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**Product
Datasheet**

ET040M4848-DC, Inline controller datasheet V1.0

ISO9001:2015 Quality System Certification

Customer			
Keyword	M series, HMI, 4.0 inch, 480*480, with configuration, LUA script, WIFI, 2.5D glass cover		
Model	ET040M4848-DC, In-line controller		
Signature of Customer		Signature of Engineer	
Date		Date	2024.07.15



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1. Introduction of Hardware

This section describes some of the product's appearance reference diagrams, hardware configuration diagrams, pin definitions, and tools required for debugging.

1.1 Product Appearance

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

Note: If there is no structural process modification, hardware reliability change or layout change, the company will not notify the customer; the standard is based on the product you received.



Figure 1-1 4.0 inch capacitive touch reference diagram

1.2 Hardware configuration

The following is a reference diagram of the hardware configuration of a product of this size, with a capacitive screen as an example, as shown in Figure 1-2.

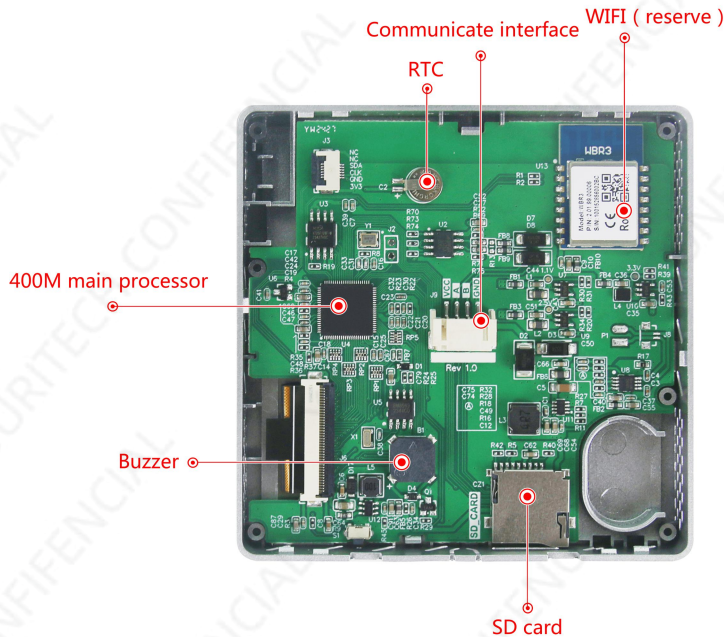


Figure 1-2 Hardware configuration



1.3 Pin Definition

Number	Definition	Description	Reference Diagram
1	VCC	Power input 5-30V	
2	A	RS485 data A-side	
3	B	RS485 data B-side	
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.

