Intelligent display terminal

SGUS Series User Manual

Document information

information	content
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Summary	Xinruida Intelligent Display Terminal SGUS Series User Manual

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Version Information

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2016-03-14	V1.1	1.WillReserveChange toReserved	
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Explanation of common terms

noun	illustrate	Remark
This terminal terminal	Represents this smart display terminal and our company's command screen products	
X	horizontal direction(Xaxis) parameter; bit width: two bytes.	
Y	vertical direction (Yaxis) parameter; bit width: two bytes.	
Xs	Starting point horizontal direction (Xaxis) parameter; bit width: two bytes.	Used in this article_Areaexpress
Ys	Starting point vertical direction (Yaxis) parameter; bit width: two bytes.	
Xe	End point horizontal direction (Xaxis) parameter; bit width: two bytes.	
Ye	End point vertical direction (Yaxis) parameter; bit width: two bytes.	
Tx	Data received by the terminal	
RX	Data uploaded by the terminal	

Tips: 1, the horizontal direction in this document (Xaxis) and vertical direction (Yaxis), please refer to the specifications of the relevant model. 2, display terminal picture index parameters (PicID)The default bit width is two bytes 3,1Bytes =8bit

4,2Bytes =16bit

5,1word =2Bytes =16bit

Example: Intelligent display terminalXS070YorKS070YThe series display resolution is800x480

- level(Xaxis) direction coordinate parameter range:0~799【0x00 00 ~ 0x03 1F】
- vertical(Yaxis) direction coordinate parameter range:0~479【0x00 00 ~ 0x01DF】

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1, normative agreement

1.1,Data Format

Since it is mainly aimed atMCUand other embedded system applications, in order to facilitate user use and program development, the data used by the display terminal uses integers (words),

Unsigned integer (word), long integer (double word), very long integer (4characters), the relevant range of expressions is as follows:

type of data	fan surround
integer	- 32768[0x8000] ~ +32767[0x7FFF]
unsigned integer	0[0x0000] ~ 65535[0xFFFF]
long integer	- 2147483648[0x80000000] ~ +2147483647[0x7FFFFFFF]
Very long integer	- 9223372036854775808 ~ +9223372036854775807

Decimals are expressed as fixed-point decimals, and the number of decimal places is user-defined. for example0x4D2(1234), the number of decimal places is specified as2bit, means12.34.

1.2, color definition

The bit width of all color data is16bit,2bytes, the colors that can be displayed are2_{16}level color, that is65536level color; its formatRed(5bit) –

Green(6bit) – Blue(5bit), which means that the data of red parameters account for a high proportion of5bit, indicating that the data of the green parameter occupies the middle6bit, representing the data of the blue parameter

Take advantage of5bit; as shown in the table below

Bit	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
definition	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B4	B3	B2	B1	B0
	Red					Green						Blue				

Table (Appendix 1 -1) Color definition table

Example:

red	0xF800
green	0x07E0
blue	0x001F
White	0xFFFF
black	0x0000

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2, serial port description

2.1, Serial port working instructions

The display terminals all use asynchronous, full-duplex serial ports (UART) as the communication interface.

Display terminal serial port mode is8n1, that is, each data adopts10Send bitwise:1starting bit,8data bits (low-order bit first,LSB),1Bit Stop bit.

Display the terminal serial port baud rate throughTFcard configuration, the factory default baud rate is115200bps.

All instructions or data for the display terminal are in hexadecimal (HEX) format, for double-byte data or multi-byte data, always send the high word first byte, and then send the low byte. Example: You need to set the background color of the display terminal to red, and its hexadecimal (HEX)for0xF800, then send The order of sending data to the display terminal is:0xF8 0x00.

2.2, data frame structure

The display terminal data frame consists of four parts, as shown in the following table:

type of data	Frame header	Data length	instruction	data	CRCCheck Digit
Data length(Byte)	2	1	1	N	2
illustrate	CONFIG.TXTDocumentary R3:RAdefinition	Data length, including instructions, numbers data and check digit	0x80 ~ 0x84		CONFIG.TXTconfiguration fileR2.4 bit settings

surface2-1Data frame format

The maximum data length that can be transmitted in one frame of data is254bytes (excludingCRCcheck) or252bytes (includingCRCcheck). CRC The verification does not include the frame header and data length, only for instructions and data, usingCRC-16(The operator is:$X_{16}+X_{15}+X_2+1$, the initial value is0xFFFF).

When enabledCRCFrame check response [i.e.R2.4for1andRC.3for1】hour,XGThe series display terminal will be inCRCAutomatically respond to the verification status after verification,

The returned information is shown in the following table:

situation	frame data
Receive data correct hour	Frame header +02+Commands received by the terminal + 0xFF +CRCCheck value
Receive data Error hour	Frame header +02+Commands received by the terminal + 0x00 +CRCCheck value

2.3,CProgram reference routine-CRCcheck

```
static const uint16_t crc16L[] = {

    0x0000, 0xC0C1, 0xC181, 0x0140,
    0xC301, 0x03C0, 0x0280, 0xC241,
    0xC601, 0x06C0, 0x0780, 0xC741,
    0x0500, 0xC5C1, 0xC481, 0 x0440,
};

static const uint16_t crc16H[] = {
```


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```
    0x0000, 0xCC01, 0xD801, 0x1400,
    0xF001, 0x3C00, 0x2800, 0xE401,
    0xA001, 0x6C00, 0x7800, 0xB401,
    0x5000, 0x9C01, 0x8801, 0x 4400,
};

uint16_t CRC16(uint16_t BraekPoint, uint8_t *Buffer, uint32_t Length) {

    uint16_t CRCValue;
    uint8_t Dat;

    CRCValue = BraekPoint;

    while(Length--)
    {
        Dat = *Buffer++;
        Dat =^ CRCValue;
        CRCValue >>= 8;
        CRCValue  =^ crc16L[Dat & 0x0F]; =^
        CRCValue  crc16H[(Dat>>4) & 0x0F];
    }

