DGUSII_T5L Application development guide

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Chapter one Quick start

1.1 Naming rule of model

E.g. : DMG72720C041-03WTC.

Table1.1 Naming rule of model

DM	DWIN intelligent screen product line
G	Color: T=65K color (16bit) G=16.7M color (24bit)
72	Lateral resolution : 32=320 48=480 64=640 72=720 80=800 85=854 10=1024 12=1280 13=1364 14=144019=1920
720	Longitudinal resolution: 240=240 480=480 600=600 720=720 768=768 800=800 108=1080 128=1280
C	Application of grade: M or L=consumer grade C=commerce grade T=industrial grade K=medical grade Q=automotive grade S=military grade F= platform of product intergation application solution
041	Display size: 041=display the diagonal dimension of 4.1 inchs
-	
A	Classification: 0-Z. Specifically, A refers to the DWIN intelligent screen based on DGUSII kernel module
3	Hardware serial number: 0-9, to distinguish between different hardware versions
W	
T	N=no touch screen TR=resistance touch screen TC=capacitive touch screen T=touch screen(distinguish touch screen categories by serial number)
Additional note 1	Nothing=standard product Z**=ODM product, while ** is 01-99
Additional note 2	Nothing=standard product F*=extend FLASH（F1=1GB F2=2GB）

1.2 Guide of type selection

Table1.2 T5L Guide of type selection

Size	Type	Resolution	Note	Reference (16%VAT)		
				N	TR	TC
3.5	DMG48320C035-03W	480*320	TN	53	59	68
4.0	DMG80480C040-03W	800*480	IPS	80	90	99
4.0	DMG48480C040-03W	800*480	IPS	68	76	95
4.1	DMG72720C041-03W	720*720	IPS			130
4.3	DMG48270C043-03W	480*272	TN	50	56	66
5.0	DMG80480C050-03W	800*480	TN	78	88	96
5.0	DMG85480C050-03W	854*480	IPS	85	85	96
5.0	DMG12720C050-03W	1280*720	IPS			150
5.6	DMG64480C056-03W	640*480	TN	215	239	253
7.0	DMG80480C070-03W	800*480	TN	83	93	110
7.0	DMG10600C070-03W	1024*600	IPS	99	110	128

8.0	DMG80600C080-03W	800*600	TN	150	170	195
8.0	DMG10768C080-03W	1024*768	IPS	175	195	215
9.7	DMG10768C097-03W	1024*768	EWTN	245	285	310
10.1	DMG10600C101-03W	1024*600	IPS	185	215	235
10.4	DMG80600C104-03W	800*600	TN	260	295	345
7.0	DMG80480L070-01WTR	800*480	TN		85	
8.0	DMG80600L080-01WTR	800*600	TN		155	

Note:TN=normal view; IPS=wide view; EWTN=wide view.

1.3 Connecting line、interface definition

1.3.1 10pin wiring、interface

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

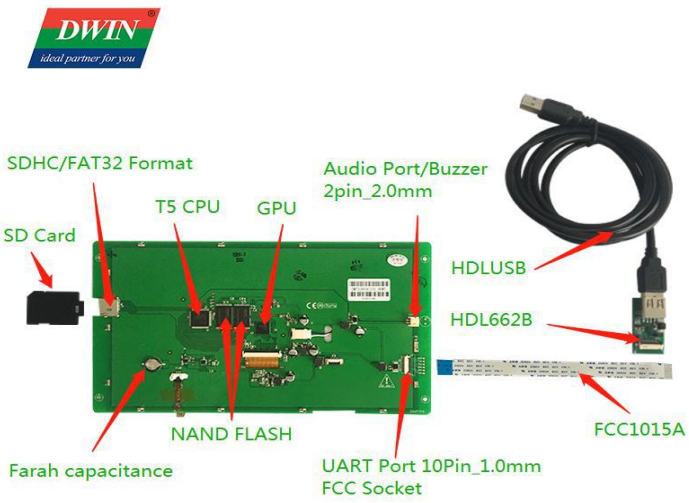


Figure 1.1 10pin wiring and interface definition

1.3.2 8pin interface

The 8pin interface has seats of 2.0mm spacing and 2.54mm spacing, respectively corresponding to different types of socket and connecting wires.

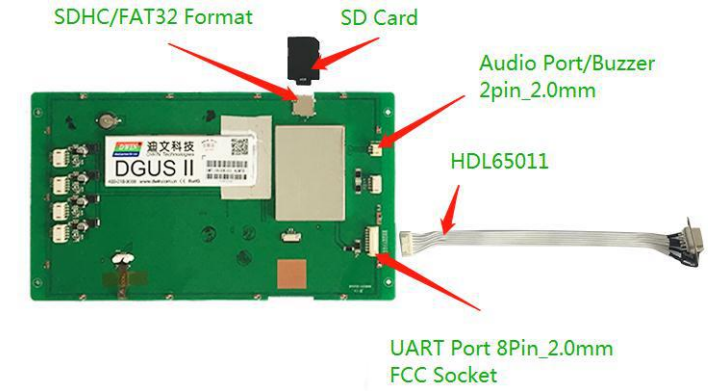


Figure 1.2 8pin2.0 wiring and interface definition

1.3.3 6pin interface

The user can make their own connecting wire through the plug screw to connect 6pin phoenix terminal wire. When using the 485 interface to connect the computer, it needs to turn 232 to 485 switch board, convert 232 signal into 485 signal, and then communicate with DGUS screen.

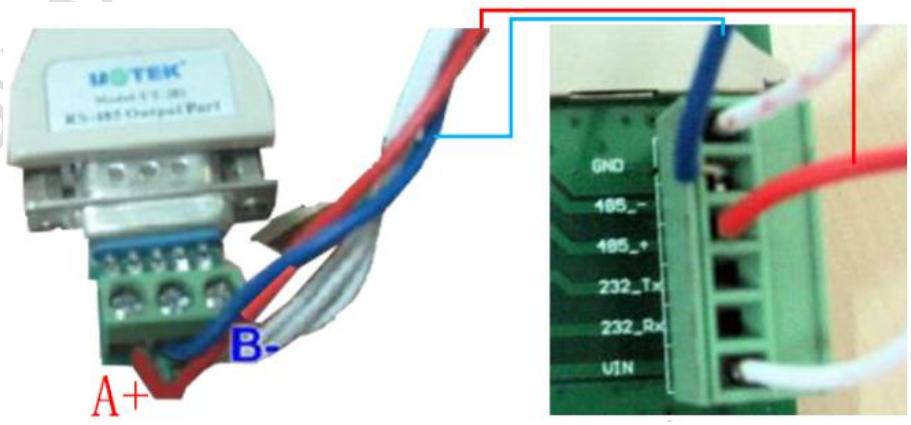


Figure 1.3 6pin wiring instruction

1.4 The screen power supply

Confirm the screen voltage and power consumption according to the selection manual or data manual, lit up the screen by a 5v/12v/24v DC regulated supply. The power supply plays a very important role in the normal display of the screen, too-low voltage,current instability,low power may lead to flashing screen ,black screen and other abnormal display phenomenon.

1.5 Driver installation

1.5.1 Serial driver installation

DWIN factory accessories selection of serial switchboard (accessories optional) USB-to-UART chip, XR21V1410 chip and CP2102 chip, According to the type of chip ,the driver can be downloaded from DWIN website or you can consult 400 for technical support ,then installed for DUGS screen communication.

HDL662B and HDL662C

Figure 1.5 Serial port driver

The specific steps are as follows:

Step 1: right-click "my computer"; click "properties" at the bottom; click "Device manager" on the upper left, pop up the "Device manager" operation box, 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 driver to complete the driver update.

Step 4: when the installation is completed, the corresponding port number of the driver can be seen in the device manager.

1.5.2 Software operating environment driver

Installation steps:

To get the software environment, double-click to install.

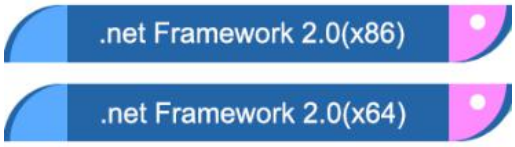


Figure 1.6 Software environment drivers

1.6 Software installation

Download DGUS development software from DWIN official website http://www.dwin.com.cn/
or obtain technical support from 400 customer service, no need to install after unzip, double-click to run.

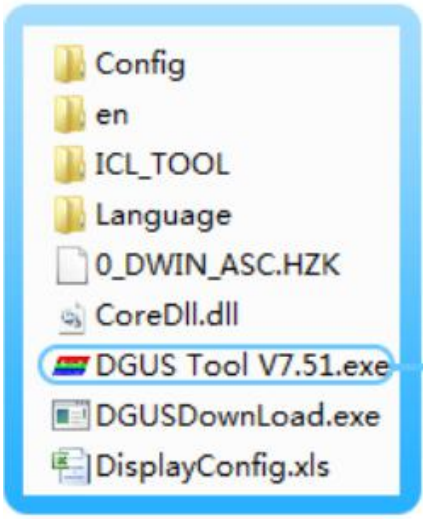


Figure 1.7 Software icon

1.7 Serial port level selection

In order to improve baud rate and facilitate connection to PC debugging, Some models of DWIN adopt TTL/RS232 compatible interface. Users can use 0Ω resistor or solder to directly short circuit.
R232=0 (short circuit) select TTL level input;
R232=1(disconnect), select RS232 level.
As shown in figure 1.8, the place is marked by white silk screen.By default,the factory disconnects the 232 level, and the short connection is TTL. OFF=232, ON=TTL.

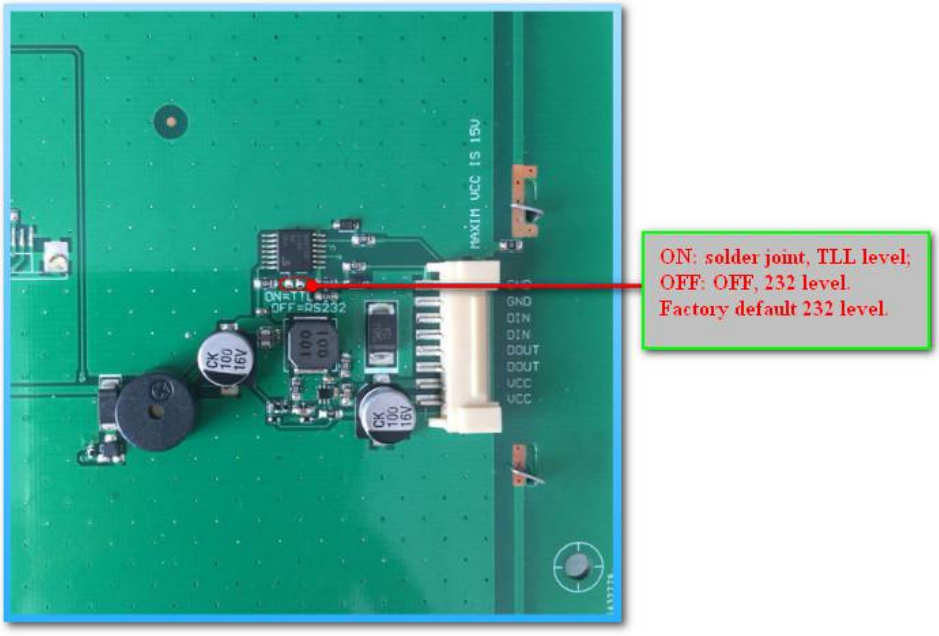


Figure 1.12 level selection

Chapter two

DGUSII_T5L introduction to DEV. System

2.1 Introduction to DGUSII_T5L ASIC chip

T5L series ASIC is ***a single chip and dual-core IC*** designed by DWIN technology for AIOT applications with low-power consumption, high-cost performance, high GUI and application integration. Including T5L1(low resolution) and T5L2(high resolution), its main features include:

（1）The most widely used ,mature and stable 8051 core,1T(single instruction cycle) high-speed operation,the highest frequency 250MHz.

（2）The DGUS II system runs on a separate CPU core(GUI CPU):

☆Built-in high-speed video memory, 2.4GB/S bandwidth, 24bit color display resolution support up to 800*600(T5L1) or 1366*768 (T5L2);
☆2D hardware acceleration, JPEG decompression speed up to 200fps@1280*800, animation and icon based UI is extremely cool and smooth;
☆JPEG compression mode to store image,icons, greatly reduced external memory into the low-cost 16Mbytes SPI Flash;
☆Support resistance or capacitance touch screen, sensitivity can be adjusted, fastest 400Hz touch dop ;
☆High-quality audio compression storage and player;
☆128Kbytes variable memory space, memory interface and OS CPU core exchange data, extremely simple of the application;
☆2 channels 10 bit 800KHz DC controller, simplifies LED backlight,analog power supply design and saves cost and space;
☆1 channel 15 bit 32Ksps PWM digital power amplifier drives the speaker, saves the cost of power amplifier and obtains high signal-to-noise ratio and sound quality revivification;
☆Support PC terminal configuration development and simulation,background remote upgrade.

（3）Single CPU core (OS CPU) runs user 8051 code or DWIN OS system,and user CPU is saved in the application:
☆Standard 8051 architecture and instruction set, 64Kbytes code space, 32Kbytes internal RAM;
☆64bit integer mathematical unit (MDU), including 64bit MAC and 64bit divider;
☆Built-in software WDT, 3 16bit Timers, 12-way interrupt signals support the highest 4 levels of interrupt nesting;
☆22 IO, 4-way UARTs, 1-way CAN interface, up to 8-way 12bit A/D, 1-way 16bit resolution adjustable PWM;
☆Supports IAP simulation online and debugging , unlimited number of breakpoints;
☆Code can be updated online through the DGUS system.

（4）1Mbytes Flash,DWIN patent encryption technology, to ensure code and data security, eliminate copycat and cloning.
（5）The oscillator and PLL Designed by a variety of inexpensive wide-range turned impedance crystal , reducing the crystal requirements and PCB design difficulties.
（6）3.3V IO voltage, can adapt to 1.8/2.5/3.3 various levels.
（7）Support SD interface download and configuration, SD card file reading and writing.
（8）Support DWIN WIFI module directly access to DWIN cloud, easy to develop a variety of cloud applications.

(9）Work to -40 ℃ to + 85 ℃ temperature range (- 55 ℃ to+ 105 ℃ customizable).

(10) With low-power consumption and strong anti-interference ability, it can work stably on double-sided PCB design and easily pass EMC/EMI test.

(11) With 0.4mmELQFP128 package,the manufacturing process is of low difficulty and cost.

(12) For industry customers to provide T5L IC+LCD+touch screen+design support of cost-effective supporting program sales and full range of technical service support.

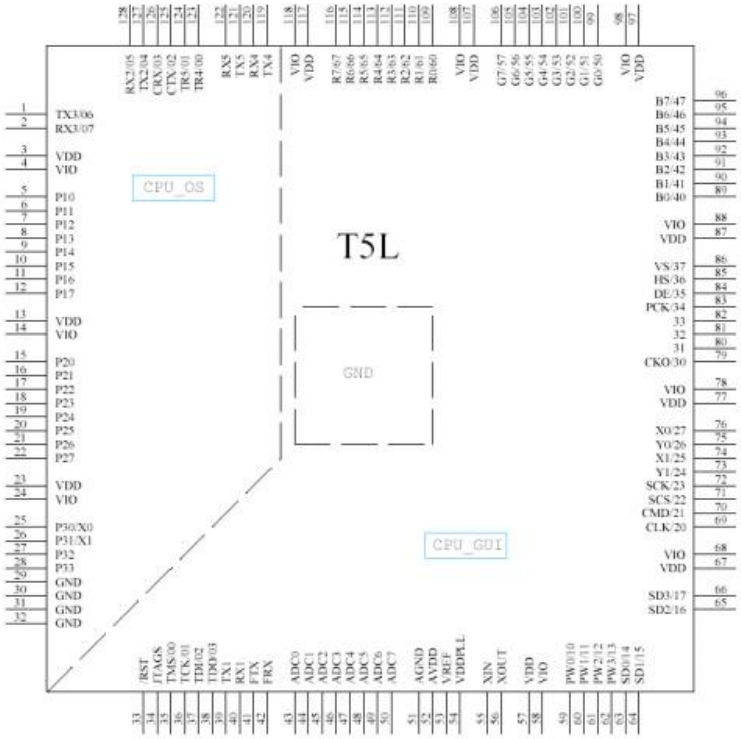


Figure 2.1 ASIC Pin arrangement diagram

If the user needs to use T5L single IC as the complete-machine and develop it in 8051 mode, please refer to 《DWIN T5L ASIC application development guide》 for detailed information of T5L ASIC pin definition and packaging diagram.

2.2 Introduction to DGUSII_T5L DEV. System

DGUS development system is composed of DGUS screen and DGUS development software, as shown in the figure below. ***DGUS*** is the abbreviation of ***D***WIN ***G***raphic ***U***tilized ***S***oftware. DGUS screen is based on the configuration file to work, so the whole development process is the use of PC DGUS development software to assist the design of variable configuration.

(1) Variable programming

Users can make a table before the project, and frame needed variable address, for the subsequent modification and maintenance.

(2) Interface design

The simple interface can made by user,and the complex or beautiful interface by professional artists, The icon sames as the picture.

(3) Interface configuration

Configure the interface through PC DGUSII_T5L software. After finishing, click "save" and "generate" in the option of "file" in the upper left of the software to generate the 13.bin touch configuration file and the 14.bin display configuration file. Click the software "touch key" and "display key" to view the specific functions.

(4) Debugging

Put the required files into the DWIN_SET folder and download to the screen by the SD card. The order is: power off -- insert Card -- power on -- blue screen reads SD Card content, and displays “SD Card Process after downloading... The END!” -- power off, exit SD card -- power on.

(5) Version setting

After finalization, the configuration files, picture files, icons, fonts and so on will be placed in the DWIN_SET folder, and the mass production can be downloaded by the SD card.

The basic development process is shown in the figure below:

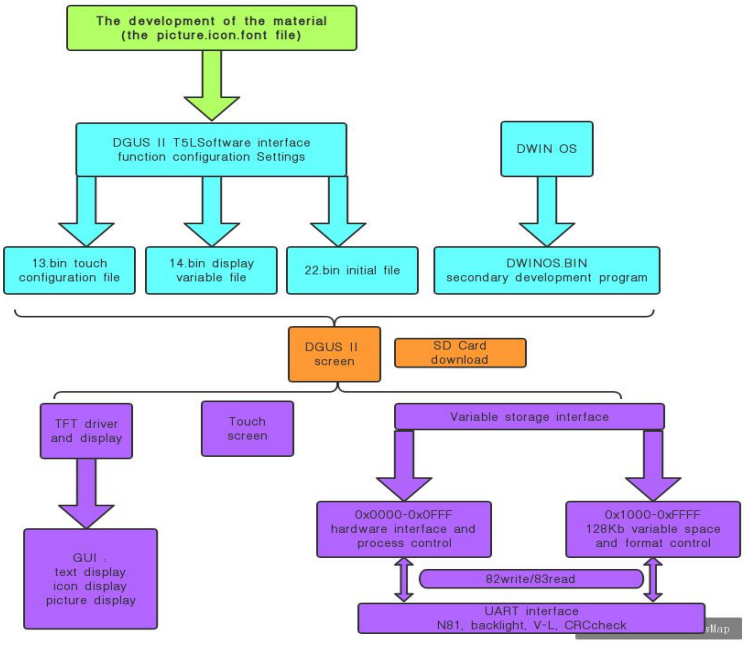


Figure 2.2

2.3 Advantages of DGUSII_T5L DEV. System

(1) The biggest advantage of DGUS II development is ***shortcut***. Different from the traditional LCM display through timing or command control, DGUS II screen adopts the direct variable driven display mode. All the display and operation are based on the pre-set variable configuration file. The two different modes lead to the completely different software architecture and secondary development difficulty for the user in developing the application.

(2) This is because the DGUS II development platform was developed ***using controls***. Control encapsulates the developer defined data properties and methods, users just need to configure controls in the PC side and use it. Design control is a heavy work, DGUS II has defined common controls needed for the human-computer interaction function, so the software can be used easily and efficiently. In some medium and small industrial automation project application, the whole system consists of some relatively independent, functional components (such as supporting Modbus protocol temperature controller or other secondary instrument) , DGUS can directly be used as host, with 485 network devices and DGUS screen to form a network,directly develop main control software and run on the DGUS screen replaced the work of the user's CPU,Based on the DWIN OS secondary development platform installed on the DGUS screen.

(3) The DGUS II_T5L platform specifies that the DGUS refresh cycle is 20 ms, which means that all contents of 13.bin and 14.bin would be read once in each cycle. At present, the development platform of DGUSII has supported the placement up to 256 variables per page, which shows that the DGUSII processing capacity is very strong. At the same time, the CPU running DWIN OS program has no running cycle and is completely independent from the running of DGUS. Therefore, developers need not worry about the interaction between DGUS and DWIN OS when both are running on the system.

(3.1) Based on T5L dual-core ASIC, GUI and OS cores are running at 200MHz main frequency with very low-power consumption.

(3.2) 16Mbytes low-cost SPI Flash, JPEG image, icon compression storage, you can specify the size of the background image storage space.

(3.3) 320Kbytes Nor Flash user database.

(3.4) 128Kbytes data variable space.

(3.5) Up to 255 display variables per page.

(3.6) Support standard T5 DWIN OS platform: Hardware can lead out 20 IO, 4 - way UART, multi - way AD, to provide custom services.

(3.7) 20mS DGUS cycle，UI extremely smooth。

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

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

(3.10) Support SD interface download and configuration, display the file statistics downloaded .

(3.11) The sensitivity adjustment of capacitive touch screen is supported to facilitate the application of front panel (the thickest to 6mm tempered glass).

2.4 DGUSII_T5L Software process

In DGUS II_T5L development platform,The feature attributes of variables (characters, data), various animations and other functions are represented by codes, stored in the 13.bin file according to the address, The configuration of touch stored in the 14.bin file similarly. Just need to configure the display or touch control to configure in the DGUS II development software. When power on, the system will call the 13.bin file and the 14.bin file, so that the human-machine interface can operate normally.

DGUS Processing Flow Chart

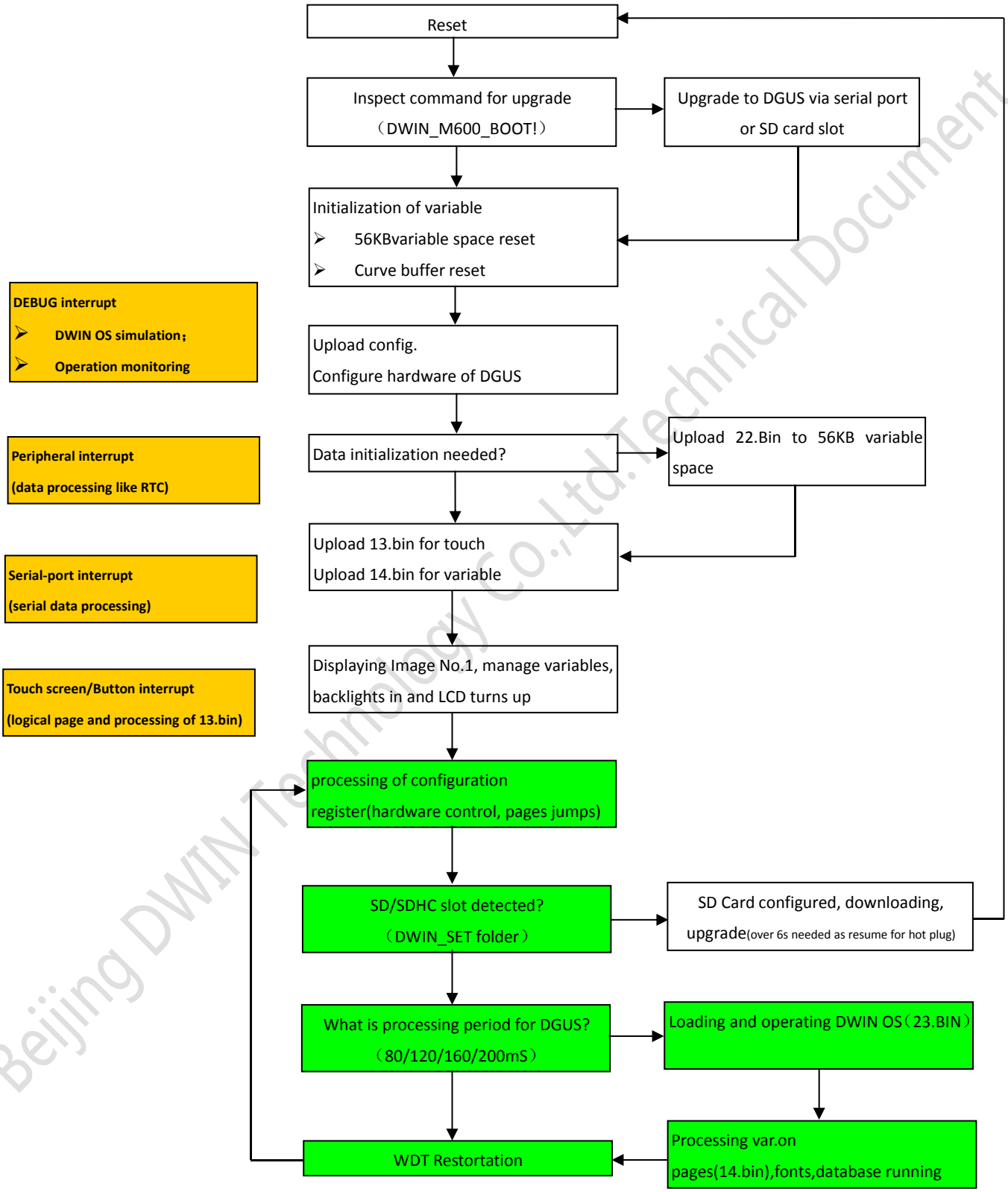


Figure 2.3

2.5 DGUSII_T5L Development model switching

According to different display resolutions,T5L includes two versions: T5L1 (maximum resolution 1280*800, 24-bit color) and T5L2 (maximum resolution 1920*1080, 24-bit color), which adopt 55nm (T5L1) and 40nm (T5L2) technologies respectively, to ensure the best cost performance for users.

In the two versions of T5L1 and T5L2, users can update the underlying kernel firmware program by SD card according to their own development habits, and flexibly change the development mode of LCD terminal: DGUSII or TA Instruction Set.

The document mainly introduces the T5L_DGUSII pattern development. If user needs to use the T5L_TA instruction set development pattern, refer to《T5L_TA Instruction Set development guide》.

T5L Version	Development Pattern	PC Hardware Version	Development Document
T5L1	DGUS II	DGUS_V7.55	T5L_DGUS II development guide
	TA Instruction Set	TA Instruction Set debugging assistance toolbox	T5L_TA Instruction Set development guide
T5L2	DGUS II	DGUS_V7.55	T5L_DGUS II development guide
	TA Instruction Set	TA Instruction Set debugging assistance toolbox	T5L_TA Instruction Set development guide

Download method of kernel firmware:

Put the following two different kernel files into an empty DWIN_SET folder by the SD card; SD card upgrade does not support online hot plug update, it must be power off, insert SD card, power on then can be downloaded, to avoid the phenomenon of white screen. “Blue screen shows SD Card Process... The END!” Indicates that the kernel firmware upgrade was successful.

The function of DWIN screen is constantly upgraded and optimized. Different time of purchase, the kernel version is different. The number after the kernel name indicates the version number. Advised to use the latest version of the kernel, which is generally compatible with older versions.

Figure 2.4 T5L underlying kernel firmware

2.6 FLASH memory distribution

16MB Flash memory can be seen as a 64 sub-storage space with a fixed capacity of 256KB, and the file ID number stored range of 0-63, Divided by two parts :
(1) 4-12MB font space, can save the font library, icon library, configuration file.
(2) 4-12MB storage space for background image file (.ICL file).

For the T5L1 CPU platform, the single image size should not exceed 256KB, and the T5L2 not exceed 768KB.
The download file must be in the SD card root directory DWIN_SET folder, and be a 4KB sector, SD or SDHC card in FAT32 format.
No.23 starting position recommended to put the font or icon library and other files; For example, the starting position of No.32 is the background image.ICL file, the location of the background image needs to be customized by CFG file configuration, the value of CFG file 0x08 position calls the background image 32.ICL, CFG file 0x08 address writes 0x20.
After getting familiar with the division of the common range, users can set up the distribution by themselves.
For example, the font base file of No. 23 occupies 10 ranges, At this time, the position of background picture cannot start from No.32, needs to start from 33. If a page ID image displayed black screen, while other images normal, It is the size of a single image exceeds 256KB. When generating the image ICL file, lower the image quality, the image will be displayed normally. See the following section "3.3.1 background image library.ICL document requirements and generating steps."

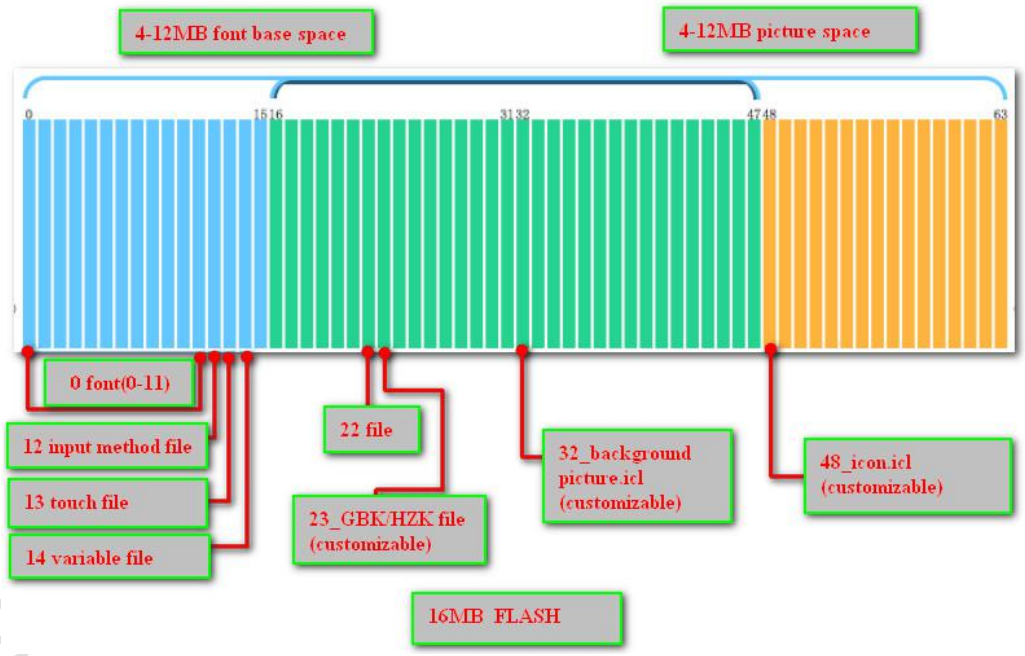


Figure 2.5 16MB storage space

2.7 RAM memory variable address space

The RAM space is fixed at 128KB, divided into 0x0000-0xFFFF subspace range, and each variable address corresponds to 2 bytes, and each byte corresponds to 8 bits of space.

0x0000 -- 0x0FFF is the address space of the system variable interface, which cannot be customized by the user;

0x1000 -- 0xFFFF is the range of variable address usage that users are free to use.

If the 8-channel curve is used at the same time,

0x1000 -- 0x4FFF will be used as the curve buffer address, and other key addresses are in the range of 0x5000 -- 0xFFFF.

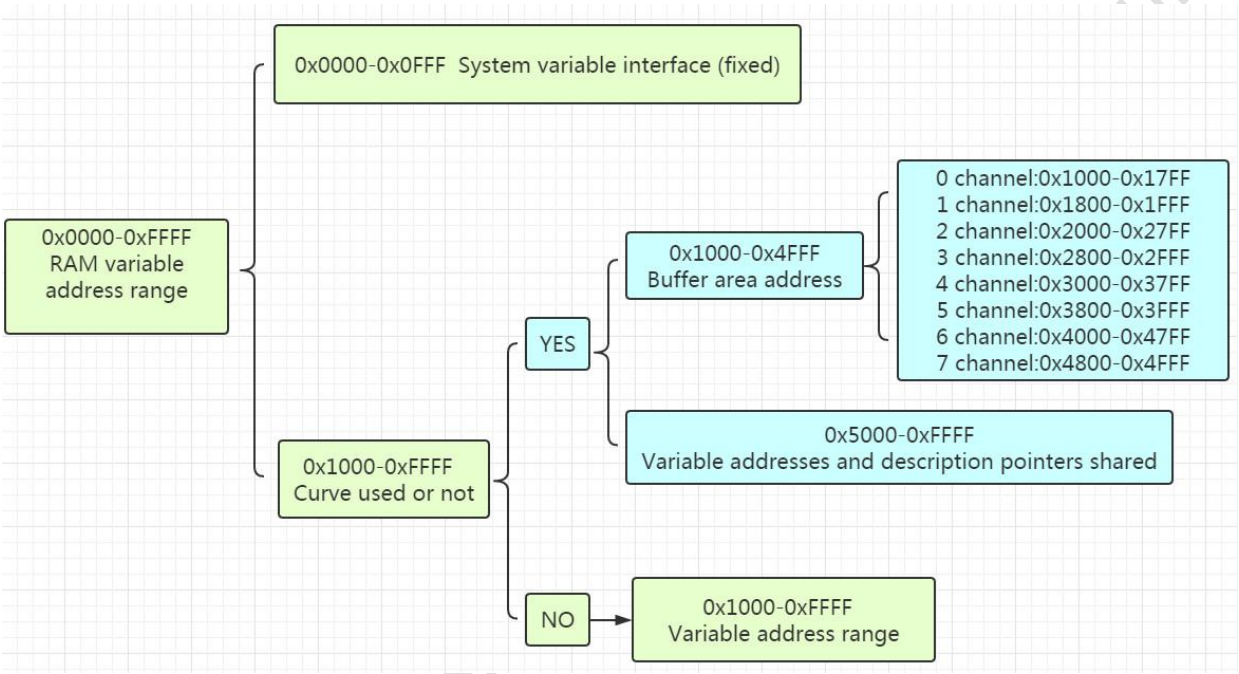
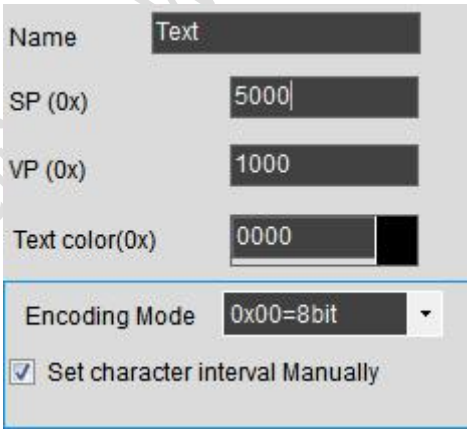


Figure 2.6 Partition of RAM memory space

A variable address is the first address of a subspace stored one or more variables in the RAM space, where the encoding or state variable values are stored, as illustrated below. For example, if the variable address of text-display control is set to 0x1000, and the text content displayed in the control is "Beijing DWIN technology", the storage method in the RAM space is as shown in the figure below. As you can see, the contents of 2 bytes can be stored in each address.



Variable address	Data storage	
.....	.....	
0x1000	B1B1	Bei
0x1001	BEA9	Jing
0x1002	B5CF	Di
0x1003	CEC4	Wen
0x1004	BFC6	Ke
0x1005	BCBC	Ji
.....	.....	

Figure 2.7 Storage mode of data in variable address

If you want to change the character displayed in this text display control, you simply change the character encoding stored in the corresponding variable address. The data stored in variable address can be modified by sending instructions and touch screen input. For example, modifying the text display control can be achieved by text entry control, just set the same variable address of the two controls, more details can refer to the following chapters; At the same time, the value stored in the variable address can be modified by sending instructions.

E.g. Send instruction: 5A A5 05 82 1001 0031
1001:The variable address where the Chinese character "jing" is stored
0031:The encoding of the numeric character "1"
Instruction effect: the display position of the character "jing" is replaced by the number "1".

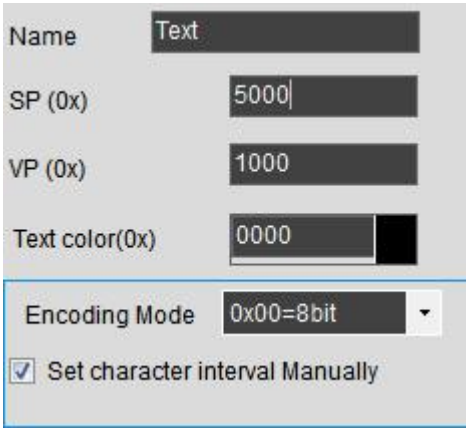
Similarly, you can modify the display data, enable/stop animation, and toggle icon by changing the values stored in the variable address. Such as:

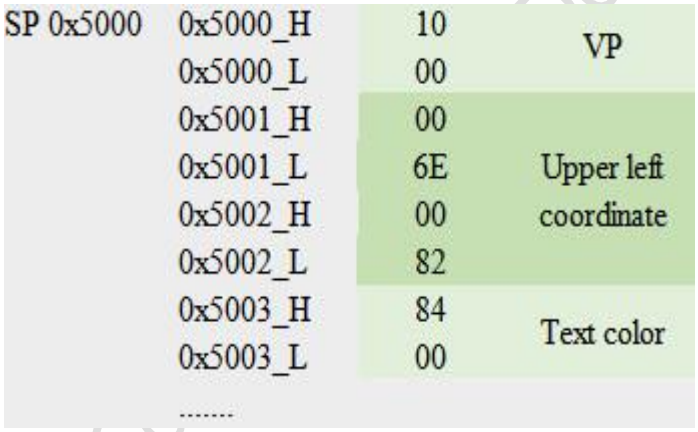
Function	Send instruction	Effect
Icon View	5A A5 05 82 0001 0001	0x0001 address displays icon 0001
Real-time data	5A A5 05 82 000A 000B	0x000A address displays data 000B

2.8 RAM Description pointer space

The description pointer is the first address of the subspace in the RAM space that stores the attribute of variables, The attribute values of the display variable are stored in the space that the address points to, such as display coordinates, color, font size, etc. It should be noted that the pointer and the variable pointer share RAM space, and the space overlap should be avoided when assigning variable addresses.

Continue with the display text control to explain. (please refer to this document description pointer usage section "show variable configuration function (14. BIN)" section, as shown in the figure below, according to the format of text display control instruction form, the text control described in sequential storage of the pointer to the space variable addresses, character at the upper left of the display position coordinates, character color, text box and coordinate data such as the upper left and lower right. In the figure 0x5000_H represents a high byte and 0x5000_L is a low byte.





E.g. Send instruction: 5A A5 05 82 5003 F800

5003:Text color storage address.

F800:Code in red.

Effect :The character color changes from khaki to red.

Function	Send instruction	Effect
Change data display position	5A A5 07 82 5001 0000 0000	The upper-left coordinate becomes to (0,0).
Change the size of the ASCII character lattice	5A A5 05 82 500A 3060	Change the character lattice to 48*96
Hide character	5A A5 05 82 5008 0000	Sets the character length value to 0 for character hiding.
Replace the font base file	5A A5 07 82 5009 003C1010	Call 60 font, font matrix size 16*16.

Chapter 3 SD interface download

3.1 Format requirements for MicroSD(TF) card download

All hardware parameter settings and data of the T5L display terminal can be completed by the SD/TF card interface. The file must be in FAT32 format.

Non-DWIN factory sales of SD card often has to be formatted under the DOS system. Otherwise, under the blue screen, The download usually shows that the number of downloaded files is 0 , or the display terminal fails to recognize the card and cannot normally enter the download interface.

Format operation method is as follows:

Step 1: start = > run = > input command (win7 system input CMD) into DOS system;

Step 2: enter the format/q g:/fs:fat32/a:4096 (note: q followed by a space), then click enter.

g is the disk number of the SD card and the corresponding disk symbol of different users is not fixed (for example, replace h or i).

