x37FF,CH5 buffer zone is 0x3800-0x3FFF,

CH6 buffer zone is 0x4000-0x47FF,CH7 buffer zone is 0x4800-0x4FFF,

The unused curve buffer can be used as a user variable area. The user can also directly rewrite the curve buffer,

For example, directly rewrite the variable address 5A A5 05 82 1000 0065.The value of the corresponding channel of the curve will change accordingly.

If the user needs to use 8 channels, the variable addresses and description pointers of other display controls are used from 0x5000~0xFFFF.

⑦The description pointer of the real time curve instructions for use

The description pointer storage address format of this function is shown in the red address in the table. Reference examples of several commonly used access commands are listed below:

SP Address	Serial Port Send Command （In the example SP address set 0x8000）	Command Effect and Application
0x05	5A A5 05 82 8005 0064	Change the position of the center axis of the curve (the curve moves up and down): move it up and down to the position of the y coordinate point 100.
0x06	5A A5 05 82 8006 0064	Change the range of the curve (vertical scaling of the curve): the curve data value corresponding to the central axis, generally half of the sum of the maximum and minimum values of the data. For example, the command here is changed to 0`200 range, (need to cooperate with the 0x08 pointer address to modify the corresponding magnification and display correctly)
0x07	5A A5 05 82 8007 F800	The color of the curve display is changed to red
0x08	5A A5 05 82 8008 00F0	Modify the magnification of the vertical axis, the unit is 1/256, 0x0000-0x7FFF. (Need to be used with 0x06 pointer)
0x09:H		Data source channel, 0x00-0x07
0x09:L	5A A5 05 82 8009 0014	Change the horizontal axis interval (curve horizontal scaling): Display the horizontal axis interval of the 00 channel curve as 0x14 (range 0x01-0xFF).

⑧Curve negative number display

7.4.2 Basic Graphic (0x21)

The basic graphics display function is to define a “drawing board" function in the display configuration file 14.BIN, and the specific drawing operation is determined by the content of the variable memory pointed to by *VP. The user realizes different drawing functions by changing the data in the variable memory.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A21	2	0x5A21
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x0008	2	0x0008
0x06	0x00	*VP	2	Variable Pointer
0x08	0x01	Area	8	Upper-left coordinates and lower-right coordinates of the Graphic. Only valid for Commands 0x0001 -0x0005, 0x0009 -0x000B
0x10	0x05:H	Dashed_Line_En	1	Write 0x00
0x11	0x05:L	Dash_Set	4	Write 0x00
0x15	0x07:L	Pixel_Scale	13	The actual size of pixel. 0x00-0x0F to 1*1-16*16
0x16			12	Write 0x00

The description of the variable data format pointed to by the variable data pointer (variable storage space) is shown in the table.

Address	Definition	Description
VP	CMD	Drawing instructions
VP+1	Data_Pack_Num_Max	Maximum data packet: connection (0x0002), defined as the number of connection lines (the number of vertices-1);
VP+2	DATA_Pack	Data

The description of drawing instruction data packet is shown in the table.

CMD	Function	The description of drawing instruction data packet			
		Address	Length	Define	Description
0x0001	Dot	0x00	2	(x,y)	The coordinate position of dot. The high byte of coordinate x is the judgment condition.
		0x02	1	Color	Dot color
0x0002	Line	0x00	1	Color	Line color
		0x01	2	(x,y)0	The coordinate of the line vertex 0, and the high byte of the x coordinate are the judgment conditions.
		0x03	2	(x,y)1	The coordinate of the line vertex 1, and the high byte of the x coordinate are the judgment conditions.
		0x01+2*n	2	(x,y)n	The coordinate of the line vertex n, and the high byte of the x coordinate are the judgment conditions.
0x0003	Rectangular	0x00	2	(x,y)s	The coordinates of the upper left corner of the rectangle and the high byte of the x coordinate are the judgment conditions.
		0x02	2	(x,y)e	The coordinates of the bottom right corner of the rectangle.
		0x04	1	Color	Rectangular color
0x0004	Rectangle filling	0x00	2	(x,y)s	The coordinates of the upper left corner of the rectangle and the high byte of the x coordinate are the judgment conditions.
		0x02	2	(x,y)e	The coordinates of the bottom right corner of the rectangle.
		0x04	1	Color	Fill color of the rectangle field.
0x0005	Circle	0x00	2	(x,y)s	Center coordinates.
		0x02	1	R	The radius of the circle.
		0x03	1	Color	The arc color.
0x0006	Picture Copy&Paste	0x00	1	Pic_ID	The ID of the page where the cut image area is located; the high byte is the judgment condition
		0x01	2	(x,y)s	The coordinates of the upper left corner of the image cutting area.
		0x03	2	(x,y)e	The coordinates of the lower right corner of the image cutting area.
		0x05	2	(x,y)	The coordinates of the upper left corner of the area in the current page that it is cut and pasted to
0x**07	Icon Display	0x00	2	(x,y)	The coordinate position of display area, and the high byte of the x coordinate is the judgment condition.
		0x02	1	ICON_ID	Icon ID, the location of the icon library is specified by the high byte of instruction. The icon is fixed to not display the background color.
0x0008	Closed	0x00	2	(x,y)	The coordinates of point.