    return CRCValue;
}
```


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3,Instruction Set

The display terminal adopts a variable-driven working mode. The working mode of the terminal isGUIThe status is completely controlled by data variables, so the user only needs to Variables can be read and written to realize the functions or states designed by the user.

List of instruction sets:

Function	instruction	data	illustrate
register	0x80	Tx:address(0x00 ~ 0xFF) +data	write register
	0x81	Tx:address(0x00 ~ 0xFF) +length(0x00 ~ 0xFF)	Read register
		RX:address(0x00 ~ 0xFF) +length + data	
	There are256BytesThe registers are mainly used for the software interface of hardware operations to byte(Byte) Address the unit.		
variable storage unit	0x82	Tx:address(0x0000 ~ 0x6FFF) +data	Write variable storage space
	0x83	Tx:address(0x0000 ~ 0x6FFF) +length(0x00 ~ 0xFF)	Read variable storage space
		RX:address(0x0000 ~ 0x6FFF) +length + data	
	There are28K Word(56K Byte)variable storage unit, mainly used forGUIVariable data storage, in Character(Word) Address the unit.		
curve buffer district	0x84	Mode+Data0+...+Datan - Mode: A byte that defines the channel arrangement order of subsequent data - ModeEach bit corresponds to one channel;Mode.0correspond0aisle,Mode.7correspond7Channel; the corresponding position is "1"Indicates that the corresponding channel data exists, which is "0"It means that the data of the corresponding channel does not exist. The data is arranged according to the low channel data first and the high channel data last. - Data: two bytes Example:Modefor0x45(01000101B), then the subsequent data format is: (channel0+aisle2+aisle6) +... + (aisle0+aisle2+aisle6)	Write curve buffer
	There is a8K wordsbuffer that can store8Curve data is used for users to display curves conveniently and quickly; the data in the curve buffer are16bit unsigned number.		

3.1, register space

The display terminal provides256Byte register interface, used for process control such as hardware operation and picture display, using0x80/0x81command to access.

The detailed definition is as follows:

address	definition	R/W	length(Byte)	illustrate
0x00	Version	R	1	Terminal version number,BCDcode
0x01	LqCy	R/W	1	LCDbacklight brightness,0x00 ~ 0x3F
0x02	BzTime	W	1	Buzzer beep control register, unit is10ms
0x03	PicIndex	R/W	2	Read: Currently displayed page index number Write: Pre-switch to the index number of the specified page
0x05	TPFlag	R/W	1	If the user does not clear this mark after reading the data, the touch coordinates will no longer be updated. 0x5A: Touch coordinates have been updated other:Touch coordinates not updated
0x06	TPStatus	R	1	0x01: Press the touch screen for the first time 0x02: Press the touch screen to end 0x03: Keep pressing

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				other:invalid
0x07	TPPosition	R	4	Touch press coordinate position:Xh Xl Yh Yl
0x0B	TPCEnable	R/W	1	0x00: Disable touch function other: Enable touch function, the default is0xFF
0x0C	RunTime	R	4	Power-on running time,BCDCode, format: hours: minutes: seconds Example:9999:59:59
0x10	R0~RC	R	13	TFCard configuration register mapping
0x1D	Config_Enable	W	1	resetR1~RCregister flags value: 0x5A — describe: R1~RCReset and save value: 0xA5 — describe: R1~RCReset but don't save
0x1E	LedLm_Now	R	1	Current backlight brightness value
0x1F	RtcComAdj	W	1	0x5AIndicates resetting the clock and clearing it after terminal execution
0x20	RtcNow	R/W	7	YY:MM:DD:WW:HH:MM:SS
0x27	Reserved	—	25	Reserved
0x40	EnLibOP	R/W	1	0x5AIndicates that the font storage unit operation is enabled and will be cleared after the terminal executes it.
0x41	LibOPMode	W	1	0xA0: Write the data of the specified font space to the variable storage space
0x42	LibID	W	1	Font index number, range0x40 ~ 0x7F
0x43	LiaAddress	W	3	The first address and range of pre-read font space0x000000 ~ 0x01FFFF
0x46	VP	W	2	The first address and range of the pre-written variable space0x0000 ~ 0x6FFF
0x48	OPLength	W	2	Pre-read data length, range0x0001 ~ 0x6FFF
0x4A	Timer0	R/W	2	Software timer0 — unit:4ms; Decrease to zero and stop
0x4C	Timer1	R/W	1	Software timer1
0x4D	Timer2	R/W	1	Software timer2
0x4E	Timer3	R/W	1	Software timer3
0x4F	KeyCode	W	1	Touch key code for departure13Touch file; valid values:0x01 ~ 0xFF;0x00Indicates invalid; the terminal will automatically clear the key code register after processing the key code.
0x50	PlayMusic	w	3	Play preset audio files; format:0x5A PlayStartID PlayNum 0x5A: Enable audio playback function PlayStartID: Index number of the starting segment of the audio file to be played PlayNum: Number of segments to play audio files
0x53	VolumeAdj	w	2	Adjust the volume of audio playback; format:0x5A VOL 0x5A: Enable audio playback volume adjustment function VOL: Pre-adjusted volume value; the volume isVOL/64, the default value is64.
0x55	Reserved	—	1	Reserved
0x56	EnDBLOP	R/W	1	0x5AIndicates that the font storage unit operation is enabled and will be cleared after the terminal executes it.
0x57	OPMode	W	1	0x50: Write the data in the variable storage space to the data storage space 0xA0: Read data from data storage space into variable storage space
0x58	DBLAddress	W	4	Database space word address,0x00000000 ~ 0x03FFFFFF,maximum64MW(128MB, depending on the kernelFlash case) database space. The database is retrieved from the physical storage space64MBStart storing, which overlaps with the picture memory space. Each1ByteDatabase memory occupied2Bytesphysical storage.
0x5C	VP	W	2	Specify the first (word) address and range of the database operation in the variable memory space.0x0000 ~ 0x6FFF

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0x5E	OPLength	W	2	Pre-read data length, range0x0001 ~ 0x6FFF
0x60	Reserved	—	139	Reserved
0xEA	TPCalTrigger	W	1	write0x5AEnable touch screen calibration and automatically clear after calibration is completed.
0xEB	TrendlineClear	W	1	Write a specially defined value to clear the corresponding curve buffer data. 0x55: Clear all8curve buffer data 0x56 ~ 0x5D: Clear separatelyCH0-CH7Curve buffer data for channel After the curve buffer data is cleared, this register will be cleared by the terminal.
0xEC	Reserved	—	twenty one	Reserved

3.2, instruction operation instructions

The default frame header information of this communication protocol is:0x5AA5[The frame header flag can be passedCONFIG.TXTin the fileR3andRARevise】 . number

The data format defaults to hexadecimal format.

3.2.1, write register instruction【0x80】

Data Format	Tx:	5AA5Length 80 Addr Data
	RX:	None [the same below]
illustrate	Length	One byte; the length of pre-sent data, including three parts: instruction, address and data, counted in bytes
	Addr	One byte; starting address of pre-written data
	Data	One byte/multiple bytes; pre-sent data

Example: Presetting the display terminal's buzzer to sound100ms, then send the following instructions to the terminal:

5AA5 03 80 02 0A

Note:

data	illustrate
5AA5	Frame header information [frame synchronization information]
03	Pre-sent data length [frame data length]
80	write register instruction
02	Register address
0A	data

3.2.2, read register instruction【0x81】

Data Format	Tx:	5AA5Length0 81 Addr Length1
	RX:	5AA5 Length2 81 Addr Length1 Data
illustrate	Length0	One byte; the length of pre-sent data, including three parts: instruction, address and data, counted in bytes
	Length1	One byte; pre-read data length
	Length2	One byte; the length of data uploaded by the terminal
	Addr	One byte; starting address of pre-written data
	Data	Register contents

Example: Read the index number of the currently displayed image

Tx: 5AA5 03 81 03 02

RX: 5AA5 05 81 03 02 00 03

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Note:

data	illustrate
5AA5	Frame header information [frame synchronization information]
03/05	Pre-sent data length [frame data length]
81	Read register instruction
03	Register address
02	Pre-read data length
00 03	Data uploaded by the terminal

3.2.3, write variable storage space instruction [0x82]

Data Format	Tx:	5AA5 Length 82 Addr Data
	RX:	none
illustrate	Length	One byte; the length of pre-sent data, including three parts: instruction, address and data, counted in bytes
	Addr	Two bytes; starting address of pre-written data
	Data	One word/multiple words; pre-sent data

Example: The address of the variable space is0x0000write everywhere0x000A, then send the following instructions to the terminal:

5AA5 0582 00 00 00 0A

Note:

data	illustrate
5AA5	Frame header information [frame synchronization information]
05	Pre-sent data length [frame data length]
82	write register instruction
00 00	Register address
00 0A	data

3.2.4, read variable storage space instruction [0x83]

Data Format	Tx:	5AA5 Length0 81 Addr Length1
	RX:	5AA5 Length2 81 Addr Length1 Data
illustrate	Length0	One byte; the length of pre-sent data, including three parts: instruction, address and data, counted in bytes
	Length1	One byte; pre-read data length
	Length2	One byte; the length of data uploaded by the terminal
	Addr	Two bytes; starting address of pre-written data
	Data	Register contents

Example: From variable storage space0x0000read everywhere1words of data, then

Tx: 5AA5 0383 00 00 01

RX: 5AA5 0683 00 00 0100 0A

Note:

data	illustrate
5AA5	Frame header information [frame synchronization information]
03/06	Pre-sent data length [frame data length]

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83	Read register instruction
00 00	Register address
01	Pre-read data length
00 0A	Data uploaded by the terminal

3.2.3, write curve buffer command【0x84】

Data Format	Tx:	5AA5 Length 84Channel Data
	RX:	none
illustrate	Length	One byte; the length of pre-sent data, including three parts: instruction, address and data, counted in bytes
	Channel	One byte; prewrite curve buffer channel;Mode.0correspond0aisle,Mode.7correspond7Channel; the corresponding position is "1"Indicates that the corresponding channel data exists, which is "0"It means that the data of the corresponding channel does not exist
	Data	One word/multiple words; pre-sent data

Example: Toward Curve Buffer Channel1write0x0001,0x0010, then send the following instructions to the terminal:

5AA5 06 84 01 00 01 00 10

Note:

data	illustrate
5AA5	Frame header information [frame synchronization information]
06	Pre-sent data length [frame data length]
84	Write curve buffer command
01	curve buffer channel
00 01 00 10	data

3.3,Register function description

3.3.1, system version register

address	definition	R/W	length(Byte)	illustrate
0x00	Version	R	1	Terminal version number,BCDcode

XGSeries display terminals do not have handshake instructions. When using the display terminal, due to the inconsistent start-up time of the control system and the display terminal, in order to ensure control

The data sent by the system at the beginning can be correctly received by the display terminal and the corresponding functions and commands can be executed. Therefore, it is necessary to confirm whether the display terminal is in normal condition.

Running status, users can confirm by reading the system version of the display terminal; or they need to confirm whether the system version of the display terminal is the correct version.

When, you can send the command frame as "5AA5 03 81 00 01"Check whether the display terminal returns the corresponding data frame to determine. If the returned data is "5A A5 04 81 00 01 64[This information is the terminal system version information]" means that the display terminal is already in normal operation.

3.3.2, backlight control register

address	definition	R/W	length(Byte)	illustrate
0x01	LqCy	R/W	1	LCDbacklight brightness,0x00 ~ 0x3F
0x1E	LedLm_Now	R	1	Current backlight brightness value

When the display terminal is running, the user may need to control the screen saver mode of the terminal himself. In this case, he can set0x01Register value to achieve,

and0x1EThe register stores the current terminal backlight brightness value; to control the LCD screen backlight brightness, send command frame data such as "5A A5 03 80 01 00[This value takes Values range from00arrive3Fbetween]";The instruction to read the current backlight brightness value is such as "5AA5 03 81 01 01"or"5AA5 03 81 1E 01".

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3.3.3,Buzzer control register

address	definition	R/W	length(Byte)	illustrate
0x02	BzTime	W	1	Buzzer beep control register, unit is10ms

In addition to controlling the buzzer sound through touch operations, the display terminal can also control the buzzer sound by sending command frames to achieve some simple functions. Audio alarm, prompt and other functions, users can send command frames "5AA5 03 80 02 01[The value range is from00arriveFFany value between, but if sending 00The buzzer will not sound] "Enable the buzzer sound function.

3.3.4, touch screen operation register

The touch screen operation register can be used to control the enabling or disabling of touch actions on the touch screen, and the touch status and contact points can also be queried through related registers. coordinate. This function is only valid for display terminals with touch screens .

address	definition	R/W	length(Byte)	illustrate
0x05	TPFlag	R/W	1	If the user does not clear this mark after reading the data, the touch coordinates will no longer be updated. 0x5A: Touch coordinates have been updated other:Touch coordinates not updated
0x06	TPStatus	R	1	0x01: Press the touch screen for the first time 0x02: Press the touch screen to end 0x03: Keep pressing other:invalid
0x07	TPPosition	R	4	Touch press coordinate position:Xh Xl Yh Yl
0x0B	TPCEnable	R/W	1	0x00: Disable touch function other: Enable touch function, the default is0xFF

On a display terminal equipped with a touch screen,0x0BIt is recommended to operate the register with caution. If this register is set to0x00【That’s right0x0Bregister Clear], the display terminal will no longer perform any predefined touch operations; during use, the display terminal can be touched by operating this register. Enable or disable the control function to prevent misoperation caused by touching the touch screen in screen saver mode or with the backlight dimmed.

If you need to judge the touch status and contact coordinate values of the display terminal, you can read0x06,0x07The value in the register is implemented, but every time it is read Need to correct after taking it0x05The register must be cleared, otherwise the display terminal will not automatically update the touch coordinate value.

3.3.4.1, Determine whether the display terminal supports touch function

Send command frame"5A A5 03 81 0B 01”to the display terminal, if the command frame returned by the display terminal is "5A A5 04 81 0B 01 ”time,00tch Indicates that the touch function of the display terminal has been disabled, otherwise if the returned command frame is "5A A5 04 81 0B 01 01[The range bits of this value[01~FF]Of any value between 】” means that the touch function of the display terminal has been enabled, and the predefined touch function can be realized by operating the touch screen.

3.3.4.2, disable/enable display terminal touch function

When using a display terminal, sometimes due to the screen saver, dimming of the backlight brightness, or when the control system needs to go to sleep, the touch screen may be accidentally triggered. You can Pause the touch operation function and wait for the control system to wake up before enabling touch operation.

Disable touch operation command frame:5AA5 03 80 0B 00

Enable touch operation command frame:5AA5 03 80 0B 01[The value can be selected from00arriveFFany value between]

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3.3.4.3, read touch operation status and touch coordinate value When using a display terminal, sometimes you need to know the touch status and contact coordinates of the touch screen. You can send a command frame to the display terminal.5AA5 03 81 05 06”Read the value in the register. If you need to read the contact coordinate value again, you need to0x06The value in the register is cleared before the terminal is displayed again. renew0x07The value in the register, it is recommended to send "5AA5 03 81 05 06 5AA5 03 80 05 00”The instruction frame realizes the reading and clearing of contact coordinate values.0x05 Register value.

3.3.5, display terminal running register

