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Custom Display

Production Custom designs Installation

Mechanical design



Product
Datasheet

ET016HMI4040-DC Datasheet V1.0

ISO9001:2015 Quality System Certification

Customer			
Keywords	DB series, HMI, 1.6 inch, 400*400, with configuration, LUA scripts, circular UI, knob screens		
Model	ET016HMI4040-DC		
Signature of Customer		Signature of Engineer	
Date		Date	2024.09.04



Version Record

Version	Date	Reason for modify	Page	Written by	Reviewed by
V1.0	2024/09/04	File creation	all		



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1. Introduction of Hardware

This chapter mainly introduces some appearance reference diagrams, hardware configuration diagrams and debugging tools diagrams.

1.1 Product Appearance

The following is a reference drawing of the appearance of a product of this size, as shown in Figure 1-1.

Note: The company does not initiate changes to the outside world without involving key structural process modifications or layout adjustments, only changes and iterations in product process or reliability, and the specific physical objects received shall prevail.



Figure 1-1 1.6 inch non-touch reference diagram

1.2 Hardware configuration

The following is a reference diagram of the hardware configuration of this size product, illustrated by a resistive screen, as shown in Figure 1-2.

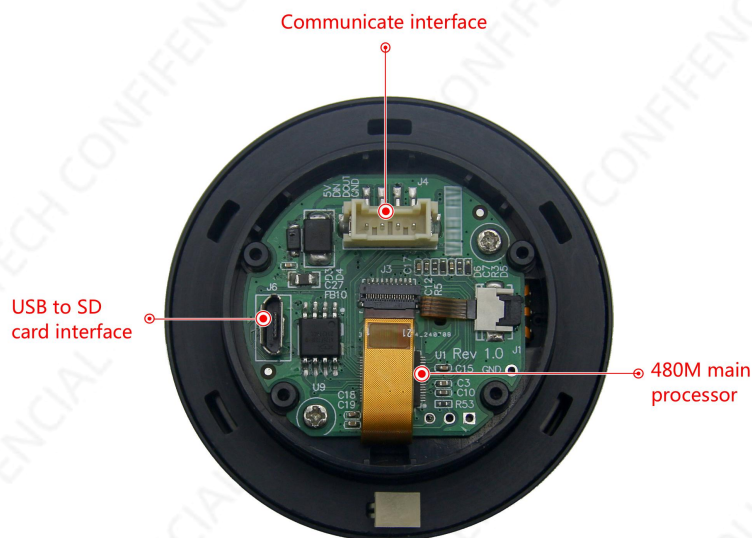


Figure 1-2 Hardware configuration



1.3 Pin Definition

Number	Definition	Description	Reference Diagram
1	5V	Power input 5V	
2	DIN	Serial port screen input, connected to the user's TXD terminal	
3	DOUT	Serial port screen output, connected to the user's RXD terminal	
4	GND	Power Ground	

1.4 Debugging tool

The following is a reference diagram of the debugging tool for this product, illustrated by a resistive screen, as shown in Figure 1-3.

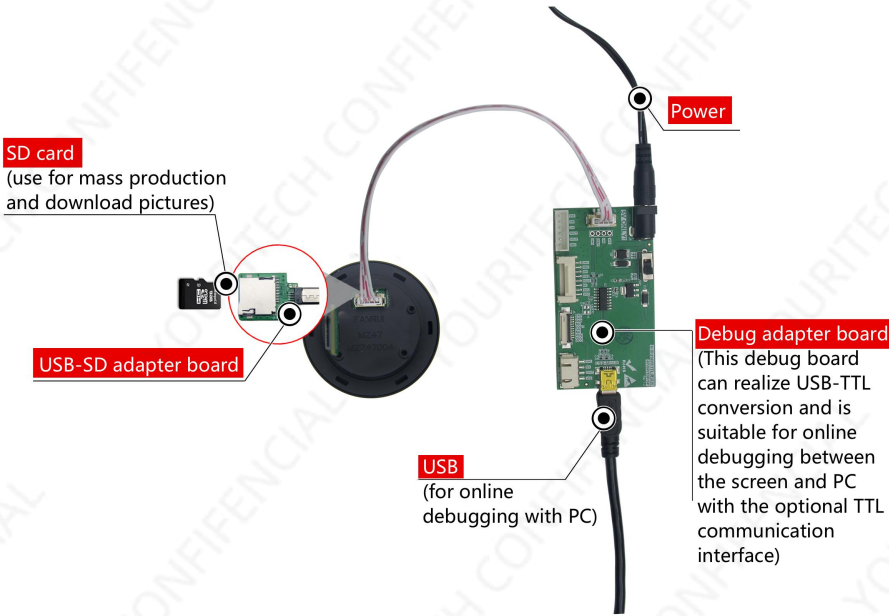


Figure 1-3 Diagram of the TTL debugging tool

◆ TTL Development & Debugging Accessories (Optional)	
Name	Accessory Model
Power adapter	Power adapter 5V
Debugging the interposer	Standard USB to TTL debug board, V1.2
Serial cable	mini USB cable
SD card	Capacity up to 32G, format: FAT32 (Kingston, SanDisk)
SD card adapter board	Knob screen USB-SD



2. Installation diagram

The following is a schematic installation diagram of this model product, as shown in Figure 2-1.