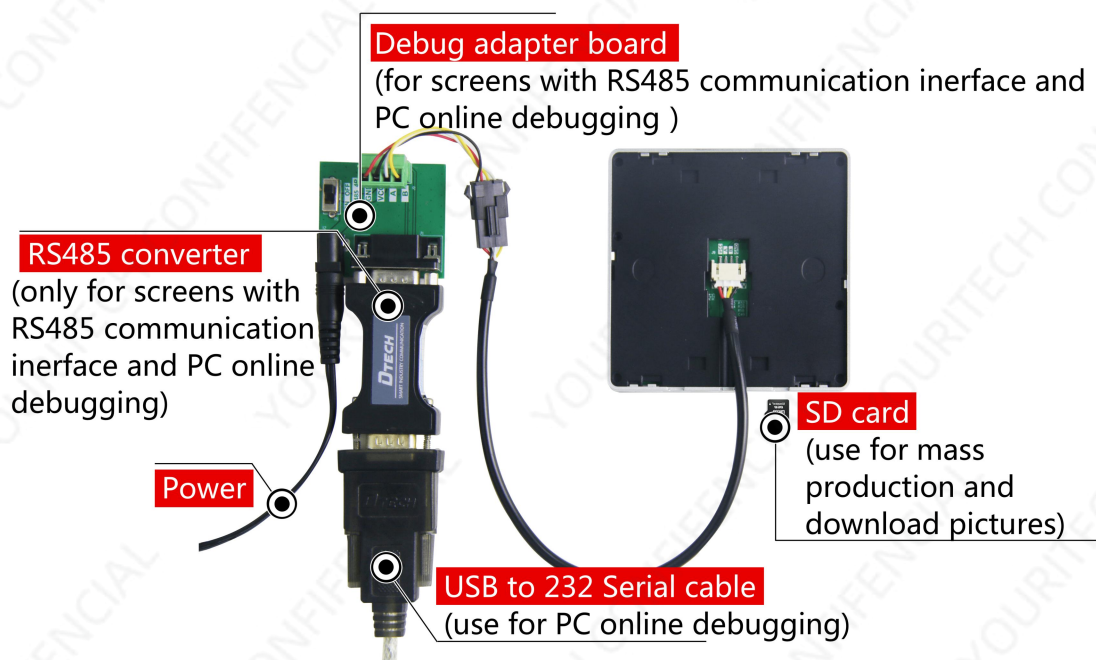


Figure 1-3 RS485 debug diagram

◆ RS232 development and debugging accessories (optional)	
Name	Accessory Model
Power adapter	Power adapter 5V/12V is available
Debugging the interposer	DC_485_4P Debug board
Serial cable	Titr USB to RS232 serial cable
SD card	Capacity up to 32G (Kingston, SanDisk)
Converter	RS485 converter



2. Installation Diagram

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

HMI人机界面4寸线控器安装示意图
(INSTALLATION DIAGRAM OF HIMSERIES -4INCH WIRE CONTROLLER)



第一步：把底壳固定在有暗盒的墙上或者固定在客户机柜上，
将螺丝插入如图红色标识位置的安装孔中并拧紧螺丝
(STEP 1: FIX THE BOTTOM SHELL ON THE WALL WITH THE CASSETTE OR ON THE CUSTOMER CABINET, INSERT THE SCREWS
INTO THE MOUNTING HOLES MARKED IN RED AS SHOWN IN THE FIGURE, AND TIGHTEN THE SCREWS)



第二步：插入电源线
(STEP 2: PLUG IN THE POWER CORD)



第三步：将串口屏与底壳的扣位对准，合紧
(STEP 3: ALIGN THE SERIAL PORT SCREEN WITH THE BOTTOM COVER AND CLOSE IT)

Figure 2-1 Installation diagram



3. Product Structure

The HMI human-machine interface screen launched by YOURITECH 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 M series serial screen processor uses a 32-bit 400M SOC processor, which integrates SDR video memory, JPEG image decoding and other functions, and the system architecture is shown in Figure 3-1.