address	definition	R/W	length(Byte)	illustrate
0x0C	RunTime	R	4	Power-on running time,BCDCode, format: hours: minutes: seconds Example:9999:59:59

After the display terminal works normally, it will automatically generate a time, which is the system running time in the format ofBCDcode. Read system running time The command frame data is "5AA5 03 81 0C 04” .

3.3.6, Configuration register operation

address	definition	R/W	length(Byte)	illustrate
0x10	R0~RC	R	13	TFCard configuration register mapping
0x1D	Config_Enable	W	1	resetR1~RCregister flags value: 0x5A — describe: R1~RCReset and save value: 0xA5 — describe: R1~RCReset but don't save

The display terminal can be changed or temporarily modified through the serial port data.R0~RCregister, you can also judge the display end by reading the register value. terminal working mode and serial port communication frequency; during operation, all registers can be operated together or registers one by one. Please refer to the configuration of each register read"4.4, configuration file (CONFIG.TXT) format description 》 .

3.3.6.1, read configuration register information

Send command frame"5AA5 03 81 10 0D”to the display terminal, the display terminal will return something like "5AA5 10 81 10 0D 03 07 0C 5A FF FF 3F 04 03 FF A5 FF 00”Similar to the instruction frame data, the meaning of each byte in the data frame can be determined by querying the register location.

3.3.6.2, Temporarily modify configuration register information

If the display terminal has turned on the screen saver mode and may need to temporarily change the screen saver waiting time during work, it can send command frame data "5AA5 03 80 18 20 5AA5 03 80 1D A5”to the display terminal.

3.3.6.3, modify configuration register information

During use, if you need to reconfigure the refresh frequency of the display terminal and hope that it will work at this refresh frequency next time it is powered on, you can send Send command frame data"5AA5 03 80 12 0B 5AA5 03 80 1D 5A”to the display terminal.

3.3.7, clock register

address	definition	R/W	length(Byte)	illustrate
0x1F	RtcComAdj	W	1	0x5AIndicates resetting the clock and clearing it after terminal execution
0x20	RtcNow	R/W	7	YY:MM:DD:WW:HH:MM:SS

The display terminal has its own clock function. Users can display it on the LCD screen or read it through the serial port; it also supports clock setting through the serial port. Correction and calibration. Clock information is saved in0x20 ~ 0x27In the register, its data format isBCDcode format.

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3.3.7.1, read clock information

read calendar(YY:MM:DD:WW:HH:MM:SS):5AA5 03 81 20 07

Reading time (HH:MM:SS):5AA5 03 81 24 03

3.3.7.2, calibrate clock

use0x80The command will0x1FThe register value is set to0x5A, and give0x20The initial register writes the time value that needs to be calibrated to achieve the final display.

Terminal time calibration. If necessary, set the clock of the display terminal to "2016-03-09 16:18:30”, the command frame data sent is: "5AA5 0A 80 1F 5A 16 03 09 00 18 30”.

Tips: When calibrating the clock, you only need to rewrite the year, month, day, hour, minute, and second of the Gregorian calendar, and the week information display terminal will automatically correct it.

3.3.8, font space data reading

address	definition	R/W	length(Byte)	illustrate
0x40	EnLibOP	R/W	1	0x5AIndicates that the font storage unit operation is enabled and will be cleared after the terminal executes it.
0x41	LibOPMode	W	1	0xA0: Write the data of the specified font space to the variable storage space
0x42	LibID	W	1	Font index number, range0x40 ~ 0x7F
0x43	LiaAddress	W	3	The first address and range of pre-read font space0x000000 ~ 0x01FFFF
0x46	VP	W	2	The first address and range of the pre-written variable space0x0000 ~ 0x6FFF
0x48	OPLength	W	2	Pre-read data length, range0x0001 ~ 0x6FFF

Display the terminal's64~127No. font library (total64a font library,16MBStorage space) The font data can be read into variable storage through the command frame. space, if the user system needs this information, it can pass0x83The instruction then reads from the variable storage space.

If necessary, start from the64No. font library0x000000Address starts reading4KW(0x1000)data to the variable storage area0x1000starting position, direction The command frame sent by the display terminal is: "5AA5 0C 80 40 5A 40 00 00 00 10 00 10 00”.

Tips: The read data cannot exceed the font space, that is, the sum of "the first address of the pre-read font space" and the "pre-read data length" cannot be greater than131072 (0x020000),(LiaAddress + OPLength) ≤ 0x020000.

3.3.9, keying processing register

address	definition	R/W	length(Byte)	illustrate
0x4F	KeyCode	W	1	Touch key code for departure13Touch file; valid values:0x01 ~ 0xFF;0x00Indicates invalid; the terminal will automatically clear the key code register after processing the key code.

The display terminal does not support the keyboard interface, but it needs to use the keyboard or key operations during actual use, soSGUSThe system provides0x4F(Keying Office management) register, which facilitates users to use the keyboard or key codes to control the display terminal to execute a predefined touch process. During the operation, the user only needs to press the key code writing0x4Fregister, the display terminal will respond to the touch profile (13Touch profile.bin)described function.

If defined in the touch configuration file10page by key code0x01Enter the data entry interface, then when the display terminal is working in the10 page, send the command frame "5AA5 03 80 4F 01”, the display terminal responds to the key code trigger function and automatically enters the data entry interface. noodle.

Key code triggering and touch screen triggering can be triggered in parallel, so they can be used at the same time.

3.3.10,WAVAudio playback register①

address	definition	R/W	length(Byte)	illustrate

①: Indicates that only some display terminals support this function

0x50	PlayMusic	w	3	Play preset audio files; format:0x5A PlayStartID PlayNum 0x5A: Enable audio playback function PlayStartID: Index number of the starting segment of the audio file to be played PlayNum: Number of segments to play audio files
0x53	VolumeAdj	w	2	Adjust the volume of audio playback; format:0x5A VOL 0x5A: Enable audio playback volume adjustment function VOL: Pre-adjusted volume value; the volume isVOL/64, the default value is64.

Supported by some display terminals128partWAVformat audio file playback function, throughMicroSD/TFcard general32Ksampling,16bitmonoWAV format audio files to the display terminal, then the user can0x80command write0x50 ~ 0x54Register implementationWAVaudio file format software playback and volume adjustment.

If you need to play an audio prompt, the audio file occupies the space from the2Section to Section6A piece of audio storage space needs to be100% volume plays the segment audio data, the command frame data sent to the display terminal is "5AA5 07 80 50 5A 02 05 5A 40"; If you only need to stop the current voice playback, just To set the number of playback segments in the playback instruction frame to00That's it, like "5AA5 05 80 50 5A 02 00"; If you only need to adjust the playback volume, just set set0x53and0x54register, if necessary adjust the volume to80%The command frame sent is "5AA5 04 80 53 5A 33".

3.3.11, database register

address	definition	R/W	length(Byte)	illustrate
0x56	EnDBLOP	R/W	1	0x5AIndicates that the font storage unit operation is enabled and will be cleared after the terminal executes it.
0x57	OPMode	W	1	0x50: Write the data in the variable storage space to the data storage space 0xA0: Read data from data storage space into variable storage space
0x58	DBLAddress	W	4	Database space word address,0x00000000 ~ 0x03FFFFFF,maximum64MW(128MB, depending on the kernelFlash case) database space. The database is retrieved from the physical storage space64MBStart storing, which overlaps with the picture memory space. Each1ByteDatabase memory occupied2Bytesphysical storage.
0x5C	VP	W	2	Specify the first (word) address and range of the database operation in the variable memory space.0x0000 ~ 0x6FFF
0x5E	OPLength	W	2	Pre-read data length, range0x0001 ~ 0x6FFF

The database is a continuous storage area in the picture storage area of the display terminal, and the space size and location can be controlled by the user. different kernel factorsFlash The difference in storage space results in different picture space and available database space. The user database is physically composed of several64KW (128KB) is composed of database pages, but the addresses in read and write operations are continuous and are not affected by paging.SGUSThe system will automatically handle paging situations. The write life of each page is10Ten thousand times, that is, starting a write operation will reduce the number of writes.

①: Indicates that only some display terminals support this function

①: Indicates that only some display terminals support this function

4,MicroSD(TF) card download instructions

All parameter settings and data downloading of the display terminal need to be done throughMicroSD/TFcard completed;MicroSD/TFThe card file system is FAT32document system. display terminalSDThe card interface only supportsMicroSDcard, that isTFCard.

In order to prevent misoperation, the display terminalMicroSD/TFCard configuration files have strict naming and format requirements, otherwise errors will occur.

file type	Naming rules	Example	illustrate
Image files	Image index number + [file name].**bmp**	00startup screen.bmp	Must be the same as the terminal resolutiontwenty fourbit colorBMPdocument
font file	Font index number + [file name].**bin/hzk/dzk/ico**	32_GBK12Chinese character library.dzk 13Touch files.bin 0XRDASCII.hzk	font space32MB, each font256KB,total128If the font library needs to be occupied3.1font space, it is recommended that the font index number be extended.
Configuration file	**CONFIG.TXT**		
audio file	Audio file index number + [file name].**WAV**	0_Start the beep.WAV 2Terminate the beep.wav 100Page switching prompt sound.WAV	Audio file space occupied8MB, is at the end of the storage space, that is, it occupies the last part of the image space, so it needs to be used with caution. Total audio files128paragraph, each paragraph64KB.

Tips: The audio playback function requires the support of the hardware environment, so before using this function, please check the data manual of the corresponding display terminal to identify the terminal. Whether to support audio playback function.

4.1,Steps

- Create under the card root directoryXRD_TFTfolder;
- Put the pictures, fonts, and configuration files that need to be downloaded to the terminal inXRD_TFTin folder;
- Power off the terminal and plug inMicroSD(TF)Card;
- Power on the terminal again and the display terminal will load automatically.XRD_TFTThe contents in the folder are saved to the terminal device;
- After the buzzer beeps once, the update is completed and the user can unplug theMicroSD(TF) card and enter the normal working mode after powering on again.

4.2, picture file format description

The image file must have the same resolution as the display terminaltwenty fourbit colorBMPFormat file, its name must start with the Arabic numeral of the image storage location head.

Example: To pass an image throughTFThe card is stored in the display terminal's15A picture file, the picture file needs to be named "15.BMP" "/15_xx.BMP" /"15 xx.BMP"/"015 xx.BMP", but cannot be named "xx 15.BMP".

After the display terminal is powered on, it first displays the0pictures; therefore, it is recommended that when using the display terminal, the pictures should be arranged in order from0start.

4.3, font file format description

There are a total of display terminals32MBThe font space is divided into128The capacity is fixed to256KBfont space.

Similar to image files, the name of the font file must also indicate the storage location of the font (0~127)starting with an Arabic numeral. The downloaded font files include Font library, configuration file, icon file.

Font file format description and rules are as follows:

①: Indicates that only some display terminals support this function

file type	Naming rules	Example	illustrate
font file	Font storage location + file name [optional].BIN/HZK/DZK	36GBK12Chinese character.DZK	
icon file	Font storage location + file name [optional].ICO	25Icon library.ICO	
standardASCIIfont	0*.HZK	0_XRD_ASC.HZK	
Touch profile	13*.BIN	13Touch files.BIN	
variable configuration file	14*.BIN	14Variable configuration file.BIN	
Variable initialization file	22*.BIN	twenty twoVariable initialization.BIN	
0~22The font library has been used by the display terminal. It is recommended that users start fromtwenty threeThe location is used.			

4.4, configuration file (CONFIG.TXT) format description

configuration file (CONFIG.TXT) uses a method similar to a script language to describe parameter registers. Each line describes a parameter. Unused parameters can be

To not write, the details are as shown in the following table:

Register name	Ranges	illustrate	
R0	LcdID	Displays the LCD screen index parameters of the terminal driver. Users do not need to configure them.	
R1	0x00 – 0x12	Baud rate setting, please see detailed parameter descriptionAppendix 2	
R5	any value	whenR1for0xFEWhen, the high byte of the baud rate setting	whenR1Set as0xFEwhen, passR5:R9The register configures the serial port
R9	any value	whenR1for0xFE, the low byte of the baud rate setting	baud rate, that is, for6250000bpsPerform frequency division.
R2	0x00 – 0xFF	SysConfigRegister, defined in bits, please see detailed parameter descriptionAppendix 3	
RC	any value	AuxConfigRegister, defined in bits, please see the detailed descriptionAppendix 4	
R3	0x00 – 0xFF	UART_SYNC_H, communication data frame header high byte	
RA	0x01 – 0xFF	UART_SYNC_L, communication data frame header low byte	
R6	0x00 – 0x3F	After the touch screen controls the backlight, the backlight lights up when the touch screen is clicked.	
R7	0x00 – 0x3F	After the touch screen controls the backlight, if the touch screen is not clicked for a period of time, the backlight will turn off.	
R8	0x01 – 0xFF	After the touch screen control backlight is started, the touch screen backlight lighting time, unit1.0s	

- The parameters of the configuration file are all one byte16Base number, such as0Cexpress10hexadecimal12;
- The parameters of the configuration file must be2bits, such as00cannot be written as0.

4.5, terminal software update

Tips: The use of this function may cause immeasurable losses to the user, please use this function with caution. Our company does not recommend users to use this function to update terminal software;

If you need to update the terminal software, please contact our company's technical staff, who will serve you wholeheartedly. Thanks!

The terminal can be accessed viaMicroSD/TFcard to perform software updates. Specific steps are as follows:

- existMicroSD/TFCreate a file in the root directory of the card**/XRD_TFT/IAP**folder and place the pre-updated software files (**update.bin**) copied toIAP folder.
- Power off the terminal and plug inMicroSD(TF)Card;
- Power on the terminal again and the terminal will search for software update files. ifMicroSD/TFIf there is a software update file in the card, the software will be automatically software update; otherwise the software will not be updated.

①: Indicates that only some display terminals support this function

During the terminal software update process, you can use the serial port debugging tool to view the terminal software update information to confirm whether the terminal has been updated successfully. string

The port baud rate is115200bps, the serial port mode is8n1[That is, the length of each data transmission is10bits:1starting bit,8data bits,1stop bit].

If you need to update the terminal system, please contact our company's technical support to seek the latest version of terminal software or customized terminal software; you can also go to the relevant links on our company's website

Then download the latest version of the terminal software, thank you!

Tips: During the update process of the terminal, please do not turn off the power or unplug it.MicroSD/TFCard.