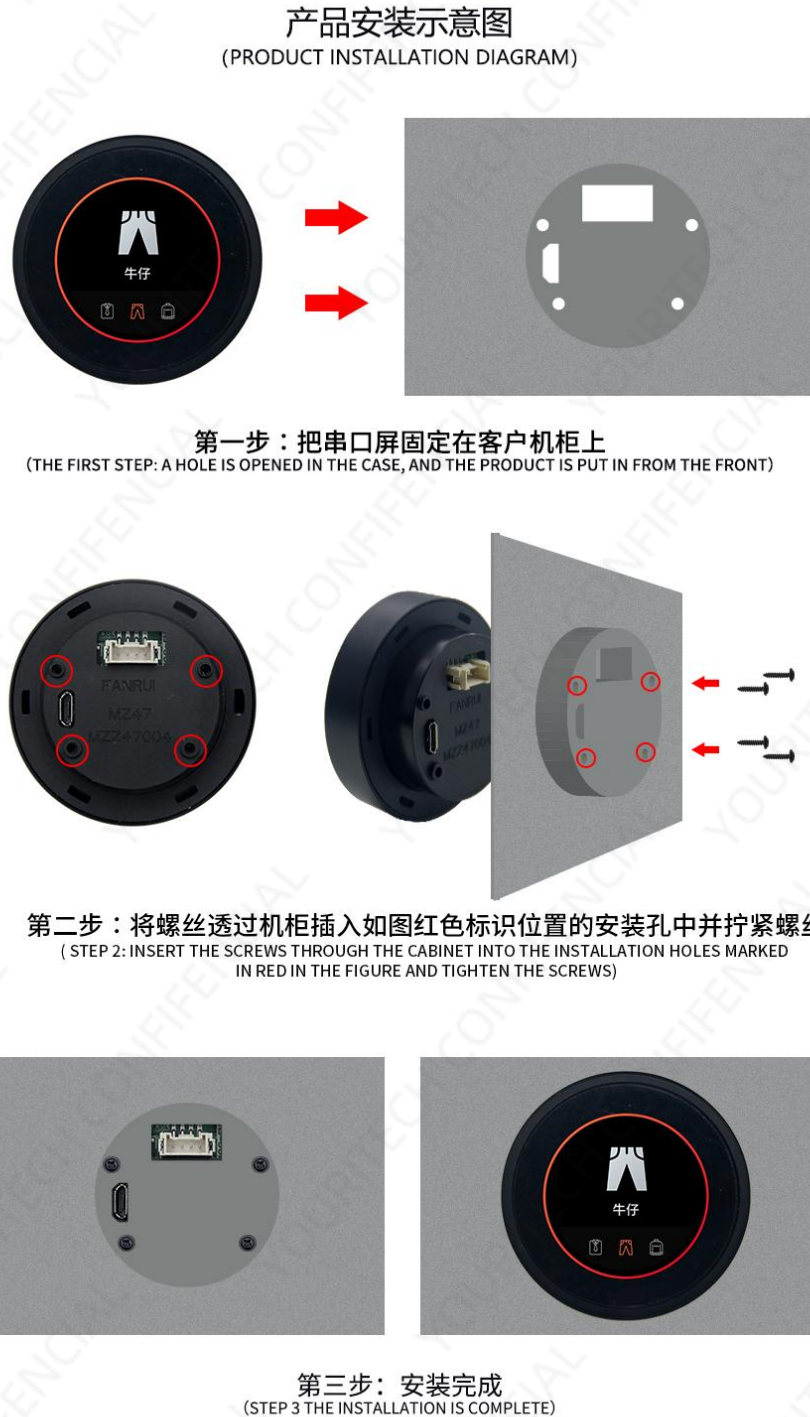


Figure 2-1 Installation diagram



3. Product Structure

The HMI human-machine interface launched by YOURITECH Technology is a serial port display terminal integrating LCD display driver, picture font storage, GUI operation, audio playback and various configuration controls. The user microcontroller only needs to send and receive the corresponding serial port instructions to easily realize text, picture and curve display.

The DB series serial screen processor adopts a 32-bit 480M SOC processor, which integrates PSRAM memory, JPEG, PNG image hardware decoding and other functions, and the system architecture is shown in Figure 3-1.