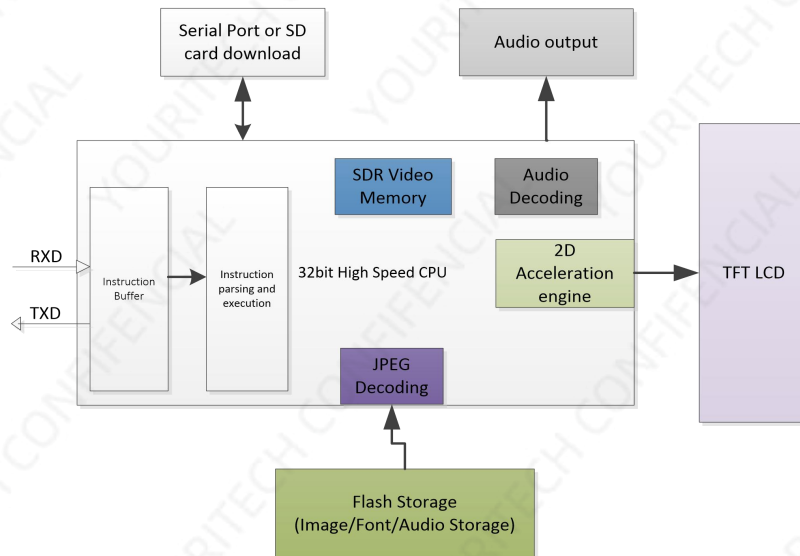


Figure 3-1 Internal structure of M series serial port screen

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

1. Dedicated 32-bit 400M SOC processor optimized for image display, with 2D acceleration engine and JPEG 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	ET040M4848-DC, In-line controller(RS485, Capacitive touch, no WiFi) ET040M4848-DC, In-line controller(RS485, Capacitive touch,with WiFi)
Product Series	M series
Core Processor	400M 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	Supporting MODBUS RTU、FX2N、FX3U、DELTA(DVP)、XINJIE(XC)、XINJIE(XD)、FATEK(FB)、HAIWELL(N/S)、SAMKOON、EMERSON、DCBUS、XGUS etc. Protocol
Script language	Version 5.3 LUA scripts with user-written logic, protocols and algorithm functions running inside the screen
Size	4.0 inch
Resolution	480*480
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 150 full-screen images (calculated based on size 40KB/image, BMP format is not recommended). The image compression ratio is different, this value fluctuates up and down
Color	65K color, 16-bit RGB
Voltage	5-30V
Power Consumption	Darkest backlight: 1.1W
	Brightest backlight: 1.7W
Communicate Interface	RS485
Communicate Baud-rate	RS485:1200~115200bps, typical baud rate: 19200bps
Communication connector specifications	Default PH2.0-4P
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
Real-time clock (RTC)	Support clock, timer, countdown and other functions
Screen Active Display	71.9mm*70.2mm



Area (AA)	
Product Size (L*W*H)	86.0mm*86.0mm*14.3mm
Supporting Host Computer Software	VisualHMI®
WIFI	Using the Tuya WBR3 module, which consists of a highly integrated wireless radio frequency chip W701, built-in Wi-Fi network protocol stack and rich library functions, users can customize the development of WiFi functions to connect with Tuya cloud services by operating the serial port transceiver function to connect with the Tuya serial port command protocol

◆ Reliability Parameters	
Operating temperature	-20~+70°C
Storage temperature	-30~+80°C
ESD Test	Test Standards: IEC 61000-4-2 Air: ±14KV
EFT Test	Test standard: IEC 61000-4-4 GB standard 4 (voltage: ±4KV; FREQUENCY: 100/5KHZ; TIME: 120S), no restart, no abnormal display, no abnormal touch, 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 an "HMI simulator", which does not need to be connected to hardware, and is directly bound to Keil IDE for debugging
Configure the controls	In addition to the 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, can customize the 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 30 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
Remote upgrades	Support remote serial port upgrade screen firmware, engineering files, specified pictures, configuration files and fonts, etc
Life cycle	It uses traditional big brand processors and has been in continuous supply for many years