```
**********************************************************************
*              (C) COPYRIGHT 2013 欣瑞达电子                         *
*                                                                    *
*     In-Application Programming Application  (Version 01.0001)      *
*                                                                    *
*                URL:http://www.xrd-lcd.com                          *
*                  TEL:0755-26018666                                 *
**********************************************************************
升级开始，请勿断电！！！
擦除用户区域>>>
擦除用户区域完成！！！
升级进行中，已烧录4K..
升级进行中，已烧录8K..
升级进行中，已烧录12K..
升级进行中，已烧录16K..
升级进行中，已烧录20K..
升级进行中，已烧录24K..
升级进行中，已烧录28K..
升级进行中，已烧录32K..
升级进行中，已烧录36K..
升级进行中，已烧录40K..
升级进行中，已烧录72K..
升级进行中，已烧录76K..
升级成功！！！
正在重启系统！！！
```

picture5-1Terminal software update diagram

4.6, display terminal energy saving control

whenR2.5bit set to1, the backlight brightness will be controlled by the touch screen operation (after the backlight is in standby, the first touch operation will not trigger an action).

register	Ranges	illustrate
R6	0x00 – 0x3F	After the touch screen controls the backlight, the backlight lights up when the touch screen is clicked.
R7	0x00 – 0x3F	After the touch screen controls the backlight, if the touch screen is not clicked for a period of time, the backlight will turn off.
R8	0x01 – 0xFF	After the touch screen control backlight is started, the touch screen backlight lighting time, unit1.0s

Example: whenR2.5for1,andR6for0x3F,R7for0x10,R8for1E,30If the touch screen is not clicked for a few seconds, the backlight brightness will automatically decrease to0x10;

After clicking the touch screen, the backlight brightness will automatically adjust to0x3F.

4.7, touch screen calibration

This function is only available on terminals equipped with a touch screen. There are two ways for the display terminal to enter touch screen calibration mode:

method one:

When the display terminal is working normally, if3Continuous clicks on non-touch areas within seconds exceed20times, it will enter the touch screen calibration mode. The steps are as follows:

1.3Within seconds, continuous clicks on non-touch areas exceed20Second-rate;

2.Enter the calibration mode and click the designated position on the touch screen to calibrate according to the cross-hair prompts;

3.After calibration is completed, return to the screen before entering calibration.

Method Two:

existCONFIG.TXTfile, write "TP_CORRECT”A touch screen calibration process will be initiated.

The display terminal will automatically check whether the calibration is valid. When the calibration is invalid (for example, the operation causes the calibration mode to be entered, etc.) , the terminal will not be set incorrectly.

Method three:

①: Indicates that only some display terminals support this function

When the display terminal is working normally, send the0xEAregister write0x5A, start a touch screen calibration process.

SGUSThe screen will automatically detect whether the calibration is valid; when the calibration is invalid,SGUSThe system will continue to perform calibration operations until the calibration test is valid. If multiple calibrations are invalid, the touch screen may have physical damage, such as broken cables, damaged touch pads...

4.8, audio files①

Some display terminals support playbackWAVFormat audio files, this function requires hardware support, so please check the corresponding display terminal data manual for query. Downloading audio files is similar to downloading fonts. The name must start with an Arabic numeral indicating the location where the audio file is stored, such as "0Closing prompt.WAV", the audio file format isWAVFormat,32KHzSampling frequency,16bitmonoWAVdocument.

Audio files are stored in the last part of the picture area, totaling128segment, occupation8MBofFlashspace.

①: Indicates that only some display terminals support this function

5, Touch/key function description

Touch/key function passed13.binfile to configure, so13.binThe file may also be called a touch profile. The document consists of one or more items in accordance with the /Composed of instructions described by the key control function, each instruction occupies a fixed space16,32or48byte space; a touch command consists of6composed of parts, specifically

Please see the table below for description:

serial number	definition	length(Byte)	illustrate
1	TPID	2	Touch/key function picture index number ifTPIDfor0xFFFF, indicating the end of the touch function
2	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye) whenXsfor0xFFFFwhen , it means that the touch operation is performed by0x4FThe key code of the register triggers, at this timeYs_His the set trigger key code value (Ys_L,Xe,YeValue is undefined); touch operation triggered by key code, no press effect whenXsfor5***hour , indicating that the prompt sound will be replaced by voice when touching Once the audio prompt mode is enabled, the buzzer audio effect caused by the current touch will be disabled . The index number where the audio starts (ID) are stored inXeandYethe highest4bits, and the number of segments for playing accompanying audio is stored inYsthe highest4Bit.
3	TraID	2	Touch/key control to switch picture index number;0xFF**Indicates no picture switching
4	AniID	2	Touch/key press effect image index number;0xFF**Indicates no button press effect
5	Code	2	Touch key code when0xFF**Indicates an invalid keycode; when0xFE(0xFD)** represents the touch/key control function mark, such as0xFE00Indicates starting variable data touch screen entry;0xFE** The function keys can beR2.3Set to whether to automatically upload after the variable is changed.0xFD**The function keys always disable automatic uploading after variables are changed; when0x00**Represents the touch key code, useASCIImeans; for example0x0031Indicates the button "1"
6	TPFun	16/32/48	whenCodefor0xFE(FD)**is used to describe the touch function buttons

List of touch/key functions

serial number	function code	function name	illustrate
1	0x00	Data Entry	Input various data such as integers and fixed-point decimals into the designated variable storage space
2	0x01	Menu operation	Click to trigger a pop-up menu and return the key code of the menu item
3	0x02	Incremental adjustment	Click the button to perform the self-increment [++] or self-decrement [--] operation on the specified variable. You can set the step size and upper and lower limits. set up0~1Range cycle adjustment can realize column check box function
4	0x03	Drag to adjust	Drag and drop adjustment to realize variable data entry, and the scale range can be set
5	0x04	RTCset up	Display terminal touch keyboard settingsRTCComponent, the Gregorian calendar year, month, day, hour, minute and second need to be entered completely.
6	0x05	Key value return	Click the button to directly return the button value to the variable, supporting bit variable return
7	0x06	Text entry	Input variousASCIIcharacter
8	0x08	Touch sync data return	When clicking the touch screen, press the preset to return the data to the variable range or serial port

①: Indicates that only some display terminals support this function

5.1,Data Entry【0xFE00/0xFD00】

address	definition	length(Byte)	illustrate
0x00	TPID	2	Touch/key function picture index number
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect
0x0E	Code	2	0xFE00/0xFD00
0x10	0xFE	1	0xFE
0x11	*VP	2	The variable address pointer corresponding to the input data
0x13	VType	1	Return data type
			0x00:2Byte, integer -32768 ~ +32767; unsigned integer0~65535
			0x01:4Bytes, long -2147483648 ~ +2147483647; unsigned long integer0 ~ 4294967295
			0x02:*VPHigh byte, unsigned number,0~255
			0x03:*VPLow byte, unsigned number,0~255
			0x04:8byte, Very long integer, -9223372036854775808 ~ +9223372036854775807
0x14	NInt	1	The number of integer digits to enter. For example, input1234.56,butNIntSet as0x04
0x15	NDot	1	The number of decimal places to enter. For example, input1234.56,butNDotSet as0x02
0x16	x,y	4	Input process display position: right alignment, (x,y) is the coordinate of the upper right corner of the last character of the string
0x1A	Color	2	The color of the characters entered
0x1C	LibID	1	of the characters displayedASCIIFont index number
0x1D	FontHor	1	font size,XNumber of lattice in axis direction
0x1E	CusorColor	1	Cursor color
			0 black
			other White
0x1F	HideEn	1	0x00: Input occlusion, displayed as "*"
			other: Input is displayed directly
0x20	0xFE	1	0xFE
0x21	KBSource	1	0x00: Keyboard on current page
			other: The keyboard is not in the current interface
0x22	KBPicID	2	The index number of the page where the keyboard is located. whenKBSourcenot equal to0x00valid when
0x24	KBArea	8	Keyboard area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye). whenKBSourcenot equal to0x00valid when
0x2C	KBPosition	4	The keyboard display position on the current page, the coordinates of the upper left corner; whenKBSourcenot equal to0x00valid when
0x30	0xFE	1	0xFE
0x31	LimitEn	1	0xFF: Enable input range restriction, invalid if the input exceeds the limit (equivalent to canceling)
			other: Input without range limit
0x32	Vmin	4	Enter the lower limit,4Bytes (long or unsigned long)
0x36	Vmax	4	Enter the upper limit,4Bytes (long or unsigned long)
0x3A	Reserved	6	It is recommended to write "0"

①: Indicates that only some display terminals support this function

Tips: The valid key code during input is0x0030(0) ~ 0x0039(9),0x002E(.),0x00F0(cancel),0x00F1(enter), 0x00F2(BackSpace).

①: Indicates that only some display terminals support this function

5.2, menu operation【0xFE01/0xFD01】

address	definition	length(Byte)	illustrate
0x00	TPID	2	Touch/key function picture index number
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect
0x0E	Code	2	0xFE01/0xFD01
0x10	0xFE	1	0xFE
0x11	*VP	2	The variable address pointer corresponding to the input data, and the returned data isVTypeDecide
0x13	VType	1	0x00:Bundle0x00**Key code writingVPWord address (integer)
			0x01: Write the ** key codeVPHigh byte address of the word address (VP_H)
			0x02: Write the ** key codeVPThe low byte address of the word address (VP_L)
			0x10-0x1F: Put the lowest digit of ** key code (1bit)variable and writeVPThe specified bit of the word address (0x10ReviseVP.0,0x1F ReviseVP.F)
0x14	KBPicID	2	Index number of the page where the keyboard is located
0x16	KBArea	8	Keyboard area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x1E	KBPositionX	2	Keyboard display position on the current page, coordinates of the upper left corner
0x20	0xFE	1	0xFE
0x21	KBPositionY	2	Keyboard display position on the current page, coordinates of the upper left corner
0x23	Reserved	13	It is recommended to write "0"

Tips: Valid key code during input:0x0000 ~ 0x00FF,in0x00FFTo cancel (return directly without selecting parameters).

①: Indicates that only some display terminals support this function

5.3, Increment adjustment【0xFE02/0xFD02】

address	definition	length(Byte)	illustrate	
0x00	TPID	2	Touch/key function picture index number	
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)	
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching	
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect	
0x0E	Code	2	0xFE02/0xFD02	
0x10	0xFE	1	0xFE	
0x11	*VP	2	The variable address pointer corresponding to the input data, and the returned data isVTypeDecide	
0x13	VType	1	0x00:adjustVPWord address (integer)	
			0x01:adjustVPHigh byte address of the word address (1byte unsigned number,VP_H)	
			0x02:adjustVPThe low byte address of the word address (1byte unsigned number,VP_L)	
			0x10-0x1F:rightVPThe specified bit of the word address (0x10correspondVP.0,0x1FcorrespondVP.F) to adjust, the adjustment range must be set to0~1	
0x14	AdjMode	1	Adjustment method	0x00:--
				other:++
0x15	ReturnMode	1	Overdue processing party Mode	0x00: Stop (equal to threshold)
				other：Cycle adjustment
0x16	AdjStep	2	Adjust the step size,0x0000 ~ 0x7FFF	
0x18	VMin	2	Lower limit:2byte integer (whenVPModefor0x01or0x02, only the low byte is valid)	
0x1A	VMax	2	Upper limit:2byte integer (whenVPModefor0x01or0x02, only the low byte is valid)	
0x1C	KeyMode	1	0x00: Continuous adjustment while pressing the button	
			0x01: Only adjust when pressing and holding the button1Second-rate	
0x1D	NULL	3	It is recommended to write "0"	

①: Indicates that only some display terminals support this function

5.4, drag to adjust【0xFE03/0xFD03】

address	definition	length(Byte)	illustrate	
0x00	TPID	2	Touch/key function picture index number	
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)	
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching	
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect	
0x0E	Code	2	0xFE03/0xFD03	
0x10	0xFE	1	0xFE	
0x11	*VP	2	The variable address pointer corresponding to the input data, and the returned data isVTypeDecide	
0x13	VType	1	high4Bit definition data return format Mode	0x0*:adjustVPWord address (integer)
				0x1*:adjustVPHigh byte address of the word address (1byte unsigned number,VP_H)
				0x2*:adjustVPThe low byte address of the word address (1byte unsigned number,VP_L)
			Low4bitDefined Drag method	0x*0: Drag horizontally
				0x*1: Drag vertically
0x14	AreaAdj	8	Effective adjustment area:Xs,Ys,Xe,Ye;must matchTPArea(touch area) consistent	
0x1C	VBegain	2	Return value corresponding to the starting position, integer	
0x1E	VEnd	2	Return value corresponding to the end position, integer	

Tips: To prevent misoperation, the effective area must be pressed beyond0.5sAfter dragging is started.

①: Indicates that only some display terminals support this function

5.5, clock adjustment【0xFE04/0xFD04】

address	definition	length(Byte)	illustrate
0x00	TPID	2	Touch/key function picture index number
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect
0x0E	Code	2	0xFE04/0xFD04
0x10	0xFE	1	0xFE
0x11	NULL	3	0x00 00 00
0x14	x,y	4	Input process display position: right alignment, (x,y) is the coordinate of the upper right corner of the last character of the string
0x18	Color	2	The color of the characters entered
0x1A	LibID	1	of the characters displayedASCIIFont index number
0x1B	x,y	4	Input process display position, right alignment,x,yIs the coordinate of the upper right corner of the string
0x1C	Reserved	1	It is recommended to write "0"
0x1D	KBSource	1	0x00: Keyboard on current page other: The keyboard is not in the current interface
0x1E	KBPicID	2	The index number of the page where the keyboard is located; whenKBSourcenot equal to0x00valid when
0x20	0xFE	1	0xFE
0x21	KBArea	8	Keyboard area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye);whenKBSourcenot equal to0x00valid when
0x29	KBPosition	4	The keyboard display position on the current page, the coordinates of the upper left corner; whenKBSourcenot equal to0x00valid when
0x2D	NULL	3	It is recommended to write "0"

①: Indicates that only some display terminals support this function

5.6, key value returns [0xFE05/0xFD05】

address	definition	length(Byte)	illustrate
0x00	TPID	2	Touch/key function picture index number