Note: Generally, the SD card formatting by right-clicking the mouse cannot be completely formatted into FAT32 format, Only support the size range of (1-16G) .

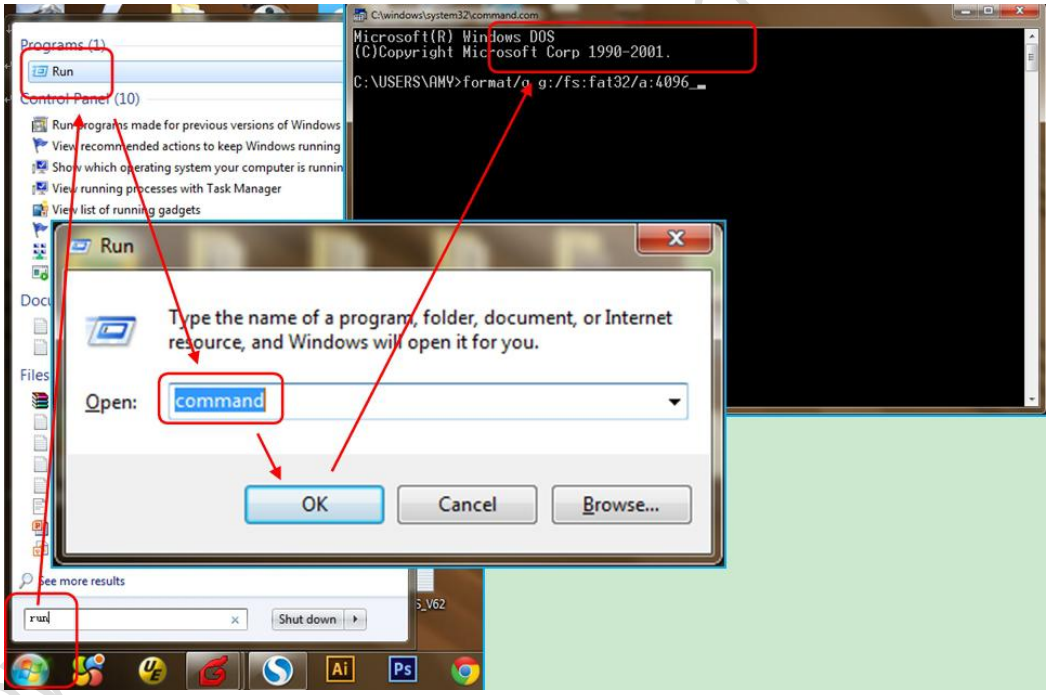


Figure 3.1 SD card formatting steps

3.2 SD card interface download instructions

SD card upgrade does not support online hot-plug update. In order to prevent hot-plug to damage the Flash , the screen must be strictly power-off first, insert SD card, and then download while power-on. Please be sure to maintain normal power supply during the download process, if not ,it may result in black screen abnormality.
Particularly, T5L_DGUS II is different from DGUS and T5_DGUS I, The background images of T5L screen need to be uniformly produced into the file format of.ICL using the DWIN tool software before downloading, and JPEG images cannot be directly read.

The DWIN_SET folder content generation process as shown below:
(1) DWIN_SET folder is established under SD card directory;
(2) Download the picture.ICL package, font, configuration files, etc. into the DWIN_SET folder;
(3) when the LCD terminal energized, SD card detected, It will identify whether there is a DWIN_SET named file in the SD card root directory. DWIN_SET folder cannot be placed under the DWIN_SET folder, otherwise the screen cannot be read normally;
(4) Finishing downloading, power-off then pull out the SD card, re-power into the normal working mode.

DWIN standard screen, if not specially customized or with the download encryption , will only recognize the folder DWIN_SET, other folder will not be recognized, the user can also backup their own folder named as other names, download is not affected.

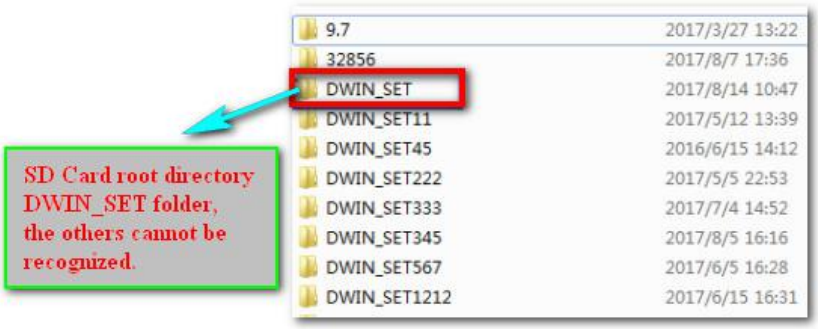


Figure 3.2 SD card download root directory file identification

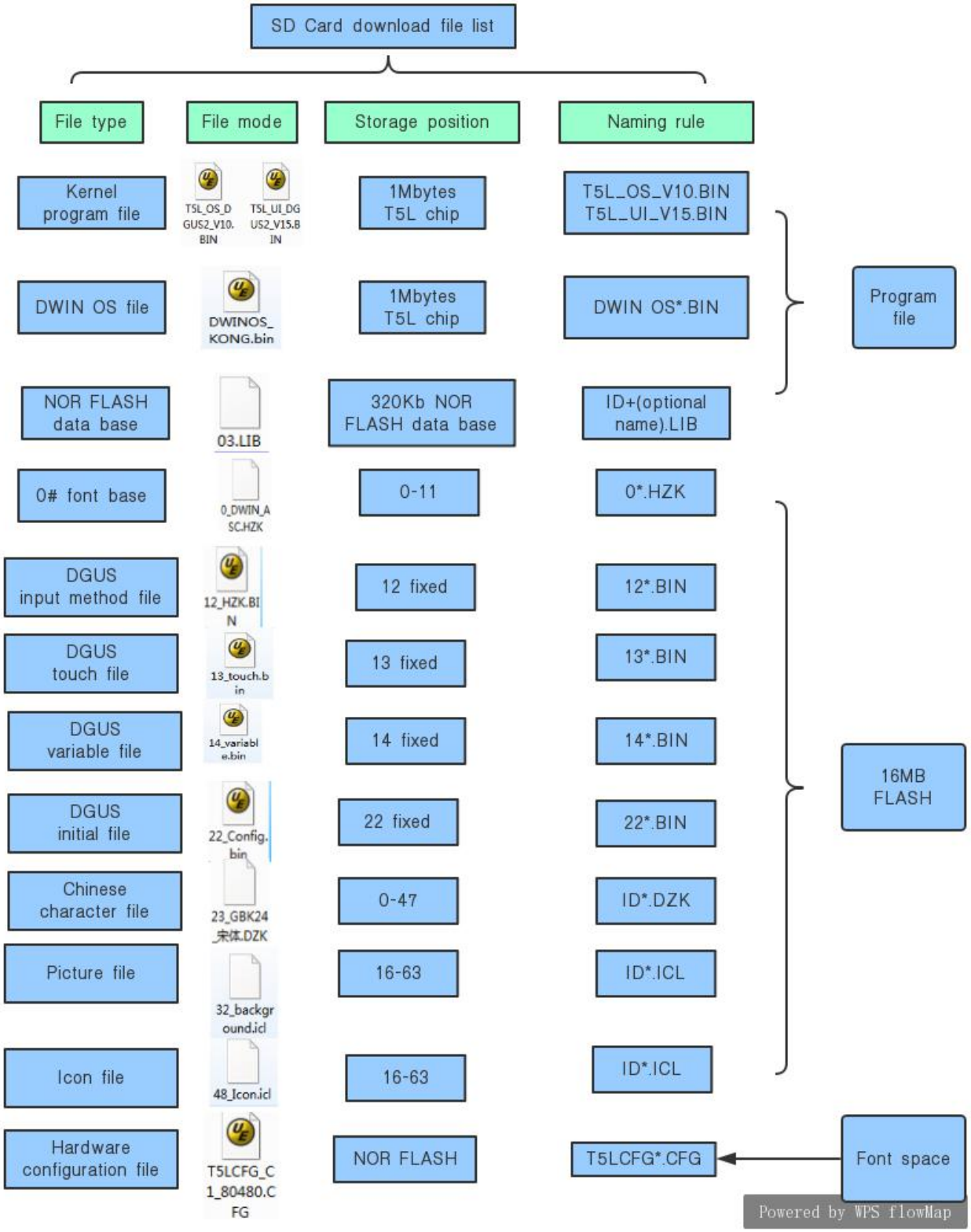
3.3 Composition of downloaded files

The files downloaded should be named in accordance with the prescribed format strictly, Other related unknown file names may cause unknown underlying errors .

The files actually needed to download shown in the following table:

File type	Naming rule	Description
Program	T5L_UI*.BIN T5L_OS*.BIN	The underlying kernel firmware application. Users update selectively. As the software constantly upgraded, the kernel version may be different by time purchasing, the higher compatible with the lower.
DWIN OS program	DWINOS*.BIN	DWIN OS program, the code must start at 0x1000. Users can download selectively according to their usage.
OS CPU 8051 program	T5L51*.BIN	Based on OS 8051 platform developed applications, Users can download selectively according to their usage.
NOR Flash database	ID+(optional) filename.LIB	Each ID corresponds to 2KWords memory, and the ID range is 0-79. The database in on-chip NOR Flash, 160KWords. Can be used to save user data or DWIN OS library files, Downloaded selectively according to their usage.
Font file (4~12MB)	Font ID+ (optional) filename.BIN/DZK/HZK, Font ID 00-47	0_DWIN_ASC.HZKASCII font Use the DGUS 0# font.
DGUS input method	12*.BIN	Fixed storage in 12 font location
DGUS touch	13*.BIN	Fixed storage in 13font location,cannot over 32KB
DGUS variables	14*.BIN	Fixed storage in 14 font location,cannot over 256KB,DGUS 2 format
DGUS variables initialization	22*.BIN	Fixed storage in 22 font location,initializes the variable space of 0x1000-0xFFFF by Loading 0x2000-0x1FFFF address .
JPEG, Icon	Font ID+(optional) file name.**ICL**	Must be JPEG ICO file format of DGUS3 format
Hardware configuration	T5LCFG*.**CFG**	Configure CRC check, modify baud rate, touch screen sound control, touch upload mode, display direction, etc

SD/SDHC interface download file list: the figure3.3


SD Card download file list
File type
File mode
Storage position
Naming rule
Kernel program file
T5L_OS_DGUS2_V10.BIN
T5L_UI_DGUS2_V15.BIN
1Mbytes T5L chip
T5L_OS_V10.BIN T5L_UI_V15.BIN
DWIN OS file
DWINOS_KONG.bin
1Mbytes T5L chip
DWIN OS*.BIN
Program file
NOR FLASH data base
03.LIB
320Kb NOR FLASH data base
ID+(optional name).LIB
0# font base
0_DWIN_ASC.HZK
0-11
0*.HZK
DGUS input method file
12_HZK.BIN
12 fixed
12*.BIN
DGUS touch file
13_touch.bin
13 fixed
13*.BIN
DGUS variable file
14_variable.bin
14 fixed
14*.BIN
16MB FLASH
DGUS initial file
22_Config.bin
22 fixed
22*.BIN
Chinese character file
23_GBK24宋体.DZK
0-47
ID*.DZK
Picture file
32_background.icl
16-63
ID*.ICL
Icon file
48_Icon.icl
16-63
ID*.ICL
Hardware configuration file
T5LCFG_C1_80480.CFG
NOR FLASH
T5LCFG*.CFG
Font space
Powered by WPS flowMap

3.4 Format requirements and generation steps of the downloaded file

(1) From the introduction of DGUSII_T5L development system, we know that via the DGUSII screen developing the project, the material files of pictures, icon library, font library, audio files and so on need to be prepared.

(2) DGUSII_T5L calls the material file by its file number.Therefore, when naming material files, they should be prefixed with Arabic numerals, and other Chinese and English or punctuation marks can be added after the serial Numbers, for example:00_boot page.JPEG,23_GBK font base.HZK,0 _DWIN_ASC. HZK,0_.wav, 48_ icon library. ICL.

Different types of files, such as 24.hzk, 24.icl, although they are named with same Arabic numeral, do not conflict with each other, because they occupy different font base, While the same type of file number can not be named repeatedly, or will cause an error to call the file.

3.4.1 Background image library.ICL file requirements and generation steps

(1) the background image library images, icon file material ,PC software tools support JPEG, BMP, PNG format .

(2) Image resolution and screen consistent; . JPEG format; 24 color; Boot default display 0 page; E.g.: 00_ start up page, 01_ function page,02_ menu page... , Start with Arabic numerals,Name the head in order of the function.

(3) No-uniform requirement for image format in software configuration, but needs to be compressed into. ICL file format and then downloaded to the screen, instead of. JPEG format file.

(4) Background .ICL downloading files must be placed in the SD card root directory DWIN_SET folder, and must be a 4KB sector, FAT32 format SD or SDHC card. DGUS II_T5L image file is finally downloaded in the format of. ICL file type.

(5) Background image library. ICL file is used to display background images on the screen. If generated a 32_ background image.ICL file, the CFG file must write 0x20 at its position 0x08 so that the underlying program can read and recognize the file correctly. If the CFG file is configured to be empty, it will appear as a black screen (with a faint backlight), users should carefully check the CFG file 0x08 position configuration.

(6) For the T5L1 CPU platform, a single JPG image file size should not exceed 256KB, and for the T5L2 CPU not exceed 768KB. Added: the size has nothing to do with the original picture material size. Because of complex gradients of the image, the compressed into. JPG size is different when generating by PC software. ICL generation tool. If bigger than the maximum, the PC software will prompt, the user just needs to lower JPG image quality percentage slightly. When viewing ICL, the corresponding JPG file will be displayed in the corresponding folder of ICL. The folder name is: ICL name _derived_JPG, and the compressed JPG file properties can be seen.

The attached:

JPEG: Joint Photographic Experts GROUP, extension.jpeg or.jpg, can provide lossy compression, and store more high-quality photos with less Photographic space.

BMP: Short for full name Bitmap. When the BMP file stores data, the image is scanned in the order from left to right and from bottom to top. The Bitmap storage format is adopted.

PNG: Portable Network Graphic Format. It is a bitmap file storage Format that allows lossless compression and transparency.

3.4.2 Icon library.ICL file requirements and generation steps

3.4.2.1 Icon library.ICL file requirements

(1) The maximum image resolution of the icon library shall not exceed 1024*1024 pixels, or Software will automatically compress to 1024*1024. Support JPEG, BMP, BNP formats ; 24 color; Start with the Arabic numerals and name them in order.

(2) In the FLASH , the single font space is 256KB. When a single icon library occupied more than 256KB,the space must be calculated strictly, otherwise result-in the display exception.

E.g. : ICL file size: 1.23MB, Calculation formula: file size *1024/256= the interval value,1.23*1024/256=4.92, that is, the occupation of 48, 49, 50, 51, 52 these 5 word library intervals, As long as it is not divisible, take-up one more byte must count as a interval. Therefore, the next icon library naming needs to start at 53.

3.4.2.2 Icon library.ICL file generation steps

ICL file is generated in the same way as the picture library, see "picture library in figure 17. ICL file generation.

3.4.3 Font file requirements and generation steps

DGUS supports a variety of international common character base encoding: 8-bit, ASCII, GBK, GB2312, UNICODE. In DGUS, the ASCII encoded font base has been pre-installed, which contains all ASCII characters with the dot matrix size of 4*8~64*128. The font library number is 0, can be directly called to achieve the display of Numbers, letters and so on.When other encoded libraries are needed, they are generated through the font generator. DGUS supports BIN, DZK,HZK three font library files.

3.4.3.1 0 font generation

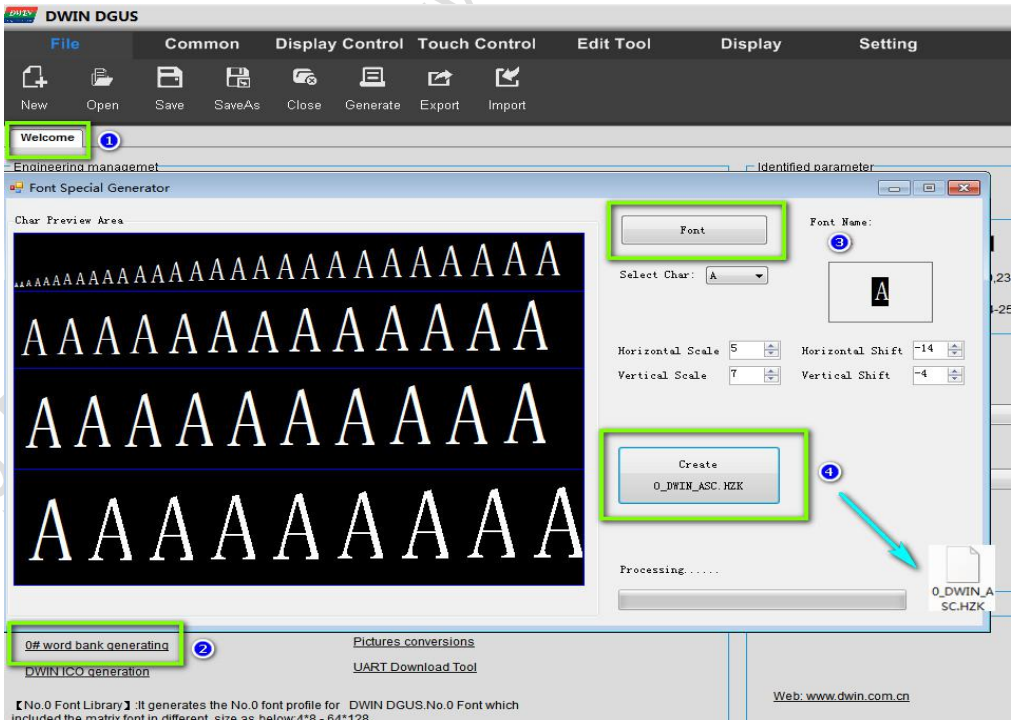


Figure 3.4 0 font generation

3.3.3.2 Unicode code font generation

Some common foreign languages corresponding to unicode encoding range (specific network query)
Arabic numerals: u0030 - u0039
Capital letters: u0041-u005a
Lowercase letters: u0061-u007a
English: u4E00 - u9FFF
Russian: u0400 - u052F
Korean: uAC00 - uD7AF
Japanese: u3040 - u31FF

English, Dutch, Spanish, Italian, Portuguese, Danish, German, Finnish, Norwegian, Swedish, French, Turkish: u0000 -- u01FF, these languages Latin letter part of the same, so you can put it into a small scope, generated after the call.

DGUS screen "data variable control display" can directly process calling Unicode font display, for example, display data 100 instruction: 5A A5 05 82 6000 0064; Therefore, Unicode encoding font base is very suitable for making different data variable fonts. The encoding u0000-u007f used for the generation of the font base can meet the needs of Numbers, English and partial punctuation. The generated font base occupies small memory, and the font style can also be varied. For example, if a project is to be applied to two different data variable fonts, then the first one can be used with the 0-point font itself, and the other one can be used with the font generator to generate Unicode encoded fonts, among which the most common one is digital tube font display. Since the range of the lattice with width and height is fixed when generating the font base, the setting must also follow the range of the lattice. However, for text control display, the instruction data to be sent must be in accordance with Unicode encoding, such as 12:5 A A5 07 82 5000 0031 0032, instead of 5A A5 05 82 5000 3132.

U0000 -- UFFFF is the entire Unicode encoding range, and the font base generated by this range can display all languages and characters. The generated 16*16 dot matrix font base is 2MB, and the larger the dot matrix is, the larger the space it takes.

3.4.4 Initial value 22 file configuration

Variable addresses doubly corresponded to 22 files, variable addresses(Word) and 22 files(byte).

When modifying the variable address 0x2000 word initial value, address the 22 file 0x4000 byte address for correct modification. UltraEdit and other software can be used to open 22 files.

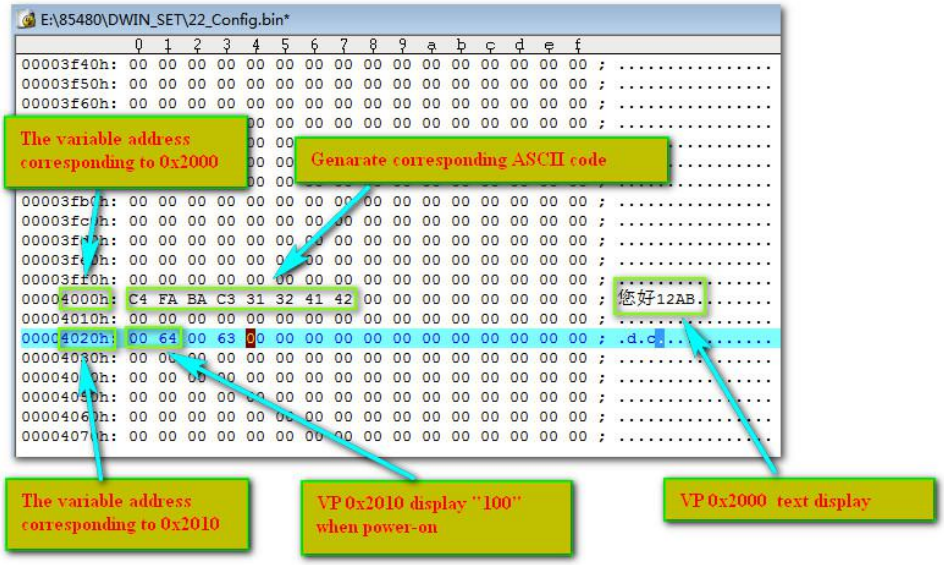


Figure 3.5 Initial value 22 file modification demonstration

3.5The CFG file configuration

T5L*.CFG hardware configuration file adopts binary-data format and can be edited using UltraEdit and other software. The instructions shown in the following table:

Category	Address	Length	Definition	Description
Configuration identification	0x00	5	0x54 0x35 0x4C 0x43 0x31	Fixed content
System configuration	0x05	1	Parameter configuration	.7: serial port CRC check,0= close 1= open. .6: reserved, 0. .5: load 22 file initialization variable space ， 0= no 1= yes .4: upload touch variable changes automatically， 0= no 1= yes. .3: touch screen audio control, 0= off 1= on. .2: touch screen backlight standby control， 1= on 0= off. . 1. 0: electricity display orientation 00 = 0 ° ,01 = 90 °, 10 = 180 °,11 = 270 °
	0x06	2	Reserved	0x00
	0x08	1	ICL file storage position	0x10--0x30(16--48), corresponding to12MB-4MB background image space
	0x09	1	TP alarm rate setting	0x01-0xFF, default 0x28, alarm rate =400Hz/ setting value.
	0x0A	2	Serial port band rate setting	Baud rate setting value =3225600/ set baud rate. 115200bps, set value =0x001C, maximum 0x03FF.
Backlight standby configuration	0x0C	1	Normal operation and starting brightness	0x00--0x64, unit 1%.
	0x0D	1	Standby brightness	0x00--0x64, unit 1%.
	0x0E	2	Turn on time after standby	0x0001--0xFFFF, unit 10ms.
Display configuration	0x10	2	Display_Config_En	0x5AA5= display configuration is valid, factory configured, the user need not.
	0x12	1	PCLK_PHS	Data latching phase setting: 0x00=PCLK descending edge 0x01=PCLK ascending edge.
	0x13	1	PCLK_DIV	Pixel clock PCLK frequency setting, PCLK frequency (MHz) =206.4/PCLK_DIV.
	0x14	1	H_W	
	0x15	1	H_S	
	0x16	2	H_D	Horizontal (X direction) resolution
	0x18	1	H_E	
	0x19	1	V_W	
	0x1A	1	V_S	
	0x1B	2	V_D	Vertical (Y) resolution
	0x1D	1	V_E	
	0x1E	1	TCON_SEL	0x00=no need to configure TCON
	0x1F	1	Reserved	0x00

TP configuration	0x20	1	TP_Set_En	0x5A= display configuration is valid, factory configured, the user need not.
	0x21	1	TP_Mode	TP mode configuration. .7-.4(high 4bit),Select the TP type: 0x0*=Resistance Touch 0x1*=GT911,GT9271,GT9110 drive IC capacitive TP 0x2*=ILI9881H Incell CTP .3 RTP test: 0= off 1= on, enabled only when SD is downloaded. .2-.0 (low 4bit), select TP mode: .2 X axis data selection: 0=0 to Xmax 1=Xmax to 0; .1 Y axis data selection: 0=0 to Ymax 1=Ymax to 0; .0 XY swap: 0=XY 1=YX. **(7 "RTP is 0x07; 8 "RTP is 0x05; 10.4 "RTP is 0x03)**
	0x22	1	TP_Sense	TP sensitivity setting: 0x00-0x1F, 0x00 lowest, 0x1F highest.Default 0x14, with high sensitivity. (ILI9881 is 0x01-0x06).
	0x23	1	TP_Freq	Frequency range selection, ILI9881H applicable, 0x01-0x14 is fixed frequency, 0x00 frequency hopping.
Clock output configuration	0x24	1	CKO_Set_En	0x5A indicates that this configuration is valid.
	0x25	1	CKO_En	0x5A:turn on CKO(P3.0) clock output and the rest to off.
	0x26	1	CKO_DIV	CKO output clock setting,frequency =825.7536/CKO_DIV MHz.
Buzzer setting	0x27	1	BUZZ_Set_En	0x5A indicates that this configuration is valid.
	0x28	1	BUZZ_Freq_DIV1	BUZZ_Freq=825753.6/ （BUZZ_Freq_DIV1*BUZZ_Freq_DIV1） KHz
	0x29	2	BUZZ_Freq_DIV2	Factory setting: DIV1=0x6E, DIV2=0x0BB8, corresponding to 2.5KHz frequency.
	0x2B	2	BUZZ_Freq_Duty	Buzzer duty cycle setting: High duty ratio =BUZZ_Freq_Duty/ BUZZ_Freq_DIV2. Factory setting: 0x00F0 corresponds to 8% high level duty cycle.
	0x2D	1	BUZZ_Time	The sound time of the touch screen sound buzzer is 10ms; Factory setting 0x0A.

3.5.1 CFG profile address 0x05 hardware parameter configuration specification

0x05 configuration:

Bit	Parameter	Value	Description
.7	CRC check	0	0= close 1= open
.6	Reserve	0	Reserve
.5	Initial value	1	0= close 1= open
.4	Data upload	1	0= close 1= open
.3	Audio	1	0= close 1= open
.2	Backlight	0	0= close 1= open
.1	Display direction	0	00=0°01=90°10=180°11=270°
.0		0	

1byte=8bits, each bit corresponds to the configuration status of parameter, ***transform 0011 1000 to hexadecimal 0x38***, and then write to the position 0x05 in the CFG file, the corresponding configuration will take effect.

Formula :0011=$1*2^0+1*2^1+0*2^2+0*2^3=3$ 1000=$0*2^0+0*2^1+0*2^2+1*2^3=8$ and so on...

E.g.:

(1)DMG10600C070-03W (factory landscape series),

0 ° ,90 ° , 180 ° , 270 ° software development and CFG configuration :

Mode	Picture resolution	ICL	Configuration value
0 ° lateral	1024 * 600 picture	1024*600 made.ICL file	0x38
90 ° vertical	600 * 1024 picture	600 * 1024 made.ICL file	0x39
180° lateral	1024 * 600 picture	1024*600 made.ICL file	0x3A
270 ° vertical	600 * 1024 picture	600 * 1024 made.ICL file	0x3B

(2)DMG85480C050-03W (factory portrait series),

0 ° ,90 ° , 180 ° , 270 ° software development and CFG configuration :

Mode	Picture resolution	ICL	Configuration value
0 ° lateral	854 * 480 picture	854 * 480 made.ICL file	0x38
90 ° vertical	480 * 854 picture	480 * 854 made.ICL file	0x39
180° lateral	854 * 480 picture	854 * 480 made.ICL file	0x3A
270 ° vertical	480 * 854 picture	480 * 854 made.ICL file	0x3B

3.5.2 CFG profile backlight configuration specification.

CFG address	Description	Configuration value
0x05	Turn on backlight	0x3C
0x0C	Brightness value	Range: 0x00-0x64
0x0D	Standby brightness value	Range: 0x00-0x64
0x0E 0x0F	10S No- click into the backlight	03E8 Range: 0x0001-0xFFFF, unit 10ms.

Note: The backlight standby screensaver turned on, first touch is to wake up the backlight, second click will trigger the touch control.

3.5.3 CFG profile address 0x08 background image location specification

If the image background file is set to 32_ image. ICL file, then write 0x20 at the address 0x08 for the underlying read and display.

3.5.4 CFG profile address 0x0A baud rate specification

***Formula*:**Baud rate setting value =3225600/ set baud rate. 0x03FF Max.

E.g.:set baud rate:115200, baud rate setting value=3225600/115200=28, 28 converted to hexadecimal 0x1C, As the baud rate is 2 bytes, CFG file 0x0A address can start writing 0x001C. The 9600 baud rate is 0x0150.

3.5.5 CFG profile address 0x21 touch screen configuration mode specification

(1) Configured when out factory, users need not normally.

(2) In case of sliding page turning, reverse touch control or white screen in the configuration process, users need to download the factory CFG file again. Address 0x20 writes 0x5A.

3.5.6 CFG profile address 0x22 sensitivity specification

Sensitivity address 0x22, factory 0x14, range 0x0000-0x1F. Address 0x20 writes 0x5A.

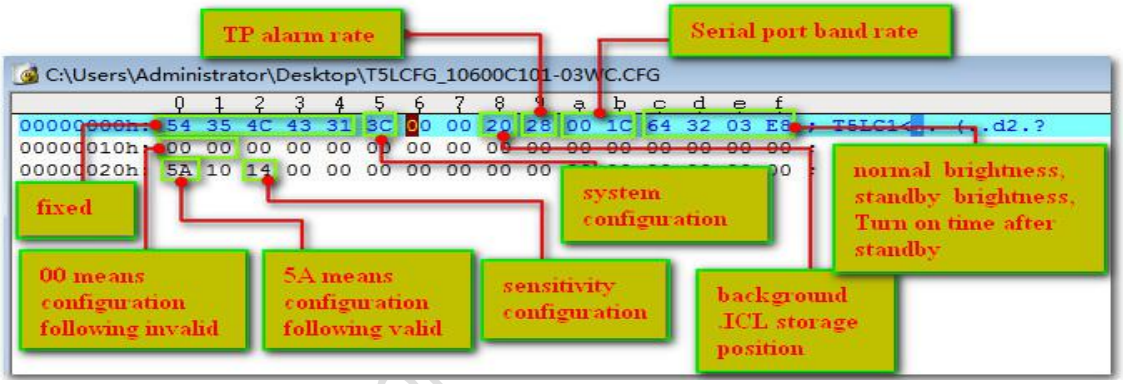


Figure 3.6 CFG file configuration instruction

Display configuration reference:

Size_resolution	T5L_SET.CFG display configuration（HEX format）													
	0x12	**0x13**	**0x14**	**0x15**	**0x16**	**0x17**	**0x18**	**0x19**	**0x1A**	**0x1B**	**0x1C**	**0x1D**	**0x1E**	**0x1F**
2.4_240*320（IPS）	01	26	0A	14	00	F0	0A	02	02	01	40	02	05	00
2.8_240*320A	01	26	0A	14	00	F0	0A	02	02	01	40	02	03	00
2.8_240*320B	01	20	10	20	00	F0	20	02	0E	01	40	08	01	00
3.5_320*240	01	1C	1E	14	01	40	40	03	0F	00	F0	10	02	00
3.5_320*480	01	14	0A	04	01	40	0A	02	02	01	E0	02	04	00
3.5_320*480（IPS）	01	14	0A	04	01	40	0A	02	02	01	E0	02	06	00
3.5_480*640	01	0A	10	20	01	E0	20	02	03	02	80	02	07	00
4.0_480*480（IPS）	00	0E	08	08	01	E0	08	02	0C	01	E0	06	08	00
4.0_480*800（IPS）	00	08	08	08	01	E0	08	04	0A	03	20	0A	09	00
4.0_720*720（IPS Incell）	00	03	70	B4	02	D0	B4	02	14	02	D0	DC	0A	00
5.0_720*1280（IPS Incell）	00	03	04	14	02	D0	14	02	12	05	00	C8	0A	00
5.0_480*854（IPS）	00	08	08	08	01	E0	08	02	0C	03	56	06	0C	00
480*272	01	16	29	02	01	E0	02	0A	02	01	10	02	00	00
640*480	01	08	1E	72	02	58	10	03	20	01	E0	0A	00	00
800*480	01	06	1E	10	03	20	D2	03	14	01	E0	0C	00	00
800*600	01	05	1E	10	03	20	D2	03	14	02	58	0C	00	00
1024*600	01	04	A0	88	04	00	18	06	1D	02	58	03	00	00
1024*768	01	04	10	40	04	00	20	04	08	03	00	04	00	00
1280*720	01	03	10	40	05	00	20	08	20	02	D0	20	00	00
1280*800	01	03	10	1C	05	00	10	08	10	03	20	10	00	00
1366*768	01	03	10	20	05	54	20	06	10	03	00	08	00	00

Chapter 4

Serial port communication protocol (UART2)

For the convenience of writing and reading,the following instructions are sent in the writing format of hexadecimal instructions, omitting "0x").

The DGUS screen adopts asynchronous, full-duplex serial port (UART), and the serial port mode is 8n1, that is, each data transmission adopts 10bits, including: 1starting bit, 8data bits and 1 stop bit.

All instructions or data in the serial port are in hexadecimal (HEX) format; For font (2-byte) data, always pass the high-byte first (MSB) method, such as 0x1234 first pass 0x12. The maximum length of data 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) of data to the DGUS screen in one DGUS cycle.

4.1 Data-frame

The mode of the system debugging serial port UART2 is fixed as 8N1, the baud rate can be set, and the data frame is composed of 5 parts:

Data block	1	2	3	4	5
Definition	Frame header	Word length	command	data	CRC check(optional)
Length(Word)	2	1	1	249bytes max	2
Description	0x5AA5	Include : command,data,check	0x81 0x82 0x83 0x84		
E.G.(No check)	5A A5	04	83	00 10 04	
E.G.(Check)	5A A5	06	83	00 10 04	25 A3

The start/close of CRC check is controlled by 0x05.7 bit of the configuration file.

Examples of comparison of CRC check enabled instructions are shown in the following table:

Instructions	**No enable CRC check**	**CRC check**
83 read	Tx:5A A5 04 83 000F 01	Tx:5A A5 06 83 000F 01ED 90
83 response	Rx:5A A5 06 83 00 0F 01 14 10	Rx:5A A5 08 83 00 0F 01 14 10 43 F0
82 read	Tx:5A A5 05 82 10 00 31 32	Tx:5A A5 07 82 10 00 31 32 CC 9B
82 response	Rx:5A A5 03 82 4F 4B	Rx:5A A5 05 82 4F 4B A5 EF
83 touch upload	Rx:5A A5 06 83 10 01 01 00 5A	Rx:5A A5 08 83 10 01 01 00 5A 0E 2C

4.2 UART2 Debug interface instructions

UART2 debugging interface instruction as following:

Command	Data	Description
0x80	Issue: Register page (0x00-0x08)+ register address (0x00-0xFF)+ data written	Write data string in designated addresses to register.
	Response: 0x4F 0x4B	Write instruction response
0x81	Issue: Register page (0x00-0x08)+ register address (0x00-0xFF)+ read data byte length(0x01-0xFB)	Read data from designated register
	Response: Register page (0x00-0x08)+ register address (0x00-0xFF)+ data length+ data	Data response
0x82	Issue: Variable space head address (0x0000-0xFFFF)+ data written	Specifies the address to start writing data strings (literal data) into the variable space. Do not write space that the system reserves.
	Response: 0x4F 0x4B	Write instruction response
0x83	Issue: Variable space head address (0x0000-0xFFFF)+read data byte length(0x01-0x7D)	Read the specified length word data from the specified address in the variable space
	Response : Variable space head address+data byte length+data read	Data response

Register page defined below:

Register page ID	Definition	Description
0x00-0x07	Data register	256 per group, R0-R255
0x08	Interface register	DRO-DR255.Refer to《DWIN OS DEV. Guide of T5》3.4 the definition of interface register

4.2.1 Write variable memory instructions(82)

Put the value 2 into the 1000 variable address:

5A A5 05 82 1000 0002 :Assigning 2 to address 1000 , displays variable integer type 2.

5A A5: Frame header

05: Data length

82: write variable memory instruction

1000 : the variable address (two bytes)

0002 : data 2 (two bytes)

Note: the address of the variable DGUS can be seen as the starting address: for example, the effect of instructions a and b below is equal to c.

a: 5A A5 05 82 1001 000A

b: 5A A5 05 82 1002 000B

c: 5A A5 07 82 1001 000A 000B

4.2.2 Read variable memory instructions(83)

Reading the value in the address of 1000 variable (assuming the current value is 2) :

5A A5 04 83 1000 01

5A A5 : frame header

04 : data length

83 : read data store instruction

1000 : the variable address (two bytes)

01: read 1 word from 1000 address, data instruction maximum allowable length 0x7c

Response:

5A A5 06 83 1000 01 0002

5A A5 : frame header

06 : data length

83 : read variable memory instruction

1000 : the variable address (two bytes)

01 : read 1 word length data from 1000 address

0002 : the data value in 1000 addresses is 2

4.2.3 Touch key return to serial port data (83)

Press return variable address 0x1001, key value 0x0002 :

5A A5 06 83 1001 01 0002

5A A5 : frame header

06 : data length

83 : read variable memory instruction instruction

1001 : variable address (two bytes)

01 : 1 word length data

0002 : key value

Keystroke return (non-basic touch) can be sent through the serial port after the system configuration CFG file is configured for data upload.

Upload protocol format :(key return address 1001 key value 000A) 5A A5 06 83 1001 01 000A

The value screen in this address will not automatically clear after the return button is pressed.

For RS485 half-duplex communication, the key value can be read out with 5A A5 04 83 10 01 01 read instruction, and the format of read instruction reply is consistent with that of touch upload.

Chapter 5 System variable interface

5.1 System variable interface(0x0000--0xFFFF Variable memory space)

Data with the same background color in the table are updated at the same time and must be rewritten once.

Variable address	Definition	Length	Description
0x00	Reserved	4	Undefined
0x04	System_Reset	2	Writing 0x55AA 5AA5 resets the T5L CPU once. E.g.:5A A5 07 82 00 04 55 AA 5A A5 Reset T5 chip, data clear 0, equivalent to power off restart
0x06	OS_Update_CMD	2	D3:0x5A starts an update DWIN OS program operation (write to chip Flash), and the CPU is cleared to 0. D2: set to 0x10. The DWIN OS code must start at 0x1000. D1:0: the first address of the data variable space where the upgrade code is stored, 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	2	D7: operation mode 0x5A= read 0xA5= write, CPU operation complete zero. D6:4: chip Nor Flash database header address, which must be even, 0x000000-0x02:7FFE, 160KWords. D3:2: the first address of the data variable space, which must be even. D1:0: read-write word length 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	1	Application version. D1 represents the GUI software version, D0 represents the DWIN OS software version. E.g:

			5A A5 04 83 000F 01 return: 5A A5 06 83 000F 01 11 10 (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 command is often used to verify that the communication between the computer serial port and the serial screen is normal.
0x10	RTC	4	D7= year (0-0x63) D6= month (0-0x0c) D5= day (0-0x1f) D4= week (0-0x6) D3= hour (0-0x17) D2= minutes (0-0x3b) D1= seconds (0-0x3b) D0=undefined , data in HEX format. Hardware support is required (no built-in RTC hardware, RTC time is written by the user). 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, 20. Automatic completion of the system; The day of 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	1	Current page display 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	1	GUI operation status feedback: 0x0000 means idle and 0x0001 means variable files are being processed. 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	4	D7:0x5A indicates that the touch screen data has been updated. D6: touch screen 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 screen 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-0x30	Reserved	23	Undefined
0x31	LED_Now	1	D1:0x5A indicates that the backlight brightness, the momentary value of AD0-AD7 have been updated. D0: the current backlight brightness, 0x00-0x64. E.g.: Read: 5A A5 04 83 0031 01 Answer: 5A A5 06 83 00 31 01 5A 64
0x32	Momentary AD0-AD7	8	Momentary value of AD0-AD7 channel, 1word per channel. The voltage=AD*3300/4095mV
0x3A-0x7F	Reserved	70	Undefined
0x80	System_Config	2	D3: the user writes 0x5A to start the system parameter configuration once, the CPU processed and reset. D2: touch screen sensitivity configuration value, read only. D1: touch screen mode configuration value, read only. D0: system status setting. .7: serial CRC check Settings, 1= on, 0= off, read only. .6: hold, write0 .5: 22 File initialization variable space 1= load 0= no load, read only. .4: variable automatic upload setting 1= on, 0= off, read and write. .3: touch screen audio control 1= open 0= close, read and write. .2: touch screen backlight standby control 1= open 0= close, read and write. .1. 0: display orientation 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 screen 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
0x82	LED_Config	2	TP backlight standby setting: D3=open lightness,0x00-0x64; Off the backlight control, D3 act as software lightness adjustment interface. D2=close lightness,0x00-0x64; D1:0=open time/10ms.