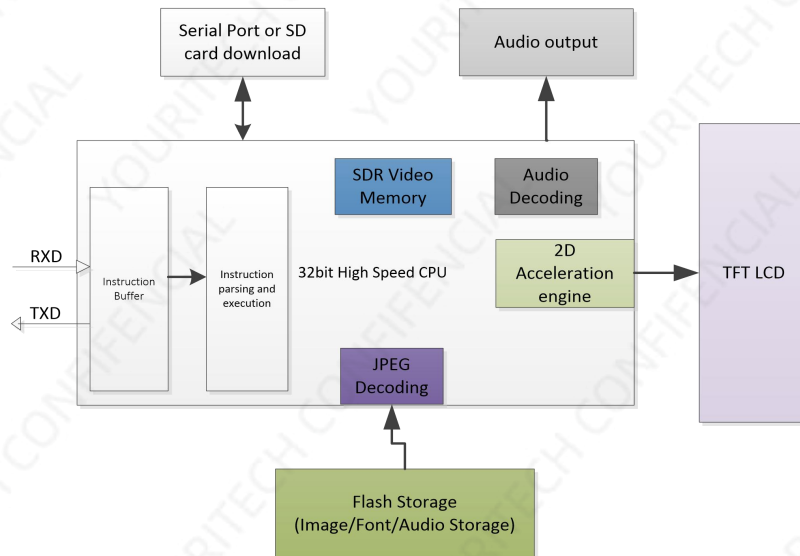


Figure 3-1 Internal structure of DB series serial port screen

The main advantages of choosing a high-performance 32-bit dual-core processor architecture are:

1. Dedicated 32-bit 480M SOC processor optimized for picture display, with 2D acceleration engine, JPEG, PNG image hardware decoding, so that the display can be matched with various special effects, and the display effect is smooth and gorgeous.
2. No operating system, continuous 24*365 hours of uninterrupted power can work reliably, no garbage redundant files.



4. Product Specification

◆ Product Specification	
Model Description	ET016HMI4040-DC(TTL, non-touch)
Product Series	DB series
Core Processor	480M SOC processor
Operating System	No operating system, it can run when it is powered on, and the startup time is about 1 second
Protocol Type	Support MODBUS RTU、FX2N、FX3U、DELTA(DVP)、XINJIE(XC)、XINJIE(XD)、FATEK(FB)、HAIWELL(N/S)、SAMKOON、EMERSON、DCBUS、XGU Setc. Protocol
Script language	Version 5.3 LUA scripts with user-written logic, protocols and algorithm functions running inside the screen
Size	1.6 inch
Resolution	400*400
Installation Orientation	It supports 0°, 90°, 180°and 270°rotation mounted displays
Storage Space	128Mbit
Font	Built-in vector font, edge anti-aliasing, support any size ASCII, GBK, GB2312, UNICODE (global language) font library, can also customize any computer font display
Image Storage	It supports JPEG and PNG (transflective/fully transparent) compression, and supports image storage of any size. Accumulation can be stored approximately 160 full-screen images (calculated according to the size of 65KB/piece, BMP format is not recommended). The image compression ratio is different,this value fluctuates up and down.
Color	65K color, 16-bit RGB
Voltage	5V
Power Consumption	Darkest backlight: 0.55W Brightest backlight: 0.8W
Communicate Interface	TTL
Communicate Baud-rate	1200~921600bps, typical baud rate: 115200bps
Communication Connector Specifications	HY2.0-4P vertical
Image Download	SD card, serial port
Firmware local/remote upgrade	Insert SD card/U disk local upgrade/support remote serial port of user motherboard to upgrade screen firmware
Picture remote upgrade	Support users to remotely use their motherboard serial port to upgrade screen-related picture projects, font libraries, configuration files, etc
Screen Active Display Area (AA)	φ 39.8mm
Product Dimensions	φ59.0mm*29.6mm



(Diameter * Height)	
Window size	φ43mm (It is recommended that the customer cabinet window sizeφ44mm)
Equipped with host computer software	VisualHMI®

◆ Reliability Parameters

Operating temperature	-20~+70°C
Storage temperature	-30~+80°C
ESD Test	Test standard: IEC 61000-4-2 Air: ±12KV
EFT test	Test standard: IEC 61000-4-4 GB standard 4 (voltage: ±4KV; FREQUENCY: 100/5KHZ; TIME: 120S), no restart, no display abnormality, etc., the test function is normal
Radiation test	Test standard: EN55022 ClassB margin - 6dB Test environment: three-meter dark wave chamber

◆ Product Core Competitiveness

Learning Cycle	30 minutes to familiarize yourself with the development environment, 3 days to complete the HMI design
Program debugging	The host computer integrates a "virtual serial port screen", which does not need to be connected to the hardware, and Keil IDE is directly bound to it for debugging
Startup time	It can be displayed when powered on
Configure Controls	In addition to traditional buttons, text, progress bars, QR codes and other controls, a variety of new configuration controls have been added, such as: multi-status indicators, recipes, operation records, flow blocks, alarm bars and other configuration controls
System Keyboard	Built-in virtual number, character keyboard, support Chinese and English input methods, customize keyboard
Data logging	Supports exporting data logging control content to SD card
Layer technology	The system has multiple built-in display layers for faster switching
Multi-language capabilities	Factory preset up to 15 global languages of any country, one-click switch of the required language, without the need for multiple sets of UI
Logical operation processing	The LUA script parser is embedded in the host computer, and users can customize various complex logical relationships and protocols on the screen, meeting 99.9% of the product function requirements of customers
Reliability	Products are tested for high and low temperature, ESD, group pulse and radiation by industry standards