		0x02	1	Color	The color of filling the rectangle field.
0x0009	Frequency Spectrum (Vertical line)	0x00	1	Color0	Connect (x0, Y0s) (x0, Y0e) with Color0 color, and the high byte of x0 is the judgment condition.
		0x01	3	X0,Y0s,Y0e	
0x000D	xOR	0x00	2	(x,y)s	The coordinates of the upper left corner of the rectangular area, and the high byte of the x coordinate are the judgment conditions.
		0x02	2	(x,y)e	The coordinates of the lower right corner of the rectangular field.
		0x04	1	Color	The color of xOR of the rectangular field, and 0xFFFF will be inverted.

In the DGUS development software, click the display control_basic graphic display, and then use the mouse to select the display area on the page where you want to display the drawing board, and define the variable address in the right setting menu, and finally use the instruction to realize drawing.

7.4.3 Zone Rolling (0x024)

Area scrolling is to move the content of the specified area around, the direction of movement can be set.It can be used to simply realize dynamic operation effects such as flowcharts and progress bars on the screen. The variable address is processed by the underlying system, the user does not need to set it.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A24	2	0x5A24
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x0007	2	0x0007
0x06	0x00	（Xs,Ys）	4	Upper-left coordinates of the area.
0x08	0x02	（Xe,Ye）	4	Lower-right coordinates of the area.
0x0C	0x04	Dis_Move	2	Move space every DGUS cycle. In pixel.
0x10	0x05_H	Mode_Move	2	0x00: move left. 0x01: move right. 0x02: move up. 0x03: move down.
0x12		Reserved	13	0x00

7.4.4 QR Code (0x025)

Used to display QR Codes generated from the value of the VP.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A25	2	0x5A25
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x0004	2	0x0004
0x06	0x00	*VP	2	Variable Pointer.
0x08	0x01	(x,y)	4	Upper-left coordinates of the Icons to display.
0x0C	0x03	Unit_Pixels	2	QR Pixel size, in pixels. It's the size of the smallest square on a QR Code. Range: 0x01-0x07.
0x0D	0X05	Reserved	18	00

7.4.4.1 Command Example:

Send command,display URL:http://www.dwin.com.cn/use Wechat scan the QR code.

5A A5 1C 82 5240 68 74 74 70 3A 2F 2F 77 77 77 2E 64 77 69 6E 2E 63 6F 6D 2E 63 6E 2F FFFF

0x 5A A5:Frame header;

0x 1C:Data length;

0x 82:Write command;

0x 5240:VP address;

0x 68 74 74 70 3A 2F 2F 77 77 77 2E 64 77 69 6E 2E 63 6F 6D 2E 63 6E 2F:URL' S ASCII code;

0x FFF:FFFF End symbol.

7.4.5 Brightness (0x26)

Used to adjust the display brightness of the designated display area to highlight or dilute the background display. It needs to be distinguished from the interface for adjusting the backlight writing system variable. The backlight is to adjust the brightness of the entire screen.

Address	SP Address	Definition	Length (bytes)	Description
0x00		0x5A26	2	
0x02		*SP	2	Parameter Pointer. 0xFFFF: Disables SP (no run-time modification).
0x04		0x0005	2	
0x06	0x00	*VP	2	Variable Pointer.
0x08	0x01	（Xs,Ys）	4	Upper-left coordinates of the area.
0x0C	0x03	(Xe,Ye)	4	Lower-right coordinates of the area.
0x10-0x1F		Reserved	18	0x00

7.4.5.1 Brightness Command Example:

5A A5 05 82 54320032

Meaning:0x5A A5 data header;0x05 length data;0x82 write command;

0x5432:VP address;

0x0032:Brightness value.（Rage0x00-0x64,100-Level brightness adjustment）