			E.g.: 1. When CFG address 0x05 is configured to turn on backlight standby control of touch screen: 5A A5 07 82 0082 6432 03E8, 10 seconds after the screen backlight automatically reduced to 0x32 brightness. 5A A5 07 82 0082 2020 ****, direct instruction control backlight brightness 0x20 brightness, and backlight screen saver brightness is consistent with standby. Note: the first physical touch on the touch screen after a certain period of time is to wake up the backlight function of the screensaver. 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 screen: 5A A5 05 82 0082 0A**, direct instruction control backlight brightness is 0x0A brightness.
0x84	PIC_Set	2	D3:0x5A means that a page processing is started once and the CPU has cleared the zero. D2:processing mode 0x01=page switching(Displays the image specified in the image store onto the current background page) D1:D0:picture ID
			E.g.: 5A A5 07 82 0084 5A01 0001, display the background picture.ICL file under the 01 ordinal Picture(If the ordinal picture ID of the instruction does not exist, the instruction operation judgment will not take effect.)
0x86	PWMO_Set	2	D3=0x5A starts the PWM0 setting once, and the CPU has cleared the zero. D2= frequency division coefficient D1:D0=PWM0 precision PWM1 carrier frequency = 825.7536mhz /(frequency division coefficient *PWM0 precision).
0x88-0x91	Reserved	10	Undefined
0x92	PWMO_Out	1	D1:D0=PWM0 output high level width, 0x0000-PWM0 precision.
0x93-0x9A	Reserved	8	Undefined
0x9B	Buzzer switch	1	D1=0x5A start a buzzer; D0= buzzer time, unit 10mS, 0x00 indicates immediate shutdown.
0x93-0xA9	Reserved	14	Undefined
0xAA	16Mbytes external memory write operation	6	Update the external memory contents with 32Kbyes block as the benchmark. D11:0x5A= start an external memory (16Mbytes) write operation and the CPU operation is cleared. D10: fixed to 0x02. D9:D8:32Kbytes block address, 0x0000-0x01ff, corresponds to the entire 16Mbytes memory. D7:D6: update the first address of the data stored in the data variable space, which must be even.

			D5:D4: the delay time waiting for the next write operation after the completion of this operation, Unit=1mS,the DGUS refresh will stop while the delay, to prevent an error from being caused by an incomplete update. D3:D0: undefined, write 0x00.
			E.g.: The address operation can achieve picture library, font library and other serial port 2 update function. The 16Mbytes memory can be seen as either 512 32Kbytes space for writing operation data update or 64 single font ID space with fixed capacity of 256KB. The following instruction 00B0 can also be seen as representing update to 22 font ID. 5A A5 0F 82 00 AA 5A 02 00 B0 80 00 00 14 00 00 00 00 00 00
0xB0	Touch instruction access interface	36	0xB0:0x5AA5 start to access to touch instruction once and the CPU operation is cleared. 0xB1:access the page ID of the touch instruction 0xB2:the high byte is the ID of touch instruction to be accessed(DGUS II configuration development settings),0x01-0xFF; the low byte is touch instruction code,0x01-0x7F. 0xB3:access mode 0xB4-0xD3:modified data of 0x02/0x03 mode. Mode 0x0000: close the touch instruction . Mode 0x0001: open the touch instruction. Mode 0x0002: read the touch instruction to the beginning data space of 0xB4. Mode 0x0003: replace the touch instruction data by the beginning data of 0xB4, the format and the data length must be the same.
			E.g.: 5AA5 0B 82 00B0 5AA5 0001 0905 0000 (close the 9th touch file on page 0001. 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.
0xD4	TP operation simulation	4	0xD4:0x5AA5 start an operation simulation of TP once and the CPU operation is cleared. 0xD5:Pressing mode 0x0001= pressing,0x0002= releasing,0x0003= continuing pressing,0x0004= clicking (pressing + lifting). 0xD6: the x coordinate of the pressed position. 0xD7: the y coordinate of the pressed position. After the simulated pressing modes 0x0001 and 0x0003, there must be a simulated lifting mode of 0x0002. Touch screen coordinates (x, y) to the relative 0 ° display screen Settings, The CPU automatically processes the display flip.

			E.g.: 5AA5 0B 82 00D4 5AA5 0004 00EE 008F (0004 is click, press + to raise, 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 screen sound control" is enabled, touch screen operation simulation will also trigger the touch screen buzzer)
0xD8	Reserved	8	
0xE0	Memory CRC check	2	D3: write 0x5A to perform a memory CRC check, and the CPU operation is cleared to zero. D2: memory type selection 0x00= byte store (16Mbytes memory) 0x02=DWIN OS code 0x03=Nor database (LIB file). D1:D0:data interface. ▶ Starts the CRC Font check mode: D1= start font ID (256KB for each font); D0= the number of 4KB blocks checked, 0x00-0xFF. OS code check mode: D1:D0= starting at 0x1000, the byte length of OS code to be checked is 0x0001-0x7000. D1:DO=Nor database ID, fixed validation of 4KB data each time. ▶after check Return value.
0xE2- 0xFF	Reserved	30	Undefined
0x100- 0x2FF	Reserved	512	
0x300- 0x37F	Dynamic curve interface	128	0x300-0x30f: state feedback for 8 channel curve buffers (read only advised), 2 characters per channel, high word is the storage pointer location (0x0000-0x07ff) where curve data is stored, and low word is the effective data length of curve buffer (0x0000-0x0800). Writing 0x0000 to the effective data length of the curve buffer will cause the curve unable display. 0x310-0x311: curve buffer data write started. D3: D2:0x5AA5 starts a curve buffer data write operation once, and the CPU operation is cleared to zero. D1: the number of data blocks, 0x01-0x08. D0: undefined, 0x00. 0x312-0x37f: data block written to the curve buffer, which is 16 bits unsigned. Single data block: data channel ID (0x00-0x07) + data word length (0x01-0x6E) + data. With dynamic curve display enabled, start at 0x1000 and create a data buffer for each curve according to 2Kwords per channel. The CH0 buffer is 0x1000-0x17ff, the CH1 buffer is 0x1800-0x1fff, and so on, the unused curve buffer zones can be used as user variables. Also Users can directly overwrite the curve buffer data and then modify 0x300-0x30f corresponding storage pointer position and data length to ensure the correct display of the

			curve.
0x380-0xFFF	Reserved	3K	Undefined, user can't use
0x400-0x4FF	Network communication interface	256	WiFi and other Internet communication equipment application control interface.
0x500-0xEFF	Reserved	2660	Undefined, user can't use
0x0F00	Variable change indication	2	After setting variables to change the automatic upload function, this function is enabled. D3=5A means variable change, D2:D1= variable memory pointer, D0= variable length (word). E.g.: Read: 5A A5 04 83 0F00 02 Response: 5A A5 06 83 1001 01 00 05 indicates that the user has a touch control, the control address 0x1001 serial port issued a word long data, similar to 5A A5 06 83 1001 01 ***
0xF02-0xFFF	Reserved	254	Undefined, user can't use

0x1000--0xFFFF variable storage space can be used at will.

5.2 Network communication interface (0x0400-0x04FF)

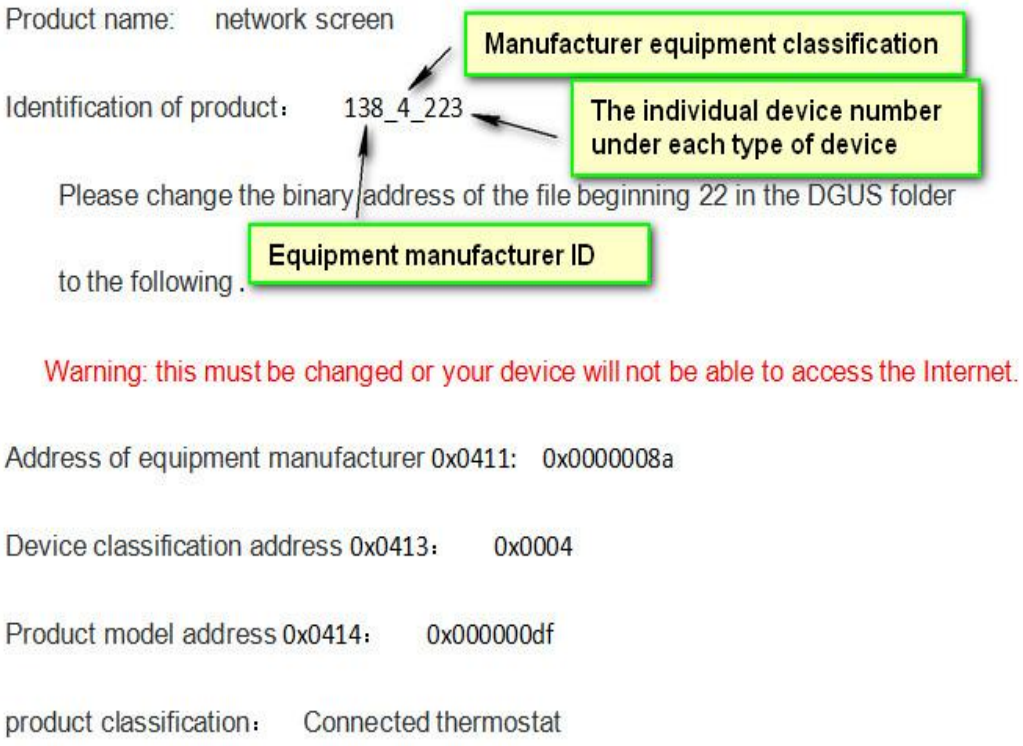
DWIN has developed WIFI module “wifi-10” and cloud platform “DWIN cloud” for AIOT applications. Wifi-10 is specially designed for DGUS development platform. The data interface has been defined, which Significantly reduce the development difficulty of customers and shorten development time. DWIN DGUS 2 platform (including T5 CPU series and T5L CPU series) has opened the network interface,with the WIFI module,it can be connected to DWIN cloud through simple DGUS development. Based on the cloud platform of DWIN ,customers can realize remote APP control, data analysis,equipment operation and other functions.

The DGUS 2 platform supports two network configurations: manual configure network and one-button configure network. It is suitable for a variety of application scenarios such as smart home, smart building, and instrumentation.

5.2.1 Network communication interface table

Note: the green filling part of the table indicates that users can optionally modify it according to the actual situation. For other parts, it is generally recommended to refer to the default recommended value of the ditext to configure the configuration of 22.bin file corresponding to the double-byte address.

Definition	Address	Length (word)	Recommended value(hex)	Instructions
Network interface switch	0x400	1	5AA5	0x5AA5 indicates that the network communication interface is enabled Recommended value description: Generally 0x5AA5 is written as a fixed value to 22 files. It is also possible to use the configuration button to return or incremental regulation and other touch controls to write the trigger key value 0x5AA5 write address 0x400 to achieve the opening of the network interface.
RAM ALARM	0x401	3	0000 0000 0000	D5-D4:0x5AA5 indicates that the specified RMA spatial data is immediately started once and uploaded to the server. D3-D2: RMA variable memory word address to be uploaded. D1-D0: the word length of the RMA variable memory to be uploaded. (Currently up to 4KByte) Recommended value description: It is used to transmit the data of the variable address on the screen to the cloud server, which is usually applied to the cloud call view of the alarm history information and other parameters. If you do not need to use this function, you can fill in 0000 by default in 22 files.
Reserve	0x404	12	All are 00	Reserve.
Device description	0x410	1	5A45	High byte: 0x5A indicates that the device description is valid. Low byte: the encoding method and length of the device description text. .7-.6: encoding 0x00=UNICODE 0x01=GBK, GBK is recommended.

				.5-.0: describes the text length 0x00-0x34.
				Recommended value description: Write the configuration at a fixed value of the 22 file corresponding address, the encoding method GBK written here, the text length 05
	0x411	2		Device manufacturer ID, DWIN factory assigned, 0xFFFF: 0000 - 0xFFFF: FFFF segment reserved. After the device is added to the DWIN cloud platform, it is automatically generated by the platform.
	0x413	1		The classification of each manufacturer's equipment is according to the DWIN classification standard equipment classification. After the device is added to the DWIN cloud platform, it is automatically generated by the platform.
	0x414	2		The individual device number of each type of device. After the device is added to the DWIN cloud platform, it is automatically generated by the platform.
	0x416	26	44475553325F543555494431（behind all 00）	Device description text, up to 52Bytes.
				Recommended value description: 44445553325F543555494431, corresponding to the ASCII code character DGUS2_T5UID1, has been written as a fixed value written in 22 files. The user can also make a text variable address association for display.
	Example of cloud platform interface:  			

Device description (RMA mapping)	0x430	1	012C	RMA automatically refreshes the server interval 0x0000-0xffff in 0.1 seconds.
				Recommended value description: Writing 0x0000 means no automatic refresh is required. 0x012C indicates that the automatic refresh interval is 30 seconds.
	0x431	1	1000	RMA (mapped to the server's variable memory) read space start address, word address, out of bounds can not be read.
				Recommended value description: 0x1000 means to start reading space from 0x1000 address.
	0x432	1	0004	RMA read space size in 128Words with a maximum size of 64KWords and 0x0000 indicates forbidden reading.
				The recommended value 0x0004 indicates a read space size of 512Words, which can be set to 0x01F4 at most.
	0x433	1	2000	RMA write space start address, can overlap with the read space, can not write out of bounds.
				The recommended value 0x2000 indicates reading space starting at the address 0x2000.
	0x434	1	0004	RMA write space size in 128Words, Max 64KWords, 0x0000 indicates write forbidden.
				The recommended value 0x0004 indicates a read space size of 512Words, which can be set to 0x01F4 at most.
	0x435	3	All are 00	reserve
Device description (remote upgrade)	0x438	1	5AA5	The remote upgrade interface is enabled. 0x5AA5 indicates that the device is enabled with the remote upgrade interface. The system will automatically detect the Buffer.
				Recommended value description: Generally 0x5AA5 is written as a fixed value to 22 files. It is also possible to use the configuration button return or incremental regulation and other touch controls to write the trigger key value 0x5AA5 write address 0x438 to achieve the switch.
	0x439	1	0064	Remote upgrade packet timeout timer configuration in 0.1 second.
	0x43A	4	5A 00 01 00 00 00 0F 00	The first remote upgrade space for the device (aligned to 4KB) is defined: D7:0x5A indicates that the remote upgrade space is enabled. D6-D3: 32-bit start address of the upgradeable space (lower 12 bits is 0), up to 4 GB. D2-D0: The size of the upgradeable space, in 4KB, up to 4GB.

	0x43E	4	5A00 0000 0000 8000	The second remote upgradeable space definition for the device
	0x442	4	All are 00	The third remote upgradeable space definition for the device
	0x446	4	All are 00	The fourth remotable upgrade space definition for the device.
	0x44A	2	5A 00 08 B0 00	Remote upgrade Buffer interface definition: D3:0x5A indicates that the remote upgrade Buffer is valid. D2: upgrade mode 0x00= the communication side is responsible for verifying the data CRC, and the error frame informs the host to resend. D1: the number of buffers available for remote upgrades, 0x01-0x10, up to 16. D0: the starting address of Buffer0 is high byte (word address) and low address is 8bit 0x00. Each Buffer is fixed in 2304 words (0x900) space, which is arranged in the back row. A single Buffer definition (the first 512 bytes is the control interface, the next 4KB is the data): D0:0x5A means to start the remote upgrade of this buffer once, and clear it after CPU processing. D1: Remote upgrade space selection, 0x00-0x03, one of 4 remote upgrade spaces. D2-D5: Write the destination address of the remote upgrade space. The lower 12 bits are 0 (aligned to 4KB). D6-D7: Data byte length, 0x0001-0x0FFF. D8-D9: Data CRC checksum. D10-D511: Reserved. D512: Data starts, up to 4096 bytes.
	0x44C	4	All are 00	reserve
Device description QR code	0x450	48		QR_Code device QR code. The QR code is automatically generated according to the device description data of 0x411, 0x413, and 0x414, and the function of downloading the APP, binding the device, and paying attention to the public number can be implemented with the mobile phone.

Communication device description	0x480	16	User-defined	D31: 0x5A indicates that the communication device description data is valid. D30: The encoding method and length of the device description text. .7-.6 Edit: Code mode 0x00=UNICODE 0x01=GBK, GBK is recommended. .5- .0 Description: The length of the text is 0x00-0x14. D29: Communication device category 0x01=WiFi D28: Communication device status, bit definition .7 Equipment working status 0=Configuration 1=Normal; .6-.3 undefined, write 0; .2- .0 signal quality, 0x00-0x07 A total of 8 files, 0x00 means the worst, 0x07 means the best. D27-D20: 8Bytes communication device MAC address, low (D20) alignment. D19-D0: Description of the communication device in text format, up to 20Bytes. Use hexadecimal to describe the information as the corresponding ASCII character.
				The user can refer to the DWIN example's configuration at 22 to set 0x480 to write 0x5A 47 01 00 0x0482 can display the 8Bytes communication device MAC address value through the HEX variable display control
Communication device	0x490	8	User-defined	Restart WIFI module is valid D15-D14: The baud rate setting is reserved. Currently fixed at 921600bps, it cannot be set. D13-D9: Reserved. D8: WIFI module switching Debug firmware 5A means valid. D7: D0: WIFI module type identification information Default "DWD100".

WiFi_Config	0x498	4		D7: Writing 5A means starting the WIFI configure network, and the configure network 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 saved at 0x4B0) D7-D6, as long as it is started once, D7-D6 will be cleared at the same time after completion. The two Internet access modes cannot be started at the same time. If they are all 5A, the one-click configure network takes 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 initiates reset and reset is cleared to 0.
				The user can design the configure button in the UI. Start manual configure network touch button (press to return 0x498 address write 0x005A) Start one-key configure network touch button (press to return 0x498 address write 0x5A00)
Reserve	0x49C	4	All are 00	reserve

network status	0x4A0	8		D15-d14: WIFI version number. D13-d12: configure network status feedback 00: unmatched network 01: start configure network 02: in the configure network 03: configure network success 0F: configure network failure D11-d10: network connection status 00:user name and password not obtained 01:WIFI router connection is successful 02: WIFI module self-upgrade 03: connect to the server 04: logged in to the server 05: connected to the cloud The user can directly display the interface variable, use the 0x4A0 address to display the wifi version number with the data variable display control, and the 0x4A1 address uses the icon variable to make 5 small icons for displaying the communication status. The 0x4A2 address uses 6 small icons to display the network connection status.
state machine	0x4A8	4		D7: state machine. D6: UART state machine. D3-d0: remaining stack space.
RTC	0x4AC	4		D7:5A means the time is valid. D6-D0:Year Month Day Week (0-6) Hours Minutes Seconds
network information	0x4B0	32		0x4B0: SSID, the end must end 0xFF. 0x4C0: SN, the end must end at 0xFF. Text ASCII input and display controls can be used for input and display.

Description:

- WIFI-10 actively reads 0x490 and other registers every 0.1s-0.2s (the register that DGUS issues commands to WIFI-10).
- WIFI-10 will write the status of WIFI-10 to the DGUS register every 3-5 seconds (the status of the WIFI module: 0x480, 0x4A0, etc.).
- After completing the configure operation on the DGUS screen or mobile app, WIFI-10 will automatically access the Internet and start running data synchronization.
- Server mapped memory debug interface web page: http://tools.dwinhmi.com.cn/
- The device description information is corresponding to the 0x0800-0x09FF byte address of the 22 initialization file, and the corresponding content configuration (regardless of whether the 22 file initialization variable buffer function is enabled, the underlying layer will automatically handle the loading).

5.2.2. Development process

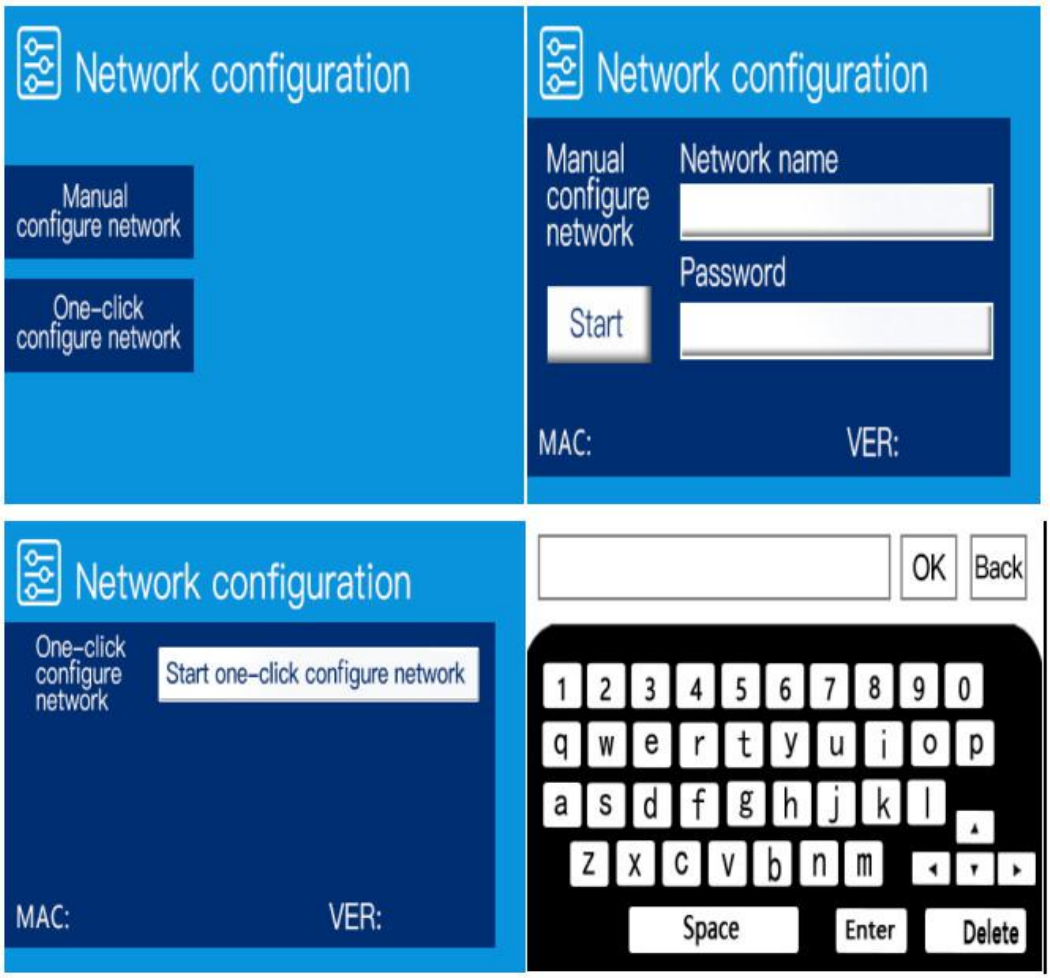
The following development process is illustrated based on the DWIN test demo, and users can adjust according to actual needs. 22.bin initialization file can be directly used as the dedicated file for the network screen, which has been configured with network interface related initialization data. Users can directly copy and use it.The configure network is divided into manual and automatic, so it needs to be used according to different choices. The configuration work done by the user is very simple:

- ◆ manual configure network users only need to do a few DGUS related address access controls, such as:
- ✓ text input and display: wifi network name,
- ✓ the text input and display: networking code,
- ✓ key returns: start the configure network button ICONS such as touch ,
- ✓ Icon variable: The network status icon indicates the control, which can realize the configure network. It does not need serial communication to receive other serial commands or other programming codes.
- ◆ One-click configure network: Design a startup one-button network button in the UI.
- ✓ button return: Start the one-button network button setting, the user only needs a simple configuration to connect the device to the DWIN server.
- ◆ Download: Finally, you can download the 22.BIN file, background image ICL package, icon library ICL package, 13.BIN, 14.BIN file to the DIWN screen through the SD card.

5.2.2.1 Material preparation

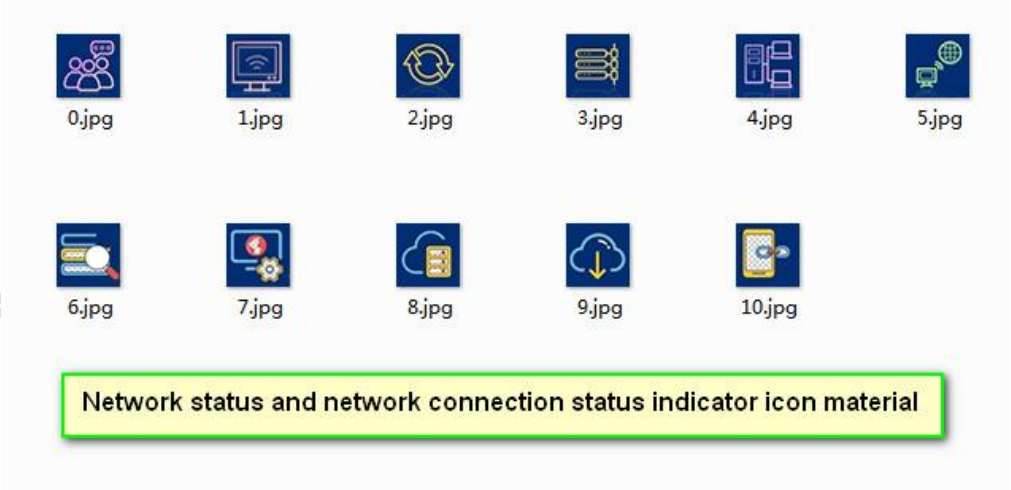
First of all, it is necessary to need to make the interface picture of configure network and the indication icon of configure network status and network link status.

Interface picture material display:



Screen interface icon material

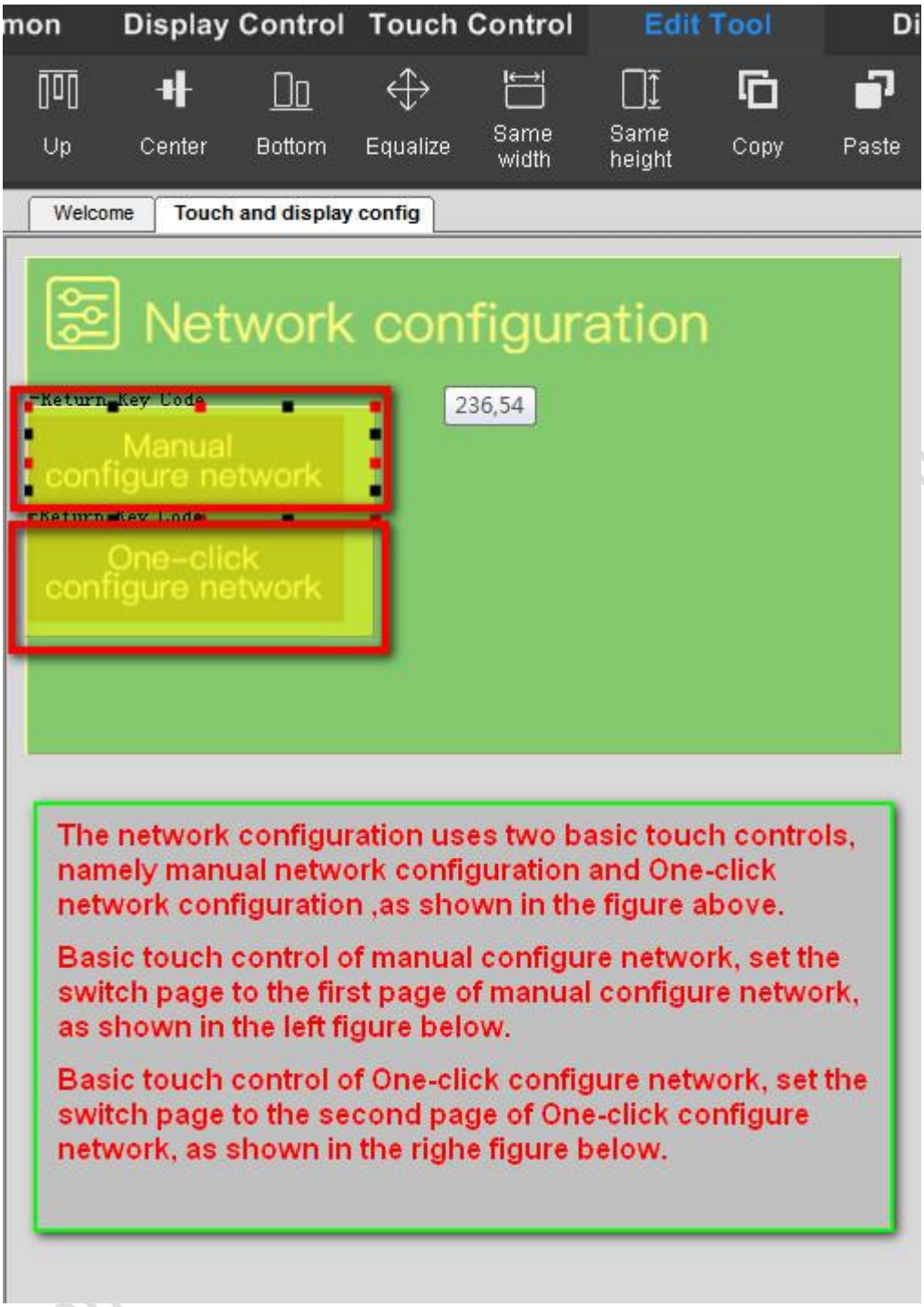
Icon material display:

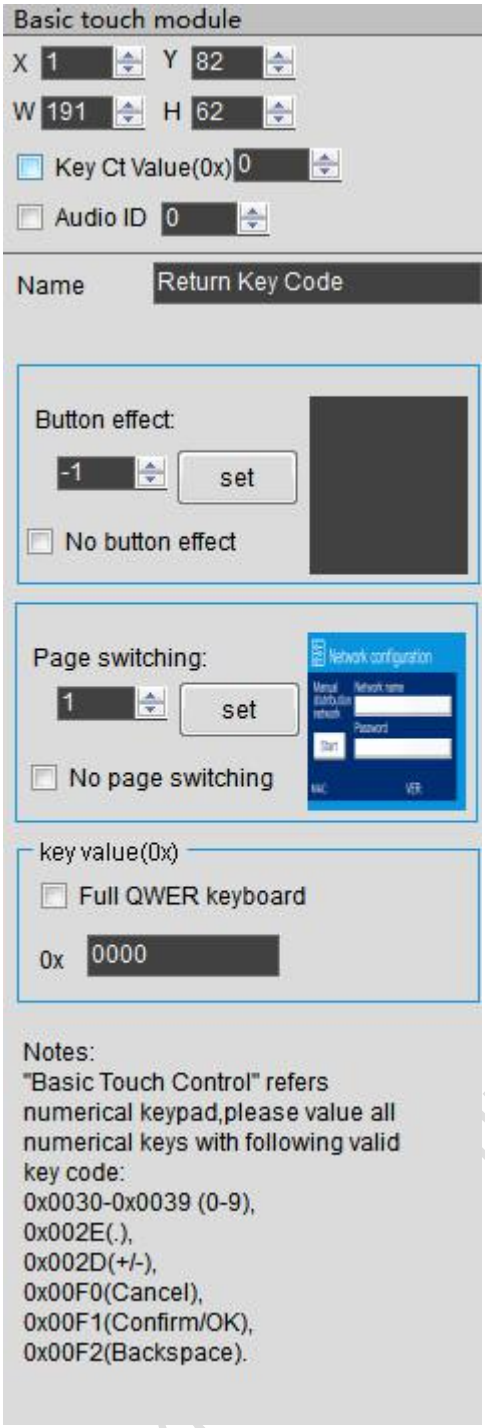


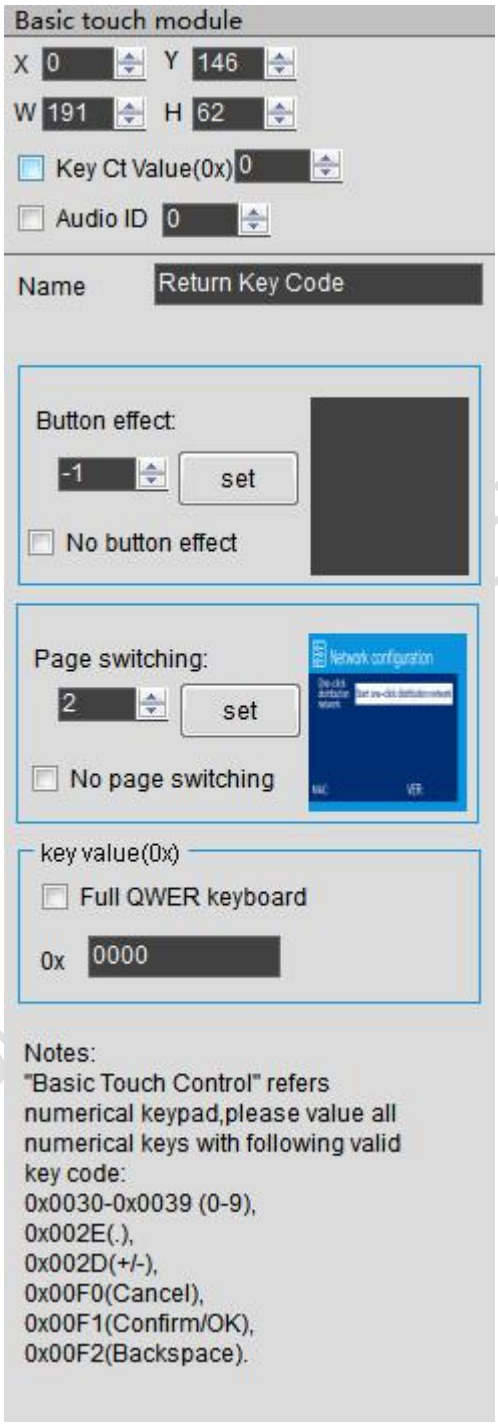
Network status and network connection status indicator icon material

5.2.2.2 Selection of network configuration mode

You can choose two configurations of “manual configure network” and “one-click configure network”, as shown below .





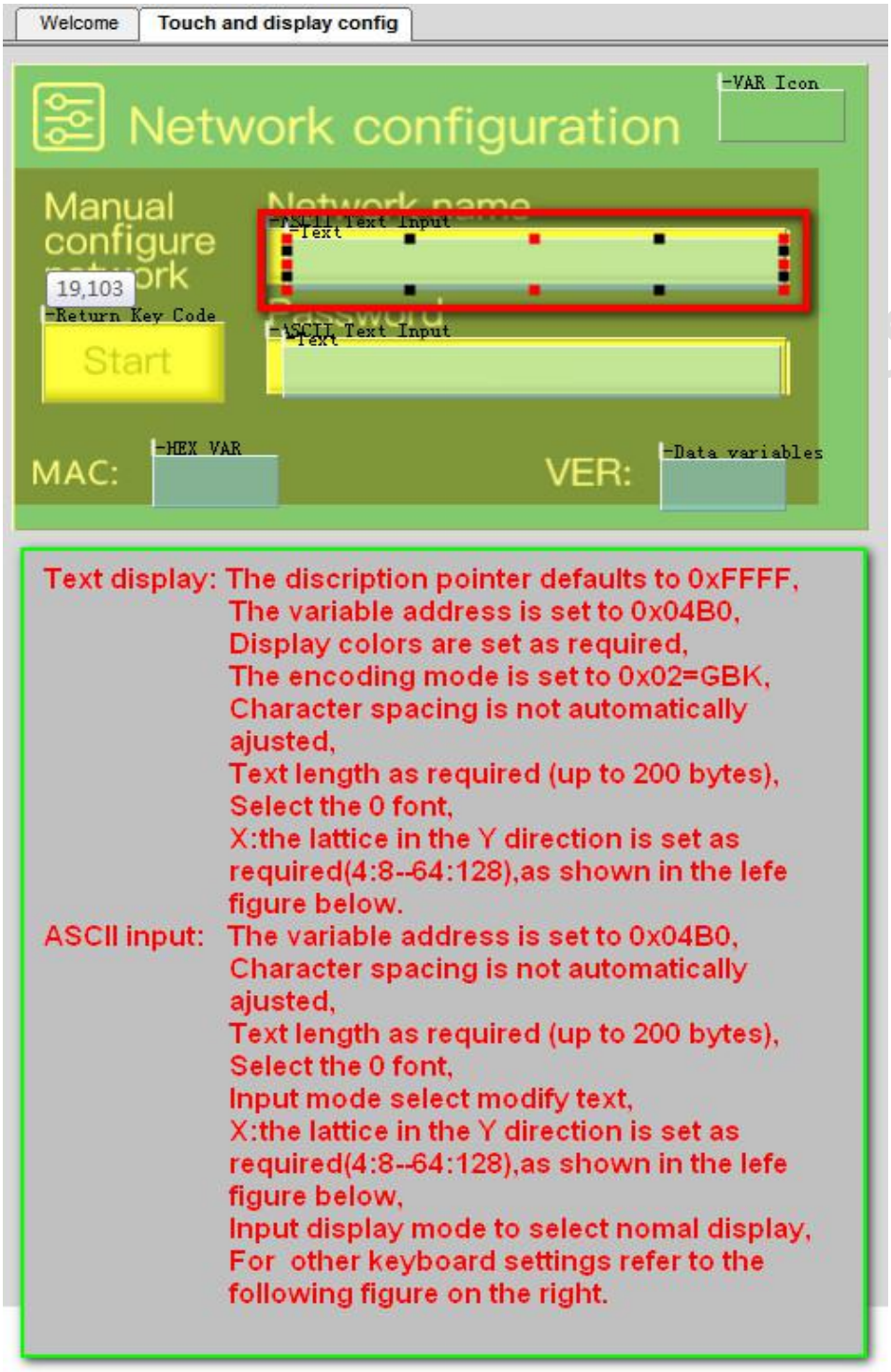


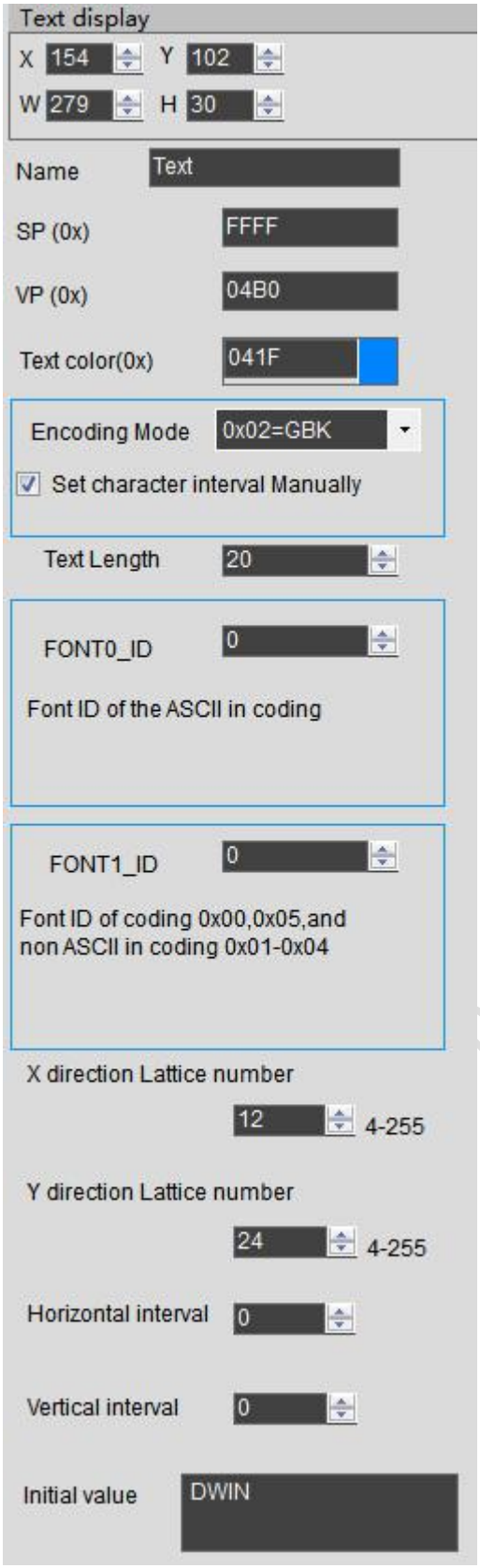
5.2.2.3 Manual configure network development process

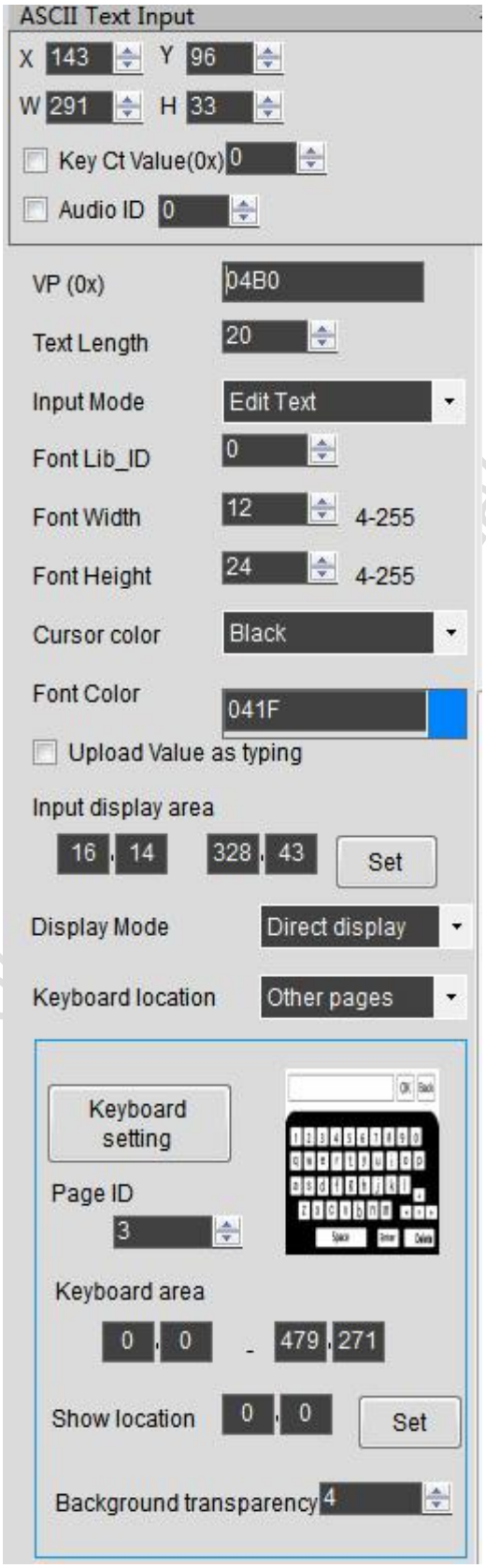
Manual configure network refers to entering the WiFi name and corresponding password to be connected on the screen to realize the network configuration mode.