◆ LCD

Display Type	IPS LCD
Backlight Tube	LED
Brightness (cd/m ²)	350
Backlight Life (h)	>20,000
Contrast Ratio	1200:1

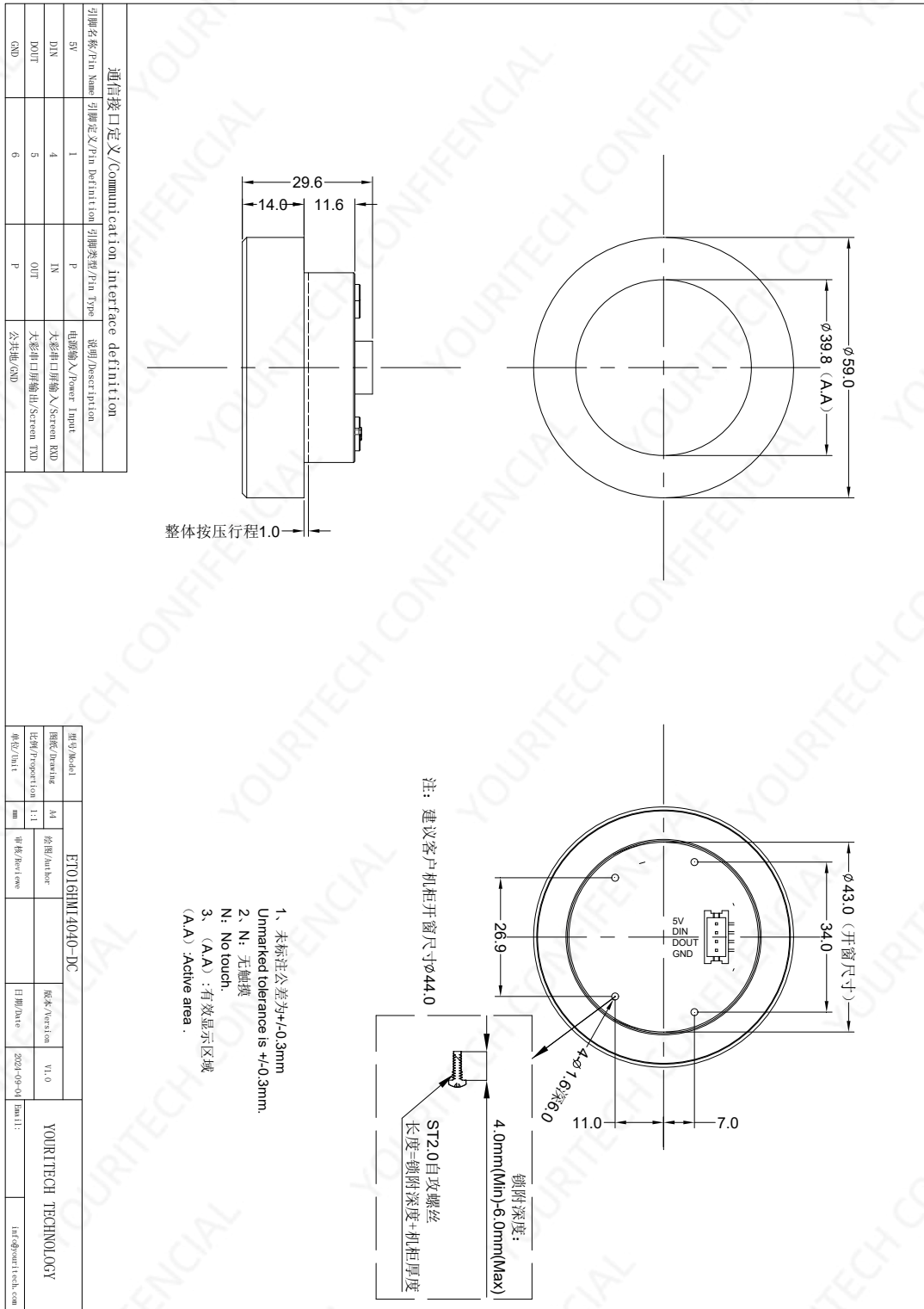


Visual Angle (L/R/T/B)	80/80/80/80
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◆ Customization Service	
Customization Fee	One-time order 1000PCS can partial exempt customized fee
Hardware Circuit	Can customize PCB size, circuit thickness, add user circuit, military-grade temperature display, etc.
Software Customization	Customize special instructions or controls according to user needs to reduce user development difficulty
UI design Service	Can provide picture art and product structure design services
Others	Customized on demand to meet all user needs



5. Product Dimensions



6. Reliability Test

All serial port screens of YOURITECH Technology have carried out a series of process reliability tests before mass production: high and low temperature, ESD, pulse burst, radiation, touch life and other tests to ensure product quality, as shown in Figure 6-1.