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect
0x0E	Code	2	0xFE05/0xFD05
0x10	0xFE	1	0xFE
0x11	*VP	2	The variable address pointer corresponding to the input data, and the returned data isVTypeDecide
0x13	VType	1	0x00: The return key value is saved inVPWord address (integer)
			0x01: The low byte of the returned key value is stored inVPHigh byte address of the word address (VP_H)
			0x02: The low byte of the returned key value is stored inVPThe low byte address of the word address (VP_L)
0x14	Code	2	Return key value
0x16	NULL	10	It is recommended to write "0"

①: Indicates that only some display terminals support this function

5.7, text entry【0xFE06/0xFD06】

In the touch file of text entry, the low byte of the two-byte key code represents the ordinary key code, and the high byte represents the uppercase key code. Typical text entry keyboard settings

The meaning is shown in the following table:

key code	ordinary	capital	key code	ordinary	capital	key code	ordinary	capital	key code	ordinary	capital
7E60	`	~	5171	q	Q	4161	a	A	5A7A	z	Z
2131	1	!	5777	w	W	5373	s	S	5878	x	X
4032	2	@	4565	e	E	4464	d	D	4363	c	C
2333	3	#	5272	r	R	4666	f	F	5676	v	V
2434	4	$	5474	t	T	4767	g	G	4262	b	B
2535	5	%	5979	y	Y	4868	h	H	4E6E	n	N
5E36	6		5575	u	U	4A6A	j	J	4D6D	m	M
2637	7	&	4969	i	I	4B6B	k	K	3C2C	,	<
2A38	8	*	4F6F	o	O	4C6C	l	L	3E2E	.	>
2839	9	(	5070	p	P	3A3B	;	:	3F2F	/	?
2930	0	)	7B5B	[	{	2227	'	"	2020	SP	SP
5F2D	-	_	7D5D	]	}	0D0D	Enter	Enter			
2B3D	=	+	7C5C	\	|						

Tips: Text keyboard keycode must be less than0x80(ASCIIcode).0x0DThe key code entry will be automatically converted into0x0D 0x0A;0x00and0xFFKeycode disabled.

Special function keyboard key code definition

key code	definition	illustrate
0x00F0	Cancel	Cancel entry and return without affecting variable data
0x00F1	Return	Confirm the entry and return, and the entered text is saved to the specified variable location.
0x00F2	Backspace	Delete one character forward (backspace)
0x00F3	Delete	Delete backward1characters
0x00F4	CapsLock	caps Lock. If enabled, the corresponding button must define the effect of button press
0x00F7	Left	Move the cursor forward one character;GBKUsed to turn pages during Chinese character entry
0x00F8	Right	Move the cursor back one character;GBKUsed to turn pages during Chinese character entry

Use the keyboard (0x4Fkey code saved in the register) for text entry, if you useCapsLockbutton, please define the animation area of the button where needed hint"CapsLock"area; after being defined in this way, sendCapsLockWhen pressing the key, the corresponding position on the screen will automatically display "CapsLock"area map of mark prompt.

①: Indicates that only some display terminals support this function

5.7.1,ASCIIEnter

address	definition	length(Byte)	illustrate
0x00	TPID	2	Touch/key function picture index number
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect
0x0E	Code	2	0xFE00/0xFD00
0x10	0xFE	1	0xFE
0x11	*VP	2	The variable address pointer corresponding to the input data
0x13	VPLenMax	1	Maximum length of text variable, words (Word) number, range:0x01 ~ 0x7B; When the text is saved to the specified address, it will automatically be added at the end of the text.0xFFFFAs the terminator; the entered text variable may actually occupy the maximum variable space ofVP_Len_Max+1
0x14	ScanMode0	1	Entry mode control 0x00 Re-enter 0x01 Open the original text and modify it
0x15	LibID	1	Show the usedASCIIfont location,0x00=Default font
0x16	FontHor	1	font size,XNumber of directional lattice
0x17	FontVer	1	font size,YNumber of directional lattice (Lib_ID=0x00hour,YThe number of direction lattice must be2*X)
0x18	CusorColor	1	Cursor color 0 black other White
0x19	Color	2	Text display color
0x1B	ScanAreaStart	4	Enter the coordinates of the upper left corner of the text display area (Xs,Ys)
0x1F	ScanReturnMode	1	0x55:exist*(VP-1)The position saves the input end tag and Valid data length: * (VP - 1)High byte, input end mark:0x5AIndicates the end of input, and the input process is0x00; * (VP - 1)Low byte, valid input data length, one byte 0x00:Do not return input end tag and length
0x20	0xFE	1	0xFE
0x21	ScanAreaEnd	4	Enter the coordinates of the lower right corner of the text display area (Xe,Ye)
0x25	KBSource	1	0x00: Keyboard on current page Other: The keyboard is not in the current interface
0x26	KBPicID	2	The index number of the page where the keyboard is located. whenKBSourcenot equal to0x00valid when
0x28	KBArea	8	Keyboard area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye). whenKBSourcenot equal to0x00 valid when
0x30	0xFE	1	0xFE
0x31	KBPosition	4	The keyboard display position on the current page, the coordinates of the upper left corner; whenKBSourcenot equal to0x00valid when
0x35	DisplayEn	1	0x00: The input process is displayed normally. 0x01: "*" is displayed during the input process, used for password input
0x36	Reserved	9	It is recommended to write "0"
0x3F	ScanMode1	1	0x00【ASCIIEntry method】

Tips: Xinruida pre-installed0The font library contains4*8 ~ 64*128All of the dot matrixASCIIFont.

①: Indicates that only some display terminals support this function

5.7.2,GBKEnter

address	definition	length(Byte)	illustrate
0x00	TPID	2	Touch/key function picture index number
0x02	TPArea	8	Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)
0x0A	TraID	2	Touch/key to switch picture index number,0xFF**Indicates no picture switching
0x0C	AniID	2	Touch/key press effect image index number,0xFF**Indicates no button press effect
0x0E	Code	2	0xFE00/0xFD00
0x10	0xFE	1	0xFE
0x11	*VP	2	The variable address pointer corresponding to the input data
0x13	VPLenMax	1	Maximum length of text variable, words (Word) number, range:0x01 ~ 0x7B; When the text is saved to the specified address, it will automatically be added at the end of the text.0xFFFFAs the terminator; the entered text variable may actually occupy the maximum variable space ofVP_Len_Max+1
0x14	ScanMode0	1	Entry mode control 0x00 Re-enter 0x01 Open the original text and modify it
0x15	LibGbk0	1	Chinese character display usesGBKfont index number,ASCIICharacters used by default0x00font
0x16	LibGbk1	1	During the input process, Chinese characters are displayed usingGBKFont index number
0x17	FontDot0	1	LibGbk0Font size, number of dots
0x18	FontDot1	1	LibGbk1Font size, number of dots
0x19	CusorColor	1	Cursor color 0x00 Cursor appears black Other The cursor appears white
0x1A	Color0	2	Enter text display color.
0x1C	Color1	2	Text display color during entry
0x1E	PyDisMode	1	During the input process, pinyin prompts and the display mode of corresponding Chinese characters 0x00 The pinyin prompt is displayed at the top, and the corresponding Chinese character display is displayed on a separate line below; the pinyin prompt and the Chinese character display are left aligned, and the line spacing isScanDis 0x01 The pinyin prompt is displayed on the left, and the corresponding Chinese character prompt is displayed on the right; the Chinese character prompt is displayed at the beginningxLocation isScan1AreaStart+3×FontDot1+ScanDis
0x1F	ScanReturnMode	1	0xAA:exist*(VP-1)Position save input end tag and valid Data length * (VP-1)Low byte, valid input data length, byte unit. * (VP-1)High byte, record Input status mark 0x5A End of input 0x00 Input process 0xFF:Does not return the input end tag and length
0x20	0xFE	1	0xFE
0x21	Scan0AreaStart	4	Enter the coordinates of the upper left corner of the text display area (Xs, Ys)
0x25	Scan0AreaEnd	4	Enter the coordinates of the lower right corner of the text display area (Xe, Ye)
0x29	Scan1AreaStart	4	The coordinates of the upper left corner of the pinyin prompt text display area during the input process
0x2D	ScanDis	1	During the input process display, the spacing between each Chinese character is displayed; each line is fixed to display the maximum8Chinese characters
0x2E	Reserved	1	It is recommended to write "0x00"
0x2F	KbSource	1	Keyboard page position selection

①: Indicates that only some display terminals support this function

			0x00	Keyboard on current page
			other	The keyboard is not on the current page
0x30	0xFE	1	0xFE	
0x31	PicKb	2	The following data is only available ifKbSourceNot for0x00valid. Index number of the page where the keyboard is located	
0x33	AreaKb	8	Keyboard area coordinates on the keyboard page: upper left corner (Xs, Ys), lower right corner (Xe, Ye)	
0x3B	AreaKbPosition	4	The keyboard area is pasted at the position displayed on the current page, the coordinates of the upper left corner.	
0x3F	ScanMode1	1	0x02【Pinyin input method】	

Tips:

- Pinyin"bd"Corresponds to allGBKEncoded full-width punctuation mark entry
- XGseries of smart display terminals are pre-installed at the factory0NumberASCIIFont library, including4*8 ~ 64*128All of the dot matrixASCIIcharacter

①: Indicates that only some display terminals support this function

5.8, touch synchronization data return【0xFE08/0xFD08】

<table>
<tr><th>address</th><th>definition</th><th>length(Byte)</th><th>illustrate</th></tr>
<tr><td>0x00</td><td>TPID</td><td>2</td><td>Touch/key function picture index number</td></tr>
<tr><td>0x02</td><td>TPArea</td><td>8</td><td>Touch/key control effective area: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye)</td></tr>
<tr><td>0x0A</td><td>TraID</td><td>2</td><td>Touch/key to switch picture index number,0xFF**Indicates no picture switching</td></tr>
<tr><td>0x0C</td><td>AniID</td><td>2</td><td>Touch/key press effect image index number,0xFF**Indicates no button press effect</td></tr>
<tr><td>0x0E</td><td>Code</td><td>2</td><td>0xFE08/0xFD08</td></tr>
<tr><td>0x10</td><td>0xFE</td><td>1</td><td>0xFE</td></tr>
<tr><td>0x11</td><td>TP_OnMode</td><td>1</td><td>When the touch screen is pressed for the first time, the data returns to the mode<table><tr><th>Mode</th><th>describe</th></tr><tr><td>0x00</td><td>no status</td></tr><tr><td>0x01</td><td>readVP1SpointedLEN1length data toVP1DDisplay variable space pointed to</td></tr><tr><td>0x02</td><td>readVP1SpointedLEN1The length variable displays the data sent to the serial port</td></tr><tr><td>0x03</td><td>readVP1SpointedLEN1length data toVP1DThe register space pointed to</td></tr><tr><td>other</td><td>reserve</td></tr></table></td></tr>
<tr><td>0x12</td><td>VP1S</td><td>2</td><td>When the touch screen is pressed for the first time, the address of the pre-read data</td></tr>
<tr><td>0x14</td><td>VP1D</td><td>2</td><td>The address of pre-written data when the touch screen is pressed for the first time</td></tr>
<tr><td>0x16</td><td>NULL</td><td>1</td><td>0x00</td></tr>
<tr><td>0x17</td><td>LEN1</td><td>1</td><td>Pre-returned data length, byte length. whenModefor1, the value must be an even number</td></tr>
<tr><td>0x18</td><td>0xFE</td><td>1</td><td>0xFE</td></tr>
<tr><td>0x19</td><td>TP_ContinueMode</td><td>1</td><td>When the touch screen is pressed for a long time, the data returns to mode<table><tr><th>Mode</th><th>describe</th></tr><tr><td>0x00</td><td>no status</td></tr><tr><td>0x01</td><td>readVP1SpointedLEN1length data toVP1DDisplay variable space pointed to</td></tr><tr><td>0x02</td><td>readVP1SpointedLEN1The length variable displays the data sent to the serial port</td></tr><tr><td>0x03</td><td>readVP1SpointedLEN1length data toVP1DThe register space pointed to</td></tr><tr><td>other</td><td>reserve</td></tr></table></td></tr>
<tr><td>0x1A</td><td>VP1S</td><td>2</td><td>When the touch screen is pressed for a long time, the address of the pre-read data</td></tr>
<tr><td>0x1C</td><td>VP1D</td><td>2</td><td>When the touch screen is pressed for a long time, the address of pre-written data</td></tr>
<tr><td>0x1E</td><td>NULL</td><td>1</td><td>0x00</td></tr>
<tr><td>0x1F</td><td>LEN1</td><td>1</td><td>Pre-returned data length, byte length. whenModefor1, the value must be an even number</td></tr>
<tr><td>0x20</td><td>0xFE</td><td>1</td><td>0xFE</td></tr>
<tr><td>0x21</td><td>TP_OffMode</td><td>1</td><td>When the touch screen is pressed and released, the data returns to the mode<table><tr><th>Mode</th><th>describe</th></tr><tr><td>0x00</td><td>no status</td></tr><tr><td>0x01</td><td>readVP1SpointedLEN1length data toVP1DDisplay variable space pointed to</td></tr><tr><td>0x02</td><td>readVP1SpointedLEN1The length variable displays the data sent to the serial port</td></tr><tr><td>0x03</td><td>readVP1SpointedLEN1length data toVP1DThe register space pointed to</td></tr><tr><td>other</td><td>reserve</td></tr></table></td></tr>
<tr><td>0x22</td><td>VP1S</td><td>2</td><td>When the touch screen is pressed and released, the address of the pre-read data</td></tr>
<tr><td>0x24</td><td>VP1D</td><td>2</td><td>The address of pre-written data when the touch screen is pressed and released</td></tr>
</table>

①: Indicates that only some display terminals support this function

0x26	NULL	1	0x00
0x27	LEN1	1	Pre-returned data length, byte length. whenModefor1, the value must be an even number
0x28	0x00	8	0x00

The three states of touch screen pressing are shown in the figure below:

①: Indicates that only some display terminals support this function

6, Variable display function description

Variable display function passes14.binfile to configure, so14.binThe file is also called a variable display configuration file. Display variable configuration file consists of a One or more strips are composed of instructions described in the variable display function, and each instruction occupies a fixed32byte. Fixed allocation per page2KBor4KB(0x0800 or0x1000)Variable storage space, each page can configure up to64or128display function. (64/128The bar display function is selected byCONFIG.TXT in the configuration fileRC.4choose). Variable display configuration file maximum2MB, you can configure up to1024pages (128In the bar display function mode, the maximum to configure512pages). For variables of the same type, the later the storage location is, the higher the display priority is. A display variable instruction is given by6composed of parts, with

Please see the table below for body description:

serial number	definition	length(Byte)	illustrate
1	0x5A	1	fixed
2	Type	1	variable category
3	*SP	2	variable description file fromFlashThe address pointer stored in the data storage area after loading,0xFFFFIndicates not to transfer to data storage area
4	Len_Dsc	2	The word length of the variable description content
5	*VP	2	variable address,0x0000 ~ 0x6FFF, for some variables that do not need to specify addresses, write0x0000That's it. When the variable address is high Bytes are0xFF, this instruction will be canceled
6	Description	N	Variable description content

Variable display function list

serial number	code	Function	illustrate
01	0x00	Variable icon display	Linearly correspond the variation range of a data variable to a groupICONIcon display; when the variable changes, the icon automatically switches accordingly; mostly used for detailed dashboards and progress bars
02	0x01	Animated icon display	Corresponds to a fixed value data variable3There are three different icon indication states: no display, fixed icon display, animated icon display. Alarm prompts mostly used for variables