(1) Set the network name (variable address 0x04B0)

This function needs to combine the text display and the text entry two controls to complete. Text entry control is used to call the keyboard, enter the name of WIFI; A text display control is used to display entered characters after exiting the input state.

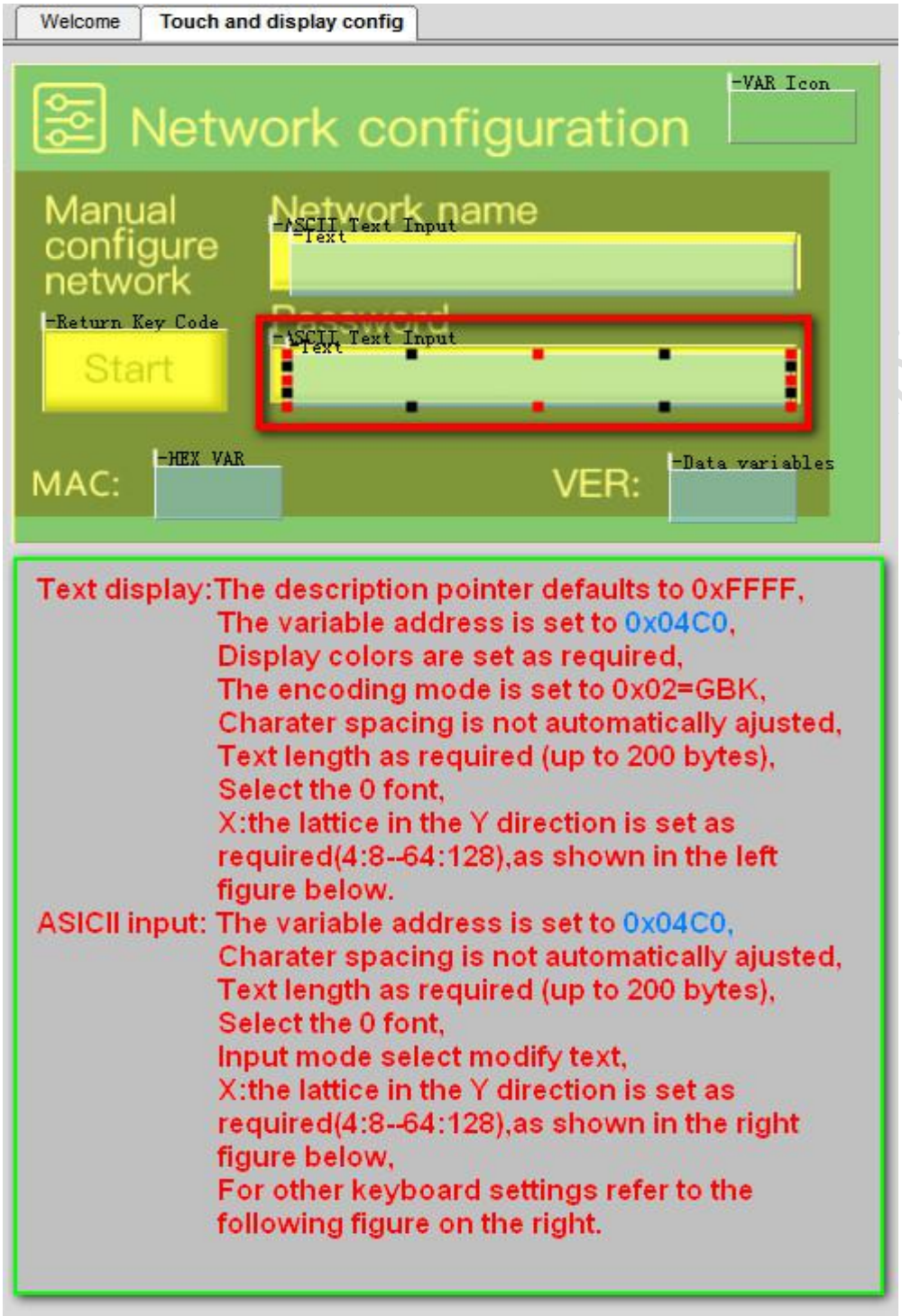


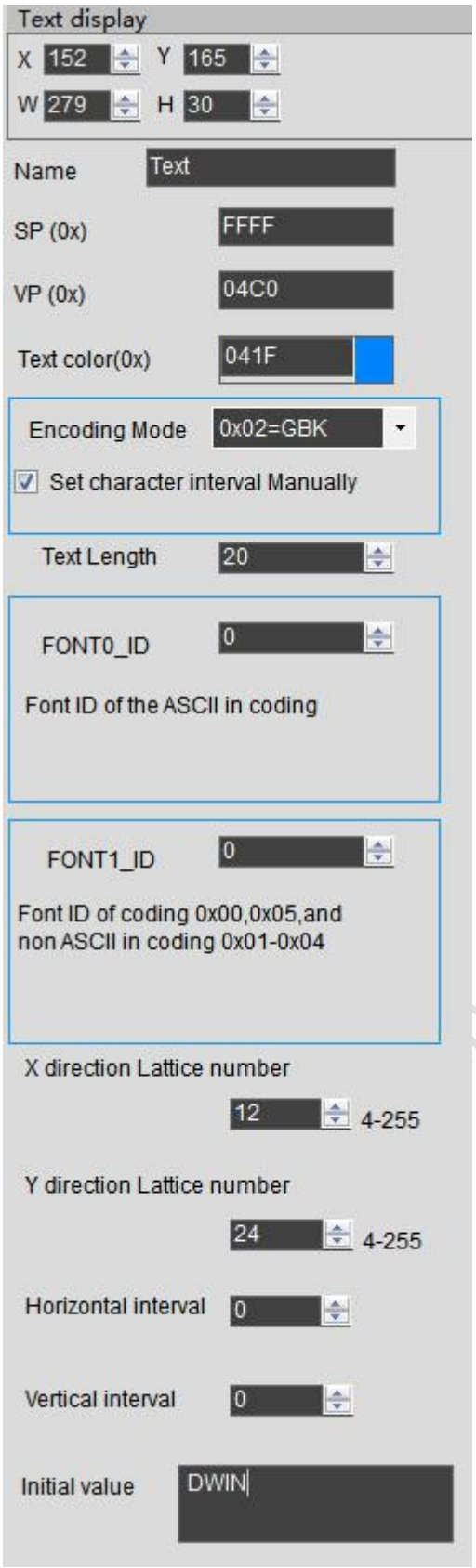


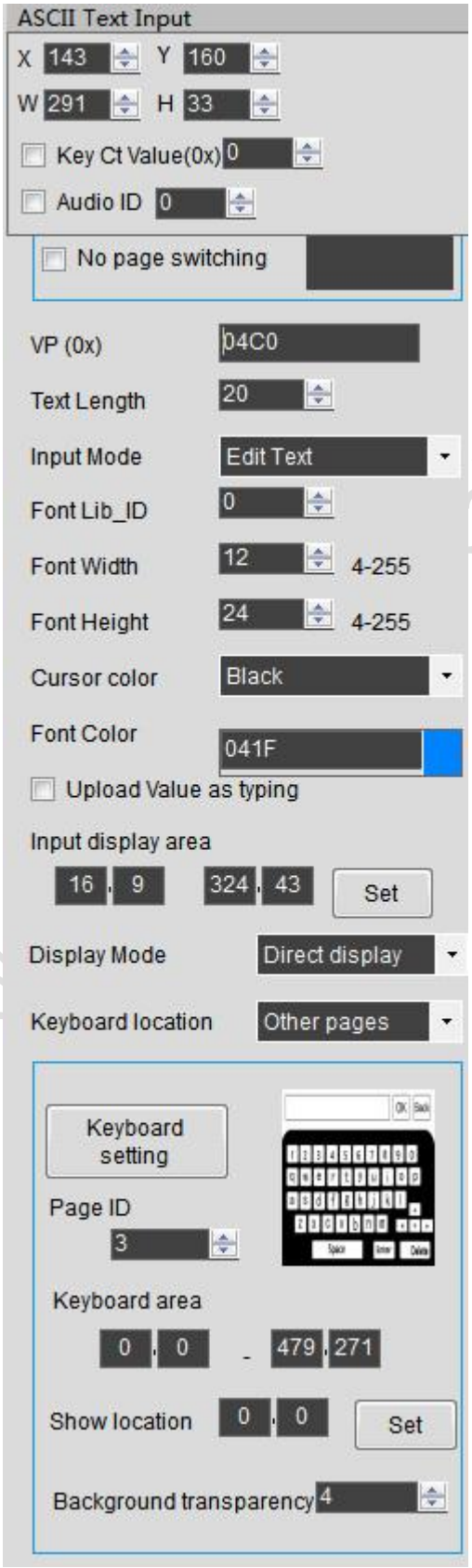


(2) Set the network password (variable address 0x04C0)

This function needs to combine the text display and the text entry two controls to complete. Text entry control is used to call the keyboard, input WIFI password; A text display control is used to display entered characters or password symbols after exiting the input state. Text display control can also be replaced by icon control, rendering a more diverse password symbol effect.



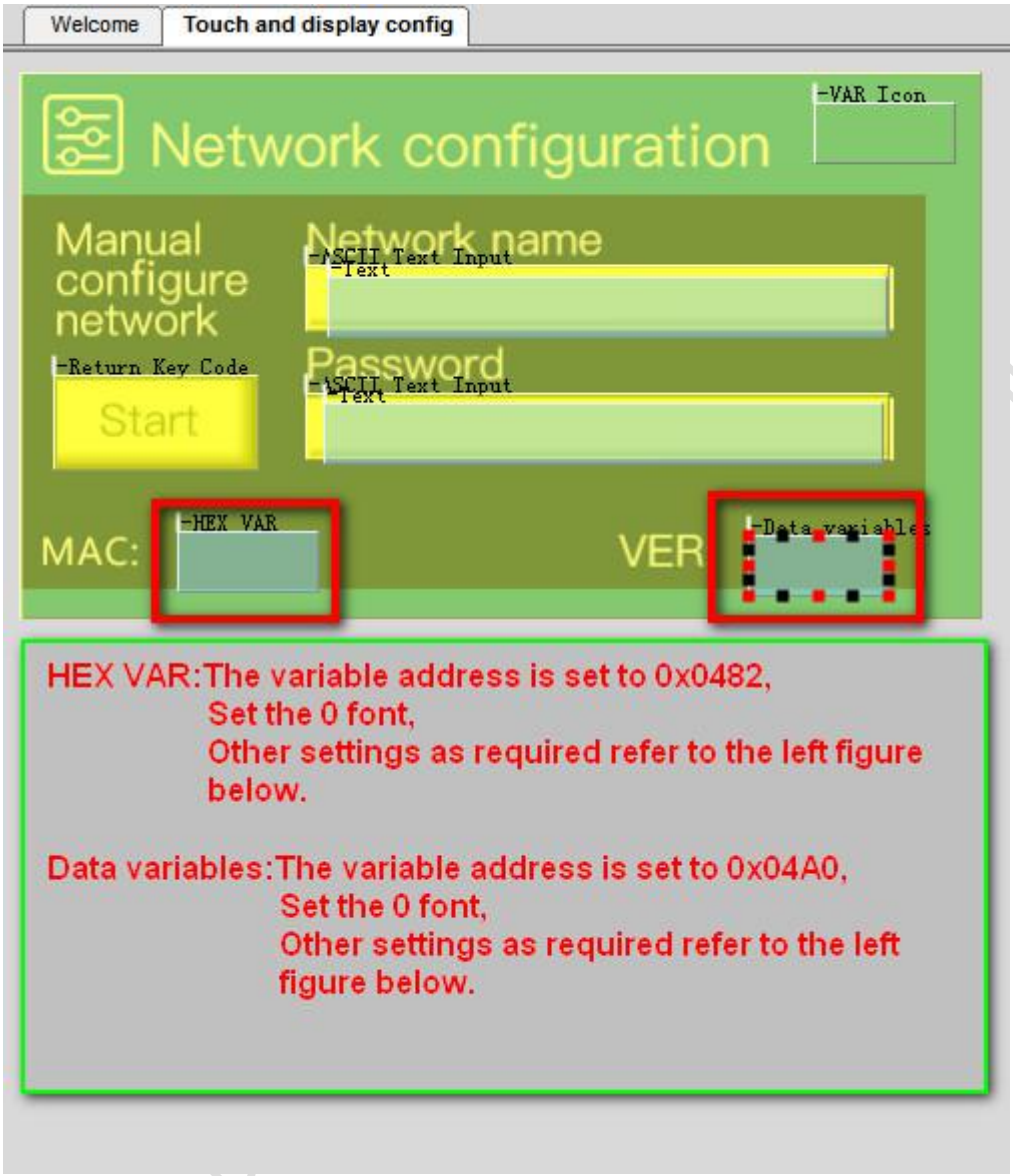


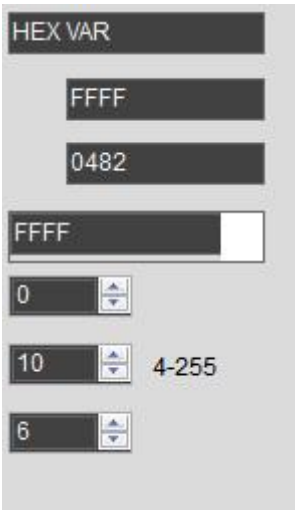


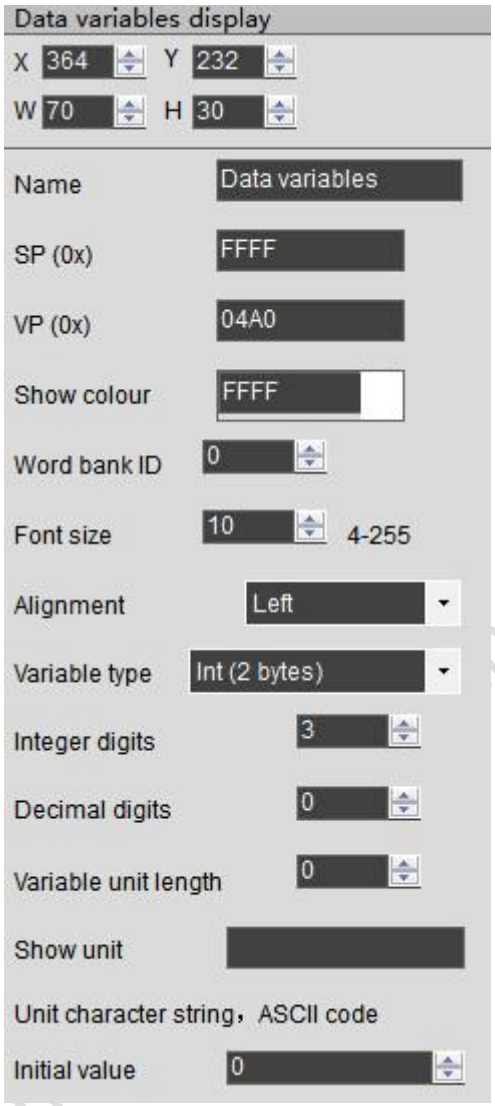
(3) Display MAC address (variable address 0x0482) and version number (variable address 0x04A0)

Each WIFI module has an independent MAC address that can be used for device ID identification. Note that the control displayed by the MAC address is the HEX display control.

The version number is the firmware version number and uses the data variable display control.







(4) Display WIFI networking status (variable address 0x04A2)

6 network states are indicated by 6 ICONS:

00: Did not get username and password

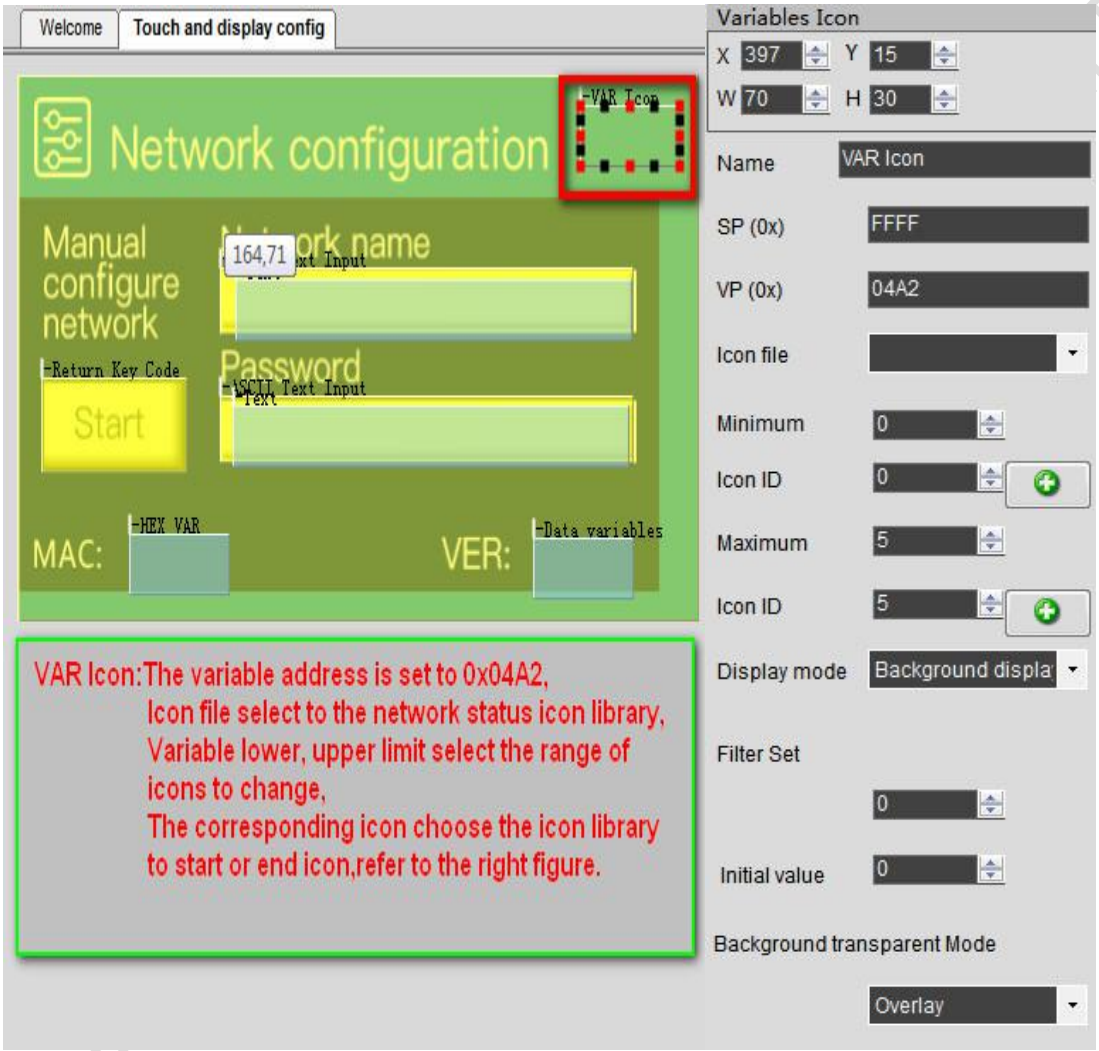
01: The WIFI router is successfully connected.

02: WIFI module is self-upgrading

03: Connect to the server

04: Logged in to the server

05: Connected to the cloud



(5) Start configure network (variable address 0x0498)

Use the key value to return the control, when the button is clicked, the last time value is 0x005A, and the configure process is started.

5.2.2.4 Development process of one-click configure network

One-click configure network refers to inputting the name of the WiFi to be connected and the corresponding password on the mobile phone to implement the network configuration mode.

Note: This function needs to be used in conjunction with the APP to complete the configure network.

(1) Configure network status icon (variable address 0x04A1)

5 kinds of configure network states are indicated by variable icon control:

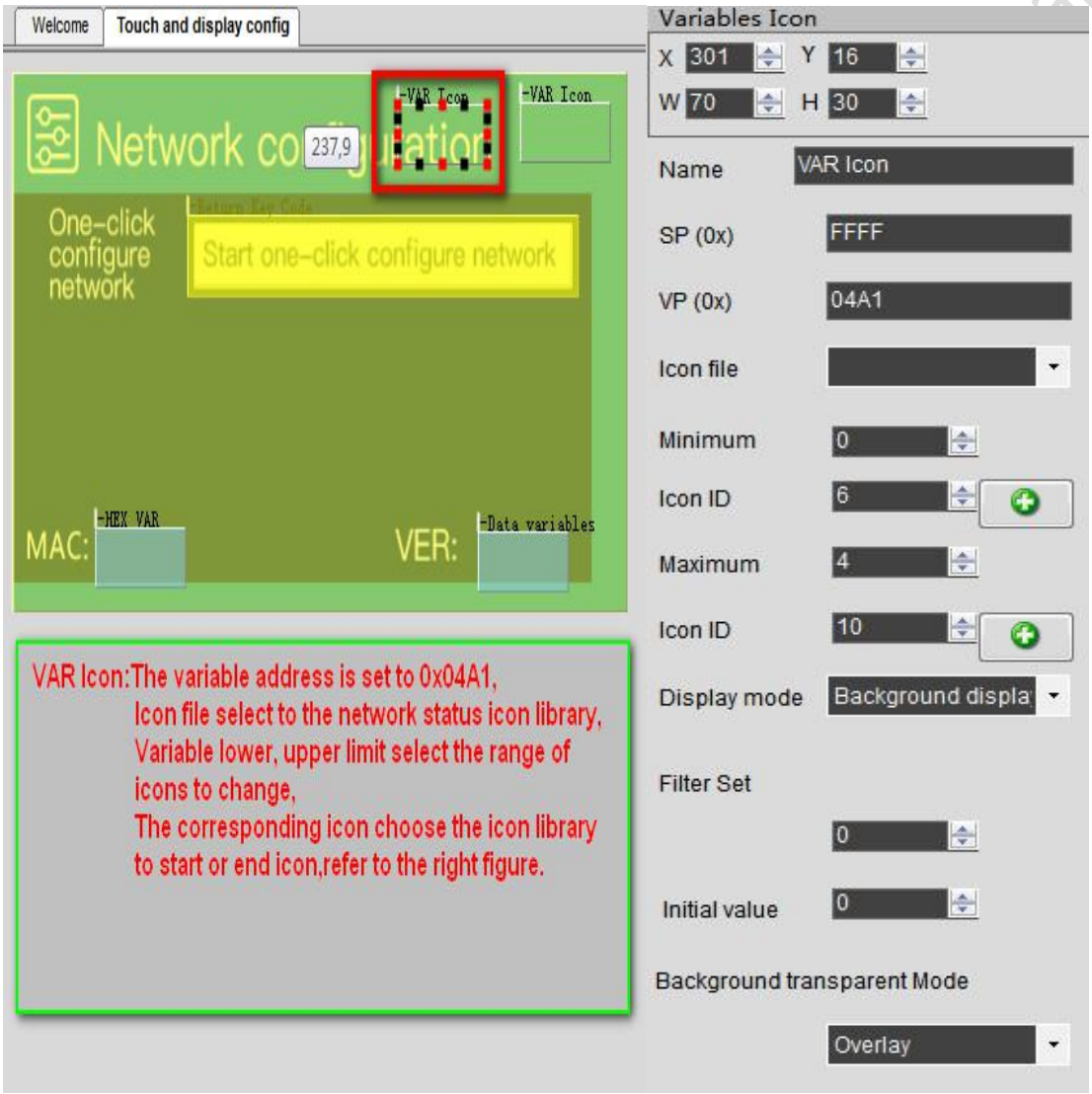
00: unmatched network

01: start the network configuration

02: in the configure network

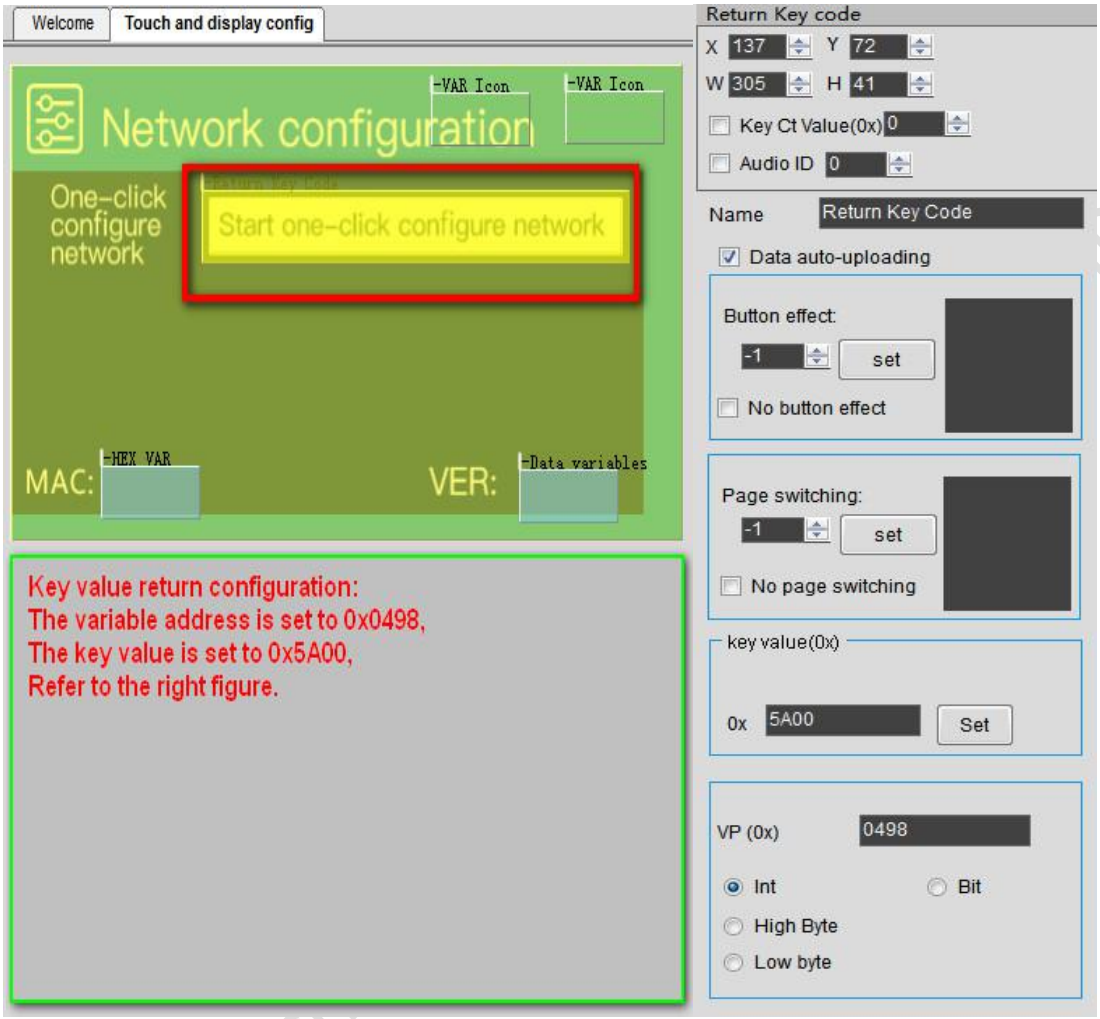
03: configure network succeeded

04: configure network failed



(2) Start configure network (variable address 0x5A00)

In the UI, design a start one-click configure network button. The start one-click configure network button is a touch button (press the button to return 0x498 address and write 0x5A00).



(3) APP configure network

One-click configure network function needs to be completed with DIWN cloud APP (APP download address http://www.pgyer.com/dwin).

- Firstly, you need a mobile phone to connect to WiFi (also the WiFi that the device will connect to);
- After clicking the button to start the one-click configure network, go to the APP and click “Add Device”, then select “One button configure network” on the pop-up page;
- Click “Start Configuration” to enter the WiFi password, click “Next” to enter the configure network status, and wait for the WiFi module to complete the configure network automatically.

Detailed operation instructions:
http://tools.dwinhmi.com.cn/doc/index.html

Device binding

Place a QR code control on the screen, set the address to 0x450, and the QR code containing the device information will be automatically displayed on the screen. Device binding can be done through the APP scan code.

(4) Operation of DWIN cloud platform

After the configure network is completed, you can log in to the DWIN cloud platform (DWIN cloud platform: http://merchant.dwinhmi.com.cn).
Click "product management" on the left to add new products, establish new products, fill in product information, save, and complete the establishment of new products. Click the product on this page to edit the product name, product number, terminal platform, screen size, binding status and other information. The platform interface is shown below.

Detailed operation instructions:http://tools.dwinhmi.com.cn/doc/index.html

Click "list of devices" in "run management" on the left. All registered devices can be found here. The MAC address of the DWIN WiFi module is unique. You can find the MAC address of the WiFi module on the display interface and fill in the device ID search area to search. Clicking on the device under the device type will bring up the debug window. You can select "memory map debugging" and "mQTT debugging".

Detailed operation instructions:http://tools.dwinhmi.com.cn/doc/index.html

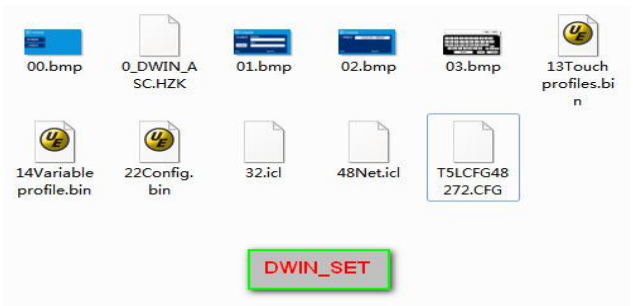
(5) Modify update data in real time

Memory map debugging can view the mapped data set in the 22.bin file, and also can be used to modify the value of the required address through this interface. First click "Connect to the server", set the address to be queried and the length of the data from this address, click "Query" will display the data on the right, this part of the data is the last data sent by the WiFi module, and will be based on 22.bin, and the data will be uploaded regularly according to the time interval set by the 22.bin file. At the same time, if the data in this address is modified, the server will automatically send the modified data to the WiFi module, and the data that needs to be updated can be modified in real time.

With the DWIN WIFI module, the required data can be saved in the data variable space. The 120KBytes space in the 0x1000~0xFFFF range can be planned and used by users themselves.

5.2.2.5 Project download

Create the DWIN_SET folder in the root directory of the SD card, and put the fonts, image libraries and configuration files that need to be downloaded into the DWIN_SET folder, as shown below.Note: that the 22.bin initialization file needs to directly use the file dedicated to the network screen configured by DWIN, and has already written the initialization data related to the network interface.



Chapter 6

Description of configuration function of touch variables (13.bin)

The touch configuration file is stored in the 13.bin font space, which is composed of N touch instructions configured according to the page. Each touch instruction occupies 16, 32 or 48 bytes of storage space. A touch command consists of six parts, as shown in the table.

Num .	Definition	Data length	Description
1	Pic_ID	2	Page ID.
2	TP_Area	8	Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye) of the touch button area.
3	Pic_Next	2	The target switch page ID after the button is pressed, 0xFF** indicates no page switch.
4	Pic_On	2	The page ID of the rendering when the button is pressed, 0xFF** indicates that there is no button pressing effect.
5	TP_Code	2	Touch key code: 0xFF** indicates invalid key code. 0xFE** or 0xFD** means touch function key, for example 0xFE00 means start touch screen digital input.
6	TP_FUN	32	Touch key code: 0xFF** indicates invalid key code. 0xFE** or 0xFD** means touch function key, for example 0xFE00 means start touch screen digital input. Where 00 is the key code value of touch control, please refer to the list of touch control functions. The function key of 0xFE** can be set by CFG file 0x05.4. The function key of 0xFD** always prevents automatic upload after variable change. Other touch key codes are represented by ASCII. For example 0x0031 means the key "1".

6.1 List of touch functions

Num .	key code	Function	Variable length (word)	Description
01	00	Variable data input	1/2/4	Input integer, fixed point decimal and other data to the specified variable storage space. The popup keyboard transparency can be set.
02	01	Popup menu	1	Click to trigger a pop-up menu and return the key code of the menu item. Popup menu transparency can be set.
03	02	Incremental adjustment	1	Click the button to perform +/- operation on the specified variable to set the step size and upper and lower limits. Setting 0-1 range loop adjustment can realize the function of column check box.
04	03	Drag adjustment	1	Drag the slider to achieve variable data input, you can set the

				scale range.
05	05	Keyvalue return	1	Click the button, directly return the key value to the variable, support bit variable return.
06	06	Text input	127 max	ASCII or GBK Chinese text input text characters, input process support cursor movement, editing. The input status and input length can be set at (vp-1) position. ASCII input mode popup keyboard transparency can be set.
07	08	Number of touch screen pressing states According to return	Use-defined	Click on the touch screen and return the data to the variable as specified. Return to serial mode is not supported, but can be configured to automatically transmit touch data to the implementation.
08	0A	Slide adjustment	2	According to the specified area x axis or Y axis direction touch screen sliding, real-time return relative adjustment value. With data window indication display variable, can achieve dynamic word - rolling adjustment. VP hold, return data at (VP+1) position.
09	0B	Slide to turn the page	0	The touch screen slides along the x axis in the specified area to achieve dynamic page dragging. You can set the target and area of page switching, and the variable display of the current page will follow the drag. If there are other touch buttons on the sliding page at the same time, and the whole page (including the drag and drop touch button) needs to be able to turn the page with gestures, the touch priority of the sliding gesture page turning must be set to the highest.
10	0C	Icon drag manager	4	With 0x07 display variable (JPEG icon translation display) to achieve Icon drag manager.

Note ：

- Please refer to《 DGUS screen development guide》 for detailed function description.
- The touch configuration file(13.BIN) cannot exceed 32Kbytes。
- By accessing the touch instruction access interface defined in 0x00B0 variable space through serial port or DWIN OS, the specified touch instruction can be dynamically opened, closed or modified to achieve complex nesting and combination functions of touch functions.

6.2 Variable data input

6.2.1 Variable data entry instruction storage format table

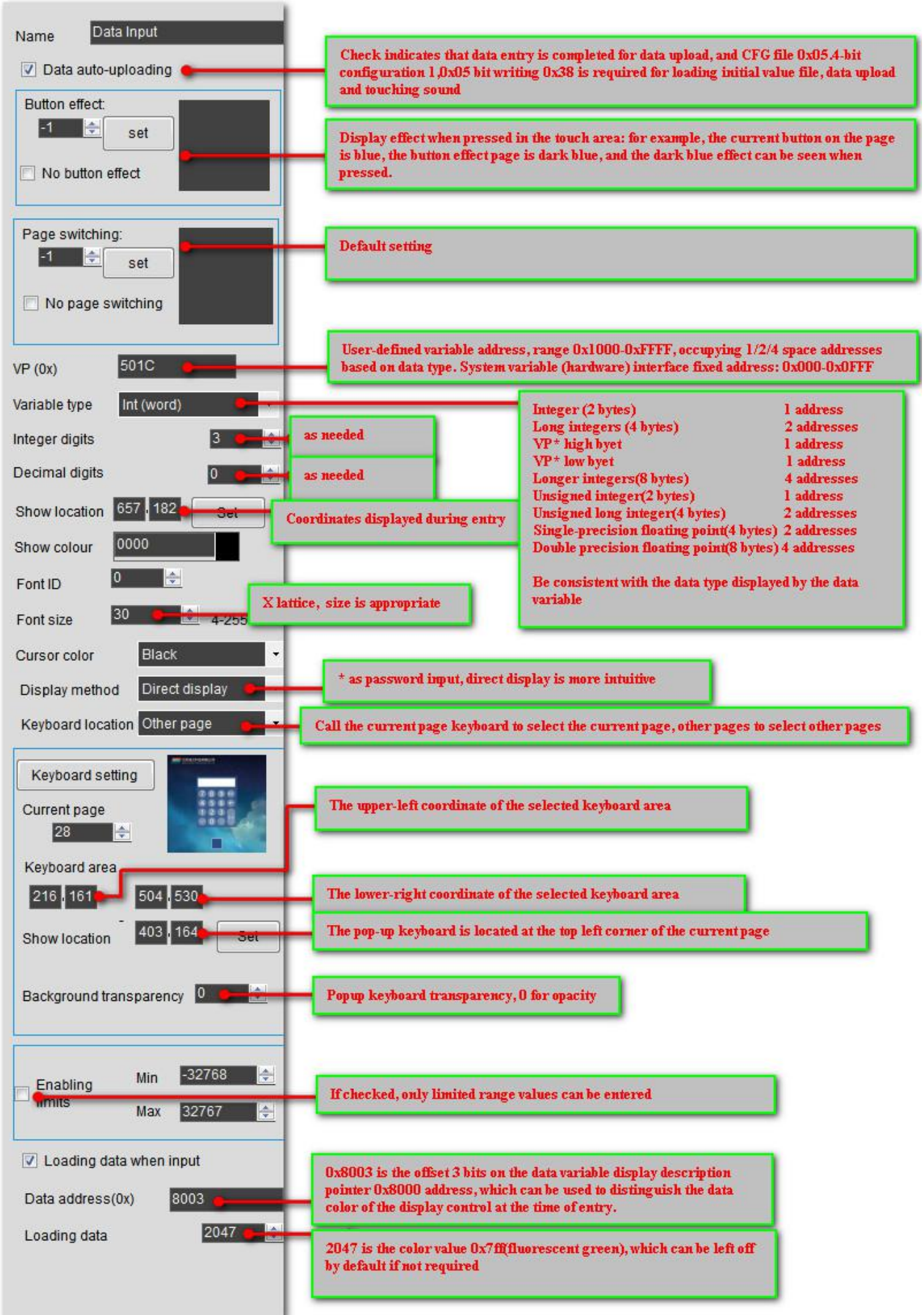
Variable data entry is used to input integer, fixed point decimal and other data to the designated variable storage space. The format of its instruction storage is shown in the table.

Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pic_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	Pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE00, variable data entry key code.
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Input data corresponding to the variable address pointer.
0x13	V_Type	1	Return variable type: 0x00 represents a 2-byte variable: Round Numbers: -32768 to 32767; Unsigned integer: 0 to 65536. 0x01 represents a 4-byte variable: Long integers: -2147483648 to 2147483647; Unsigned long integers: 0 through 4294967295. 0x02 means *VP high byte, unsigned number: 0 to 255. 0x03 means *VP low byte, unsigned number: 0 to 255. 0x04 indicates an 8-byte long integer: -9223372036854775808 to 92233720368575807
0x14	N_Int	1	The number of integers entered. If 1234.56 is entered, N_Int=0x04.
0x15	N_Dot	1	The number of decimal places entered. If 1234.56 is entered, N_Int=0x02.
0x16	（x，y）	4	Input process display position: right alignment, (x, y) is the upper-right coordinate of the string input cursor.
0x1A	Color	2	Input the display color of the font
0x1C	Lib_ID	1	Displays the ASCII font location used, 0x00 being the default font.
0x1D	Font_Hor	1	Font size, the number of x - direction lattice.
0x1E	Cusor_Color	1	Cursor color 0x00 indicates black, otherwise white.
0x1F	Hide_En	1	0x00 indicates that the text in the input process is not displayed directly but displayed as "*"; For other values, the contents of the input procedure are displayed directly.
0x20	0xFE	1	Fixed value 0xFE.
0x21	KB_Source	1	0x00 indicates the keyboard is on the current page; Other values indicate that the keyboard is no longer on the current page.
0x22	PIC_KB	2	The page ID where the keyboard is located is valid only if KB_Source is not equal to 0x00.
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, I.e. 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.
0x30	0xFE	1	Fixed value 0xFE.
0x31	Limite_En	1	0xFF: indicates that input range restriction is enabled and 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 (0x3B) is loaded with Return_Data (the content of address 0x3D) 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	VP address to which data is loaded during input.
0x3D	Return_Data	2	Data loaded into Return_VP during input.
0x3F	reserve	1	Write 0x00

Note: the valid key code for numeric entry is 0x0030-0x0039, 0x002E(.), 0x002D(+/-), 0x00F0(cancel), 0x00F1(ok), 0x00F2(backspace)

6.2.2 Setting instructions of variable data entry software


Name
Data Input
Data auto-uploading
Check indicates that data entry is completed for data upload, and CFG file 0x05.4-bit configuration 1,0x05 bit writing 0x38 is required for loading initial value file, data upload and touching sound
Button effect:
-1
set
No button effect
Display effect when pressed in the touch area: for example, the current button on the page is blue, the button effect page is dark blue, and the dark blue effect can be seen when pressed.
Page switching:
-1
set
No page switching
Default setting
VP (0x)
501C
User-defined variable address, range 0x1000-0xFFFF, occupying 1/2/4 space addresses based on data type. System variable (hardware) interface fixed address: 0x000-0x0FFF
Variable type
Int (word)
Integer (2 bytes) 1 address
Long integers (4 bytes) 2 addresses
VP* high byet 1 address
VP* low byet 1 address
Longer integers(8 bytes) 4 addresses
Unsigned integer(2 bytes) 1 address
Unsigned long integer(4 bytes) 2 addresses
Single-precision floating point(4 bytes) 2 addresses
Double precision floating point(8 bytes) 4 addresses
Be consistent with the data type displayed by the data variable
Integer digits
3
as needed
Decimal digits
0
as needed
Show location
657
182
Set
Coordinates displayed during entry
Show colour
0000
Font ID
0
Font size
30
4-255
X lattice, size is appropriate
Cursor color
Black
Display method
Direct display
* as password input, direct display is more intuitive
Keyboard location
Other page
Call the current page keyboard to select the current page, other pages to select other pages
Keyboard setting
Current page
28
Keyboard area
216
161
504
530
The upper-left coordinate of the selected keyboard area
The lower-right coordinate of the selected keyboard area
Show location
403
164
Set
The pop-up keyboard is located at the top left corner of the current page
Background transparency
0
Popup keyboard transparency, 0 for opacity
Enabling limits
Min
-32768
Max
32767
If checked, only limited range values can be entered
Loading data when input
Data address(0x)
8003
0x8003 is the offset 3 bits on the data variable display description pointer 0x8000 address, which can be used to distinguish the data color of the display control at the time of entry.
Loading data
2047
2047 is the color value 0x7ff(fluorescent green), which can be left off by default if not required

6.3 Pop up menu (0x01)

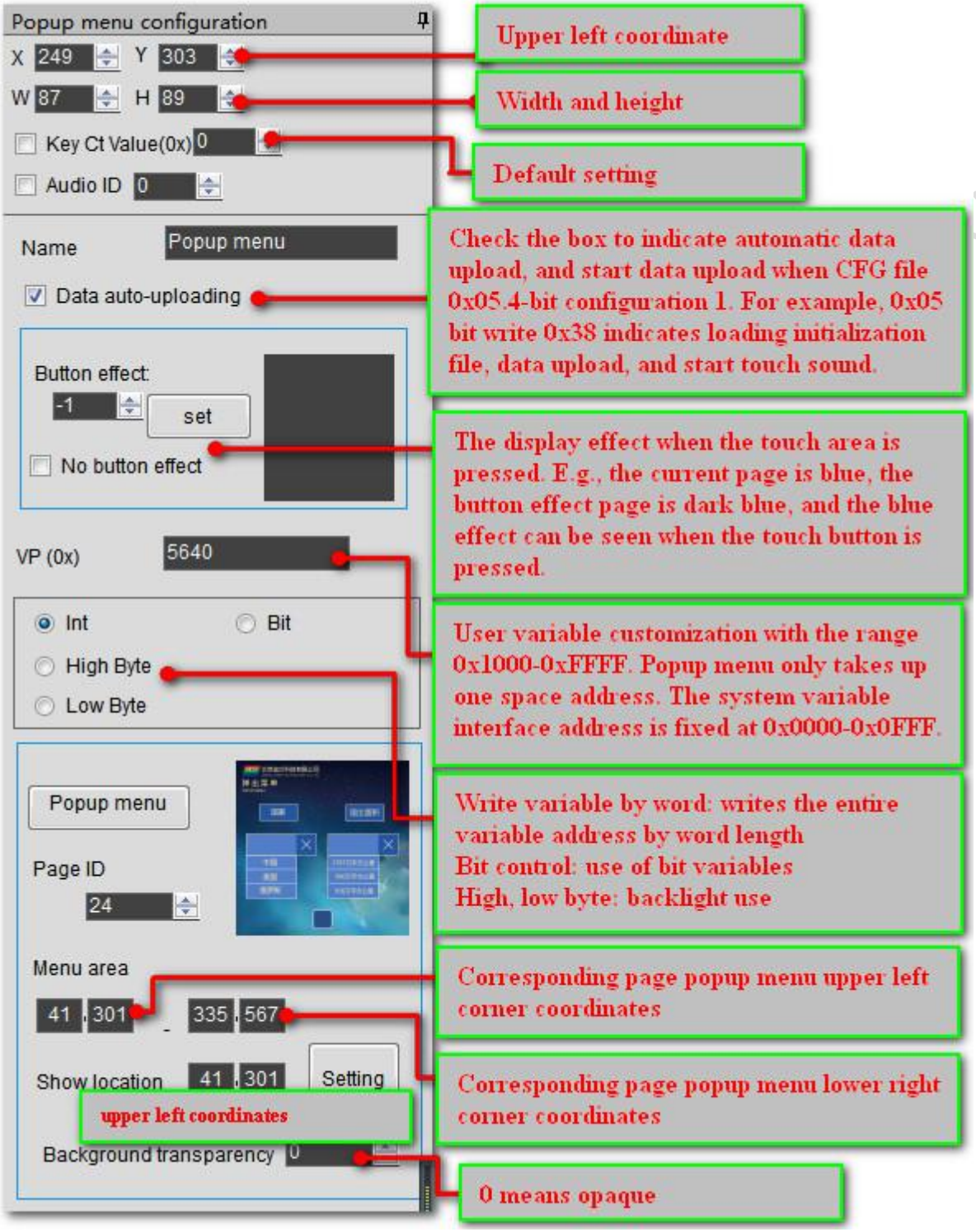
6.3.1 pop-up menu instruction storage format

The pop-up menu selection function is to click to trigger a pop-up menu and return the key code of the menu item. The drop-down menu can also use this instruction. 0x0000-0x00FF is valid key code during input, 0x00FF is cancelled (that is, returned without parameter selection). The pop-up menu can only do basic touch control keys. The format of its instruction storage is shown in the table.

Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pic_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	Pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE01, variable data entry key code.
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Input data corresponding to the variable address pointer.
0x13	V_Type	1	0x00 = Write 0x00** key code into VP word address (integer type); 0x01=Write 0x** key code into high byte address of VP word address (VP_H); 0x02=Write 0x** key code into the low byte address of VP self-address (VP_L); 0x10-0x1F: write the ** key code lowest bit (1bit) variable and the specified bit of the VP word address (0x10 modifies VP. 0,0 x1F modifies VP.F)
0x14	Pic_Menu	2	Pop-up menu picture location.
0x16	Area_Menu	8	Pop-up menu area: upper left coordinate (xs,Ys), lower right coordinate (xe,Ye).
0x1E	Menu_Position_x	2	The menu displays the x-coordinate of the top left corner of the current page.
0x20	0xFE	1	Fixed value 0xFE.
0x21	Menu_Position_Y	2	The menu is displayed in the top left corner of the current page.
0x23	NULL	13	Write 0 x00

6.3.2 Setting instructions of pop-up menu software

Open DGUS software and click the touch button on the page _ pop-up menu. Next, select an area with the mouse box to set the function in the menu on the right.



As shown in the figure above, the basic touch key code (0x0000-0x00FE) on "China", "America" and "Russia" will return to the variable address pointed by the control key of the pop-up menu after being clicked. The key code of "x" cancel button is set to 0x00FF, which will not return a value and exit the menu when clicked.

6.4 Incremental adjustment (0x02)

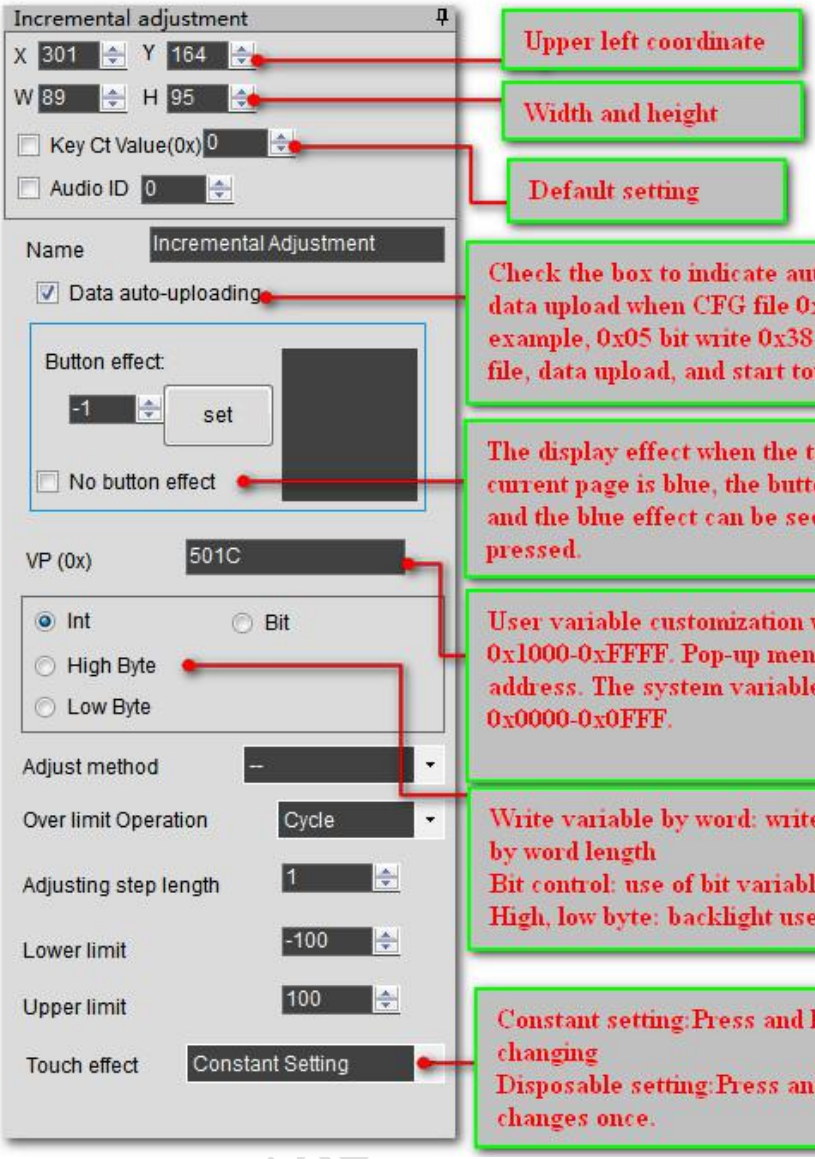
6.4.1 Incremental adjustment of instruction storage format

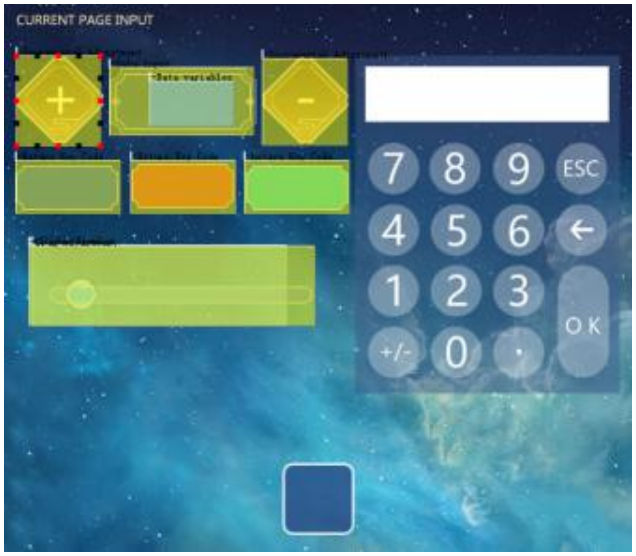
Incremental adjustment is used to adjust the data value. Click the button to perform +/- operation on the specified variable , set the step size , upper and lower limits.

Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pic_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	Pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE02, variable data entry key code.
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Variable address pointer, return data determined by VP_Mode.
0x13	V_Mode	1	0x00 = Write 0x00** key code into VP word address (integer type); 0x01=Write 0x** key code into high byte address of VP word address (VP_H); 0x02=Write 0x** key code into the low byte address of VP self-address (VP_L); 0x10-0x1F: the specified bit of the VP word address (0x10 corresponds to VP.0, 0x1F corresponds to VP.F) is adjusted, and the adjustment range must be set to 0-1.
0x14	Adj_Mode	2	Adjust mode: 0x00=-- others =++
0x15	Return_Mode	1	Out-of-limit treatment: 0x00= stop (equal to threshold) others = cycle adjustment
0x16	Adj_Step	2	Adjust step size 0x0000-0x7FFF
0x18	V_Min	2	Lower limit: 2-byte integer (only valid for low bytes when VP_Mode=0x01 or 0x02)
0x1A	V_Max	2	Upper limit: 2-byte integer (only valid for low bytes when VP_Mode=0x01 or 0x02)
0x1C	Key_Mode	1	0x00: press and hold the key to adjust continuously; 0x01: press and hold the button only once.
0x1D	NULL	3	Write 0 x00

6.4.2 Instructions for setting incremental adjustment software

In the DGUS software, click the touch button _ incremental adjustment, then select an area with the mouse box, and set the function in the menu on the right.





6.5 Drag adjustment (0x03)

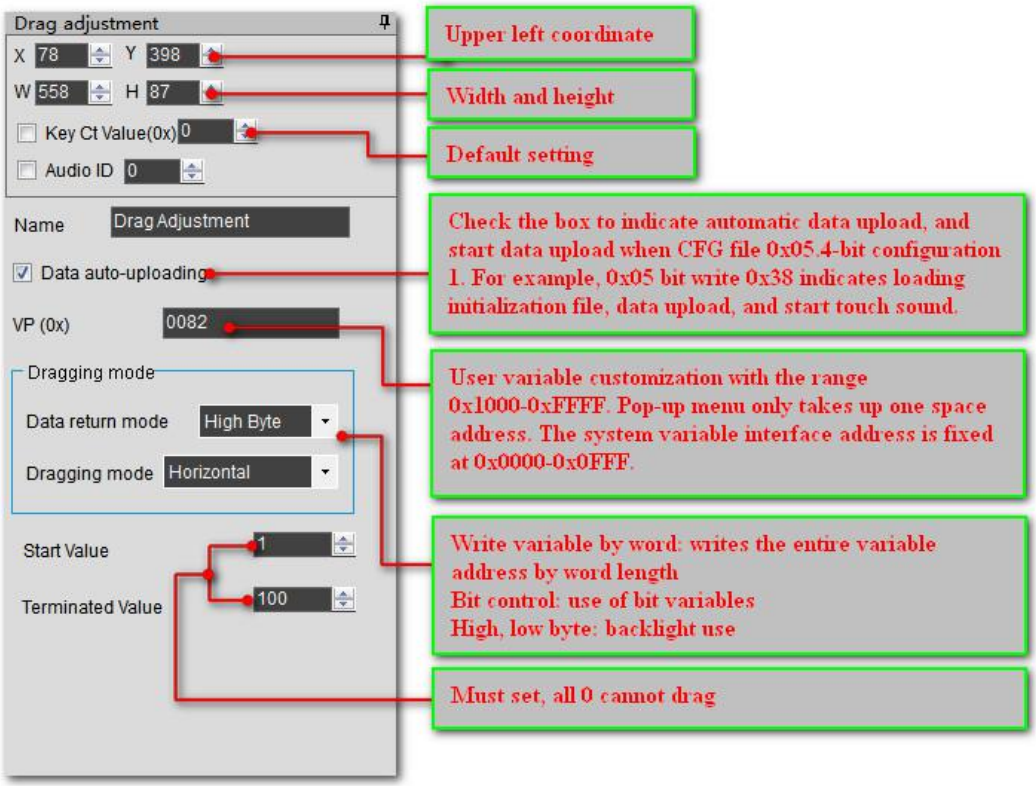
6.5.1 Drag to adjust the instruction storage format

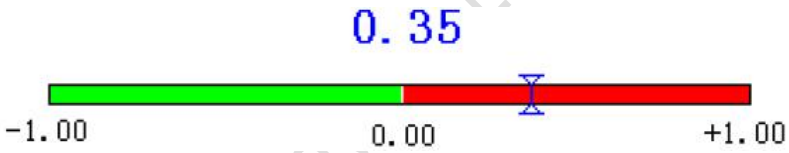
Drag adjustment is used to drag slider to realize variable data entry, also can set the scale range.

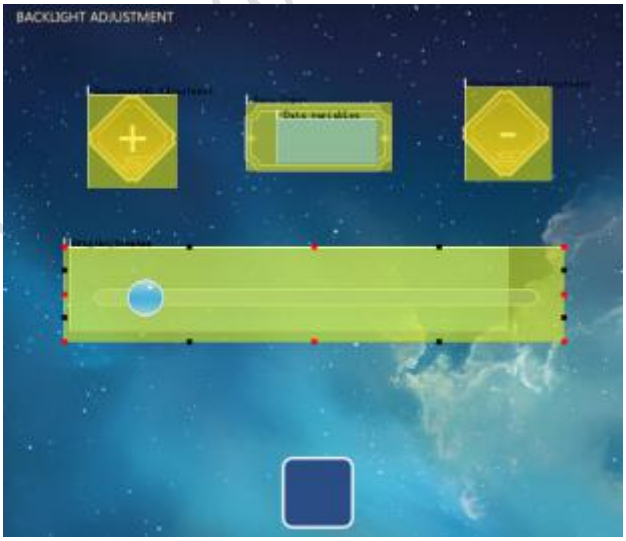
Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pic_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	Pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE03, variable data entry key code.
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Variable address pointer.
0x13	Adj_Mode	1	☆The high 4bit defines the data return format: 0x00 = Write 0x00** key code into VP word address (integer type); 0x01=Write 0x** key code into high byte address of VP word address (VP_H); 0x02=Write 0x** key code into the low byte address of VP self-address (VP_L); ☆The lower 4bit defines the drag mode: 0x*0= drag horizontally; 0x*1= drag vertically.
0x14	Area_Adj	8	Effective adjustment area :(xs,Ys) (xe,Ye) must be consistent with the touch area.
0x1C	V_Begain	2	Begin position corresponding to the return value, integer.
0x1E	V_End	2	End position corresponding to the return value, integer.

6.5.2 Setting instructions of drag adjustment software

In the DGUS software, Click the touch button _ drag to adjust, select an area with the mouse box, and set the function in the menu on the right. The advantage of drag adjustment is intuitive, fast, and the parameters do not cross the boundary. When more accurate drag input is needed, the variable data pointed by drag adjustment can be displayed with the "data variable display" function (0.35 in the figure).







6.6 Key value return (0x05)

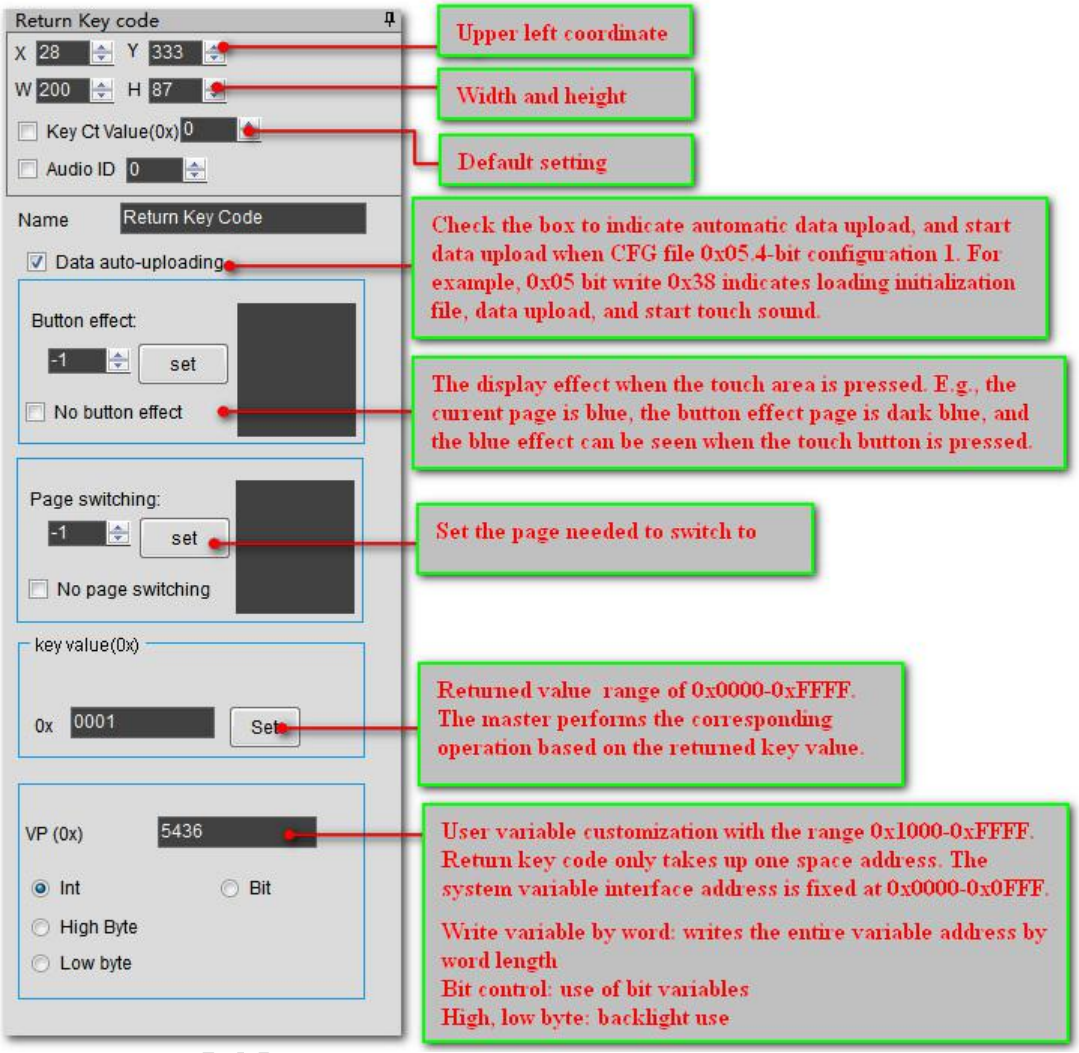
6.6.1 key return instruction storage

Key value return is used to click the key, directly return the key value to the variable, support bit variable return.

Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pic_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE05, variable data entry key code.
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Variable address pointer.
0x13	TP_Mode	1	0x00 = Write 0x00** key code into VP word address (integer type); 0x01=Write 0x** key code into high byte address of VP word address (VP_H); 0x02=Write 0x** key code into the low byte address of VP self-address (VP_L); 0x10-0x1F: writes the lowest bit (1bit) of the return key value to the specified bit of the VP word address (0x10 modifies vp.0, 0x1F modifies vp.F).
0x14	Key_Code	2	Returns the key value
0x16	NULL	10	Writes 0x00

6.6.2 Key back to software Settings

In the DGUS development software, click the touch control key _ return, select the area of the button in the box and set the button effect, page switch, return key value, variable address and so on to complete the configuration.



Return data format:

5AA5 06 83 6000 01 0001

5AA5	06	83	6000	**01**	**0001**
Frame header	Data length	Read instruction	VP	**Return word length**	**Return key code 0001**

6.7 Text input (0x06)

Text input includes ASCII and GBK Chinese characters. The input process supports cursor movement and editing. The input status and input length can be set at (vp-1) position. ASCII input mode pop-up keyboard transparency can be set.

Key codes of the input text keyboard are shown in the following table:

Key code is the key value defined for the basic touch on the keyboard. The lower byte of two of the bytecodes represents the normal key code, and the higher byte represents the upper case key code. If 0x61 corresponds to a, 0x41 corresponds to A, and 0x31 corresponds to 1. At the same time, the key code definition of the text keyboard must be less than 0x80(ASCII code), 0x0D key code input will be automatically converted to 0x0D 0x0A; The 0x00 and 0xFF key codes are disabled.

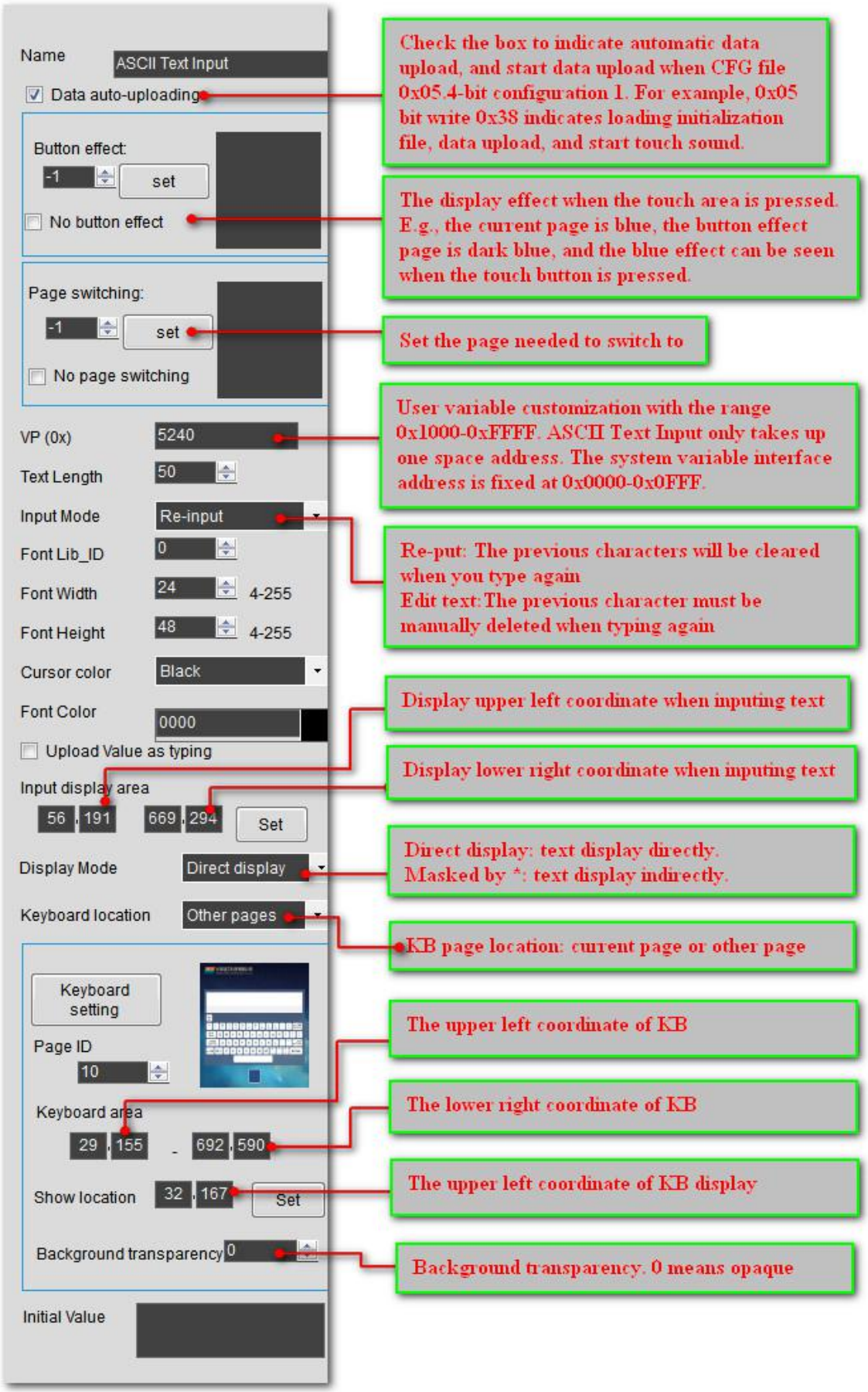
Key code	Common	Capital	Key code	Common	Capital	Key code	Common	Capital	Key code	Common	Capital
0x7E60	`	~	0x5171	q	Q	0x4161	a	A	0x5A7A	z	Z
0x2131	1	!	0x5777	w	W	0x5373	s	S	0x5878	x	x
0x4032	2	@	0x4565	e	E	0x4464	d	D	0x4363	c	C
0x2333	3	#	0x5272	r	R	0x4666	f	F	0x5676	v	V
0x2434	4	$	0x5474	t	T	0x4767	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	)	0x7B5B	[	{	0x2227	‘	“	0x2020	SP	SP
0x5F2D	-	_	0x7D5D	]	}	0x0D0D	Enter	Enter			
0x2B30	=	+	0x7C5C	\	|						

Definition table of keyboard function keys:

Key code	definition	Description
0x00F0	Cancel	Cancel input return, does not affect variable data.
0x00F1	Return	Confirm input return, input text saved to the specified variable location.
0x00F2	Backspace	Delete a character forward (backspace).
0x00F3	Delete	Delete a character backwards.
0x00F4	CapsLock	Caps lock. If enabled, the corresponding button must define the effect of the button being pressed.
0x00F7	Left	Moves cursor one character ahead; GBK Chinese characters input for page turning.
0x00F8	Right	Move the cursor one character back; GBK Chinese characters input for page turning.

6.7.1 ASCII text input

6.7.1.2 ASCII text input software Settings


Name
ASCII Text Input
Data auto-uploading
Button effect:
-1
set
No button effect
Page switching:
-1
set
No page switching
VP (0x)
5240
Text Length
50
Input Mode
Re-input
Font Lib_ID
0
Font Width
24
4-255
Font Height
48
4-255
Cursor color
Black
Font Color
0000
Upload Value as typing
Input display area
56
191
669
294
Set
Display Mode
Direct display
Keyboard location
Other pages
Keyboard setting
Page ID
10
Keyboard area
29
155
692
590
Show location
32
167
Set
Background transparency
0
Initial Value
Check the box to indicate automatic data upload, and start data upload when CFG file 0x05.4-bit configuration 1. For example, 0x05 bit write 0x38 indicates loading initialization file, data upload, and start touch sound.
The display effect when the touch area is pressed. E.g., the current page is blue, the button effect page is dark blue, and the blue effect can be seen when the touch button is pressed.
Set the page needed to switch to
User variable customization with the range 0x1000-0xFFFF. ASCII Text Input only takes up one space address. The system variable interface address is fixed at 0x0000-0x0FFF.
Re-put: The previous characters will be cleared when you type again
Edit text:The previous character must be manually deleted when typing again
Display upper left coordinate when inputing text
Display lower right coordinate when inputing text
Direct display: text display directly.
Masked by *: text display indirectly.
KB page location: current page or other page
The upper left coordinate of KB
The lower right coordinate of KB
The upper left coordinate of KB display
Background transparency. 0 means opaque

6.7.1.1 ASCII text input instruction storage format

ASCII text input is used to input ASCII characters. Open DGUS software, click basic touch _ text input, and select an area with the mouse box to set this function in the menu on the right side. "ASCII text input" can be associated with "text display" control key to display input characters. DWIN's pre-installed 0# font library contains all ASCII characters of the 4* 8-64 *128 bitmap.

Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pic_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE06, (Key code for text entry)
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Variable address pointer.
0x13	VP_Len_Max	1	Text variable maximum length, number of words (Word), range 0x01-0x7B; When text is saved to the specified address, the end of the text is automatically preceded by 0xFFFF as the terminator; The maximum variable space actually occupied by the entered text variable =VP_Len_Max+1.
0x14	Scan_Mode	1	Input mode : 0x00= re-entry, 0x01= open the original text and modify.
0x15	Lib_ID	1	Display the ASCII font location to be used, 0x00= default font.
0x16	Font_Hor	1	Font size, number of arrays in the x direction
0x17	Font_Ver	1	Font size, and the number of y-direction arrays (the number of y-direction arrays must be twice the number of x-direction arrays when using the default font library).
0x18	Cusor_Color	1	Cursor color 0x00= black, others = white
0x19	Color	2	Text display color
0x1B	Scan_Area_Start	4	Input text display area upper-left coordinate (xs,Ys)
0x1F	Scan_Return_Mode	1	
0x20	0xFE	1	0xFE
0x21	Scan_Area_End	4	Input text display area lower-right coordinate (xs,Ys)
0x25	KB_Source	1	Keyboard page location selection: 0x00= keyboard on the current page; Other = keyboard not on current page.
0x26	PIC_KB	2	Page where the keyboard is located (valid when the keyboard is not on the current page)
0x28	Area_KB	8	Coordinates of keyboard area when the keyboard is on the page :(xs,Ys), (xe,Ye) (valid when the keyboard is not on the current page)
0x30	0xFE	1	0xFE
0x31	AREA_KB_Position	4	When the keyboard is not on the current page, the keyboard displays the upper-left coordinate of the position.
0x35	Display_EN	1	0x00= normal display of input procedure; 0x01= the input procedure is displayed as "*" for password input.
0x36	NULL	10	Write 0x00

6.7.2 GBK Chinese characters input

GBK Chinese character input is used to input Chinese characters. Open DGUS software, click the basic touch control _GBK input, and select an area with the mouse box to set the function in the menu on the right side. "GBK Chinese character input" can be associated with the "text display" control key to display the input characters.

6.7.2.1 GBK Chinese character input instruction storage format

Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pix_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	Pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE06, (Key code for text entry)
0x10	0xFE	1	Fixed value 0xFE.
0x11	*VP	2	Variable address pointer.
0x13	VP_Len_Max	1	Text variable maximum length, number of words (Word), range 0x01-0x7B; When text is saved to the specified address, the end of the text is automatically preceded by 0xFFFF as the terminator; The maximum variable space actually occupied by the entered text variable =VP_Len_Max+1.
0x14	Scan_Mode	1	Input mode : 0x00= re-entry, 0x01= open the original text and modify.
0x15	Lib_GBK1	1	Display GBK character library ID, 0x00 character by default.
0x16	Lib_GBK2	1	The GBK character library ID used in the Chinese character display in the input process.
0x17	Font_Scale1	1	Lib_GBK1 font size, number of bitmaps.
0x18	Font_Scale2	1	Lib_GBK2 font size, number of bitmaps.
0x19	Cusor_Color	1	Cursor color 0x00= black, others = white.
0x1A	Color0	2	The color of the input text.
0x1C	Color1	2	The color of text in the input process.
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	Input the upper-left coordinate (xs,Ys) of the text display area.
0x25	Scan0_Area_End	4	Input the lower right coordinates (xe,Ye) of the text display area.
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	Keyboard page location selection: 0x00= keyboard on the current page; Other = keyboard not on current page.
0x30	0xFE	1	0xFE
0x31	PIC_KB	2	The ID of the page on which the keyboard is located. (only valid if the keyboard is not on the current page)
0x33	Area_KB	8	Coordinates of keyboard area on the page where the keyboard is located :(xs,Ys); (xe, Ye).
0x3B	Area_KB_Position	4	The keyboard is displayed in the upper-left coordinate of the current page,When the keyboard is not on the current page.
0x3F	Scan_Mode	1	0x02= pinyin input method 0x03= phonetic input method.

Note :

Pinyin "bd" corresponds to all GBK coding full Angle punctuation input;

DWIN's pre-installed 0# font library contains all ASCII characters of the 4* 8-64 *128 bitmap

6.7.2.2 GBK Chinese character input software setting instructions

Similar with the ASC input.

6.8 Touch screen press status data return (0x08)

Pressing state data return includes: bottom pressing, continuous pressing and releasing. Click the touch screen to return data to the variable according to the regulations.

6.8.1 Storage format of pressing state data return instruction on the touch screen

The function of state synchronize data return when the touch screen presses：click the touch screen to return data to variable or serial port as required.