图 6-1 可靠性测试设备

6.1 ESD Test

6.1.1 Executive Standard

Executive Standard

IEC 61000-4-2

6.1.2 Test Ambient

Test ambient temperature: 25°C

Test ambient humidity: 50%

Test process: Place the product on the test stand, lay down on the serial port screen buckle and the display area in order to make contact and air discharge as shown in Figure 6-2. Observe whether if the screen have reset or restarted, or abnormal display.





Figure 6-2 ESD Test

6.1.3 Test Data

Product Model	Discharge type	Humidity	Test result
ET016HMI4040-DC	Air	±12KV	No restart, no abnormal display, normal function
	Air	±13KV	Occasional reset and restart, no abnormal display, normal function

Note: The current test tests are all product bare tests, and the ESD performance index of the whole machine will be higher if the screen and machine are well grounded on the actual product assembly machine, or the surface of the touchpad is protected by PVC or cover

6.2 High and Low Temperature Aging Test

6.2.1 Test environment

Test ambient temperature: -20~+70°C

Test ambient humidity: 60%±3%RH

Test process: the product is placed obliquely in the high and low temperature test box as shown in Figure 6-3, through the 72H high temperature, low temperature, high and low temperature alternating transformation aging test, observe whether the screen during the test and after the experimental test whether the screen has reset and restart, display abnormality, abnormal function and other phenomena.





Figure 6-3 High and low temperature aging test

6.2.2 Test data

Product Model	Temperature	Humidity	Test results
ET016HMI4040-DC	High temperature (70°C)	65%	No restart, no abnormal display, normal function
	Low temperature (-20°C)	65%	No restart, no abnormal display, normal function
	Alternating high and low temperature (-20~70°C)	65%	No restart, no abnormal display, normal function

6.3 Group Pulse Test

6.3.1 Executive Standard

Executive Standard	IEC 61000-4-4
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6.3.2 Test environment

Test ambient temperature: 25°C

Test ambient humidity: 50%

Test process: the product is placed flat on the test bench, and the power supply after coupling the pulse group generator is used to power the screen, as shown in Figure 6-4, and observe whether the screen is reset and restarted, display abnormal, touch abnormality and other phenomena during the experiment.



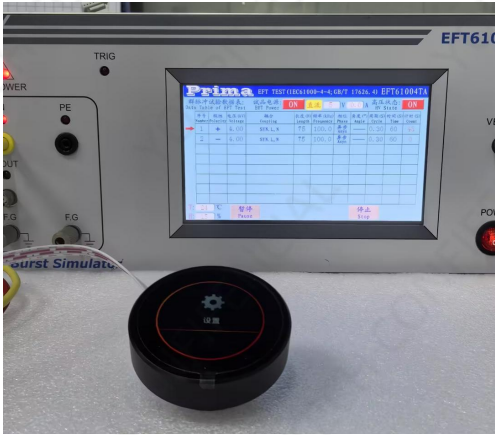


Figure 6-4 group pulse test diagram

6.3.3 Test Data

Product Model	Test Standard			Test Result
ET016HMI4040-DC	International Standard 4			No restart, normal communication, normal function
	Voltage (KV)	Frequency (KHZ)	Time (S)	
	±4.0	5	120	

6.4 Radiation Test

6.4.1 Executive Standard

Executive Standard	EN55022 ClassB
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6.4.2 Test environment

The radiation test laboratory environment is shown in Figure 6-5.