03	0x02	Slider scale indication	Corresponds the change range of a data variable to the display position change of an icon (slider); mostly used for indications of liquid level, dials, and progress meters.
04	0x03	WordArt variable display	useICONIcons replace fonts to display variable data
05	0x04	Picture animation display	Play a set of full-screen pictures at a specified speed; mostly used for startup interface or screensaver
06	0x05	Icon rotation display	Linearly correspond the variation range of a data variable to angle data, and then convert aICONThe icon is displayed after being rotated according to the corresponding angle data; it is mostly used for displays such as pointers and instruments.
07	0x06	Bit variable icon display	Put each bit of a data variable (bit)of0/1Status correspondence8Two of the different display schemes, usingICON icon (or icon animation) to correspond to the display; mostly used for switch status display, such as fan operation (animation) stop (static, icon)
08	0x10	Data variable display	Display a data variable in the specified format (integer, decimal, with or without unit) using Arabic numerals in the specified font and size.
09	0x11	text display	Display the string in the specified text box display area according to the specified format (determined by selecting the font)
10	0x12_00	text formatRTCshow	Convert the Gregorian calendar to the format edited by the userRTCdisplay with text
11	0x12_01	Dial formatRTCshow	useICONThe icon rotates and the Gregorian calendar is changed using the pointer dial method.RTCdisplay
12	0x13	HEXData Display	Sort variable data according to bytesHEXmode interval user specifiedASCIIThe characters displayed are mostly used for timing display, such as1234displayed as12:34.
13	0x20	Curve display	combine0x84The serial port writes curve buffer data to automatically match and display the real-time curve (trend chart). The display area, central axis coordinates, and display ratio (enlargement/reduction) can be specified and controlled

①: Indicates that only some display terminals support this function

<table>
<tr><td>14</td><td>0x21</td><td>Drawing</td><td>Draw basic graphics
<table>
<tr><th>Cmd</th><th>Function</th><th>describe</th></tr>
<tr><td>0x0001</td><td>Set point</td><td>Set point (x, y, color)</td></tr>
<tr><td>0x0002</td><td>Draw a straight line</td><td>Multi-point connection (color, (x0, y0), ... (xn, yn))</td></tr>
<tr><td>0x0003</td><td>Draw a rectangular box</td><td>Display a rectangular frame with customizable size, area, and location</td></tr>
<tr><td>0x0004</td><td>Draw a rectangular area</td><td>Fill the specified area with the specified color</td></tr>
<tr><td>0x0005</td><td>Draw a circular frame</td><td>Display a circular frame with customizable size, area, and location</td></tr>
<tr><td>0x0006</td><td>Picture cut display</td><td>Cut an area from the specified page to the currently displayed page</td></tr>
<tr><td>0x**07</td><td>Icon display</td><td>Extract the corresponding icon from the specified icon library and display it</td></tr>
<tr><td>0x0008</td><td>Solid color area fill</td><td>Fill the specified area with the specified color</td></tr>
<tr><td>0x0009</td><td>Draw a straight vertical line</td><td>Display vertical lines based on variable data, and the color and position can be customized</td></tr>
<tr><td>0x000A</td><td>Draw line segments</td><td>Display connections based on variable data, with customizable colors and positions</td></tr>
<tr><td>0x000B</td><td>Draw arc</td><td>Display arc with customizable radius, color, start and end angles</td></tr>
<tr><td>0x000C</td><td>Character display</td><td>Display corresponding characters according to variable data</td></tr>
<tr><td>0x000D</td><td>Rectangular area displayed in reverse color</td><td>Invert the specified area</td></tr>
<tr><td>0x000E</td><td>Two-color bitmap display</td><td>Display the corresponding color bit by bit according to the variable data</td></tr>
<tr><td>0x000F</td><td>Bitmap display</td><td>Statement variable data display</td></tr>
</table></td></tr>
<tr><td>15</td><td>0x22</td><td>List display</td><td>Display the data defined as a two-dimensional array in a table.</td></tr>
<tr><td>16</td><td>0x25</td><td>QR code display</td><td>Display the specified content at the specified location through a QR code</td></tr>
<tr><td>17</td><td>0x14</td><td>scroll text display</td><td>Display the specified content in the specified area using scrolling</td></tr>
</table>

①: Indicates that only some display terminals support this function

6.1, icon display function

6.1.1, variable icon display【0x00】

address		definition	length(Byte)	illustrate	
0x00		0x5A00	2		
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file	
0x04		0x0008	2		
0x06	0x00	*VP	2	Variable pointer, variable is in integer format	
0x08	0x01	x,y	4	Variable display position, coordinate position of the upper left corner of the icon	
0x0C	0x03	Vmin	2	The lower limit of the variable. If it exceeds the limit, it will not be displayed.	
0x0E	0x04	Vmax	2	The upper limit of the variable. If it exceeds the limit, it will not be displayed.	
0x10	0x05	IconMin	2	VminCorresponding iconID	
0x12	0x06	IconMax	2	VmaxCorresponding iconID	
0x14	0x07:H	IconLib	1	Icon library storage location	
0x15	0x07:L	Mode	1	icondisplay mode	0x00: Transparent (no background shown)
					other:Show icon background

①: Indicates that only some display terminals support this function

6.1.2, animated icon display【0x01】

address		definition	length(Byte)	illustrate	
0x00		0x5A01	2		
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file	
0x04		0x000A	2		
0x06	0x00	*VP	2	Initial icon variable pointer, the variable isdouble word, the low-order word is reserved, the high-order word is unsigned ( ) 0x0000-0x0FFFF User data controls animated icon display	
0x08	0x01	x, y	4	Variable display position, coordinate position of the upper left corner of the icon	
0x0C	0x03	0x0000	2	fixed	
0x0E	0x04	VStop	2	Display fixed icon when variable has this value	
0x10	0x05	VStart	2	Automatically display animated icons when the variable has this value	
0x12	0x06	IconStop	2	The variable isVStopThe icon that is fixedly displayed when the value is	
0x14	0x07	IconStart	2	The variable isVStartvalue, automatically fromIconStartarriveIconEndDisplay icons to form animations	
0x16	0x08	IconEnd	2		
0x18	0x09:H	IconLib	1	Icon library storage location	
0x19	0x09:L	Mode	1	icondisplay mode	0x00: Transparent (no background shown) other:Show icon background

Tips:

VP+1It is a reserved position and cannot be used by other parties.

When the variable is not equal toVStoporVStartWhen , no icon or animation is displayed

①: Indicates that only some display terminals support this function

6.1.3, slider scale indication【0x02】

address		definition	length(Byte)	illustrate	
0x00		0x5A02	2		
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file	
0x04		0x000A	2		
0x06	0x00	*VP	2	Initial icon variable pointer, the variable is a double word, the low-order word is reserved, and the high-order word is an unsigned number (0x0000-0x0FFFF)User data controls animated icon display	
0x08	0x01	VBegain	2	The variable value corresponding to the starting scale	
0x0A	0x02	VEnd	2	The variable value corresponding to the end scale	
0x0C	0x03	XBegain	2	Starting scale coordinate (longitudinal isYcoordinate)	
0x0E	0x04	XEnd	2	End scale coordinate (longitudinal isYcoordinate)	
0x10	0x05	IconID	2	scale slider iconID	
0x12	0x06	Y	2	The scale indicator icon displaysYCoordinate position (longitudinal isXcoordinate)	
0x14	0x07:H	wxya	1	The scale indicator icon displaysXCoordinate forward offset (longitudinal isY),0x00 ~ 0xFF	
0x15	0x07:L	Mode	1	scale mode	0x00:Horizontal scale bar
					0x01: Vertical scale bar
0x16	0x08:H	IconLib	1	Icon library storage location	
0x17	0x08:L	DisplayMode	1	icondisplay mode	0x00: Transparent (no background shown)
					other:Show icon background
0x18	0x09:H	DataMode	1	0x00:*VPPoints to an integer variable	
				0x01:*VPPoints to the high byte data of an integer variable	
				0x02:*VPPoints to the low-byte data of an integer variable	

①: Indicates that only some display terminals support this function

6.1.4, artistic word variable display【0x03】

address		definition	length(Byte)	illustrate	
0x00		0x5A03	2		
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file	
0x04		0x0007	2		
0x06	0x00	*VP	2	variable pointer	
0x08	0x01	X,Y	4	Start display Location	Right-aligned mode, the coordinates are the coordinates of the upper right corner of the displayed string. Left-aligned mode, the coordinates are the coordinates of the upper left corner of the display string
0x0C	0x03	Icon0	2	0correspondingIconID, the sort order is0123456789-.	
0x0E	0x04:H	IconID	1	iconlibrary index number	
0x0F	0x04:L	IconMode	1	icondisplay mode	0x00: Transparent (no background shown) other:Show icon background
0x10	0x05:H	Nint	1	Number of integer digits to display	
0x11	0x05:L	NDot	1	Number of decimal places to display	
0x12	0x06:H	VType	1	0x00:integer(2byte),-32768 ~ +32767	
				0x01: long integer(4byte), - 2147483647 ~ +2147483647	
				0x02:*VPHigh byte, unsigned number,0~255	
				0x03:*VPLow byte, unsigned number,0~255	
				0x04: Very long integer (8byte), - 9223372036854775808 ~ +9223372036854775807	
				0x05: unsigned integer (2byte),0~65535	
				0x06: unsigned long integer (4byte),0 ~ 4294967295	
0x13	0x06:L	Mode	1	0x00: left aligned	
				0x01: right aligned	

①: Indicates that only some display terminals support this function

6.1.5, picture animation display【0x04】

address		definition	length(Byte)	illustrate
0x00		0x5A04	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x0004	2	
0x06	0x00	0x0000	2	fixed
0x08	0x01	PicBegain	2	Starting image index number
0x0A	0x02	PicEnd	2	Terminate image index number
0x0C	0x03:H	FrameTime	1	The time it takes for one frame (one picture) to be displayed, in units of8ms

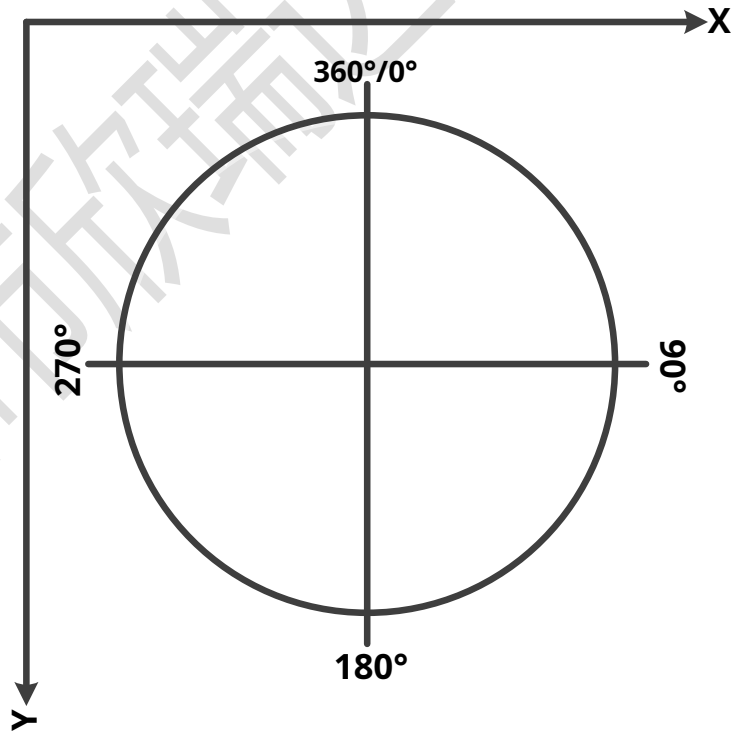
Tips: In fact, the image index number must be smaller than the ending image index number; ifPicEndThe page has also set up image animation variables, which will enable continuous replay; you can pass0x80Command or touch command to switch pictures and end the picture animation.

①: Indicates that only some display terminals support this function

6.1.6, icon rotation indication【0x05】

address		definition	length(Byte)	illustrate	
0x00		0x5A05	2		
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file	
0x04		0x000C	2		
0x06	0x00	*VP	2	Variable pointer, variable format is given byVPModeDecide	
0x08	0x01	IconID	2	The specified icon index number	
0x0A	0x02	IconXc	2	iconThe position of the center of rotation on the icon:Xcoordinate	
0x0C	0x03	IconY	2	iconThe position of the center of rotation on the icon:Ycoordinate	
0x0E	0x04	xc	2	iconDisplay to the rotation center position of the current screen:Xcoordinate	
0x10	0x05	Yc	2	iconDisplay to the rotation center position of the current screen:Ycoordinate	
0x12	0x06	VBegain	2	Variable value corresponding to the starting rotation angle, integer, not displayed if out of bounds	
0x14	0x07	VEnd	2	Variable value corresponding to the end rotation angle, integer, not displayed if out of bounds	
0x16	0x08	ALBegain	2	starting rotation angle,0~720【0x000-0x2D0】,unit0.5°	
0x18	0x09	ALEnd	2	End rotation angle,0~720【0x000-0x2D0】,unit0.5°	
0x1A	0x0A:H	VPMode	1	0x00:*VPPoints to an integer variable	
				0x01:*VPPoints to the high byte data of an integer variable	
				0x02:*VPPoints to the low-byte data of an integer variable	
0x1B	0x0A:L	LibID	1	iconIcon library index number	
0x1C	0x0B:H	Mode	1	icondisplay mode	0x00: Transparent display (no background shown)
					other:Show icon background

Tips: This command is mainly used for the pointer indication of the instrument dial; when rotating, it is always assumed to be "clockwise" rotation, that is,ALEndmust be greater thanALBegain.



①: Indicates that only some display terminals support this function

6.1.7, the bit variable icon displays [0x06】

<table>
<tr><th colspan="2">address</th><th>definition</th><th>length(Byte)</th><th>illustrate</th></tr>
<tr><td colspan="2">0x00</td><td>0x5A06</td><td>2</td><td></td></tr>
<tr><td colspan="2">0x02</td><td>*SP</td><td>2</td><td>variable description pointer,0xFFFFIndicates that it is loaded from the configuration file</td></tr>
<tr><td colspan="2">0x04</td><td>0x000C</td><td>2</td><td></td></tr>
<tr><td>0x06</td><td>0x00</td><td>*VP</td><td>2</td><td>Variable pointer, variable format is given byVPModeDecide</td></tr>
<tr><td>0x08</td><td>0x01</td><td>*VpAux</td><td>2</td><td>Auxiliary variable pointer,double word, user software cannot access</td></tr>
<tr><td>0x0A</td><td>0x02</td><td>ActBitSet</td><td>2</td><td>for1ofbitLocation Description*VPThe corresponding location needs to be displayed</td></tr>
<tr><td>0x0C</td><td>0x03:H</td><td>DisplayMode</td><td>1</td><td>Display mode; example:DisplayModefor0x02,So*VPA certain bit of the corresponding variable is "0"is , displayed whenIcon0Sicon
<table>
<tr><th rowspan="2">DisplayMode</th><th colspan="2">variable bit(Bit)value</th></tr>
<tr><th>0</th><th>1</th></tr>
<tr><td>0x00</td><td>Icon0S</td><td>Icon1S</td></tr>
<tr><td>0x01</td><td>Icon0S</td><td>Do not show</td></tr>
<tr><td>0x02</td><td>Icon0S</td><td>Icon0S ~ Icon0Eanimation</td></tr>
<tr><td>0x03</td><td>Do not show</td><td>Icon1S</td></tr>
<tr><td>0x04</td><td>Do not show</td><td>Icon0S ~ Icon0Eanimation</td></tr>
<tr><td>0x05</td><td>Icon0S ~ Icon0Eanimation</td><td>Do not show</td></tr>
<tr><td>0x06</td><td>Icon0S ~ Icon0Eanimation</td><td>Do not show</td></tr>
<tr><td>0x07</td><td>Icon0S ~ Icon0Eanimation</td><td>Icon0S ~ Icon0Eanimation</td></tr>
</table></td></tr>
<tr><td>0x0D</td><td>0x03:L</td><td>MoveMode</td><td>1</td><td>Bitmap icon arrangement
0x00:X++,ActBitSetSpecified ones are not processedbitNo place reserved
0x01:Y++,ActBitSetSpecified ones are not processedbitNo place reserved
0x02:X++,ActBitSetSpecified ones are not processedbitreserveDisMovLocation
0x03:Y++,ActBitSetSpecified ones are not processedbitreserveDisMovLocation</td></tr>
<tr><td>0x0E</td><td>0x04:H</td><td>IconMode</td><td>1</td><td>icondisplay mode
0x00: Transparent display
0x01: Opaque display</td></tr>
<tr><td>0x0F</td><td>0x04:L</td><td>IconLib</td><td>1</td><td>Icon library index number</td></tr>
<tr><td>0x10</td><td>0x05</td><td>Icon0S</td><td>2</td><td>Do not show animation mode,bit 0Icon index number shows animation mode,bit 0Icon animation starting index number position</td></tr>
<tr><td>0x12</td><td>0x06</td><td>Icon0E</td><td>2</td><td>Show animation mode,bit 0Icon animation end index number position</td></tr>
<tr><td>0x14</td><td>0x07</td><td>Icon1S</td><td>2</td><td>Do not show animation mode,bit 1Icon index number shows animation mode,bit 1Icon animation starting index number position</td></tr>
<tr><td>0x16</td><td>0x08</td><td>Icon1E</td><td>2</td><td>Show animation mode,bit 1Icon animation end index number position</td></tr>
<tr><td>0x18</td><td>0x09</td><td>x,y</td><td>4</td><td>The display position of the starting bit variable, the coordinate position of the upper left corner of the icon</td></tr>