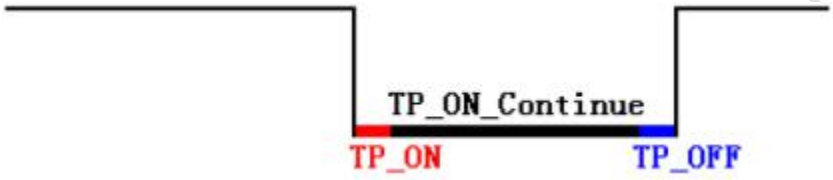
T5L_DGUS II screen only has mode 01, which replaces the mode 02 of DGUS1 with the mode 01 function. The new functions include: frame header +data length +83 and vp address + length +data.

There are two Settings in the PC software: VP1S is the VP address that Settings can initialize in the file with 22 files and VP1T refers to the 83 instruction.

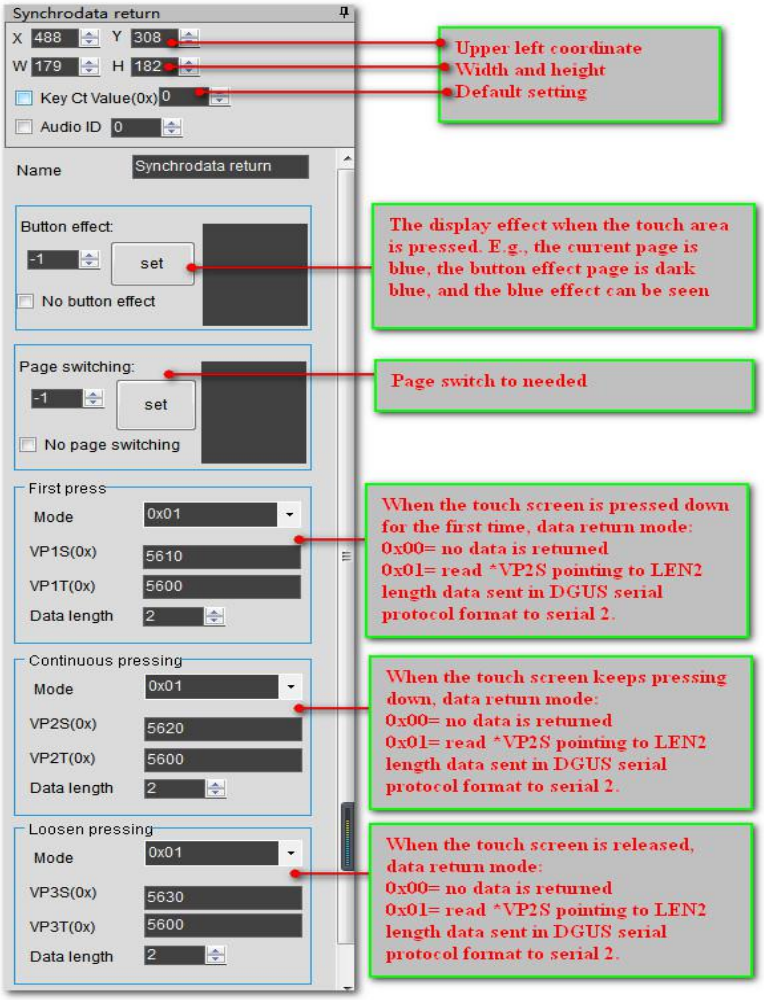
Address	Definition	Data length (word)	Description
0x00	Pic_ID	2	Page ID.
0x02	TP_Area	8	Touch bottom area: Upper left coordinate (xs,Ys) and lower right coordinate (xe,Ye)
0x0A	Pix_Next	2	Target toggle page, 0xFF** indicates no page toggle.
0x0C	Pic_On	2	Button presses the page where the rendering is located, 0xFF** indicates that there is no button press effect.
0x0E	TP_Code	2	0xFE08.
0x10	0xFE	1	Fixed value 0xFE.
0x11	TP_On_Mode	1	When the touch screen 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 address of the data when first pressing.
0x14	VP1T	2	Write the address of the data 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 screen keeps pressing down, 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 address of the data when keeps pressing.
0x1C	VP2T	2	Write the address of the data when keeps pressing.
0x1E	0x00	1	0x00
0x1F	LEN2	1	Return data length in bytes. When TP_On_Continue_Mode=0x01, LEN2 must be even.
0x20	0xFE	1	0xFE
0x21	TP_Off_Mode	1	When the touch screen is released, 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	VP2S	2	Read the address of the data when releasing.
0x24	VP2T	2	Write the address of the data when releasing.
0x26	0x00	1	0x00
0x27	LEN2	1	Returns the length of the data in bytes. When TP_OFF_Mode=0x01, LEN3 must be even.
0x28	0xFE	1	0x00

The three pressing states of the touch screen are shown in the figure below. In the DGUS development software, the button icon for adding this function is .



6.8.2 Instructions for setting the software to return pressed state data on the touch screen



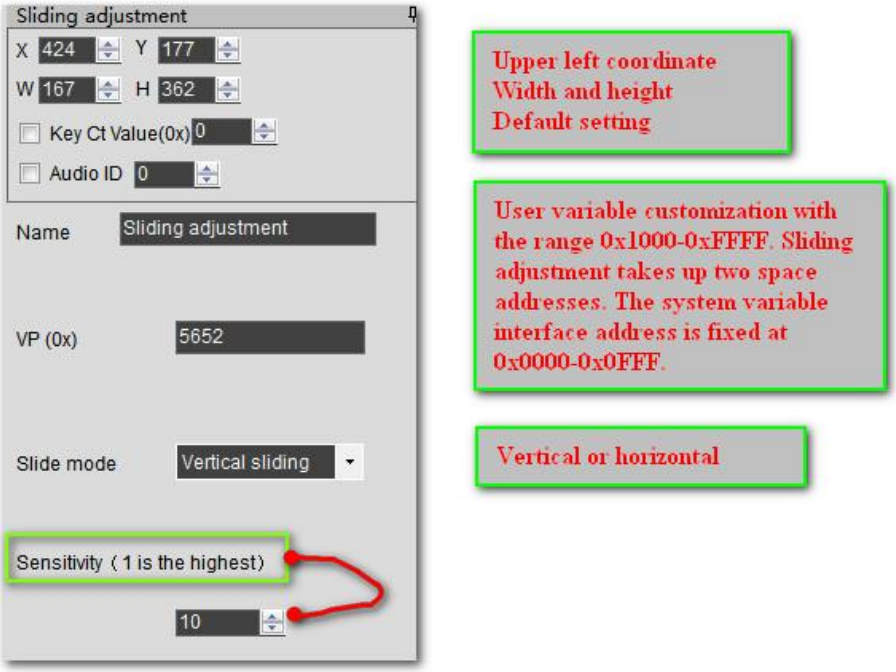
6.9 Slide (gesture) adjustment (0x0A)

Sliding gesture adjustment can be adjusted according to the x axis or Y axis direction of the specified area of the touch screen sliding, real-time return relative adjustment value. With data window indication display variable, can achieve dynamic word - rolling adjustment.

6.9.1 Slide (gesture) to adjust the instruction storage format

Address	Data length (word)	Description
0x00	1	Fixed value 0xFE
0x01	2	Variable address
0x03	1	Drag horizontally/vertically
0x04	1	Setting sensitivity

6.9.2 Slide (gesture) adjustment software setting instructions



6.10 Slide (gesture) page turning (0x0B)

Setting the target and area of page switching, and the variable display of the current page will follow the drag. If there are other touch buttons on the sliding page at the same time, and the whole page (including the drag and drop touch button) needs to be able to turn the page with gestures, the touch priority of the sliding gesture page turning must be set to the highest.

6.10.1 Slide (gesture) page-turning instruction storage format

Address	Definition	Data length (word)	Description
0x00	FE	1	
0x01	Page_Front	2	Page ID of the preceding page .
0x03	Page_Next	2	Page ID of the next page .
0x05	Y coordinate	4	Slide the Y coordinates of the upper right and lower right corners of the area
0x09	Turning sensitivity	1	Distance
0x0A	0x00	1	00
0x0B	Turning sensitivity	1	Time
0x0C	0x00	4	00
0x10	Current page	2	Current page

6.10.2 Slide (gesture) page-turning software setting instructions

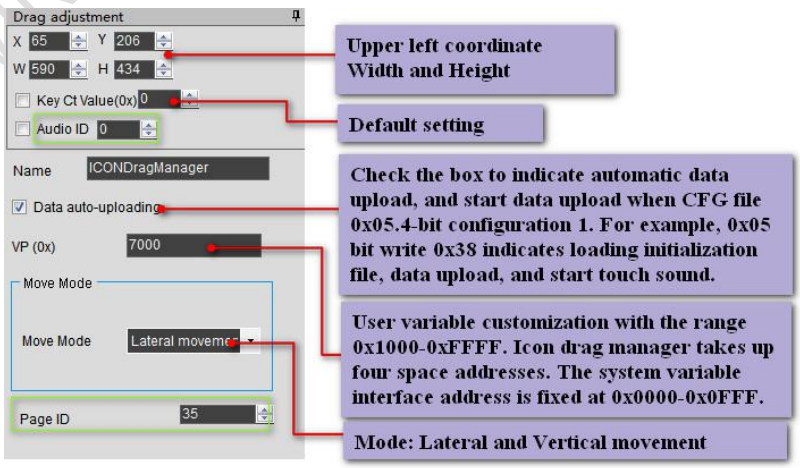
Similar with the slide (gesture) adjustment software setting instruction.

6.11 Icon drag manager (0x0C)

In DGUS development software, click the touch control key _Icon drag manager button. Next, select an area with the mouse box to set the function in the menu on the right. As shown in the figure.

With 0x07 display variable (JPEG icon translation display) to achieve Icon drag manager.

6.11.1 Icon drag manager software setting instructions.



Chapter 7

The variable configuration function (14.bin) description

The display variable configuration file is stored in the font space composed of N variable instructions configured according to the page. Each variable instruction occupies 32 bytes of storage space. A fixed allocation of 2KB, 4KB, or 8KB (0x0800, 0x1000, or 0x2000) variable storage space per page means that up to 64, 128, or 255 variables can be set per page. The maximum size of the display variable configuration file is 2MB, that is, 1024 pages can be configured at most (512 pages in 128 variable mode and 256 pages in 255 variable mode).

Due to the practical application in less than 2 MB variable configuration space, so 16 MB flash fixed divided into a 256 KB subspace as 14. BIN configuration file space, namely fixed allocation 2 KB, 4 KB per page or 8 KB (64, 128 or 255) variables under the storage space, can be configured at most 128 page (128 variable mode for 64 page, 255 variable mode for page 32). The data variable display space is 128Kbytes. For variables of the same type, the lower the storage position, the higher the display priority.

Display variables (14.bin) can be generated by DGUS configuration software. Complex display variable combination functions can be realized in the application by cooperating with touch variables, associating variable addresses, modifying 22 file information, using description pointer and accessing through serial port or DWIN OS.

A display variable configuration instruction consists of the following six parts:

Num .	Definition	Byte length	Description
1	0x5A	1	Fixed
2	Type	1	Variable type
3	*SP	2	Variable description file is stored from Flash after loading into the data storage area address pointer.
4	Len_Dsc	2	Word length of the variable description
5	*VP	2	Variable address 0x0000-0xFFFF, some variables do not need to specify the address, just write 0x0000.
6	Description	N	Variable description

7.1 List of display variable functions

NUM.	Key code	Function	User variable length (word)	Description
01	0x00	Variable Icon	1	Icon display related with a data variable. If variable changes, icon will be switches accordingly which is widely used for dashboard, progress bar application. Support for background overlay and transparency setting.
02	0x01	Animation Icon	2	3 kinds of icon status corresponding to a data variable: no display, display fixed, Animation icon display which is widely used for alerting. Variables occupy two word positions,position(VP+1) is reserved,the icon can not exceed 255(0xFF). Support for background overlay and transparency setting, can set the speed of

				animation
03	0x02	Slider	1	Slider related with a data variable for value changes. Normally it was used for liquid level, dial board, progress bar. Support for background overlay and transparency setting.
04	0x03	Artistic Variables	1/2/4	Use created icon material of artistic variables to display data. Support for background overlay and transparency setting.
05	0x04	Image Animation	0	Auto play of images at a certain speed. Normally used in welcome page or screensaver.
06	0x05	Icon Rotation	1	Use a pointer as icon file to display data changes on a dashboard. Normally used for pointer dashboard display.
07	0x06	Bit Variable Icon	3	Connect status 0 or 1 on each bit of a variable to display 2 status, 8 pcs of status in option totally, then use icon to display the status. Normal use for display of on-off state
08	0x07	JPEG Icon translation	4	Move the JPEG icon page above screen resolution up and down or left and right in the screen window. With 0x0C touch variable, Icon drag manager can be achieved. Background filtering intensity can be set.
09	0x10	Data Variable	1/2/4	Display a variable in designated format, including decimals, font type, and alphabet.
10	0x11	Text	2K max	Display character strings in text area.
11	0x12_00	Digital RTC	0	Display RTC in form of text with custom format
12	0x12_01	Analog Clock	0	Use ICON to display RCT in form of watch-face
13	0x13	HEX Variable	8 max	Use ASCII to display variables in byte HEX interval. E.g.: display 1234 to 12:34 on timer.
14	0x14	Roll Text	0	Scroll text stored in variable space in the specified area of the screen.
15	0x15	Data Window	2	Display the variable data in the specific window, highlighting the selected data. Combined with touch screen sliding or incremental adjustment, Data can be adjusted by scrolling, Also can adjust the speed by the DWIN OS. Variables occupy 2 positions, (VP+1)position is reserved.
16	0x20	Dynamic Trend Curve	2K per channel	Based on curve buffer data to configure curve in real-time automatically. Display area, coordinate, scales(zoom in/out),curve direction can be managed.
17	0x21_01	Dot	User defined	Dot set（x,y,color）
18	0x21_02	Line		Dot Connection (color,(x0,y0),…(xn,yn))
19	0x21_03	Rectangle		Rectangle displayed. Color/position/size can be managed.
20	0x21_04	Rectangle Area Fill		Fill designated rectangle area, color/position/size can be managed.
21	0x21_05	Circle		Display entire arc, color/position/size can be managed.
22	0x21_06	Picture Cut/Paste		Cut an area from designated image to current page.
23	0x21_07	Icon Display		ICON display, icon library in option.
24	0x21_09	Spectrum		Spectrum display according to variable data. Color/position can be managed.
25	0x21_0D	Rectangle XOR		Perform XOR operation on the bitmap data of a specific rectangular field in designated color. Usually for highlighting.
26	0x24	Zone scrolling	1	Move the contents of the specific area in a circular motion,the direction can be set. Used for the simple realization of the flow chart,process bar and other dynamic

				effect. Variables are taken up by system,the user does not.
27	0x25	QR_code	259 max	Display QR_code based on the specific content.
28	0x26	Brightness	1	Adjust the brightness of a specific display to highlight or lighten the background display

NOTE:

1.Please refer to 《DWIN DUGS screen DEV. guide》 for more detailed functions.

2.VP refers to the storage location(pointer) of the user variable storage space.

3.When setting the variable description pointer in the development of PC configuration software, the display variable configuration information will be stored in the user variable space pointed by the variable description pointer. Applications can be accessed through the serial port or DWIN OS, dynamically open, close or modify variable configuration information to achieve complex display variable combination functions.

7.2 Icon variables

7.2.1 Variable icon display (0x00)

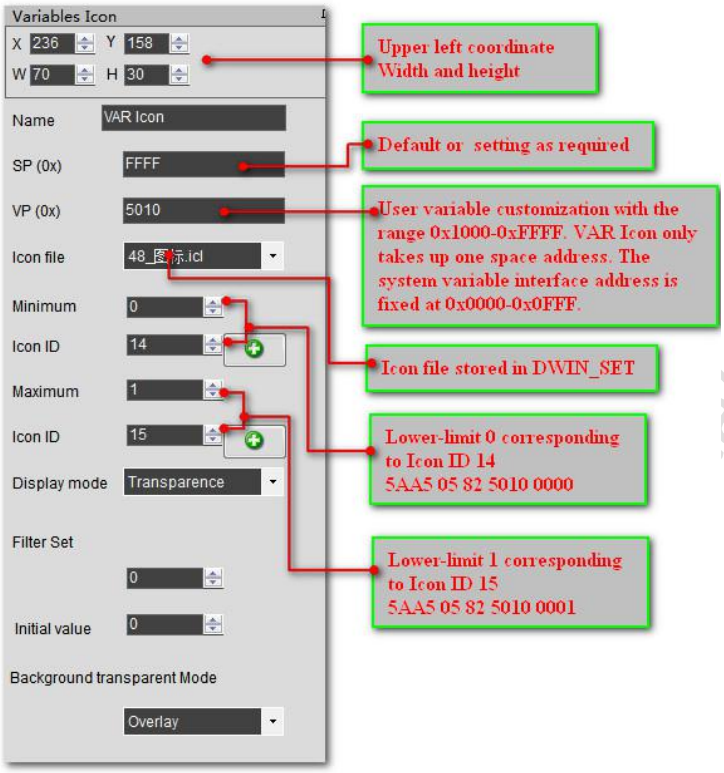
7.2.1.1 Variable icon displays instruction storage format

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

Address	SP offset	Definition	Data length	Description
0x00		0x5A00	2	Fixed value, The last two is function code,Refer to the list of display functions for details.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x0008	2	Fixed 0x0008
0x06	0x00	*VP	2	Variable pointer, variable in integer format.
0x08	0x01	（x,y）	4	The variable displays the position, and the upper-left of the icon coordinates the position.
0x0C	0x03	V_Min	2	Variable lower limit, not shown if crossed.
0x0E	0x04	V_Max	2	Variable upper limit, not shown if crossed.
0x10	0x05	Icon_Min	2	V_Min corresponding ICON ID
0x12	0x06	Icon_Max	2	V_Max corresponding ICON ID
0x14	0x07:H	Icon_Lib	1	The location of icon library storage
0x15	0x07:L	Mode	1	ICON display mode, 0x00= transparent (no background), others = display ICON background.

7.2.1.2 Variable ICONS display instructions for software Settings

In the DGUS development software, click the display control key _ variable icon to display, then select the display area and complete the configuration.



7.2.1.3 Variable ICONS examples of application instructions

(1) Display lower limit 0 corresponding icon

5AA5 05 82 5012 0000

5AA5	05	82	5012	***0000***
Frame header	Data length	Write instruction	VP	***Displays the icon corresponding to the lower limit 0***

(2) Display upper limit 1 corresponding icon

5AA5 05 82 5012 0001

5AA5	05	82	5012	***0001***
Frame header	Data length	Write instruction	VP	***Displays the icon corresponding to the upper limit 1***

(3) Not-Display beyond upper and lower limitation

5AA5 05 82 5012 0002 The instruction can hide the icon display

5AA5	05	82	5012	***0002***
Frame header	Data length	Write instruction	VP	***Beyond limitation***

(4) Description pointer hiding and moving ICONS

The hidden and moving positions need to use the description pointer. The detailed explanation of the description pointer is shown in the data variable display description pointer instruction section.

7.2.2 Animation icon display (0x01)

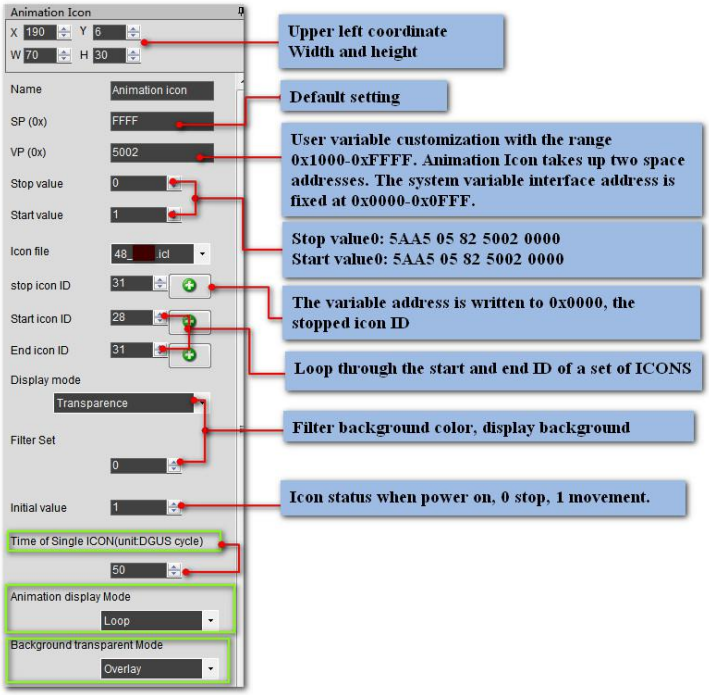
7.2.2.1 Animation icon display instruction storage format

Animated icon through a fixed data variable corresponding to three different icon indicating states: No, Fixed, and Animated, More for variable alarm prompts. Variables take up 2 word positions, (VP+1) position is reserved to assist animation display function, and serial instruction does not participate in address access. ICONS or animations are not displayed when a variable is not V_Stop or V_Start. Support background overlay and transparency Settings, animation speed Setting. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A01	2	Fixed value 0x5A01.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x000A	2	Fixed value 0x000A
0x06	0x00	*VP	2	Initial icon variable pointer, variable is double word, low bit reserved, high bit unsigned number (0x0000-0xFFFF) user data control animation icon display.
0x08	0x01	（x,y）	4	The variable displays the position, and the upper-left of the icon coordinates the position.
0x0C	0x03	Reset_ICON_En	2	0x0000: when stopped, the starting value of a bitless animation icon (the animation icon displays an arbitrary value starting from ICON_Start to ICON_End). 0x0001: when stopped, reset the start value of the animation icon (the animation icon display is fixed starting from ICON_Start).
0x0E	0x04	V_Stop	2	Display fixed ICONS.
0x10	0x05	V_Start	2	Display animated ICONS.
0x12	0x06	ICON_Stop	2	Display when the variable is V_Stop.
0x14	0x07	ICON_Start	2	When the variable is V_Start, ICONS are automatically displayed from ICON_Start to ICON_End to form an animation effect.
0x16	0x08	ICON_End	2	
0x18	0x09:H	ICON_Lib	1	The location of the icon library storage.
0x19	0x09:L	Mode	1	ICON display mode, 0x00= transparent.

7.2.2.2 Animation ICONS display instructions of software Settings

In DGUS development software, click display control key _ animation icon to display, then select the display area and complete the configuration of this function. Where the stop value and stop icon represent fixed ICONS displayed when the variable is the value. While the start value represents the trigger value when the animation icon is displayed, the start and end ICONS are the scope of the animation circle when the variable is the start value.



7.2.2.3 Animation ICONS examples of application instructions

(1) Turn on animation and play in loop mode.

5AA5 05 82 5650 0001

5AA5	05	82	5650	***0001***
Frame header	Data length	Write instruction	VP	Writes the start animation value set value 1

(2) Stop animation and play in loop mode.

5AA5 05 82 5650 0000

(3) Sequential animation, single play mode

5AA5 05 82 5650 0001 The animation display mode should be set to single play.

(4) Reverse animation, single play mode

5AA5 05 82 5650 0000 The animation display mode should be set to single play.

(5) Hide, move, and change the frame number of the animation icon

Hide, move position and so on need to use the description pointer, the use of the description pointer is detailed in the data variable display description pointer instruction part.

7.2.2.4 Animation ICONS display effect

A set of ICONS displayed in a loop of animation.

7.2.3 Slider scale indicator (0x02)

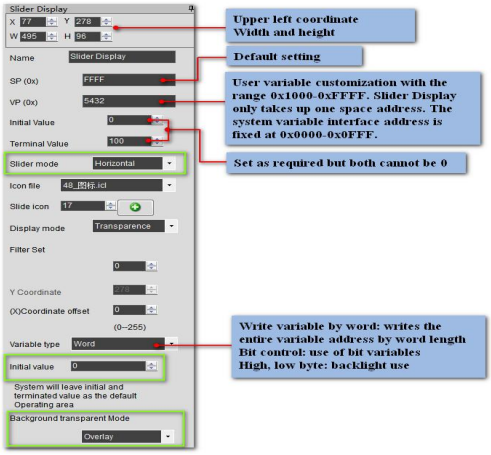
7.2.3.1 Instruction storage format of slider scale

The slider scale indicator function changes the display position by an icon (slider) corresponding to the change range of a data variable. Mainly used for the indication of liquid level, dial and schedule. Support for background overlay and transparency Settings. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A02	2	Fixed value 0x5A02.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x000A	2	Fixed value 0x000A
0x06	0x00	*VP	2	Variable pointer, variable format determined by VP_Data_Mode.
0x08	0x01	V_Begain	2	The variable value corresponding to the starting scale.
0x0A	0x02	V_End	2	The variable value corresponding to the ending scale.
0x0C	0x03	x_Begain	2	The initial scale coordinate (the vertical is the y-coordinate).
0x0E	0x04	x_End	2	The end scale coordinate (y-coordinate in the vertical direction).
0x10	0x05	ICON_ID	2	Scale slider icon ID
0x12	0x06	Y	2	Scale indicates the position of the Y coordinate displayed by the icon (the vertical position is the X coordinate).
0x14	0x07:H	x_adj	1	The scale indicates the forward offset of the X coordinate (vertical Y coordinate) displayed by the scale icon, 0x00-0xFF.
0x15	0x07:L	Mode	1	Scale mode: 0x00= horizontal scale bar 0x01= vertical scale bar.
0x16	0x08:H	ICON_Lib	1	The location of the icon library storage.
0x17	0x08:L	ICON_Mode	1	ICON display mode, 0x00= transparent (no background), others = display ICON background.
0x18	0x09:H	VP_Data_Mode	1	0x00: *VP points to an integer variable 0x01: *VP points to the high-byte address of an integer variable 0x02: *VP points to the low byte address of an integer variable.

7.2.3.2 Setting instructions of slider scale indicating software

In DGUS development software, click display control key _ slide scale indicator, then select the area and complete the configuration of this function. Slider scale indicator is display function, drag adjustment is control function, the together can achieve drag slider icon change variable value function.



7.2.3.3 Example of slider scale indicator application instructions

The 0x82 instruction writes data to the variable address that matches the set variable type.

For example: 5A A5 05 82 00A1 000A

7.2.3.4 Display effect of slider scale indicator

7.2.4 Display of artistic word variable (0x03)

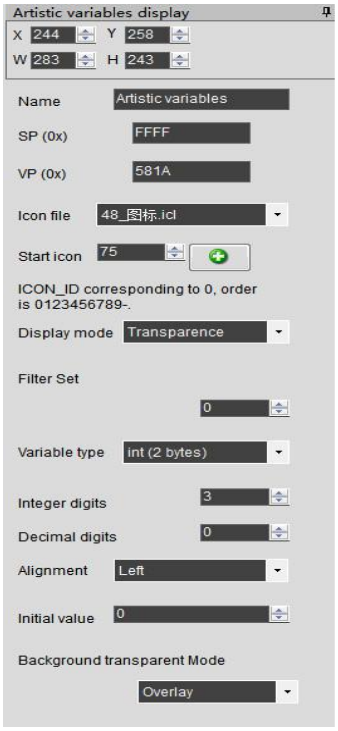
7.2.4.1 Art word variable instruction storage format

The display function of art-word variable is to replace the font base with ICON to display variable data. The function is similar to the display function of ICON variable, with background overlay and transparency setting. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A03	2	Fixed value 0x5A03.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x0007	2	Fixed value 0x0007
0x06	0x00	*VP	2	Variable pointer.
0x08	0x01	（X，Y）	4	Starting display position: Left-aligned mode, which is the upper-left coordinate of the display string; Right-justified mode, which is the upper-right coordinate of the display string.
0x0C	0x03	ICON0	2	0 corresponding to ICON_ID , the order of 0123456789... .
0x0E	0x04:H	ICON_Lib	1	The location of the icon library storage.
0x0F	0x04:L	ICON_Mode	1	ICON display mode 0x00= transparent other = display background.
0x10	0x05:H	Integer number	1	The number of integers displayed.
0x11	0x05:L	Decimal digits	1	The number of decimal places displayed.
0x12	0x06:H	Variable model	1	0x00= integer (2 bytes), range -32768 to 32767 0x01= long integer (4 bytes), range -2147483648 to 2147483647 0x02=*VP high byte, unsigned number, range 0 to 255 0x03=*VP low byte, unsigned number, range 0 to 255 0x04= super-long integer (8 bytes), range -9223372036854775808 to 92233720368575807 0x05= unsigned integer (2 bytes), range 0 to 65535 0x06= unsigned long integer (4 bytes), range 0 to 4294967295
0x13	0x06:L	Alignment model	1	0x00= left alignment 0x01= right alignment.

7.2.4.2 Setting instructions of Artistic variable software

In DGUS development software, click display control key _ Artistic variable display, then select the box and complete the configuration of this function.



Refer to explantion above

7.2.4.3 Example of Artistic variable application instructions

5AA5	05	82	5700	0002
FH	Data length	Write instruction	Variable address	Display data 2

7.2.4.4 Display effect of Artistic variables

7.2.5 Image animation display (0x04)

7.2.5.1 Picture animation instruction storage format

The picture animation display function is to play a group of full-screen pictures at a specified speed. Used for boot screen or screen saver. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A04	2	Fixed value 0x5A04.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x0004	2	Fixed value 0x0004
0x06	0x00	0x0000	2	Fixed value 0x0000
0x08	0x01	Pic_Begain	2	Start picture location
0x0A	0x02	Pic_End	2	End picture location
0x0C	0x03:H	Frame_Time	1	The display time of a frame unit: 8ms.

7.2.5.2 Picture animation software setting instructions

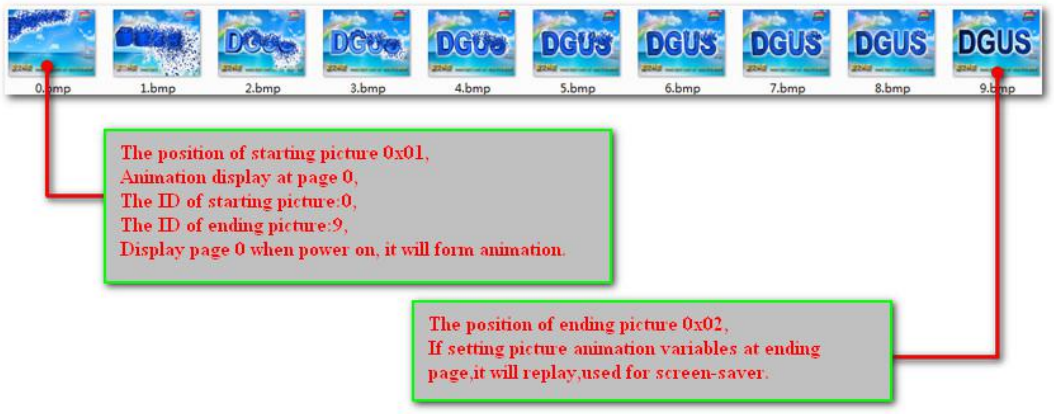
In the DGUS development software, click the display control key _ picture animation display, select the area in the specified page box and complete the configuration of this function. This function does not need a button to trigger, the area can be arbitrarily selected box, ensure that the specified page.

7.2.5.3 Example of Artistic variable application instructions

5A A5 07 82 0084 5A01 0000

5AA5	07	82	0084	5A01	0000
FH	Data length	Write instruction	System variable interface address for fixed switching page address	5A01: fixed. High byte 0x5A means that a page processing is started, and the CPU has cleared to zero; The low byte 0x01 indicates a page switch to display the image specified in the image store to the current background page	Page ID, the page number to switch.

7.2.5.4 Picture animation display effect



7.2.6 Icon rotation indicator display (0x05)

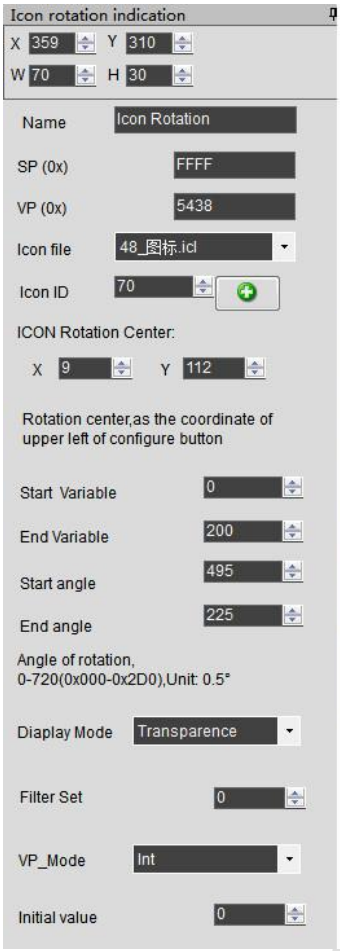
7.2.6.1 Icon rotation instruction storage format

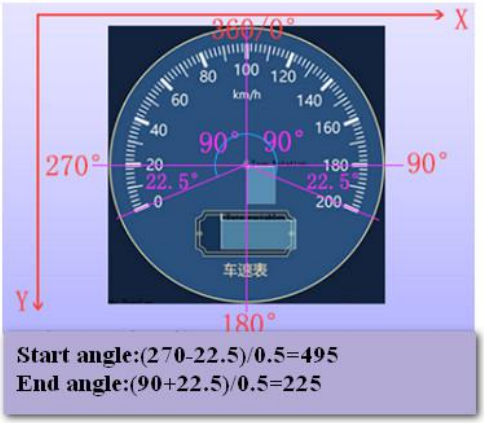
The function of ICON rotation indicator is to linearly correspond the range of a data variable to the Angle data, and then display an ICON after rotating according to the corresponding Angle data. Mostly used for pointer dashboard display. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A05	2	Fixed value 0x5A05.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x000C	2	Fixed value 0x000C.
0x06	0x00	*VP	2	Variable pointer,The variable mode is determined by VP_Mode.
0x08	0x01	ICON_ID	2	The specified icon ID.
0x0A	0x02	ICON_Xc	2	Rotation center position on the ICON: x coordinate.
0x0C	0x03	ICON_Yc	2	Rotation center position on the ICON: Y coordinate.
0x0E	0x04	Xc	2	ICON displays the rotation center position of the current screen: X coordinate.
0x10	0x05	Yc	2	ICON displays the rotation center position of the current screen: Y coordinate.
0x12	0x06	V_Begain	2	Variable value corresponding to the initial rotation Angle, integer number, not shown beyond the bounds.
0x14	0x07	V_End	2	Variable value corresponding to the ending rotation Angle, integer number, not shown beyond the bounds.
0x16	0x08	AL_Begain	2	Starting rotation Angle, 0-720 (0x000- 0x2D0), unit :0.5 °
0x18	0x09	AL_End	2	Ending rotation Angle, 0-720 (0x000- 0x2D0), unit :0.5 °
0x1A	0x0A:H	VP_Mode	1	0x00: *VP points to an integer variable. 0x01: *VP points to high-byte data for an integer variable. 0x02: *VP points to the low byte data of an integer variable.
0x1B	0x0A:L	Lib_ID	1	The location of the icon library storage.
0x1C	0x0B	Mode	1	ICON display mode 0x00= transparent (no chart background) others = display ICON background.

In the DGUS development software, click the display control key _ icon to rotate the indicator, and then select the box and complete the configuration of this function. The rotation indicator of the icon is the display function, and the rotation adjustment is the control function. The two functions together can realize the function of rotating the slider icon to change the variable value. This function can also be used for the display of the instrument panel alone, without the coordination of the rotation adjustment function. When used in conjunction with the rotary adjustment, the selection range of the rotary adjustment box should be consistent with the range indicated by the rotation of the icon, so as to achieve the effect of dragging the slider with the finger. Rotating always assumed to be "clockwise", namely AL_End must be greater than AL_Begin, if less than AL_Begin AL_End, system will automatically add 360 °.

7.2.6.2 Software setting instructions for icon rotation





7.2.7 Display of bit variable icon (0x06)

7.2.7.1 Bit variable icon instruction storage format

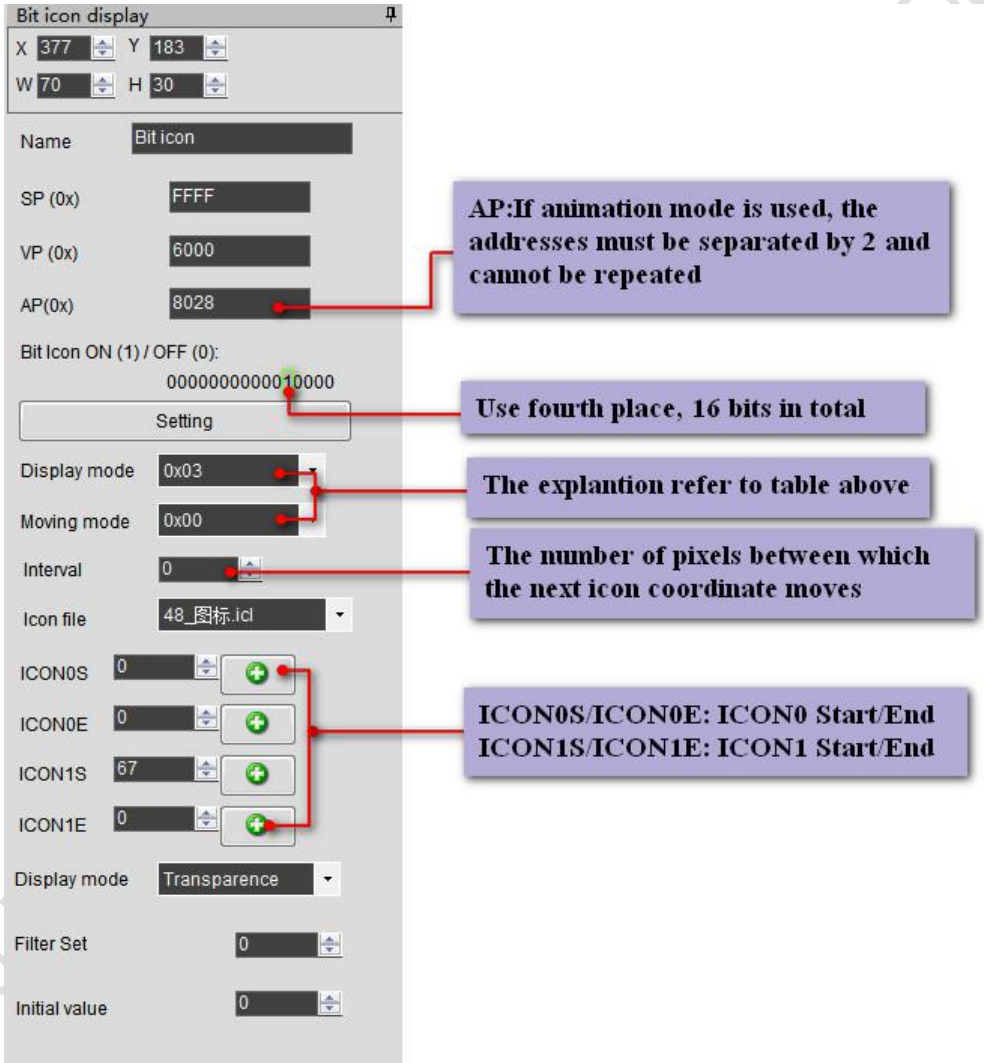
Bit-variable ICON display function is to use ICON (or ICON animation) to display two of the eight different display schemes corresponding to the 0/1 state of each bit of a data variable. It is mainly used for on/off status display, such as fan operation (animation), stop (still icon). The format of its instruction storage is shown in the table.