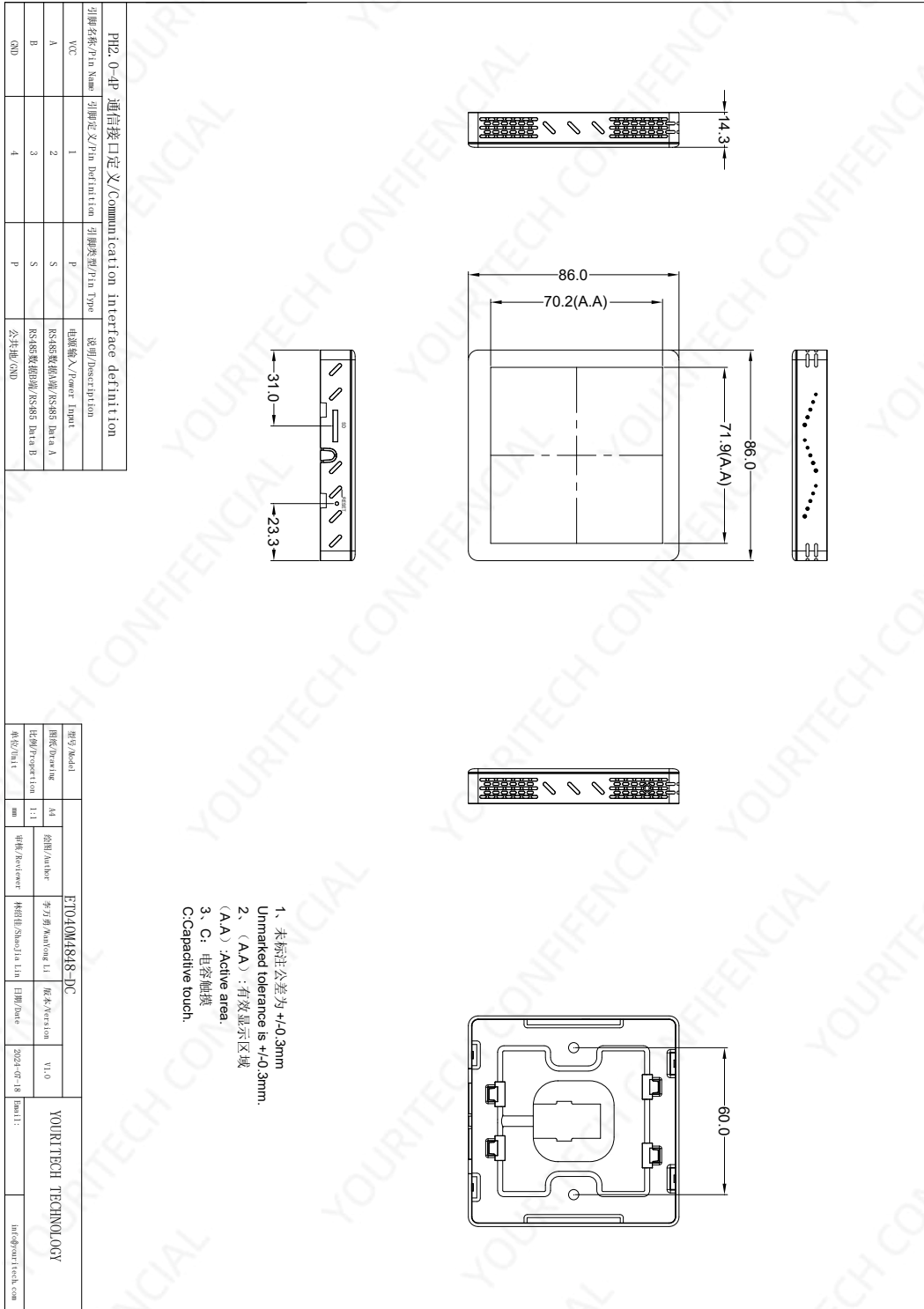
◆ LCD	
Display Type	IPS LCD
Backlight Tube	LED
Brightness (cd/m ²)	350
Backlight Life (h)	>20,000
Contrast Ratio	800:1
Visual Angle (L/R/T/B)	80/80/80/80

◆ Touch Panel	
Touch type	Capacitive touch screen (IC:GT911)
Capacitive screen touch mode	Single-point, swipe touch
Capacitive screen light transmittance	More than 90%
The number of capacitive screen touches	The number of capacitive screen touches is theoretically unlimited, and the touch life is related to the working environment (dust, humidity).
Capacitor cover is customized	The "glass cover + capacitive touch" integrated lamination service can be customized according to the user's drawing size

◆ 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 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.



Figure 6-1 Reliability Test Equipment

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
ET040M4848-DC	Air	±14KV	No restart, no abnormal display, normal function

Note: The current test test is the product exposed test, the actual product assembly machine, keep the screen and the machine well grounded, or the surface of the touch board is protected by PVC or cover, the ESD performance index of the whole machine will be higher

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
ET040M4848-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
ET040M4848-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.

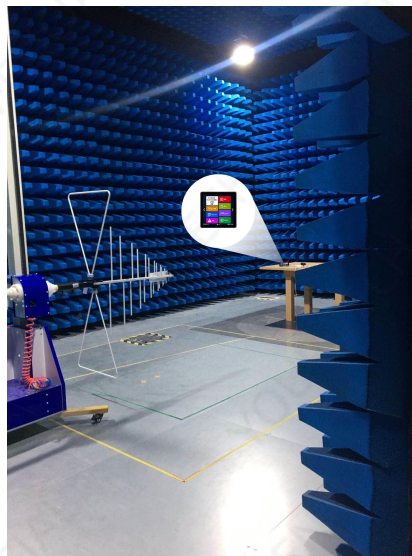


Figure 6-5 Radiation test chart



6.4.3 Test Data

- Radiation test data in the horizontal direction, as shown in Figure 6-6.