<tr><td>0x1C</td><td>0x0B:H</td><td>DisMov</td><td>2</td><td>Next icon coordinate moving coordinate interval</td></tr>
<tr><td>0x1E</td><td></td><td>Reserved</td><td>2</td><td>It is recommended to write "0"</td></tr>
</table>

①: Indicates that only some display terminals support this function

6.2, text display function

6.2.1, data variable display【0x10】

address		definition	length(Byte)	illustrate	
0x00		0x5A10	2		
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file	
0x04		0x000D	2		
0x06	0x00	*VP	2	variable pointer	
0x08	0x01	x,y	4	Starting display position, displaying the coordinates of the upper left corner of the string	
0x0C	0x03	Color	2	Display color	
0x0E	0x04:H	LibID	1	ASCIIFont location	
0x0F	0x04:L	FontSize	1	characterXDirection lattice number	
0x10	0x05:H	Mode	1	0x00: left aligned	
				0x01: right aligned	
				0x02: Centered	
0x11	0x05:L	NInt	1	Display integer digits	The sum of the number of integer digits and decimal digits cannot exceed20
0x11	0x06:H	NDot	1	Show decimal places	
0x13	0x06:L	VType	1	0x00:integer(2byte),-32768 ~ +32767	
				0x01: long integer(4byte), - 2147483647 ~ +2147483647	
				0x02:*VPHigh byte, unsigned number,0~255	
				0x03:*VPLow byte, unsigned number,0~255	
				0x04: Very long integer (8byte), - 9223372036854775808 ~ +9223372036854775807	
				0x05: unsigned integer (2byte),0~65535	
				0x06: unsigned long integer (4byte),0 ~ 4294967295	
0x14	0x07:H	Len	1	Variable unit (fixed string) display length,0x00Indicates that no unit is displayed	
0x15	0x07:L	StringUnit	Max11	unit string,ASCIIcoding	

①: Indicates that only some display terminals support this function

6.2.2, text display【0x11】

address		definition	length(Byte)	illustrate
0x00		0x5A11	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x000D	2	
0x06	0x00	*VP	2	text pointer
0x08	0x01	X,Y	4	Starting display position, displaying the coordinates of the upper left corner of the string
0x0C	0x03	Color	2	Show text color
0x0E	0x04	Area	8	text box
0x16	0x08	Textlength	2	Display number of bytes meet0xFFFF,0x0000Data or displayed to the end of the text box will no longer be displayed.
0x18	0x09:H	Font0ID	1	Encoding0x01 ~ 0x04hourASCIIFont index number
0x19	0x09:L	Font1ID	1	Encoding0x00,0x05as well as0x01 ~ 0x04of nonASCIIFont index number used by the character
0x1A	0x0A:H	FontXDots	1	fontXDirection lattice number (0x01 ~ 0x04model,ASCIIcharacterXaccording toX/2calculate)
0x1B	0x0A:L	FontYDots	1	fontYNumber of directional lattice
0x1C	0x0B:H	Encode	1	•7Defines whether the character spacing of text display is automatically adjusted: logo / illustrate 0 / Automatically adjust character spacing 1 / The character spacing is not automatically adjusted, and the character width is fixed to the set number of dots. •6 ~.0:Text encoding method The index number / coding table 0 / 8bitcoding 1 / GB2312Internal Code 2 / GBK 3 / BIG5 4 / SJIS 5 / UNICODE
0x1D	0x0B:L	HorDis	1	character horizontal spacing
0x1E	0x0C:H	VerDis	1	Character vertical spacing
0x1F	0x0C:L	Reserved	1	It is recommended to write "0"

Tips: When text is displayed, the font in the font libraryYThe number of directional dots must be an even number; the display terminal is pre-installed0No. font library, including4*8 ~ 64*128 dot matrixASCIIcharacter.

①: Indicates that only some display terminals support this function

6.2.3,RTCshow【0x12】

6.2.3.1, text mode

address		definition	length(Byte)	illustrate
0x00		0x5A12	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x000D	2	
0x06	0x00	0x0000	2	
0x08	0x01	X,Y	4	Display position, display the coordinates of the upper left corner of the string
0x0C	0x03	Color	2	font color
0x0E	0x04:H	LibID	1	Font index number
0x0F	0x04:L	FontSize	1	XNumber of directional lattice
0x10	0x05	StringCode	MAX16	encoded string, as definedRTCEncoding rules display Example: Suppose the current time is2014-03-22 16:18:50Saturday, then rule one:YMD H:Q:S 0x00will be displayed as 2014-03-22 16:18:50 Rule two:MD WH:Q 0x00will be displayed as 03-22SAT 16:18

RTCCoding table description:

RTCinformation	code	display format
Year	Y	2000~2099
moon	M	01~12
day	D	01~31
hour	H	00~23
point	Q	00~59
Second	S	00~59
Week	W	SUN MON TUE WED THU FRI SAT
end sign	0x00	

6.2.3.2, dial mode

address		definition	length(Byte)	illustrate
0x00		0x5A13	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x000D	2	
0x06	0x00	0x0001	2	
0x08	0x01	x,y	4	Center of hands on clock face
0x0C	0x03	IconHour	2	hour handiconindex number,0xFFFFIndicates that the hour hand is not displayed
0x0E	0x04	IconHourCentral	4	hour handiconThe position of the center of rotation
0x12	0x06	IconMinute	2	minute handiconindex number,0xFFFFIndicates that the minute hand is not displayed
0x14	0x07	IconMinuteCentral	4	minute handiconThe position of the center of rotation
0x18	0x09	IconSecond	2	Second handiconindex number,0xFFFFIndicates that the seconds hand is not displayed
0x1A	0x0A	IconSecondCentral	4	Second handiconThe position of the center of rotation
0x1E	0x0C:H	IconLib	1	where the pointer icon isiconLibrary file index number
0x1F		Reserved	1	It is recommended to write "0"

①: Indicates that only some display terminals support this function

6.2.4, numerical display【0x13】

address		definition	length(Byte)	illustrate
0x00		0x5A13	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x000D	2	
0x06	0x00	*VP	2	The first address of the variable pointer data string, the variable isBCD(HEX) Coding Example: Data0x32shown as32;data0xBFwill be displayed asBF
0x08	0x01	X,Y	4	Display the starting position and the coordinates of the upper left corner of the string
0x0C	0x03	Color	2	font color
0x0E	0x04:H	ByteNum	1	*VPThe number of bytes displayed starting from the high byte of the pointer,0x01 ~ 0x0F
0x0F	0x04:L	LibID	1	Font location; the font must be half-width ifLibIDNot for0, the font must be used8bitcoding
0x10	0x05:H	Fontx	1	XNumber of lattice in axis direction
0x11	0x05:L	StringCode	MAX15	The encoding string is used to combine with the time variable to produce the display format required by the customer; in the encoding string, special characters are defined as follows: 0x00: Invalid, this character is not displayed 0x0D: Line break display, that isX=Xs,Y=Y+FontX*2

①: Indicates that only some display terminals support this function

6.2.5, Text scrolling display【0x14】

address		definition	length(Byte)	illustrate
0x00		0x5A13	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x000B	2	
0x06	0x00	*VP	2	text pointer The first three characters of the text pointer are reserved; the text content starts from (VP+3)start to arrive0xFF/0x00end
0x08	0x01:H	RollingMode	1	Scroll mode, scroll from right to left
0x09	0x01:L	RollingDis	1	Scroll spacing, the pixel size of text scrolling per cycle
0x0A	0x02:H	AdjustMode	1	When the text display content can be displayed in the text box, the display mode specified by this bit is executed: The index number: 0x00 / 0x01 / 0x02 model: left aligned / center / Align right
0x0B	0x02:L	RunControl	1	scroll state control The index number: 0x00 / 0x01 / 0x02 / 0x03 model: normal scrolling / pause / closure / Initialization [static display]
0x0C	0x03	Color	2	The color of text display
0x0E	0x04	[X_s,Y_s] ~ [X_e,Y_e]	8	text box
0x16	0x08:H	Font0ID	1	ASCIICharacter display font; when the encoding method is0x00/0x05, the default is0No. font library.
0x17	0x08:L	Font1ID	1	NoASCIICharacter display font
0x18	0x09:H	FontXDots	1	characterXNumber of direction lattice [asASCIIcharacters, automaticallyX/2calculate】
0x19	0x09:L	FontYDots	1	characterYDirection lattice number
0x1A	0x0A:H	EncodeMode	1	[7]:Specifies whether the character spacing of text display is indented 0 Automatically adjust character spacing 1 Character spacing does not adjust automatically [6:0]:Text encoding The index number: 0x00 / 0x01 / 0x02 / 0x03 / 0x04 / 0x05 Encoding: 8Bits / GB2312 / GBK / BIG5 / SJUS / UNICODE
0x1B	0x0A:L	TextDis	1	character spacing
0x1C	0x0B	Reserved	4	Reserved, it is recommended to write0x00

Tips: When text is displayed, the characterYThe number of directional lattice must be an even number;SGUSpre-installed0No. font library, including4x8~64x128Dot matrix characters.

①: Indicates that only some display terminals support this function

6.3, Graphic display function

6.3.1, curve display【0x20】

address		definition	length(Byte)	illustrate
0x00		0x5A20	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x000A	2	
0x06	0x00	0x0000	2	no definition
0x08	0x01	Area	8	Curve window: upper left corner coordinates (Xs,Ys), the coordinates of the lower right corner (Xe,Ye); The curve will not be displayed if it crosses the boundary.
0x10	0x05	YCentral	2	Curve center axis position
0x12	0x06	VDCentral	2	The curve data value corresponding to the central axis is generally the sum of the maximum data and the minimum data.50%
0x14	0x07	Color	2	Curve color
0x16	0x08	MUY	2	The vertical axis magnification, the unit is1/256,0x0000 ~ 0x7FFF
0x18	0x09:H	Channel	1	data source channel,0x00 ~ 0x07
0x19	0x09:L	DisHor	1	Horizontal axis interval,0x01 ~ 0xFF

①: Indicates that only some display terminals support this function

6.3.2, basic graphic display【0x21】

address		definition	length(Byte)	illustrate
0x00		0x5A21	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x0008	2	
0x06	0x00	*VP	2	variable data pointer
0x08	0x01	Area	8	Drawing display area Specify the coordinates of the upper left corner and lower right corner of the display area. If the drawing crosses the boundary, it will not be displayed. only for0x0001, ~ 0x0005 0x0009 ~ 0x000BThe command is valid.
0x10	0x05	Reserved	18	Reserved, it is recommended to write "0"

Basic graphic display comes first14.binDefine a "drawing pad" function in , and the specific drawing operations are performed by *VPThe content in the variable space pointed to determines

Certainly. Users implement different drawing functions by sending different data frames.

Description of variable data frame structure in variable space:

address	definition	illustrate
VP	CMD	Drawing instructions
VP+1	Data_Pack_Num_Max	Maximum number of packets. connection command (0x0002), defined as the number of connecting lines (number of vertices -1)
VP+2	Data_Pack	data pack

The drawing command frame packet format can be explained

instruction (CMD)	Function	Drawing data packet format description			
		relative address	length	definition	illustrate
0x0001	Set point	0x00	2	(x,y)	Set the coordinate position of the point,xThe high byte of the parameter is the judgment condition
		0x01	1	color	Set point color
0x0002	Two points connected	0x00	1	color	line color
		0x01	2	$(x,y)_0$	Connect vertices0coordinate,xThe high byte of the parameter is the judgment condition
		0x03	2	$(x,y)_1$	Connect vertices1coordinate,xThe high byte of the parameter is the judgment condition
		...	...	...	...
		0x01+2*n	2	$(x,y)_n$	Connect verticesncoordinate,xThe high byte of the parameter is the judgment condition
0x0003	Rectangle	0x00	2	$(x,y)_s$	The coordinates of the upper left corner of the rectangular box,xThe high byte of the parameter is the judgment condition
		0x02	2	$(x,y)_e$	Coordinates of the lower right corner of the rectangular box
		0x04	1	color	Rectangle color
0x0004	Rectangular area	0x00	2	$(x,y)_s$	The coordinates of the upper left corner of the rectangular area,xThe high byte of the parameter is the judgment condition
		0x02	2	$(x,y)_e$	Coordinates of the lower right corner of the rectangular area
		0x04	1	color	Rectangle color
0x0005	round frame	0x00	2	(x,y)	circle center coordinates,xThe high byte of the parameter is the judgment condition
		0x02	1	rad	radius
		0x03	1	color	Round frame color
0x0006	Picture area Cut display	0x00	1	Pic_Index	The index number of the pre-cut image page, the high byte is the judgment condition
		0x01	2	$(x,y)_s$	The coordinates of the upper left corner of the pre-cut area
		0x03	2	$(x,y)_e$	The coordinates of the lower right corner of the pre-cut area

①: Indicates that only some display terminals support this function

		0x05	2	(x,y)	Paste the cut area to the position of the currently displayed page, the coordinates of the upper left corner
0x**07	Icon display	0x00	2	(x,y)	icon display location,xThe high byte of the parameter is the judgment condition
		0x02	1	Icon_Index	Icon index number, the location of the icon library is specified by the high byte of the command The icon is displayed without the background color
0x0008	area filling	0x00	2	(x,y)	Seed point coordinates,xThe high byte of the parameter is the judgment condition
		0x02	1	color	fill color
0x0009	Spectrum display	0x00	1	color	Will(x_0, y_{0s}) (x_0, y_{0e})usecolor Color lines,x_0The high byte of the parameter is the judgment condition
		0x01	3	x_0, y_{0s}, y_{0e}	
0x000A	Line segment display	0x00	1	color	Bundle(x,y)$_s$(x,y)$_e$usecolorColor lines,x_sThe high byte of the parameter is the judgment condition
		0x01	2	(x,y)$_s$	
		0x03	2	(x,y)$_e$	
0x000B	Arc display	0x00	1	color$_0$	Arc display color
		0x01	2	(x,y)$_0$	circle center coordinates,xThe high byte of the parameter is the judgment condition
		0x03	1	rad0	radius
		0x04	1	Deg_s$_0$	Starting angle, unit0.5°,0~720
		0x05	1	Deg_e$_0$	End angle, unit0.5°,0~720
0x000C	Character display	0x00	1	color$_0$	Character display color
		0x01	2	(x,y)$_0$	Character display starting position,xThe high byte of the parameter is the judgment condition
		0x03H	0.5	Lib_Index	Font location
		0x03L	0.5	mode	character encoding mode;0 : 8bit;1: GB2312;2: GBK; 3: BIG5; 4: SJIS; 5: UNICODE
		0x04H	0.5	x_dots	characterxNumber of directional lattice
		0x04L	0.5	y_dots	characteryNumber of directional lattice
		0x05	1	text$_0$	character data
0x000D	Rectangular area Display in reverse color	0x00	2	(x,y)$_s$	The coordinates of the upper left corner of the rectangular area,xThe high byte of the parameter is the judgment condition
		0x02	2	(x,y)$_e$	Coordinates of the lower right corner of the rectangular area
		0x04	1	color	The inverse color of the rectangular area,0xFFFFThe color inversion operation will be performed
0x000E	Two-color bitmap show	0x00	2	(x,y)$_s$	The bitmap displays the coordinates of the upper left corner of the rectangle,xThe high byte of the parameter is the judgment condition
		0x02	1	x_dots	bitmapXNumber of lattice in axis direction
		0x03	1	y_dots	bitmapYNumber of lattice in axis direction
		0x04	1	color$_0$	'1'The corresponding display color when
		0x05	1	color1	'0'The corresponding display color when
		0x06	N	DataPack	Display Data,MSBmethod; it is required that each row of data must be aligned to a word, that is, the next row of data always starts from a new word
0x000F	Bitmap display	0x00	2	(x,y)$_s$	The bitmap displays the coordinates of the upper left corner of the rectangle,xThe high byte of the parameter is the judgment condition
		0x02	1	x_dots	bitmapXNumber of lattice in axis direction; Limited by variable space, the maximum display bitmap for196x146(4:3)/226x126(16:9)
		0x03	1	y_dots	bitmapYNumber of lattice in axis direction
		0x04	N	DataPack	Display data, one word per pixel (MSB,5R6G5BFormat)

Analyzing conditions:0xFFEnd of drawing operation;0xFETo ignore this operation.