<table>
<tr><th>Address</th><th>SP offset</th><th>Definition</th><th>Data length</th><th>Description</th></tr>
<tr><td>0x00</td><td></td><td>0x5A06</td><td>2</td><td>Fixed value 0x5A06.</td></tr>
<tr><td>0x02</td><td></td><td>*SP</td><td>2</td><td>Variable description pointer, 0xFFFF:means uploaded by configuration file.</td></tr>
<tr><td>0x04</td><td></td><td>0x000C</td><td>2</td><td>Fixed value 0x000C.</td></tr>
<tr><td>0x06</td><td>0x00</td><td>*VP</td><td>2</td><td>Bit variable pointer, word variable.</td></tr>
<tr><td>0x08</td><td>0x01</td><td>*VP_AUx</td><td>2</td><td>Auxiliary variable pointer, double word, user software cannot access.</td></tr>
<tr><td>0x0A</td><td>0x02</td><td>Act_Bit_Set</td><td>2</td><td>The bit position with a value of 1 indicates that the corresponding position of *VP needs to be displayed.</td></tr>
<tr><td>0x0C</td><td>0x03:H</td><td>Display_Mode</td><td>1</td><td>Display mode definition :
<table>
<tr><td>Display_ Mode</td><td colspan="2">Bit variable value</td></tr>
<tr><td></td><td>0</td><td>1</td></tr>
<tr><td>0x00</td><td>ICONS</td><td>ICONS</td></tr>
<tr><td>0x01</td><td>ICONS</td><td>Not display</td></tr>
<tr><td>0x02</td><td>ICONS</td><td>ICONS-ICONOE animation</td></tr>
<tr><td>0x03</td><td>Not display</td><td>ICONS</td></tr>
<tr><td>0x04</td><td>Not display</td><td>ICONS-ICONOE animation</td></tr>
<tr><td>0x05</td><td>ICON0S-ICON0E animation</td><td>ICONS</td></tr>
<tr><td>0x06</td><td>ICON0S-ICON0E animation</td><td>Not display</td></tr>
<tr><td>0x07</td><td>ICON0S-ICON0E animation</td><td>ICONS-ICONOE animation</td></tr>
</table>
For example, set Display_Mode=2, then:
when the variable corresponding to *VP is 0, the ICONS icon will be displayed.</td></tr>
<tr><td>0x0D</td><td>0x03:L</td><td>Move_Mode</td><td>1</td><td>Bitmap icon arrangement:
0x00=x++, Act_Bit_Set specifies no display bit does not retain bits;
0x01=Y++, Act_Bit_Set specifies no display bit does not retain position;
0x02=x++, Act_Bit_Set specified not to display bit reserved DIS_MOV position;
0x03=Y++, Act_Bit_Set specified not to display bit reserved DIS_MOV position.</td></tr>
<tr><td>0x0E</td><td>0x04:H</td><td>Icon_Mode</td><td>1</td><td>ICON display mode: 0x00= transparent 0x01= opaque.</td></tr>
<tr><td>0x0F</td><td>0x04:L</td><td>Icon_Lib</td><td>1</td><td>The location of the icon library storage.</td></tr>
<tr><td>0x10</td><td>0x05</td><td>ICON0S</td><td>2</td><td>Do not show animation mode, bit_0 icon ID
Display animation mode, bit_0 icon animation start ID position.</td></tr>
<tr><td>0x12</td><td>0x06</td><td>ICON0E</td><td>2</td><td>Display animation mode, bit_0 icon animation end ID position.</td></tr>
</table>

0x14	0x07	ICON1S	2	Do not show animation mode, bit_1 icon ID Display animation mode, bit_1 icon animation start ID position.
0x16	0x08	ICON1E	2	Display animation mode, bit_1 icon animation end ID position.
0x18	0x09	（x，y）	4	The starting bit variable displays the position, and the upper-left corner coordinate position of the icon.
0x1C	0x0B	DIS_MOV	2	The next icon coordinate moves the coordinate interval.
0x1E	0x0C	reserve	2	Write 0 x00

7.2.7.2 Setting instructions of bit variable icon software

In DGUS development software, click the display control key _ bit variable icon display button. Next, select an area with the mouse box to set the function in the menu on the right. As shown in the figure.



7.2.7.3 Example of bit variable icon application instructions

(1) All 16 bits opened All write 1.

5AA5 05 82 6000 FFFF

5AA5	05	82	6000	F	F	F	F
FH	Data length	Write instruction	Variable address	1111	1111	1111	1111

*(2)*All 16 bits closed All write 0.

5AA5 05 82 6000 0000

5AA5	05	82	6000	0	0	0	0
FH	Data length	Write instruction	Variable address	0000	0000	0000	0000

*(3)*Opened bits 0 and 3.

5AA5 05 82 6000 0009

5AA5	05	82	6000	0	0	0	9
FH	Data length	Write instruction	Variable address	0000	0000	0000	1001

7.2.7.4 Display effect of variable icon

7.3 Text variable

7.3.1 Data variable display (0x10)

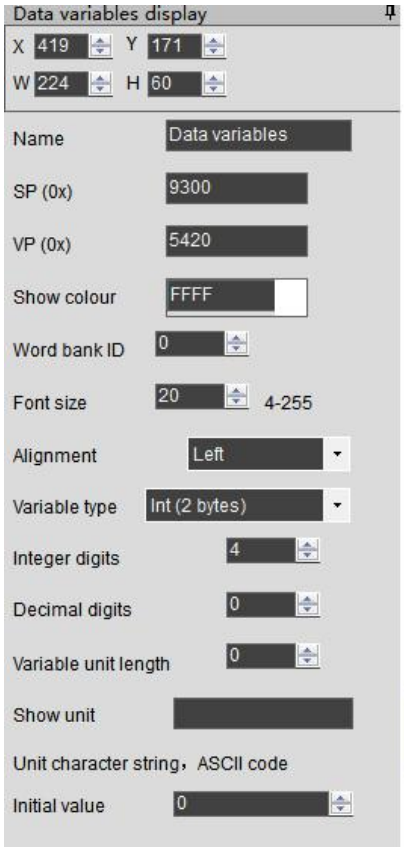
7.3.1.1 Data variable instruction storage format

Data variable display function is to display a data variable in the specified format (integer, decimal, with or without AICII unit) with the specified font and size of Arabic numerals, the instruction storage format is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A10	2	Fixed value 0x5A10.
0x02		*SP	2	Variable description pointer, 0xFFFF:means uploaded by configuration file.
0x04		0x000D	2	Fixed value 0x000D.
0x06	0x00	*VP	2	Variable pointer.
0x08	0x01	X,Y	4	Displays the upper-left coordinate of the string.
0x0C	0x03	COLOR	2	Display color
0x0E	0x04:H	Lib_ID	1	The position of ASC II library.
0x0F	0x04:L	Font size	1	The number of dots in the x direction of the character.
0x10	0x05:H	Alignment	1	0x00= left aligned 0x01= right aligned 0x02= center
0x11	0x05:L	Integer number	1	Displays integer bits. The sum of the whole and decimal digits must not exceed 20.
0x12	0x06:H	Decimal digits	1	Displays decimal places. The sum of the whole and decimal digits must not exceed 20.
0x13	0x06:L	Variable mode	1	0x00= integer (2 bytes), range -32768 to 32767 0x01= long integer (4 bytes), ranging from -2147483648 to 2147483647 0x02=*VP high byte, unsigned number, range 0 to 255 0x03=*VP low byte, unsigned number, range 0 to 255 0x04= super-long integer (8 bytes), ranging from -9223372036854775808 to 92233720368575807 0x05= unsigned integer (2 bytes), range 0 to 65535 0x06= unsigned long integer (4 bytes), ranging from 0 to 4294967295
0x14	0x07:H	Len_unit	1	The variable unit (fixed string) displays the length, 0x00 indicating no unit display.
0x15	0x07:L	String_Unit	Max11	Unit string, ASCII encoding

7.3.1.2 Setting instructions of data variable software

In the DGUS development software, click the display control "data variable display", then select the display area in the box, and conduct function configuration in the setting menu on the right side.



Refer to instruction above

7.3.1.3 Examples of data variable application instructions

Variable address range 0x1000-0xFFFF, instruction data are in hexadecimal format.

(1) Display integer data 100

5AA5 05 82 5420 0064

5AA5	05	82	5420	0064
FH	Data length	Write instruction	Variable address	**Data 100. Integer range: -32768 to 32767, 2 bytes.**

(2) An instruction displays three data at the same time. Addresses must be ***contiguous.***

5AA5 09 82 5420 0064 0063 0062

5AA5	09	82	5420	0064 0063 0062
FH	Data length	Write instruction	Variable address	**Data 100**（Map 0x5420 address）. **Data 99**（Map 0x5421 address）. **Data 98**（Map 0x5422 address）.

(3) Display long integer data 100

5AA5 07 82 5420 0000 0064

5AA5	07	82	5420	0000 0064
FH	Data length	Write instruction	Variable address	**Data 100.** **Long integer range -2147473648 to 2147483647, accounting for 4 bytes, byte not enough bit complement 00.**

(4) Display super-long integer data 100

5AA5 0B 82 5420 0000 0000 0000 0064

5AA5	0B	82	5420	0000 0000 0000 0064
FH	Data length	Write instruction	Variable address	**Data 100.** **Super-long integer range: -9223372036854775808 to 9223372036854775807, accounting for 8 bytes, not enough bit complement 00.**

(5) Display single-precision floating-point data 99

5AA5 07 82 5420 42C6 0000

5AA5	07	82	5420	42C6 0000
FH	Data length	Write instruction	Variable address	**0x42C6 0000 single-precision floating point number 99, which can be converted by the floating point number conversion tool.**

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

5AA5 0B 82 5420 4058 C000 0000 0000

5AA5	0B	82	5420	4058 C000 0000 0000
FH	Data length	Write instruction	Variable address	**4058 C000 0000 0000 double-precision floating point number 99, which can be converted by the floating point number conversion tool.**

(7) Display integer data -100

5AA5 05 82 5420 FF9C

5AA5	05	82	5420	FF9C
FH	Data length	Write instruction	Variable address	**0x FF9C minus 100. Negative complement: sign bit is 1, the rest bits are the absolute value of the number of the original code by bit inverse; And then you add 1 to the whole thing.**

(8) Display 2 decimal places

Software data variable display control key set integer bit as 1, decimal place as 2, click save, generate will 14.BIN display file down to the screen.

Send: 5A A5 05 82 5300 0064

Response:1.00

(9) Change data color

5AA5 05 82 9003 F800

9003:based on 0x9000 offset 3bits F800:color code

See the data variable display instruction storage format table for the offset address,

Changing the properties of a property box requires the use of a description pointer, such as coordinates, color, font location, integer number, decimal number, font size, dot matrix, and so on.

Description of pointer setting problem:

A: if there is no curve display, 0x1000-0x7FFFF is recommended to be used as variable address interval; 0x8000-0xFFFF is used as a description pointer interval, distinguished to avoid conflicting pointer addresses.

B: if there is a curve and all 8 channels are used, 0x1000-0x4FFFF will be used as the address of the curve buffer. This part of the address is not used as the address of other variables. 0x5000-0x7FFFF is recommended to be used as the address range of VP variables. 0x8000-0xFFFF is recommended for use as the SP description pointer interval. In the application, the range of VP variable address and SP description pointer address can be planned by users according to actual needs. The division of VP variable address and SP description pointer address here is only for reference.

C: for the same display key description pointer, 10H addresses can be set; for different types of display keys, 30H addresses can be set. The difference is to avoid confusion of pointer addresses and display conflicts.

D: if the description pointer of the same type is to be set to the same, only Ctrl C+Ctrl V can be copied, that is, copied to other pages. The control key can no longer change the font size and other properties, and cannot move the position of a pixel point, otherwise it will cause abnormal display..

(10) Change data coordinates

5AA5 07 82 9001 0064 0064

9001:based on 0x9000 offset 1bit 0064 0064:offset to (100,100) coordinates.

(11) Change font size

5AA5 05 82 9004 0028

9004:based on 0x9000 offset 4bits 0x0028: the high byte 0x00 is 0 font base;and the low byte 0x28 is the font size.

(12) Change the integer bit to 3

5AA5 05 82 9005 0003

9005:based on 0x9000 offset 5bits 0x0003: The high byte 0x00 is left-aligned, and the low byte 0x03 is an integer number.

(13) Change the decimal to 2

5AA5 05 82 9006 0200

9006:based on 0x9000 offset 6bits 0x0200: The high byte 0x20 is decimal digits, the low byte 0x00 is an integer number.

(14) Power on does not display data 0

Set the variable address to 0x 5300, the pointer address to 0x 9000.

Method 1: hide

Hidden data variables show: 5A A5 05 82 9000FF00

0x9000: description pointer;

0xFF00: hides the data.

Hidden data: 5A A5 05 82 90005300

0x 9000: description pointer;

0x 5300: variable address.

Change the data value again: 5A A5 05 82 5300 0062

0x 5300 variable address;

0x 0062 shows data 98.

Method 2: change the coordinate position with the description pointer

5A A5 07 82 900102D0 02D0

0x9001: describes that the pointer is offset by 1 bit on the basis of 0x 9000;

0x02D0 02D0 :(720,720) coordinate point.

Do not show by crossing boundaries. For example, if 720*720 resolution screen, change the display coordinate on the upper left to (720*720) and hide it beyond the boundary, the normal display will move back to the original coordinate.

7.3.1.4 Display effect of data variables

7.3.2 Text display (0x11)

7.3.2.1 Text display instruction storage format

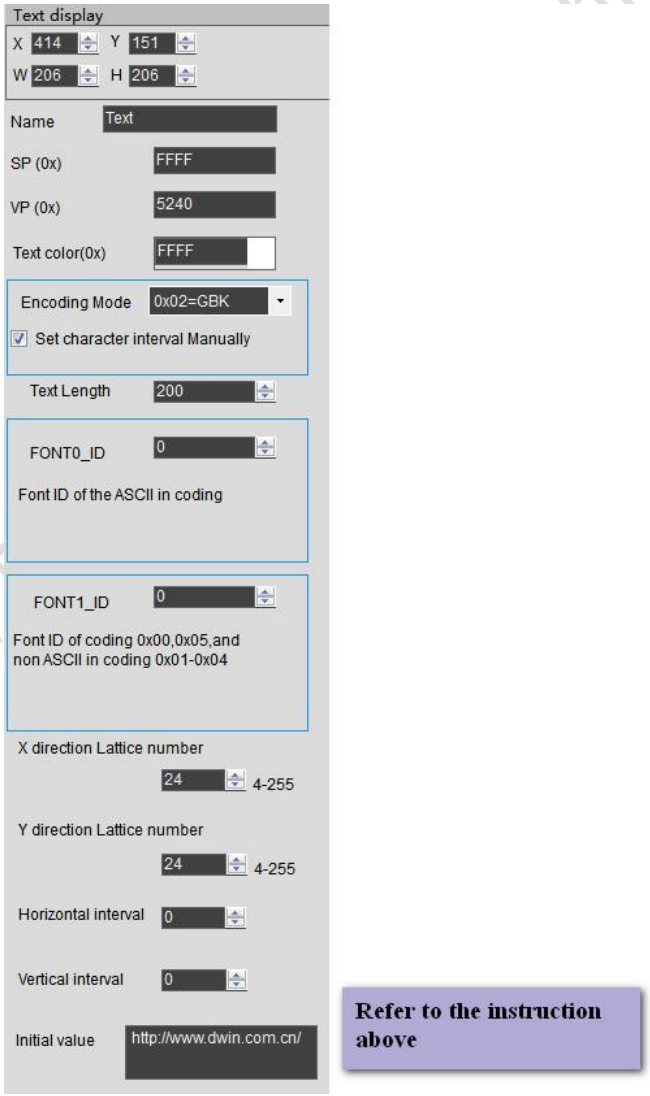
The text display function displays the string in the specified format (depending on the font library) in the specified text box display area. Usually used with text input. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A11	2	Fixed value 0x5A11.
0x02		*SP	2	Variable description pointer.
0x04		0x000D	2	Fixed value 0x000D.
0x06	0x00	*VP	2	Text pointer.
0x08	0x01	（X，Y）	4	Displays the upper-left coordinate of the string.
0x0C	0x03	Color	2	Display text color
0x0E	0x04	(Xs,Ys)(Xe,Ye)	8	Text-box area
0x16	0x08	Text_Length	2	Display the number of bytes that will not be displayed when 0xFFFF, 0x0000, or display to the end of the text box is encountered.
0x18	0x09:H	Font0_ID	1	The font library location used by ASII characters encoded 0x01-0x04.
0x19	0x09:L	Font1_ID	1	The encoding is 0x00, 0x05, and the font location used by non-ASCII characters at 0x01-0x04.
0x1A	0x0A:H	Font_x_Dots	1	The number of bitmaps in the X direction of the font (0x01-0x04 mode, the ASCII character x will be automatically computed as x/2).
0x1B	0x0A:L	Font_Y_Dots	1	The number of bitmaps in the Y direction of the font .
0x1C	0x0B:H	Encode_Mode	1	.7: defines whether the character spacing displayed is automatically adjusted: 7=0 the spacing of characters is automatically adjusted;;

				7=1 the spacing of characters is not automatically adjusted, and the width of characters is the number of dot arrays set. .0 -.6: defines the text encoding method: 0=8bit encoding 1=GB2312 internal code 2=GBK 3=BIG5 4=SJIS 5=UNICODE
0x1D	0x0B:L	HOR_Dis	1	Horizontal character spacing.
0x1E	0x0C:H	VER_Dis	1	Vertical Character spacing.
0x1F	0x0C:L	Undefined	1	0x00.

7.3.2.2 Setting instructions of the text display software

In the DGUS development software, click the display control button _ text display button, select the display area with the mouse box, and then configure the function in the Settings menu on the right. The number of arrays in the Y direction of the font must be even. The DGUS screen is pre-installed with a 0# font library, which contains all ASCII characters of 4*8--6*128 lattice.



7.3.2.3 Examples of text display application instructions

(1) Display "north 12AB"

5AA5 09 82 5020 *B1B1 3132 4142*

5020: Variable address;

B1B1: ASCII code of the word "north";

3132: ASCII code of "12";

4142:ASCII code of "AB". ASCII code can be converted by ASCII conversion tool.

(2) Line feed display

5AA5 05 82 5020 *0D0A*

5020: Variable address;

0D0A:0D0A newline ASCII code, can be converted by ASCII conversion tool.

(3) Clear text display

5AA5 05 82 5020 *2020 2020*

5020: Variable address;

20: ASCII code of The blank, *2020*: clear an address data.

*2020 2020:*Clear data of two addresses starting at address 5020.

(3) Clear text color

5AA5 05 82 8803 *F800*

8803: Based on Description pointer 0x 8000 offset 3 bits to change color;

F800: Color value.

(4) Hidden text display

Method 1: hide

5A A5 05 82 8800FF00

0x 8800: description pointer;

0x FF00: hide text.

Hidden display: 5A A5 05 82 88008070

0x 8800: description pointer;

0x 8070: variable address.

Method 2: modify coordinates

5A A5 07 82 880102D0 02D0

0x 8801: the description pointer is offset by 1 bit on the base address to change the display coordinate;

0x 02D0 02D0 :(720,720) coordinates point, move out of sight.

Hide and show:

5A A5 07 82 88010064 0064

0x 8801: the description pointer is offset by 1 bit on the base address to change the display coordinate;

0x 0064 0064 :(100,100) coordinate point, cross the boundary and move to where it can be seen.

Method 3: display length changed to 0000

5A A5 05 82 88080000
0x 8808 description pointer 0x 8000 base address offset 8 bits to change the display byte length;
0x 0000 displays 0 bytes of data.
Hidden display: 5A A5 05 82 88080064
0x 8808 description pointer 0x 8000 base address offset 8 bits to change the display byte length;
0x 0064 displays 100 bytes of data.

7.3.3 Text scroll display (0x14)

7.3.3.1 Text scroll instruction storage format

Text scroll function is the variable data scroll display in the specified area with the specified direction . The format of its instruction storage is shown in the table. (V14 kernel not support)

Address	SP offset	Definition	Data length	Description
0x00		0x5A14	2	Fixed value 0x5A14.
0x02		*SP	2	Variable description pointer.
0x04		0x000B	2	Fixed value 0x000B.
0x06	0x00	*VP	2	Text pointer. The first 3 words of the text pointer must be retained, and the user displays the text content starting with (VP+3). The text must end at 0xFF or 0x00.
0x08	0x01:H	Rolling_Mode	1	Scroll mode: 0x00= scroll from right to left.
0x09	0x01:L	Rolling_Dis	1	Scroll spacing, the number of pixels in the bitmap that the text scrolls in each DGUS cycle.
0x0A	0x02:H	Adjust_Mode	1	0x00= left aligned 0x01= right aligned 0x02= center When the text display content is insufficient for the text box, the scrolling stops. At this time, the display alignment mode is effective.
0x0B	0x02:L	Undefined	1	0x00
0x0C	0x03	Color	2	Display text color
0x0E	0x04	Xs Ys Xe Ye	8	Text-box area
0x16	0x08:H	Font0_ID	1	When encoding is 0x01-0x04, the ASCII character displays the font location. When encoding is 0x00, 0x05, do not set the parameter, just write 0x00.
0x17	0x08:L	Font1_ID	1	When encoding is 0x01-0x04, the position of the font library displayed by non-ASCII characters. When encoding is 0x00, 0x05, the font library position used by the character is displayed.
0x18	0x09:H	Font_x_Dots	1	The number of bitmaps in the X direction of the font (0x01-0x04 mode, the ASCII character x will be automatically computed as x/2).
0x19	0x09:L	Font_Y_Dots	1	The number of bitmaps in the Y direction of the font .
0x1A	0x0A:H	Encode_Mode	1	.7: defines whether the character spacing displayed is automatically adjusted: 7=0 the spacing of characters is automatically adjusted;; 7=1 the spacing of characters is not automatically adjusted, and the width of characters is the number of dot arrays set.

				.0 -.6: defines the text encoding method: 0=8bit encoding 1=GB2312 internal code 2=GBK 3=BIG5 4=SJIS 5=UNICODE
0x1B	0x0A:L	Text_Dis	1	Character pitch
0x1C	0x0B:H	Undefined	4	Write 0x00

7.3.3.2 Setting instructions of text scrolling software

In DGUS development software, click display control key _ text scroll display, then select the display area with the mouse box and configure the scroll mode, scroll mode, font color and other Settings in the right setting menu to achieve this function. The configuration method is similar to text display. The dot arrays number of y-direction font must be even. DGUS screen pre-installed 0# font library, containing all ASCII characters of 4* 8-64 *128 lattice.

7.3.3.3 Examples of text scrolling application instructions

5A A5 15 82 6013 BBB6 D3AD C0B4 B5BD B5CFCEC4BFC6BCBC FFFF

6013: Variable address.Text display should be stored from (VP+3) address.

BBB6 D3AD C0B4 B5BD B5CFCEC4BFC6BCBC : ASCII Code: Welcome to DWIN technology

FFFF: End mark.

7.3.3.4 Text scrolling display effect

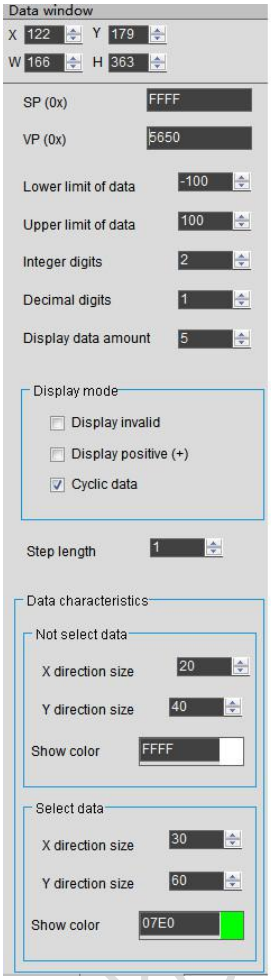
7.3.4 Data window indication (0x15)

7.3.4.1 Data window instruction storage format

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

Address	SP offset	Definition	Data length	Description
0x00		0x5A15	2	Fixed value 0x5A15.
0x02		*SP	2	Variable description pointer.
0x04		0x 000C	2	Fixed value 0x000C.
0x06	0x00	*VP	2	Variable pointer, double-word, low-word reserved, high-word is integer data -32768 to +32767.
0x08	0x01	Lower limit	2	Data lower limit
0x0A	0x02	Upper limit	2	Data upper limit
0x0C	0x03:H	Integer number	1	Integer number
0x0D	0x03L	Decimal digits	1	Decimal digits
0x0E	0x04:H	Data number	1	Data number sum
0x0F	0x04L	Display model	1	0x01= display invalid 0, 0x02= display positive number +, 0x04= turn around after crossing the bounds
0x10	0x05	（x,y）	4	Display the variable center coordinate
0x14	0x07	Switch step	2	Adjusting the step length
0x16	0x08:H	Font size	1	The point size in the x direction of the data is not selected
0x17	0x08:L	Font size	1	The point size in the Y direction of the data is not selected
0x18	0x09	Font color	2	Data color not selected
0x1A	0x0A:H	Font size	1	The point size in the x direction of the data is selected
0x1B	0x0A:L	Font size	1	The point size in the Y direction of the data is selected
0x1C	0x0B	Font color	2	Data color selected
0x1E	0x0C	0000		Reserve write 0x0000

7.3.4.2 Setting instructions of data window software



Refer to the instruction above

7.3.4.3 Examples of text scrolling application instructions

5A A5 05 82 5652 *0064*

5652: variable address;

0064: writes data 100 to the variable .

7.3.4.4 Display effect of data window

7.3.5 RTC display (0x12)

7.3.5.1 Text RTC display

7.3.5.1.1 Text RTC display instruction storage format

Text clock display function is to display calendar RTC with text in accordance with the format of user edit. The instruction storage format is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A12	2	Fixed value 0x5A12.
0x02		*SP	2	Variable description pointer.
0x04		0x000D	2	Fixed value 0x000D.
0x06	0x00	0x0000	2	0x0000
0x08	0x01	(X,Y)	4	Displays the upper-left coordinate of the string.
0x0C	0x03	Color	2	Font library color
0x0E	0x04:H	Lib_ID	1	Font library position
0x0F	0x04:L	Font size	1	Number of lattice in the x direction
0x10	0x05	String_Code	Max16	Encoding string, using RTC encoding and ASCII characters. Suppose the current time is 2012-05-02 12:00:00 Wednesday, then Y-M-D H:Q:S 0x00 will display as 2012-05-02 12:00:00 M-D W H:Q 0x00 will be displayed as 05-02 WED 12:00

The RTC codes are shown in the table.

Description	Encode	Display format
Calendar_Year	Y	2000-2099
Calendar_Month	M	01-12
Calendar_Day	D	01-31
Calendar_Hour	H	00-23
Calendar_Minute	M	00-59
Calendar_Second	S	00-59
Calendar_Week	W	SUN MON TUE WED THU FRI SAT
End of encode	0x00	

7.3.5.1.2 Setting instructions of text RTC display software

In the DGUS development software, click display control key _ text RTC display, then select the display range with the mouse box, and configure the font base, time format and other configurations in the setting menu on the right side to achieve the display of text clock. Time can be modified by RTC Settings or by using serial port instructions.

7.3.5.1.3 Examples of text RTC display application instructions

Reference system variable interface 0x10 address text RTC instruction.

7.3.5.1.4 Text RTC display effect

RTC hardware support is required for display.

7.3.5.2 RTC display of dial format

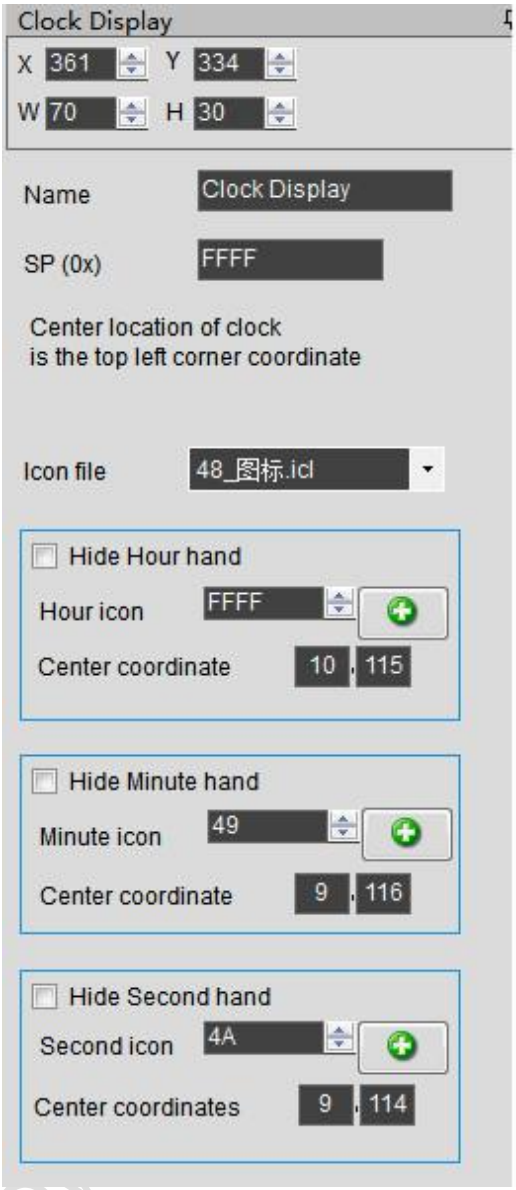
7.3.5.2.1 Dial format RTC instruction storage format

The clock display function of the dial adopts the rotation of ICON to display the Gregorian calendar RTC by the way of the dial. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A12	2	Fixed value 0x5A12.
0x02		*SP	2	Variable description pointer.
0x04		0x000D	2	Fixed value 0x000D.
0x06	0x00	0x0001	2	0x000
0x08	0x01	（X,Y）	4	The center of clock dial
0x0C	0x03	Icon_Hour	2	The ID of the pointer ICON, 0xFFFF, indicates that the hour hand is not displayed.
0x0E	0x04	Icon_Hour_Central	4	Position of rotation center of hour hand ICON.
0x12	0x06	Icon_Minute	2	The ID of the pointer ICON, 0xFFFF, indicates that the minute hand is not displayed.
0x14	0x07	Icon_Minute_Central	4	Position of rotation center of minute hand ICON.
0x18	0x09	Icon_Second	2	The ID of the pointer ICON, 0xFFFF, indicates that the second hand is not displayed.
0x1A	0x0A	Icon_Second_Central	4	Position of rotation center of second hand ICON.
0x1E	0x0C:H	Icon_Lib	1	The ICON library ID where the pointer ICON resides
0x1F	0x0C:L	Undefined	1	Write 0x00

7.3.5.2.2 Setting instructions of dial format RTC software

In the DGUS development software, click display control key _ text RTC display, then select the display range with the mouse box, and configure the font base, time format and other configurations in the setting menu on the right side to achieve the display of text clock. Time can be modified by RTC Settings or by using serial port instructions.



Refer to the instruction above

7.3.5.2.3 examples of dial format RTC application instructions

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

5A A5 0B 82 009C 5AA5 32 0A 01 0B 0C 0D

0x009C: variable address; The address is fixed and cannot be customized. Please refer to the system variable interface table 0x9C address definition for details.

0x 5AA5: start RTC setting once, and see system variable interface table 0x9C address definition in detail;

0x32 :year, 0x0A :month, 0x01 :day, 0x0B :time, 0x0C :minute, 0x0D :second.

7.3.5.2.4 display effect of dial format RTC

RTC hardware support is required for display. Please refer to "7.3.5.1.4" for renderings.

7.3.6 HEX variable display (0x13)

7.3.6.1 HEX variable instruction storage format

HEX data display function is to display variable data in HEX interval of the ASCII characters specified by the user. Mostly used for timing displays, such as 1234 at 12:34. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A12	2	Fixed value 0x5A12.
0x02		*SP	2	Variable description pointer.
0x04		0x000D	2	Fixed value 0x000D.
0x06	0x00	0x0001	2	0x001.
0x08	0x01	（X,Y）	4	The center of clock dial
0x0C	0x03	Icon_Hour	2	The ID of the pointer ICON, 0xFFFF, indicates that the hour hand is not displayed.
0x0E	0x04	Icon_Hour_Central	4	Position of rotation center of hour hand ICON.
0x12	0x06	Icon_Minute	2	The ID of the pointer ICON, 0xFFFF, indicates that the minute hand is not displayed.
0x14	0x07	Icon_Minute_Central	4	Position of rotation center of minute hand ICON.
0x18	0x09	Icon_Second	2	The ID of the pointer ICON, 0xFFFF, indicates that the second hand is not displayed.
0x1A	0x0A	Icon_Second_Central	4	Position of rotation center of second hand ICON.
0x1E	0x0C:H	Icon_Lib	1	The ICON library ID where the pointer ICON resides
0x1F	0x0C:L	Undefined	1	Write 0x00

7.3.6.2 HEX variable software setting instructions

The encoded string is used to combine with the variable data to the display of client needed format. After each BCD code is displayed, an ASCII character is taken out from the encoded string by order to be displayed at intervals.

0x00 means invalid, this character is not displayed and the two BCD codes will be joined.

0x0D means newline display.

Suppose that ":::" is entered in the encoding string, after conversion, the hexadecimal data is 3A3A3A.

Assuming the variable is 0x01210224, the final output displays 01:21:02:24.

As shown in the figure below.

7.3.6.3 Examples of HEX variable application instructions

5A A5 07 82 5434 10 11 12 13

0x5434 variable address;

0x10 11 12 13: BCD (HEX) code.

7.3.6.4 Display effect of HEX variables

7.4 Graphics variables

7.4.1 Real-time curve (trend chart) display (0x20)

7.4.1.1 Real-time curve instruction storage format

The real-time curve (trend graph) display function combines the 0x84 instruction to write curve buffer data to automatically match the displayed real-time curve (trend graph). You can specify the display area, the center axis coordinates, display scale (zoom in/out) controllable. The format of the instruction store for this function is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A20	2	Fixed value 0x5A20.
0x02		*SP	2	Variable description pointer.
0x04		0x000A	2	Fixed value 0x000A.
0x06	0x00	0x0000	2	Undefined
0x08	0x01	xs,Ys xe,Ye	8	The upper-left coordinate of the curve window (xs,Ys) and the lower-right coordinate (xe,Ye). Curve overstepping will not be shown.
0x10	0x05	Y_Central	2	Center axis position of curve
0x12	0x06	VD_Central	2	The curve data value corresponding to the central axis is generally half of the sum of the maximum and minimum values of the data.
0x14	0x07	Color	2	Curve color
0x16	0x08	MUL_Y	2	Vertical axis magnification in 1/256, 0x0000-0x7FFF.
0x18	0x09:H	CHANEL	1	Data source channel, 0x00-0x07
0x19	0x09:L	Dis_HOR	1	Horizontal axis interval, 0x01-0xFF.

7.4.1.2 Setting instructions of the real-time curve software

In the DGUS development software, click the display control key _ dynamic curve, then select the display range with the mouse box, and configure the curve color and data source channel in the setting menu on the right side to achieve this function.

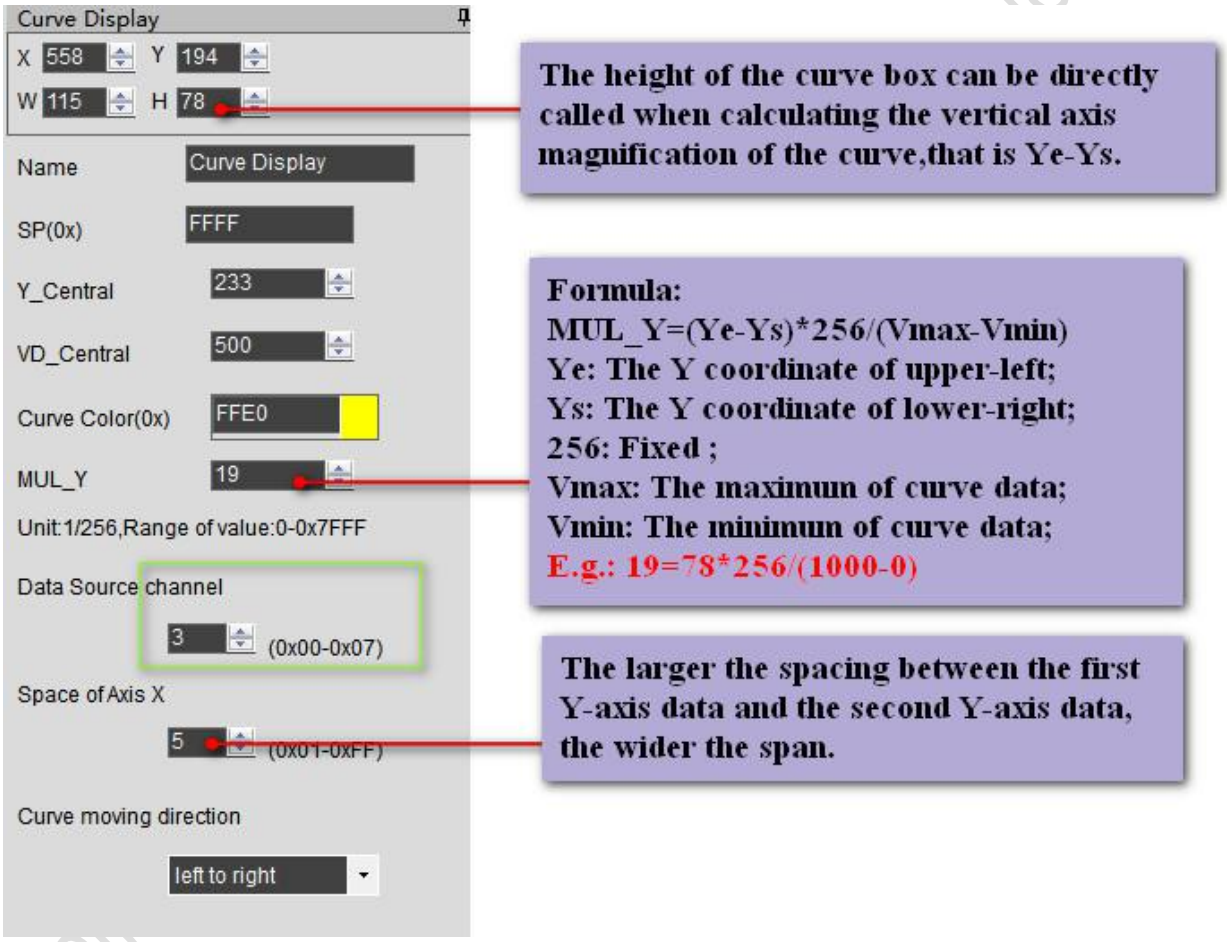
If you need to ***display a thick curve line***, you can put multiple curve variables that have been shifted up and down (Y-axis) in the same position and refer to the same data source. That is, CtrlC and CtrlV ,copy a set curve box, click the copied curve box, hold down the up and down key of the keyboard, and then move one pixel up and down. The more times of operation, the thicker the curve, and other set parameters do not need to be changed.

Note: configuration with use of touch buttons

If the variable description content is stored in the data storage space (*SP specified storage location),

(1) Combined with incremental touch control, adjust the low byte access position of +0x09 to achieve automatic curve scaling without user code intervention;

(2) Combined with dragging the touch, adjust +0x05 to change the value of Y_Central to move the curve up and down without user code intervention.



7.4.1.3 Examples of real-time curve application instructions

Real-time curve system variable interface address definition.

System read and write addresses	Description
0x300-0x30F：	State feedback of 8 channel curve buffers (Recommended to read only), 2 words per channel, ***High word:*** the pointer position of storage curve data (0x0000-0x07ff), ***Low word:*** the valid data length of storage curve buffer(0x0000-0x0800), ***Writing0x0000*** : will cause the curve to not display .0x0000 is the effective data length of the curve buffer. ***Example:*** 5A A5, 05, 82, 0301, 0000 curve 0 channel will not display the curve, and it will recover if some value is written again.
0x310-0x311	Curve buffer data write started. D3: D2:0x5AA5 starts a curve buffer data write operation, and the CPU operation is cleared to zero. D1: the number of data blocks, 0x01-0x08. D0: undefined, write 0x00.
0x312-0x37F	The data block to write to the curve buffer is 16 bits unsigned. A single data block: data channel ID (0x00-0x07) + data word length (0x01-0x6E) + data.

(1) The 0x00 channel displays data 0 and 1000.