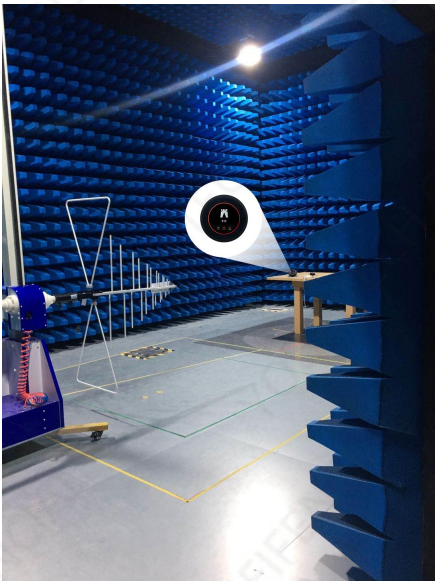


Figure 6-5 Radiation test chart



6.4.3 Test Data

1. Radiation test horizontal test data, shown in Figure 6-6.

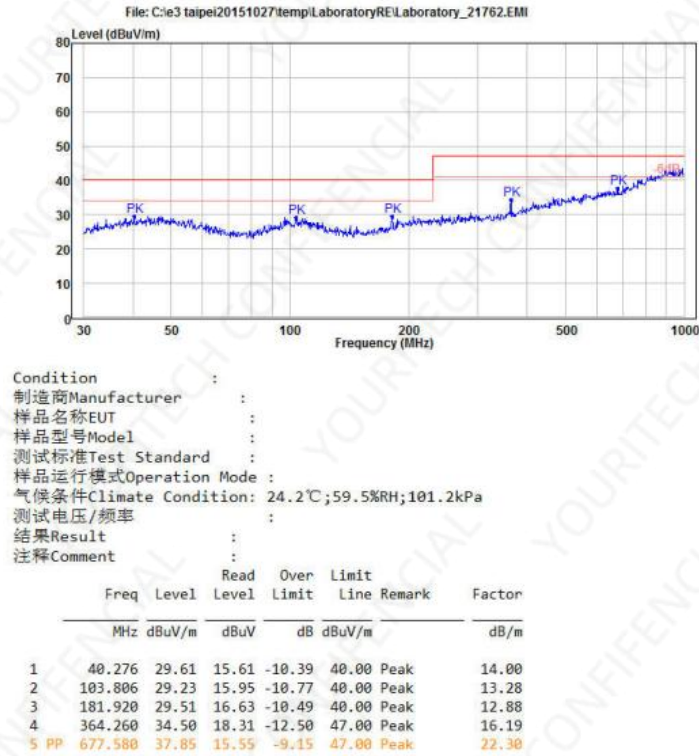


Figure 6-6: Horizontal direction of radiation measurement

2. Radiation test data in the vertical direction, as shown in Figure 6-7.

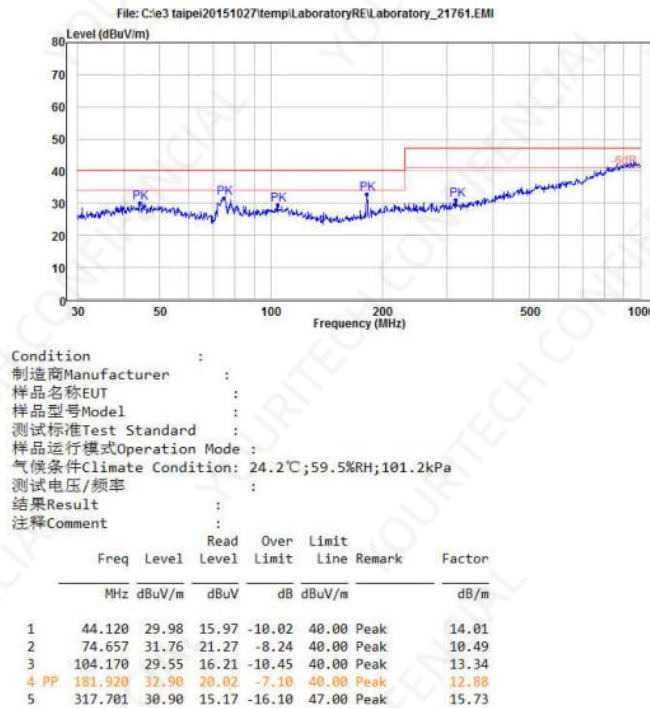


Figure 6-7: Radiation test in the vertical direction



7. Protocol Configuration

VisualHMI is a configuration development platform independently developed by YOURITECH for human-machine interface applications, which integrates the "HMI simulator" and is free to use for life. After the user creates a new project, imports the designed art pictures, and then configures the buttons and other controls in each screen, and finally downloads the entire project to the serial port screen after the simulation is correct. The software interface is shown in Figure 7-1.

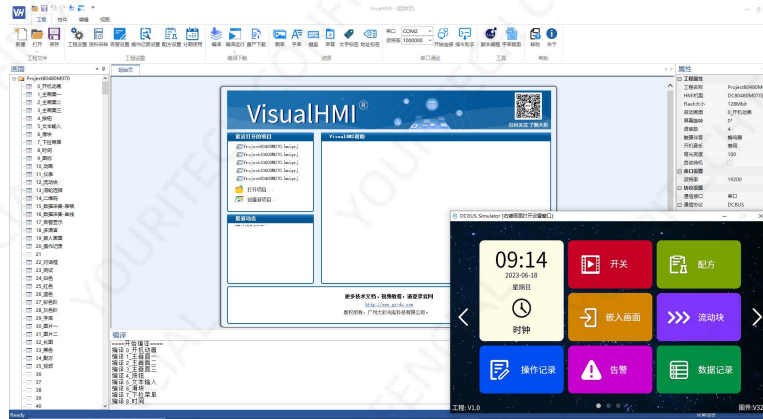


Figure 7-1 VisualHMI main interface

Any user only needs 3 steps to complete complex human-computer interaction design within 30 minutes.

1. Prepare art design materials

Arrange UI designers to design the images required for products such as start-up image, text background, button icon and prompt box.

2. Conduct image editing, scripting, control configuration and image downloading with VisualHM software

First of all, using the supporting host computer VisualHM software, then typeset interface and configure controls of the pre-designed artwork pictures, run the "virtual serial port screen" for simulation, and finally the entire project can be completed download through SD / UART (depending on the hardware configuration of different models) to the internal memory of the serial port screen. The PC software will assign a unique ID number to each screen, picture and control in the project. Users can also write the required logic control and algorithms through the script editor embedded in the host computer to reduce the communication frequency between the screen and the motherboard.