①: Indicates that only some display terminals support this function

6.3.3, list display【0x22】

address		definition	length(Byte)	illustrate			
0x00		0x5A22	2				
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file			
0x04		0x000C	2				
0x06	0x00	*VP	2	variable data pointer			
0x08	0x01:H	Tab_X_Num	1	number of columns,0x01 ~ 0xFF			
0x09	0x01:L	Tab_Y_Num	1	number of rows,0x01 ~ 0xFF			
0x0A	0x02:H	Tab_X_Start	1	The starting column position of the table,0x00 ~ 0xFF			
0x0B	0x02:L	Tab_Y_Start	1	The starting row position of the table,0x00 ~ 0xFF			
0x0C	0x03:H	Unit_Data_Num	1	0x01 ~ 0x7F	All cells store data of the same length The length of data space occupied by a cell [word, word length]		
				0x00	Depend on*VPThe variable storage space pointed by the pointer defines the data length of cells in different columns [word, word length]; whenUnit_Data_Numfor0When, the table data content storage location is delayed accordingly. (Unit_Data_Num/2)Take the entire word address upwards. Example:*VP0=x1000,Tab_X_NumThe value is7,but0x1000 ~ 0x1003Stored in sequence0~6 The table data length of the column, where0x1003The low byte is unused 0x1004The ; address starts storing table contents.		
0x0D	0x03:L	Encode_Mode	1	. 7	character spacing auto-adjust	0	Automatically adjust character spacing
						1	The character spacing is not automatically adjusted, and the character width is fixed to the set number of dots.
				.6	Table content Format	0	text format
						1	The first two words of the cell data represent
				.5	Border display	0	Show borders
						1	Do not show borders
				.4	Undefined, it is recommended to write '0'		
				. 3 ~ .0	text encoding Way	0	8bitcoding
						1	GB2312
						2	GBK
						3	BIG5
						4	SJIS
						5	UNICODE
0x0E	0x04	Area	8	Table display area definition, coordinates of the upper left corner and lower right corner of the table; The table is always displayed starting from the upper left corner and ends when it crosses the boundary.			
0x16	0x08	color_line	2	Table border line color			
0x18	0x09	color_text	2	Table text display color			
0x1A	0x0A:H	fontID0	1	Encoding0x01 ~ 0x04hourASCIIFont location			
0x1B	0x0A:L	fontID1	1	Encoding0x00,0x05,as well as0x01 ~ 0x04Time is wrongASCIIFont location			
0x1C	0x0B:H	Font_X_dots	1	fontXNumber of lattice in axis direction【0x01 ~ 0x04hour,ASCIIcharacterXaccording toX/2calculate】			
0x1D	0x0B:L	Font_Y_dots	1	fontYNumber of lattice in axis direction			
0x1E	0x0C:H	Tab_X_Adj_Mod	1	When settingTab_X_StartWhen it is not zero, control the display header;0x00The first column is not displayed,0x01beginning of time			

①: Indicates that only some display terminals support this function

				Column display
0x1F	0x0C:L	Tab_Y_Adj_Mod	1	When settingTab_Y_StartWhen it is not zero, control the display header;0x00When the first line is not displayed,0x01When the first line is displayed

whenEncode_ModeFirst6The bit is "1"When , the first two words of each cell data content define the table data format. The specific definition is as follows:

Function	storage location	illustrate		
type of data	high byte of first word	value	definition	illustrate
		0x00	integer,2byte	- 32768 ~ 32767
		0x01	long integer,4byte	- 2147483648 ~ 2147483647
		0x02	*VPHigh byte, unsigned number	0~255
		0x03	*VPLow byte, unsigned number	0~255
		0x04	Very long integer,8byte	- 9223372036854775808 ~ 9223372036854775807
		0x05	unsigned integer,2byte	0~65536
		0x06	unsigned long integer,4byte	0 ~ 4294967295
		0x10	Time format1	BCDcode string,12:34:56
		0x11	Time format2	BCDcode string,12-34-56
		0x12	Time format3	BCDcode string,YYYER-MM-DDHH:MM:SS
		0xFF	text format	text format
Data Format	low byte of first word	value	definition	Remark
		0x00 ~ 0x06	Variable data display format	high4bit is the integer part, low4The digit is the decimal part,
		0x10 ~ 0x11	timeBCDcode string	The byte length of the code string
		others	no definition	
text color	second word	Cell text display color		

If the actual content of the table is shorter thanUnit_Data_Numspecified length, use0xFFFFAs the cell text terminator. For particularly large tables grid, modified through touch screen operationTAB_X_Start,TAB_Y_StartValues make it easy to position or drag tables.

①: Indicates that only some display terminals support this function

6.3.4, QR code display【0x25】

address		definition	length(Byte)	illustrate
0x00		0x5A12	2	
0x02		*SP	2	variable description pointer,0xFFFFIndicates that it is loaded from the configuration file
0x04		0x0004	2	
0x06	0x00	*VP	2	The QR code displays the content pointer; the longest displayed content458Bytes, in0x0000/0xFFFFfor the end mark
				Byte length: QR code display unit point integer
				greater or equal to1bytes and less than155bytes: 45x45unit pixel
				greater or equal to155bytes and less than or equal to458bytes: 73x73unit pixel
0x08	0x01	X,Y	4	The displayed coordinate position, this value is the upper left corner position;
0x0C	0x03	Size	2	The physical pixel matrix size occupied by each QR code unit pixel, range:0x01 ~ 0x07. When the value is2When , each unit pixel will appear as2x2lattice size
0x0D		Reserved	18	It is recommended to write "0"

①: Indicates that only some display terminals support this function

Appendix 1: Introduction to font library

1, font extraction

In the font library, the font pattern of each character is stored in rows first and then columns; encoding rules: row first and then columns, horizontally (Xaxis) direction: coded from left to right, vertical (Yaxis) square

Direction: Coding from top to bottom. The high-end-first scanning storage method is one byte wide, and the data is fetched from the high bit to the low bit, as shown in the following figure:

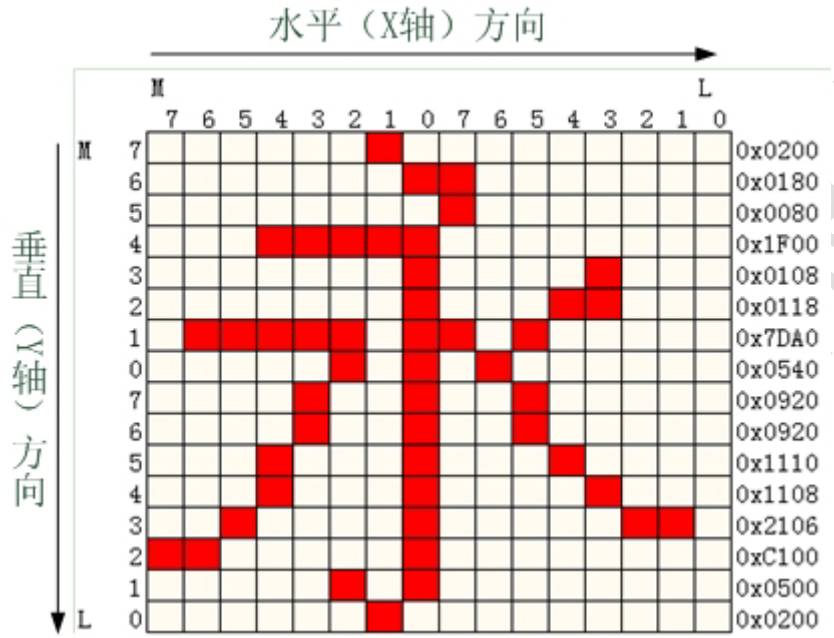


Figure (Appendix 9 -1) The word 'yong'16*16Schematic diagram of dot matrix font extraction

2, Introduction to display terminal default font encoding

2.1,ASCIIcoding

At present, the most widely used character set and encoding in computers are developed by the American National Bureau of Standards (ANSI)customizedASCIIcode(American Standard Code for Information

Interchange, American Standard Information Interchange Code), which has been adopted by the International Organization for Standardization (ISO) is set as an international standard and is calledISO-646Standard for all Latin script letters.ASCII

The code is encoded in eight-bit binary, with a total of256characters or symbols, including all English characters and Arabic numerals, etc.

2.2,GB2312Chinese encoding

GB2312orGB2312-80It is a Chinese national standard for simplified Chinese character sets. Its full name is "Chinese Coded Character Set for Information Exchange".·Basic Set", also known asGB0, by China

Released by the State Administration of Standards,1981Year5moon1Implemented on the day.GB2312The encoding is popular in mainland China, and is also used in Singapore and other places. Almost all Chinese systems and international

All software supportsGB2312.GB2312Standard included6,763Chinese characters, including first-level Chinese characters3,755, second-level Chinese characters3,008each; at the same timeGB2312Includes Latin letters,

Greek letters, Japanese hiragana and katakana letters, Russian Cyrillic letters, including682full-width characters.GB2312The emergence of basically meets the computer processing needs of Chinese characters. It

The collected Chinese characters already cover mainland China99.75%frequency of use. For rare characters appearing in names, ancient Chinese, etc.,GB2312cannot be dealt with, which leads to laterGBKand

GB18030The emergence of the Chinese character set.

2.3,GBKChinese encoding

GBKThat is, the Chinese character internal code expansion specification,KIt is the initial consonant of the word "Kuo" in the extended Chinese Pinyin. Full English nameChinese Internal Code Specification.GBKCoding standards compliant

GB2312, a total of Chinese characters included21,003individual, symbol883and provide1,894Each character code bit integrates simplified and traditional Chinese characters into one database.GB2312The code is the national Chinese character information of the People's Republic of China

Coding for exchange, the full name is "Chinese Coded Character Set for Information Exchange - Basic Set",1980Published by the State Administration of Standards. The basic set contains a total of Chinese characters6,763and non-Chinese character graphics

①: Indicates that only some display terminals support this function

character682, commonly used in mainland China, Singapore and other places also use this code.GBKis trueGB2312-80extension, that isCP936code list (Code Page 936)extension (of forwardCP936andGB2312-80exactly the same).

2.4,Unicodeuniversal character encoding

Unicode(Unicode, Unicode, Unicode) is a character encoding used on computers. It sets a unified and unique binary for every character in every language. Customized encoding to meet the requirements for cross-language and cross-platform text conversion and processing.1990Started research and development in1994Officially announced in the year. As computer capabilities increase,Unicode It has also gained popularity in the more than ten years since its introduction.

UnicodeIt is a character encoding scheme developed by an international organization that can accommodate all texts and symbols in the world.Unicodeuse numbers0 - 0x10FFFFto map these characters, up to accommodate1,114,112characters, or there are1,114,112code bits. A code point is a number that can be assigned to a character.

2.5,BIG-5Traditional Chinese encoding

BIG-5Code is a traditional Chinese character encoding scheme popular in Taiwan and Hong Kong, commonly known as "Big Five Code". The regional standard code is:CNS11643.BIG-5The code is using Traditional Chinese Society The most commonly used computer Chinese character set standards in the group, included in total13,060Among the Chinese characters, two characters are repeated codes.BIG-5Belongs to Chinese internal code (Chinese code is divided into Chinese internal code and Chinese interchange code) code-escape two categories).BIG-5Although it is popular in areas where Traditional Chinese is spoken in Taiwan, Hong Kong and Macau, it has not been a local national standard for a long time, but only an industry standard (de facto standard). Yitian Chinese system,WindowsThe character sets of major systems are all based onBIG-5As a benchmark, manufacturers have added and deleted their own additions and deletions, resulting in many different versions.

①: Indicates that only some display terminals support this function

Appendix 2: Baud rate index table (BaudID)

Displays the current common baud rate of the serial port supported by the terminal. The specific correspondence is shown in the following table.

Serial port baud rate index table (unitbps)								
BaudID	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07
baud rate	1200	2400	4800	9600	19200	38400	57600	115200
BaudID	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
baud rate	28800	76800	62500	125000	250000	230400	345600	460800
BaudID	0x10	0x11	0x12	0x12-0xFF			0xFE	0xFF
baud rate	625000	691200	921600	Reserved			Custom	Reserved

Table (Appendix IV -1) Serial port baud rate index table

illustrate:

① 0x00 – 0x07,0x0D,0x0F,0x12The indexed baud isPCThe baud rate supported by the machine's serial port;

② 0x08 – 0x0C,0x0E,0x10,0x11The indexed baud rate is notPCThe baud rate supported by the serial port of the machine, please use it with caution.

① Due to misoperation, the communication with the display terminal cannot be normal. You can useMicroSD/TFSet up the card; the steps are as follows [please see "4MicroSD(TF)Card Download instructions》]：

1existMicroSD/TFCreated in the root directory of the cardXRD_TFTfolder;

2existXRD_TFTCreate in folderCONFIG.txtdocument

3If you need to set the baud rate115200bps, then write in the fileR1=07,save.

4Insert the card into the display terminal deviceMicroSD/TFcard slot.

5After powering on again, the serial port baud rate can be set to115200bps.

①: Indicates that only some display terminals support this function

Appendix 3:SysConfigregister

<table>
<tr><th>Bit</th><th>Weights</th><th>definition</th><th colspan="2">illustrate</th></tr>
<tr><td>. 7</td><td>0x80</td><td>VDS</td><td>0:normal display
1:90°Display</td><td>The corresponding kernel needs to be updated to achieve this. It is recommended to write "0"</td></tr>
<tr><td>.6</td><td>0x40</td><td>Reserved</td><td colspan="2">It is recommended to write "0"</td></tr>
<tr><td>.5</td><td>0x20</td><td>TPLed</td><td colspan="2">0: Disable backlight energy-saving control
1: Enable backlight energy-saving control, the control parameters areconfig.txtmiddleR6/R7/R8set up</td></tr>
<tr><td>.4</td><td>0x10</td><td>FCRC</td><td colspan="2">0: Disable serial communicationCRC-16check
1: Enable serial communicationCRC-16check</td></tr>
<tr><td>. 3</td><td>0x08</td><td>TPSAUTO</td><td colspan="2">0: Disable automatic upload of touch/key control parameters, user access is required
1: Enable automatic upload of touch/key control parameters, and affect the corresponding touch/key control configuration at the same time</td></tr>
<tr><td>. 2</td><td>0x04</td><td>L22_InitEn</td><td colspan="2">0: Clear the variable storage space, and the initialization value is0
1:Set the variable storage space, and place the initialization data in0x16[22]No. font file</td></tr>
<tr><td>. 1</td><td>0x02</td><td>FRS1</td><td colspan="2" rowspan="2">Display terminal scan cycle
<table><tr><th>Scan cycle</th><th>80ms</th><th>120ms</th><th>160ms</th><th>200ms</th></tr><tr><td>FRS1</td><td>1</td><td>1</td><td>0</td><td>0</td></tr><tr><td>FRS0</td><td>1</td><td>0</td><td>1</td><td>0</td></tr></table>The smaller the scan period, the more sensitive the variable response will be, but the lower the processing power; the scan period will affect the animation speed of the animated icon display.</td></tr>
<tr><td>. 0</td><td>0x01</td><td>FRS0</td></tr>
</table>

①: Indicates that only some display terminals support this function

Appendix 4:AuxConfigregister

Bit	Weights	definition	illustrate
. 7	0x80	Reserved	It is recommended to write "0"
.6	0x40	RunOSEnable	0: Disable operationOSsystem
			1: Enable operationOSsystem
.5	0x20	TpBuzzEnable	0: Enables a buzzer sound when the touch control is valid.
			1: It is forbidden to have a buzzer sound when the touch is valid, but it can be controlled through the register.0x02Control tweets
.4	0x10	Page128Enable	0: Maximum variable display function that can be set per page64strip
			1: Maximum variable display function that can be set per page128strip
. 3	0x08	CRCAckEnable	0:EnableCRCAfter frame verification, it is forbidden to automatically respond to the frame verification result.
			1:EnableCRCAfter frame verification, enable automatic response frame verification structure
. 2	0x04	Reserved	It is recommended to write "0"
. 1	0x02	Reserved	It is recommended to write "0"
. 0	0x01	Reserved	It is recommended to write "0"

①: Indicates that only some display terminals support this function