5AA5 0D 82 ***0310*** 5AA5 ***0100*** 0002 ***0000*** 03E8

0310: curve buffer data write start, system variable hardware interface curve fixed address;

5AA5: start a curve buffer data write operation once, and the CPU operation is cleared to zero;

0100: high byte 0x01means the number of curve data blocks occupies several channels, low byte 0x00 undefined;

0002: high byte 0x00 means 0 channel, low byte 0x02 means the number of data word length, here is two word length data, namely 0x0000, 0x03E8;

0000: display data 0,

03E8: display data 1000.

(2) The 0x06 channel displays data 0 and 1000.

5AA5 0D 82 0310 5AA5 0100 0602 0000 03E8

(3) The 0x07 channel displays data 0 and 1000.

5AA5 0D 82 0310 5AA5 0100 0702 0000 03E8

(4) The 0x00 and 0x07 channel displays data 0 and 1000.

5AA5 12 82 0310 5AA5 0100 0002 0000 03E8 0702 0000 03E8

(5) The 0x06 and 0x07 channels display two intersecting curves and display them from right to left.

Instruction 1: 5AA5 12 82 0310 5AA5 0100 0602 0000 03E8 0702 03E8 0000

The maximum and minimum values of the two curves are set opposite to each other, so that the curve box can be displayed intersectionally in the middle to see the effect.

Instruction 2: 5AA5 12 82 0310 5AA5 0200 0602 0064 01F4 0702 01F4 0064

Meaning: the software displays from left to right in the first setting screen from right to left. When the curve box is filled, write instruction 2, and then the curve will be displayed from right to left.

(6) **0x00-0x07 all 8 channels are displayed together.**

5A A5 37 82 0310 5AA5 0800 0002 0000 03E8 0102 0000 03E8 0202 0000 03E8 0302 0000 03E8 0402 0000 03E80502 0000 03E80602 0000 03E80702 0000 03E8

T5DGUS curve shows 8 channels, each channel can store 2048 words, Dynamic curve display start at 0x1000 and create a data buffer for each curve according to 2Kwords per channel.

CH0 buffer	CH1 buffer	CH2 buffer	CH3 buffer
0x1000-0x17FF	0x1800-0x1FFF	0x2000-0x27FF	0x2800-0x2FFF
CH4 buffer	CH5 buffer	CH6 buffer	CH7 buffer
0x3000-0x37FF	0x3800-0x3FFF	0x4000-0x47FF	0x4800-0x4FFF

The unused curve buffer can be used as the user variable area.

Users can also directly overwrite the curve buffer,

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

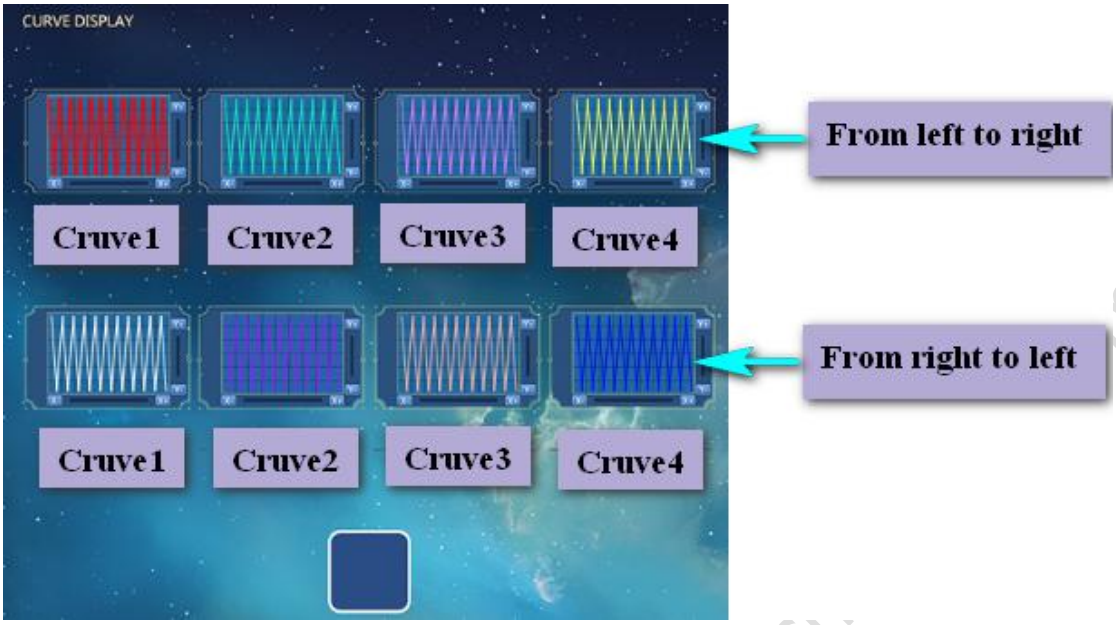
If the user needs eight channels, the variable addresses and description Pointers for other display controls are used from 0x5000~0xFFFF.

(7) Example of real - time curve description pointer

The description pointer storage address format for this feature is shown in table red. Here are some examples of common access instructions:

SP offset	Serial port send instruction (the example SP is set to 0x8000)	Instruction 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 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 is generally taken as half of the sum of the maximum and minimum values of the data. Here with instructions to 0 ` 200 range, for example, (need to cooperate with 0 x08 pointer address right after the modification of the corresponding magnification).
0x07	5A A5 05 82 8007 F800	The color of the curve changes to red.
0x08	5A A5 05 82 8008 00F0	Modify the vertical axis magnification in 1/256, 0x0000-0x7FFF. (need to be used with a 0x06 pointer).
0x09:H		Data source channel, 0x00-0x07.
0x09:L	5A A5 05 82 8009 0014	Change horizontal axis interval (curve horizontal scaling) : displays the curve of channel 00 with a horizontal axis interval of 0x14 (range 0x01-0xFF).

7.4.1.4 Real-time curve display effect



7.4.2 Basic graphics display (0x21)

7.4.2.1 Basic graphics instruction storage format

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 variable memory pointed by *VP. The user realizes different drawing functions by changing the data in the variable memory. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A21	2	Fixed value 0x5A21.
0x02		*SP	2	Variable description pointer.
0x04		0x0008	2	Fixed value 0x0008.
0x06	0x00	*VP	2	Undefined
0x08	0x01	Area	8	The upper-left and lower-right coordinates of the drawing display area; Drawing out of bounds will not show. Only valid for 0x0001-0x0005, 0x0009, 0x000A, 0x000B instructions.
0x10	0x05:H	Dashed_Line_En	1	0x5A: the drawing instruction using line segment (0x02, 0x03, 0x09, 0x0A instruction) will display the line segment using a dotted line; Other: drawing instructions using line segments use solid lines to display line segments.
0x11	0x05:L	Dash_Set	4	The four bytes are set in the dotted format: The number of solid lines in the first paragraph, the number of dotted lines in the first paragraph, the number of solid lines in the second paragraph, and the number of dotted lines in the second paragraph. For example, setting 0x10 0x04 0x10 0x04 will display the dotted line;

				Setting 0x10 0x04 0x02 0x04 will display the dot underscore.
0x15	0x07	Undefined	13	Write 0x00

The variable data format that the variable data pointer points to is shown in the table.

Address	Definition	Description
VP	CMD	Drawing command
VP+1	Data_Pack_Num_Max	Maximum packet data: line instruction (0x0002), defined as the number of line (vertex count -1)
VP+2	DATA_Pack	Data

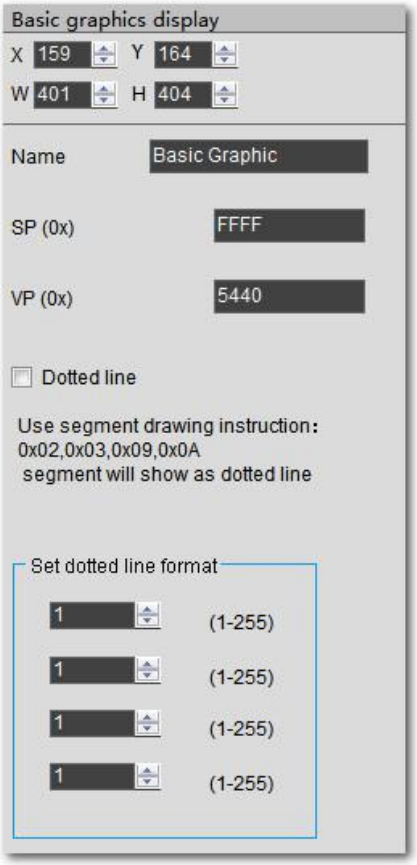
The drawing instruction packet description is shown in the table.

CMD	Operation	Drawing packet format specification (relative address and length in word)			
		relative address	Length	Definition	Description
0x0001	Set point	0x00	2	(x,y)	Set point coordinate position, x coordinate high byte is the judgment condition.
		0x02	1	Color	Point color
0x0002	Endpoint line	0x00	1	Color	Line color
		0x01	2	(x,y)0	The 0 coordinate of the front vertex , x - coordinate high byte as a criterion.
		0x03	2	(x,y)1	The 1 coordinate of the front vertex, x - coordinate high byte as a criterion.
		0x01+2*n	2	(x,y)n	The n coordinate of the front vertex, x - coordinate high byte as a criterion.
0x0003	Rectangle	0x00	2	(x,y)s	Rectangle box upper left coordinates, x - coordinate high byte as a criterion.
		0x02	2	(x,y)e	The bottom right corner of the rectangle.
		0x04	1	Color	Rectangle color
0x0004	Rectangle fill	0x00	2	(x,y)s	Rectangle box upper left coordinates, x - coordinate high byte as a criterion.
		0x02	2	(x,y)e	The bottom right corner of the rectangle.
		0x04	1	Color	Rectangle color
0x0005	Full arc display	0x00	2	(x,y)	Center coordinates, x - coordinate high byte as a criterion.
		0x02	1	Rad	Rad
		0x03	1	Color	Arc color
0x0006	Cut and paste the picture area	0x00	1	Pic_ID	The ID of picture-cut area, x - coordinate high byte as a criterion.
		0x01	2	(x,y)s	The upper left coordinate of picture-cut area
		0x03	2	(x,y)e	The lower right coordinate of picture-cut area
		0x05	2	(x,y)	The upper left coordinate of copying the picture-cut area to current page coordinate.
0x**07	ICON	0x00	2	(x,y)	Display the coordinate, x - coordinate high byte as a criterion.

		0x02	1	ICON_ID	ICON ID,The icon library location is specified by the instruction high byte,Icon fixed to not show background color.
0x0008	Area fill	0x00	2	(x,y)	Seed point coordinates, x - coordinate high byte as a criterion.
		0x02	1	Color	Fill color
0x0009	Spectrum display (vertical lines)	0x00	1	Color0	
		0x01	3	x0,Y0s,Y0e	
0x000D	Rectangle xOR	0x00	2	(x,y)s	Rectangle area upper left coordinate, x - coordinate high byte as a criterion.
		0x02	2	(x,y)e	Rectangle area lower right coordinate.
		0x04	1	Color	Rectangle area xOR color,0xFFFF will reverse the color operation

7.4.2.2 Setting instructions of basic graphics software

In the DGUS development software, click the display control key _ basic graphic display, then select the display area with the mouse box on the page that wants to display the board, and define the variable address and so on in the setting menu on the right side. Finally, the drawing can be realized by using the serial port instruction.



Refer to the instruction above

7.4.2.3 Examples of basic graphics application instructions

7.4.2.3.1 Spot

(1) Display a red dot

5AA5 0F 82 5440 0001 0001 0168 0168 F800 FF00

5440:variable address;

0001: draw a dot;

0001: number of points;

0168:0168 (360,360) coordinates;

F800: color value;

FF00: end.

(2) Display two red dots

5A A5 15 82 5440 0001 0002 0168 0168 F800 0169 0169 F800 FF00

5440 variable address;

0001: draw a dot;

0002: number of points;

0168 0168 :(360,360) coordinates, F800 color value;

0169 0169 :(361,361) coordinates, F800 color value;

0x FF00: end.

(3) Display three red dots

5A A5 19 82 5440 0001 0003 0168 0168F800 0169 0169 F800 016A 016A F800 FF00

5440 variable address;

0001: draw a dot;

0003: number of points;

0168 0168:(360,360) coordinates; F800 color value;

0169 0169 :(361,361) coordinate, F800 color value;

016A 016A :(362,362) coordinates, F800 color value;

FF00: end.

7.4.2.3.2 Endpoint connection

(1)The two endpoints are joined into a line

5A A5 13 82 5440 0002 0001 F800 00FC 0168 015E 0168 FF00

5440 variable address;

0002: draw line segment;

0001: number of continuous line;

F800: color value;

00FC 0168 :(252,360) coordinates;

015E 0168 :(350,360) coordinates;

FF00: end .

(2) Three endpoints are connected into a line

5A A5 17 82 5440 0002 0002 F800 00FC 0168 015E 0168 015E 0136 FF00

5440 variable address;
0002: draw line segment;
0002: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
FF00: end.

(3)Four endpoints are connected as a line

5A A5 1B 82 5440 0002 0003 F800 00FC 0168 015E 0168 015E 0136 0190 0136 FF00
5440 variable address;
0002: draw line segment;
0003: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(350,310) coordinates;
FF00: end.

(4)Five endpoints are connected into a line

5A A5 1F 82 5440 0002 0004 F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 FF00
5440 variable address;
0002: draw line segment;
0004: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(350,310) coordinates;
0190 0168 :(400,360) coordinates;
FF00: end.

(5)Six endpoints are connected into a line

5A A5 23 82 5440 0002 0005 F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 01C2 0168 FF00
5440 variable address;
0002: draw line segment;
0005: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(400,310) coordinates;

0190 0168 :(400,360) coordinates;
01C2 0168 :(450, 360) coordinates;
FF00: end.

(5) ***Seven endpoints are connected into a line***
5A A5 27 82 5440 0002 0006 F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 01C2 0168 01C2 0136 FF00
5440 variable address;
0002: draw line segment;
0006: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(400,310) coordinates;
0190 0168 :(400,360) coordinates;
01C2 0168 :(450, 360) coordinates;
01C2 0136 :(450,310) coordinates;
0xFF00: drawing operation ends.

(6) ***Eight endpoints are connected into a line***
5A A5 2B 82 5440 0002 0007F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 01C2 0168 01C2 0136 01F4 0136 FF00
5440 variable address;
0002: draw line segment;
0006: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(400,310) coordinates;
0190 0168 :(400,360) coordinates;
01C2 0168 :(450, 360) coordinates;
01C2 0136 :(450,310) coordinates;
01F4 0136 :(500,310) coordinates;
0xFF00: drawing operation ends.

(7) ***Nine endpoints are connected into a line***
5A A5 2F 82 5440 0002 0007F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 01C2 0168 01C2 0136 01F4 0136 01F4 0168FF00
5440 variable address;
0002: draw line segment;
0006: number of continuous lines;
F800: color value;

00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(400,310) coordinates;
0190 0168 :(400,360) coordinates;
01C2 0168 :(450, 360) coordinates;
01C2 0136 :(450,310) coordinates;
01F4 0136 :(500,310) coordinates;
01F4 0168 :(500,360) coordinates;
0xFF00: drawing operation ends.

(8) ***Ten endpoints are connected into a line***

5A A5 33 82 5440 0002 0007F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 01C2 0168 01C2 0136 01F4 0136 01F4 0168 0226 0168FF00

5440 variable address;
0002: draw line segment;
0006: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(400,310) coordinates;
0190 0168 :(400,360) coordinates;
01C2 0168 :(450, 360) coordinates;
01C2 0136 :(450,310) coordinates;
01F4 0136 :(500,310) coordinates;
01F4 0168 :(500,360) coordinates;
0226 0168 :(550,360) coordinates;
0xFF00: drawing operation ends.

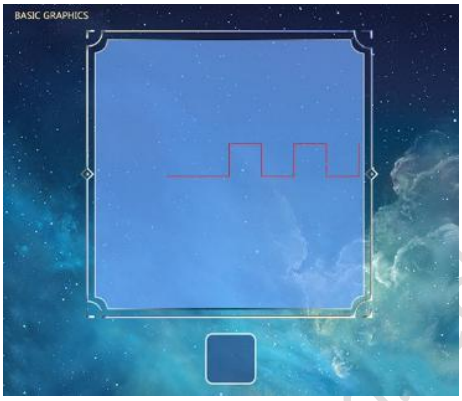
(9) ***Eleven endpoints are connected into a line***

5A A5 37 82 5440 0002 0007F800 00FC 0168 015E 0168 015E 0136 0190 0136 0190 0168 01C2 0168 01C2 0136 01F4 0136 01F4 0168 0226 0168 0226 0136FF00

5440 variable address;
0002: draw line segment;
0006: number of continuous lines;
F800: color value;
00FC 0168 :(252,360) coordinates;
015E 0168 :(350,360) coordinates;
015E 0136 :(350,310) coordinates;
0190 0136 :(400,310) coordinates;
0190 0168 :(400,360) coordinates;
01C2 0168 :(450, 360) coordinates;
01C2 0136 :(450,310) coordinates;

01F4 0136 :(500,310) coordinates;
01F4 0168 :(500,360) coordinates;
0226 0168 :(550,360) coordinates;
0226 0136 :(550,310) coordinates;
0xFF00: drawing operation ends.

Display effect :



7.4.2.3.3 Rectangle

(1)Display a rectangle

5A A5 13 82 5440 0003 0001 011E 012C 01AA 018C F800 FF00
5440 variable address;
0003: draw a rectangle;
0001: draw a rectangle;
011E 012C :(286,300) upper left coordinate;
01AA 018C :(426,396) lower right coordinate;
F800: color;
FF00: end.

(2)Display two rectangles

5A A5 1D 82 5440 0003 0002 011E 012C 01AA 018C F800 01AB 018D 01E6 01E6 F800 FF00
5440 variable address;
0003: draw a rectangle;
0002: draw two rectangles;
011E012C :(286,300) upper left coordinate;
01AA 018C :(426,396) lower right coordinate; F800 color;
01AB 018D :(427,397) upper left coordinate;
01E6 01E6 :(486,486) lower right coordinate; 800 color;
FF00: end .

(4) Display three rectangles

5A A5 27 82 5440 0003 0003 011E 012C 01AA 018C F800 01AB 018D 01E6 01E6 F800 01E6 01E6 0162 022C F800 FF00

5440 variable address;

0003: draw a rectangle;

0003: draw three rectangles;

011E012C :(286,300) upper left coordinate;

01AA 018C :(426,96) lower right coordinate; 0x F800 color;

01AB 018D :(426,96) upper left coordinate;

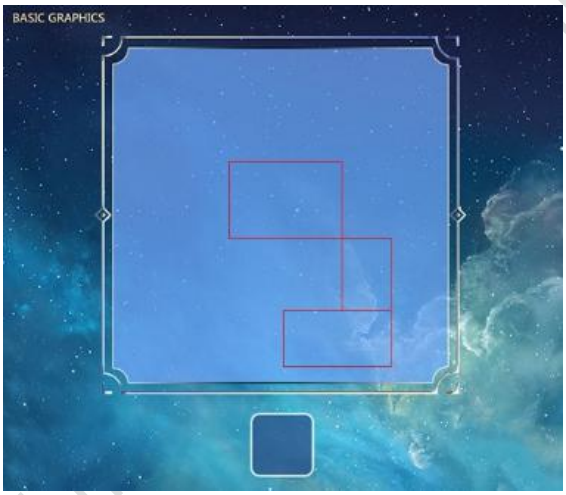
01E6 01E6 :(486,486) upper right coordinate; 0x F800 color;

01E6 01E6 :(486,486) upper left coordinate;

0162 022C :(354,556) lower right coordinate; 0 xF800 color;

FF00: end.

Display effect :



7.4.2.3.4 Rectangle fill

(1) Fill one rectangle

5AA5 13 82 5400 0004 0001 011E 012C 01AA 018C F800 FF00

5400: Variable address;

0004: Rectangle fill;

0001: Fill one rectangle;

011E 012C:（286，300）:Upper left coordinate；

01AA 018C:（426，396）: Lower right coordinate;

F800: color;

FF00: End;

(2) Fill two rectangles

5AA5 1D 82 5400 0004 0002 011E 012C 01AA 018C F800 01AB 018D 01E6 01E6 F800 FF00

5400: Variable address;

0004: Rectangle fill;

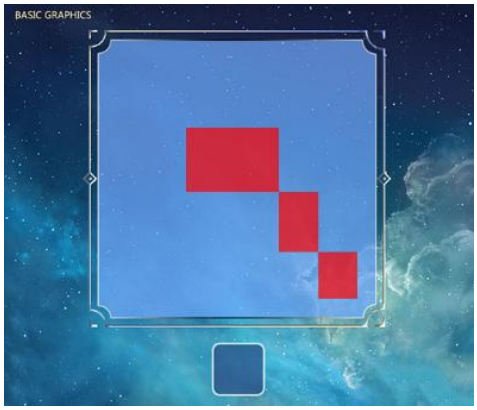
0002: Fill two rectangles;

011E 012C:（286，300）:Upper left coordinate；
01AA 018C:（426，396）: Lower right coordinate;
01AB 018D（427,97）:Upper left coordinate；
01E6 01E6（486,486）:Lower right coordinate;
F800: color;
FF00: End；

(3) Fill three rectangles

5A A5 27 82 5440 0004 0003 011E 012C 01AA 018C F800 01AB 018D 01E6 01E6 F800 01E6 01E60221 022C F800 FF00
5400: Variable address;
0004: Rectangle fill;
0003: Fill three rectangles;
011E 012C:（286，300）:Upper left coordinate；
01AA 018C:（426，396）: Lower right coordinate;
01AB 018D（427,97）:Upper left coordinate；
01E6 01E6（486,486）:Lower right coordinate;
01E6 01E6（486,486）:Upper left coordinate；
0221 022C（545,556）:Lower right coordinate;
F800: color;
FF00: End；

Display effect:



7.4.2.3.5 Circle

Draw a circle (V14 kernel version is not supported)
5A A5 11 82 5440 0005 0001 0168 0168 0030 F800 FF00

5440 :variable address;
0005 :draw circle;
0001 :draw one circle;
0168 0168（360,260）:center coordinates ;
0030: center radius;
F800: color;
FF00: end.

7.4.2.3.6 Copy and paste pictures

This instruction is used frequently and can be used for the clipping display of the progress bar.

5A A5 17 82 5440 0006 0001 0000 0021 0027 00A3 0040 0168 0168 FF00
5440: variable address;
0006: picture copy and paste;
0001: cut a region;
0000: cut page 0;
0021 0027 (33, 39):upper left coordinate of page 0;
00A3 0040 (163,64) :lower right coordinate of page 0;
0168 0168 (360,360):paste into the current page coordinates;
0xFF00 :end.

Display effect:

7.4.2.3.7 ICON display

Display call icon (V14 kernel version is not supported)
5A A5 0D 82 9010 **070001 0168 0168 30 00
0x5A A5 frame header; 0D data length; 82 write instructions; Variable address;

7.4.2.3.8 Spectrum display

(1)Display a spectrum (V14 kernel version is not supported)
5AA5 11 82 5440 0009 0001 F800 0168 0168 0190 FF00
5440: variable address;
0009: spectrum display;
0001: display a spectrum;

F800: color;
0168: x0 coordinates,
0168: Y0s starting coordinate;
0190: Y0e ending coordinate;
FF00: end.

(2)Display two spectrums

5A A5 19 82 5440 0009 0002 F800 0168 0168 0190 F800 0190 0168 01C2 FF00
5440: variable address;
0009: spectrum display;
0002: display two spectrums;
F800 color; 0168 (360) x0 coordinate, 0168 (360) Y0s start coordinate; 0190 (400) Y0e end coordinate;
F800 color; 0190 (400) x1 coordinate; 0168 (360) Y1s start coordinate; 01C2 (450) Y1e end coordinate;
FF00: end.

(3)Display three spectrums

5A A5 21 82 5440 0009 0003 F800 0168 0168 0190 F800 0190 0168 01C2 F800 01C2 0168 01F4 FF00
5440: variable address;
0009: spectrum display;
0003: display three spectrums;
F800 color; 0168 (360) x0 coordinate; 0168 (360) Y0s start coordinate; 0190 (400) Y0e end coordinate;
F800 color; 0190 (400) x1 coordinate; 0168 (360) Y1s start coordinate; 01C2 (450) Y1e end coordinate;
F800 color; 01C2 (450) x2 coordinate; 0168 (360) Y2s start coordinate; 01F4 (500) Y2e end coordinate;
FF00: end.

(4)Display four spectrums

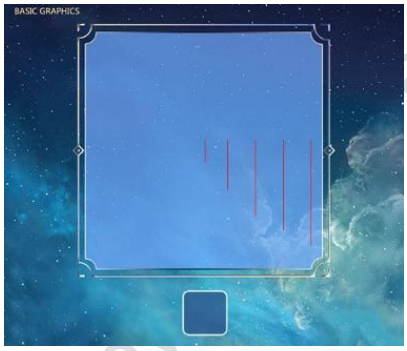
5A A5 29 82 5440 0009 0004 F800 0168 0168 0190 F800 0190 0168 01C2 F800 01C2 0168 01F4 F800 01F4 0168 020D FF00
5440: variable address;
0009: spectrum display;
0004: display four spectrums;
F800 color; 0168 (360) x0 coordinate; 0168 (360) Y0s start coordinate; 0190 (400) Y0e end coordinate;
F800 color; 0190 (400) x1 coordinate; 0168 (360) Y1s start coordinate; 01C2 (450) Y1e end coordinate;
F800 color; 01C2 (450) x2coordinate; 0168(360) Y2s Start coordinate; 01F4 (500) Y2e end coordinate;
F800 color; 01F4 (500) x3coordinate; 0168 (360) Y3s Start coordinate; 020D (525) Y3e end coordinate;
FF00: end.

(5)Display five spectrums

5A A5 31 82 5440 0009 0004 F800 0168 0168 0190 F800 0190 0168 01C2 F800 01C2 0168 01F4 F800 01F4 0168 020D F800 0226 0168 0226 FF00
5440: variable address;
0009: spectrum display;

0004: display four spectrums;
F800 color; 0168 (360) x0 coordinate; 0168 (360) Y0s start coordinate; 0190 (400) Y0e end coordinate;
F800 color; 0190 (400) x1 coordinate; 0168 (360) Y1s start coordinate; 01C2 (450) Y1e end coordinate;
F800 color; 01C2 (450) x2coordinate; 0168(360) Y2s Start coordinate; 01F4 (500) Y2e end coordinate;
F800 color; 01F4 (500) x3coordinate; 0168 (360) Y3s Start coordinate; 020D (525) Y3e end coordinate;
F800 color; 0226(550) x4coordinate; 0168 (360) Y4s Start coordinate; 0226 (550) Y4e end coordinate;
FF00: end.
Y0s and Y0e can be the same.

Display effect:



7.4.2.3.9 Line segment display

(1) Display a line segment

5A A5 13 82 5440 000A 0001 F800 0168 0168 0190 0168 FF00
5440: variable address;
000A: draw line segment;
0001: draw a line segment;
F800 color;
0168 0168 (360,360): Coordinate;0190 0168 (400,360): Coordinate;
FF00: end.

(2) Display two line segments

5A A5 1D 82 5440 000A 0001 F800 0168 0168 0190 0168 F800 0168 0190 01C2 0190 FF00
5440: variable address;
000A: draw line segment;
0002: draw two line segments;
F800 color;
0168 0168 (360,360): Coordinate;0190 0168 (400,360): Coordinate;

0168 0190 (360,400): Coordinate;01C2 0190 (450,400): Coordinate;
FF00: end.

(3) Display three line segments

5A A5 1D 82 5440 000A 0001 F800 0168 0168 0190 0168 F800 0168 0190 01C2 0190 F800 0168 01C2 01F4 01C2 FF00
5440: variable address;
000A: draw line segment;
0003: draw three line segments;
F800: color;
0168 0168 (360,360): Coordinate;0190 0168 (400,360): Coordinate;
0168 0190 (360,400): Coordinate;01C2 0190 (450,400): Coordinate;
0168 01C2 (360,450): Coordinate;01F4 01C2 (500,450): Coordinate;
FF00: end.

(4) Display four line segments

5A A5 1D 82 5440 000A 0001 F800 0168 0168 0190 0168 F800 0168 0190 01C2 0190 F800 0168 01C2 01F4 01C2 F800 0168 01F4 0226 01F4FF00
5440: variable address;
000A: draw line segment;
0004: draw four line segments;
F800: color;
0168 0168 (360,360): Coordinate;0190 0168 (400,360): Coordinate;
0168 0190 (360,400): Coordinate;01C2 0190 (450,400): Coordinate;
0168 01C2 (360,450): Coordinate;01F4 01C2 (500,450): Coordinate;
0168 01F4 (360,500): Coordinate;0226 01F4 (550,500): Coordinate;
FF00: end.

Display effect:

7.4.2.3.10 Rectangle xOR, highlight the inverted color display

(1)Rectangle field xOR, highlight inverted color once

5A A5 13 82 5440 000D 0001 0168 0168 0190 0190 F800 FF00

5440: variable address;

000D: rectangle domain xOR;

0001: rectangle xOR once;

0168 0168 (360,360) coordinate;0190 0190 (400,400) coordinate;

F800: color;

FF00:end.

(2)Rectangle field xOR, highlight inverted color twice

5A A5 13 82 5440 000D 0001 0168 0168 0190 0190 F800 0190 0190 01C2 01C2 F800 FF00

5440: variable address;

000D: rectangle domain xOR;

0002: rectangle xOR twice;

0168 0168 (360,360) coordinate;0190 0190 (400,400) coordinate;

0190 0190 (400,400) coordinate;01C2 01C2(450,450) coordinate;

F800: color;

FF00:end.

(3)Rectangle field xOR, highlight inverted color thrice

5A A5 13 82 5440 000D 0001 0168 0168 0190 0190 F800 0190 0190 01C2 01C2 F800 01C2 01C2 01F4 01F4 F800 FF00

5440: variable address;

000D: rectangle domain xOR;

0003: rectangle xOR thrice;

0168 0168 (360,360) coordinate;0190 0190 (400,400) coordinate;

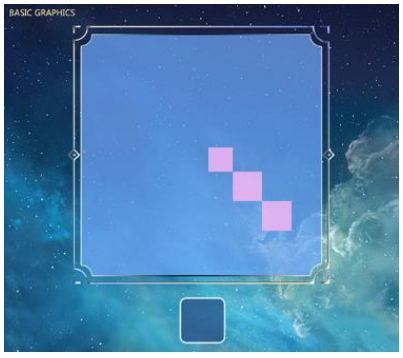
0190 0190 (400,400) coordinate;01C2 01C2(450,450) coordinate;

01C2 01C2(450,450) coordinate;01F4 01F4(500,500) coordinate;

F800:color;

FF00:end.

Display effect:



7.4.3 Area scroll display (0x24)

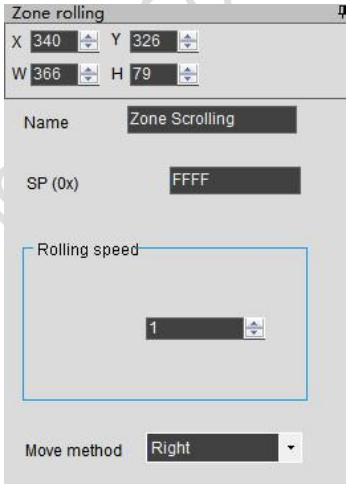
7.4.3.1 Storage format of regional scrolling instruction

Area scrolling is to move the content of the specified area around, the direction of movement can be set. Usually used to realize a simple screen above the flow chart, progress bar and other dynamic operation effect. Variable addresses are handled by the underlying system and are not set by the user. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A24	2	Fixed value 0x5A24.
0x02		*SP	2	Variable description pointer.
0x04		0x0007	2	Fixed value 0x0007.
0x06	0x00	*VP	2	Variable point
0x08	0x01	(x_start,y_start)	4	Upper left starting display position
0x0C	0x03	(x_end,y_end)	2	Lower right starting display position
0x10	0x05	Speed	2	Scrolling speed
0x12	0x06_H	Move_way	1	Rolling way 0x00= left shift, 0x01= right shift, 0x02= up shift, 0x03= down shift

7.4.3.2 Setting instructions of regional scrolling software

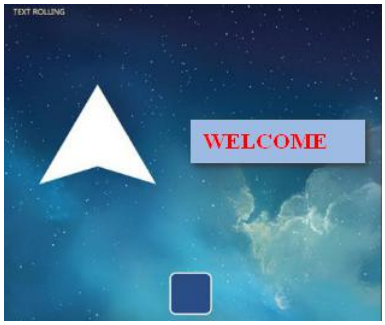
In the DGUS development software, click display control key _ area scroll display, then select the display range with the mouse box, and set the scroll speed on the right side to achieve the area scroll display.



7.4.3.3 Examples of regional scrolling application instructions

Variables are held by the system and should not be used by the user.

7.4.3.4 Area scrolling display effect



7.4.4 Qr code display (0x25)

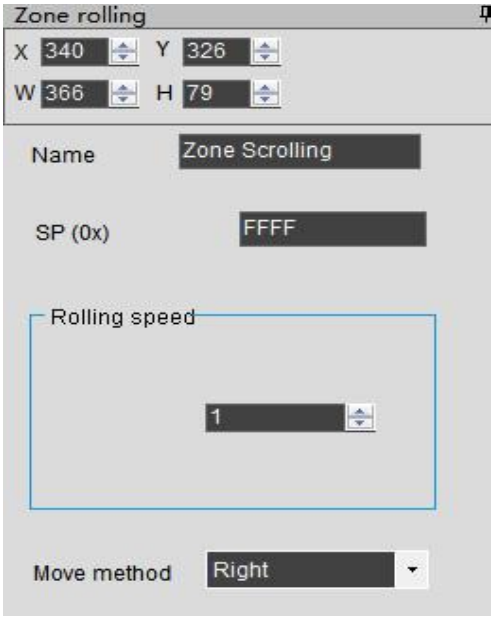
7.4.4.1 Qr code instruction storage format

Qr code display function is based on the specified content on the screen to display the specified two-dimensional code graphics. The format of its instruction storage is shown in the table.

Address	SP offset	Definition	Data length	Description
0x00		0x5A25	2	Fixed value 0x5A25.
0x02		*SP	2	Variable description pointer.
0x04		0x0004	2	Fixed value 0x0004.
0x06	0x00	*VP	2	Qr code display content pointer. The maximum qr code content is 458Bytes,0x0000 or 0xFFFF as the end character.
0x08	0x01	(x,y)	4	The coordinate position of the upper left corner displayed by the qr code. Qr code graphics are available in 45*45 pixels (data less than 155 bytes) and 73*73 pixels (data less than 459Bytes).
0x0C	0x03	Unit_Pixels	2	The physical pixel lattice size occupied by each Qr code cell pixel is 0x01-0x07. Set Unit_Pixels=4, then each cell pixel will be displayed as 4*4 pixels.
0x0B-0x1F		Undefined	18	0x00

7.4.4.2 Qr code instruction software setting

In the DGUS development software, click the display control key _QR display, then select the display range with the mouse box, and configure the variable address and the physical pixel size of each Qr code unit pixel in the setting menu on the right side to achieve Qr code display.



7.4.4.3 Examples of Qr code application instructions

Send instructions to display the Url http://www.dwin.com.cn/ scan and open the site by WeChat.

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

5AA5: frame header;

1C: data length;

82: write instructions;

5240: variable address;

68 74 74 70 3A 2F 2F 77 77 77 2E 64 77 69 6E 2E 63 6F 6D 2E 63 6E 2F: ASCII code of the address;

FFFF:end.

7.4.4.4 Display effect of Qr code instructions

Appendix 1: T5LDGUS screen FAQ

(1)After downloading the DWIN_SET image, it shows a black screen (with only faint light).

Answer : The kernel firmware version from T5L_UI_TA_V10.bin to T5L_UI_TA_V11.bin adds the function of the background image space customizable by CFG file. The original first batch of users did not configure the correct CFG file, Background image. Icl file is not loaded and therefore black screen.

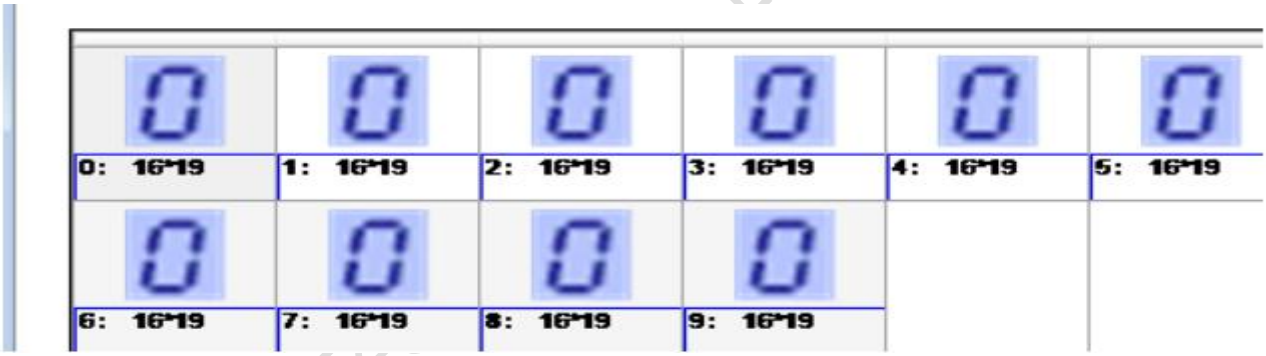
(2)Only one image is shown in black.

Answer : For the T5L1 CPU platform, a single JPG image file size should not exceed 256KB, and for the T5L2 CPU not exceed 768KB. Because the complexity of image display is inconsistent, especially high resolution, JPG images may be larger than 256KB, so the user needs to lower the JPG image quality percentage slightly. Using the latest PC version of the tool software conversion, over the size will be prompted.

(3)The data variable displays 05 instead of 5, fill 0 in the front.

Method 1: the data variable itself does not have this function, using ASCII code instead of text display control;

Method 2: art-word variable right-aligned, add a icon in the lower limit on the left upper limit corresponding to 0 to 10, with 0-9 points to icon when 0 little pictures, is nine small image content writing 0 generated ICO icon file, when the address values for 10 icon controls address points to ten empty icon is not displayed, you can swallow the 0. The advantage of this method is that there is no need to send additional instruction code, and the trouble for customers is that they only need to do 0-9 icon display art-word.



Method 3: the integer type can be used to display the control Settings in the data window. The control address should be set to double words, low word bit reserved set to invalid 0. In order to make the upper and lower redundant data not to be displayed, the display Settings of the unselected data can be consistent with the base image.

(4)How to make progress bar display?

Method 1: e.g., 0-100 make 100 ICONS, 0 lower limit, 100 upper limit, resolve by using the icon (T5L DGUS screen maximum 1023x1023 support icon). If the scale needs to be accurate, it will need artists to do a lot of pictures. The advantage of this method is that it is convenient to handle the process of making circular and fan-shaped bars.

Method 2: picture animation display, that is to say, to use the whole picture switching principle.

Method 3: cut the basic graphics and draw rectangles, that is, cut the progress bar of other pages according to the coordinates. You can also use OS to calculate coordinate scale to assist in synchronous processing display.

Appendix 2: Revision records

Data	Revise content	Ver.
2019.02.02	First Posted	V1.0
2019.03.04	Added background image space can be customized by SD card CFG file.	V1.1
2019.03.22	Added the network communication interface 0x0400, which can be directly connected to the DWIN cloud through the DWIN WiFi module.	V1.2
2019.04.10	Added the background filtering intensity setting of the icon transparent display to solve the boundary burr problem caused by JPEG low-quality compression. Added PWM0 output interface; Added the system clock frequency division output function.	V1.4
2019.04.28	Added configurable buzzer output function.	V1.5
2019.05.20	Added ICON drag manager function	V1.6

If you have any questions during the use of this document or DWIN products, or want to know more about the latest information of DWIN products, please contact us in time:
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Enterprise QQ and WeChat: 400 018 9008
Enterprise mail:dwinhmi@dwin.com.cn

Thank you for your support all the time. Your support is the driving force of our progress!
Thank you!