3. User's single-chip micro computer monitors and sends the corresponding serial port instructions to control the image display

After the project is downloaded to the screen, once a button is pressed on the screen, the user MCU serial port will receive the button information uploaded on the screen. By judging the value of the variable according to the binding address, the user can obtain the current button's screen position and functional attributes, so that it can control the relevant peripheral device action or screen update display.



7.1 HMI Simulator

"HMI Simulator" is an HMI simulation software developed by YOURITECH Technology . After the user installs the VisualHMI software of the host computer, it can be run and used. The "HMI Simulator" simulation results are exactly the same as the real HMI. Therefore, there is no need to purchase hardware during the early evaluation of R&D, and it can communicate with each other through its own single-chip microcomputer serial port, and the button control information will be uploaded immediately when the mouse clicks the button, as shown in Figure 7 -2. Once the developer has debugged, the real hardware does not need to be debugged.



Figure 7-2 Online debugging between the serial port of the user's single-chip microcomputer and the HMI simulator

7.2 Keil and virtual HMI binding debugging

In order to further improve development efficiency, users can also bind Debug to the "virtual HMI" through the Keil development environment. When the program is single-step debugging, all running results can be presented on the "virtual HMI", which greatly saves the engineer's development time, as shown in Figure 7-3. Once the engineering interface is changed, the user no longer needs to re-download the image to the HMI, and all pre-project evaluation can be done on the PC.

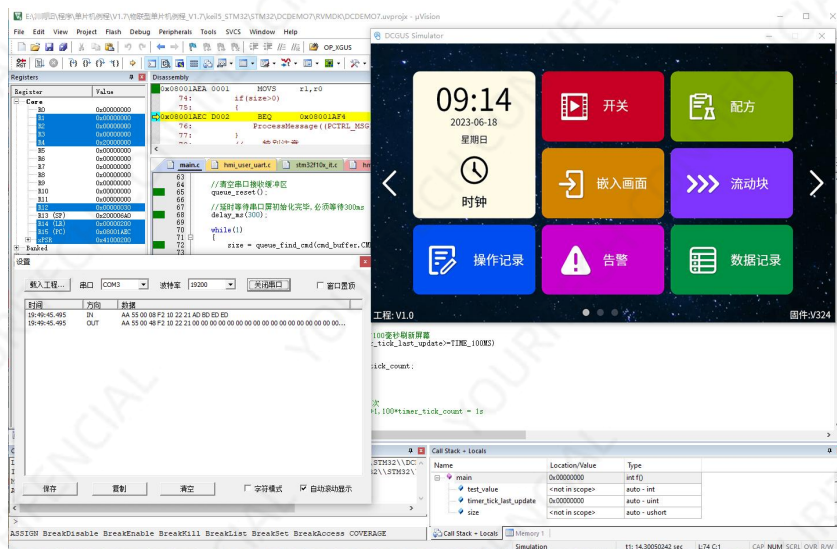


Figure 7-3: The Keil development environment is bound to debug with the virtual HMI



Note: The debugging of virtual HMI needs keil software support, in the debug process, enter dirvtreg in the command serial port, you need to list SxIN (according to the microcomputer, x may represent 0, 1, 2), if there is a list of means that keil has virtualized the serial port of the single-chip microcomputer to the register, so that it can be used.



8. Protocol Configuration

Users can configure and run DCBUS, MODBUS RTU, FX2N, FX3U and other protocols through the host computer.

Open the VisualHMI host computer software, click [Project Settings] → [Communication Protocol] in the menu bar to enter the protocol configuration interface, and users can choose to enable the corresponding protocol according to their own needs, as shown in Figure 8-1.

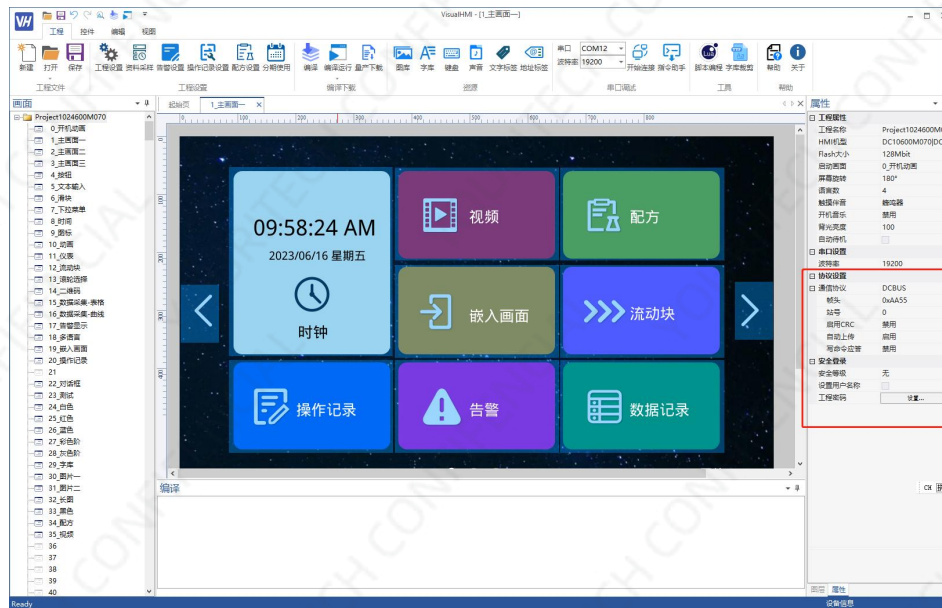


Figure 8-1 Protocol configuration



9. LUA Script Configuration

The HMI series launched by YOURITECH Technology all support LUA language scripts. HMI provides a wealth of LUA script APIs and callback interfaces, users can directly set and obtain the running status of all configuration controls by calling the API interface, combined with the written logic processing, the screen can complete the predetermined action without the participation of the external MCU, reducing the data communication between the MCU and the screen.

LUA is a lightweight scripting language with simpler syntax and logic than C, so developers can get started directly. The LUA language comes with a complete mathematical function library, string processing, JSON and other libraries, which have function support for common mathematical operations, such as open square, sine and cosine, absolute value, etc.; Due to the high frequency of the screen itself, all complex algorithms are processed by the screen, which greatly reduces the execution overhead of the user's MCU.

You can click [Project] → [LUA Programming] in the menu bar to open the LUA script of the project in the VisualHMI software, as shown in Figure 9 -1, and enter the LUA script writing interface as shown in Figure 9-2.

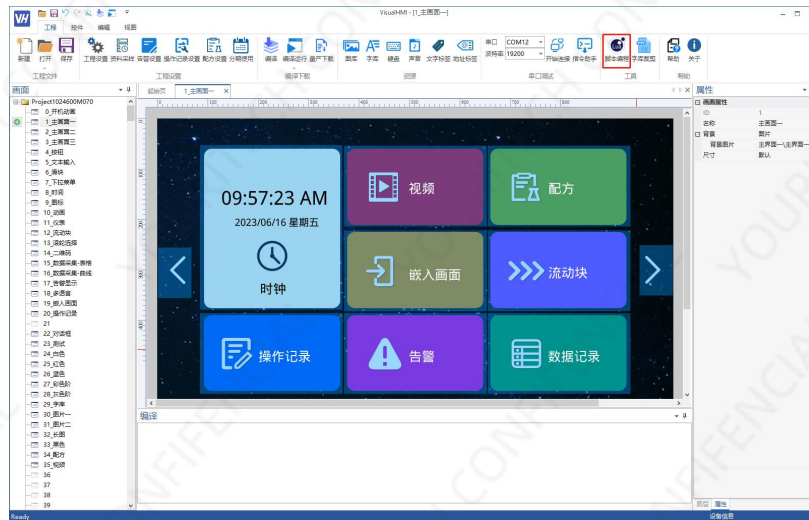


Figure 9- 1 LUA Script Programming



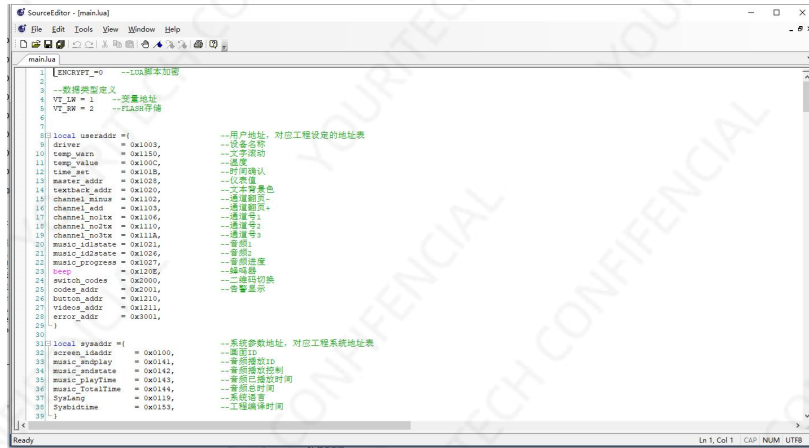


Figure 9- 2 Lua Script Programming



10. Packaging With Physical Dimensions

Unit Weight					
NET WEIGHT (KG)	0.05				
Packing standards and total weight					
Box model	Box size (length * width * height in mm)	Number of layers	Quantity (PCS)/layer	Total Quantity (Pieces)	TOTAL WEIGHT (KG)
Folding box	116*100*36	1	1	1	0.08
Box 1	616*523*275	2	32	64	8.12

Note: The total weight does not include the weight of the accessories; The above weight information is an estimated weight for reference only, and the actual weight is subject to the actual weight.



11. Disclaimer

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