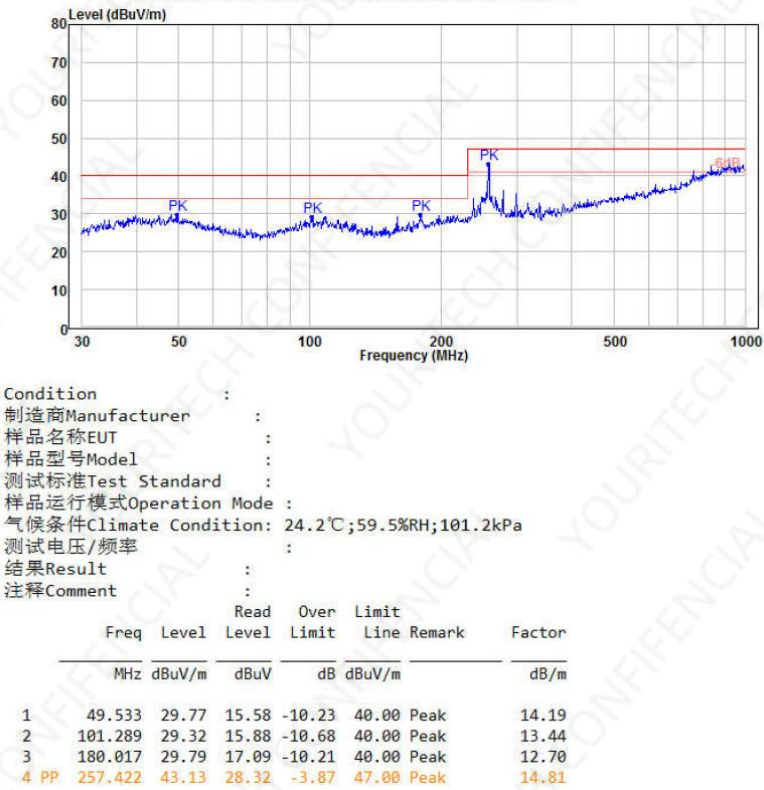


Figure 6-6 Horizontal direction of radiation measurement



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

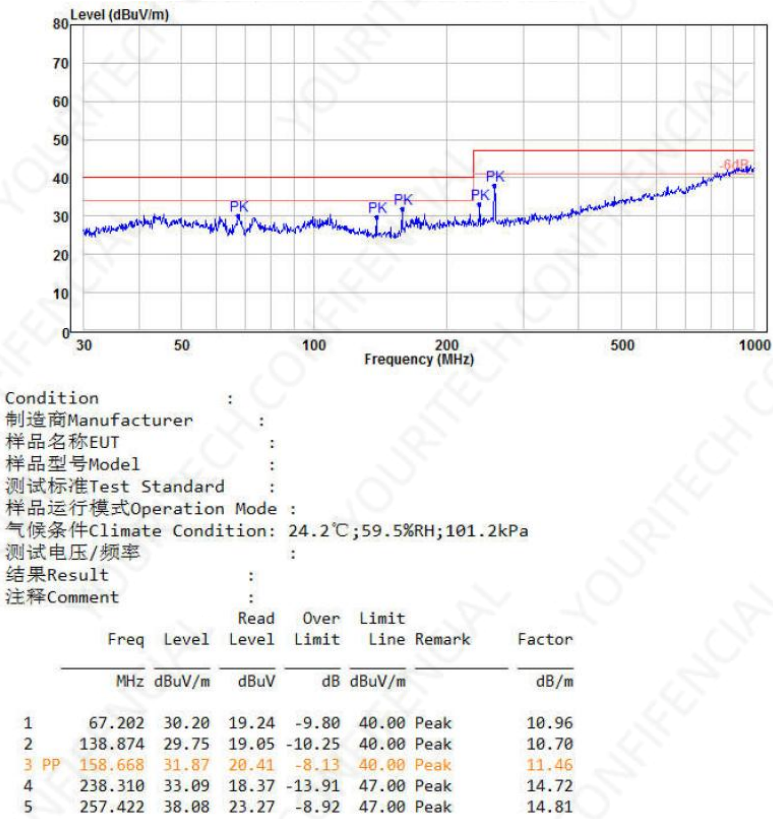


Figure 6-7 Vertical direction of radiation test



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.

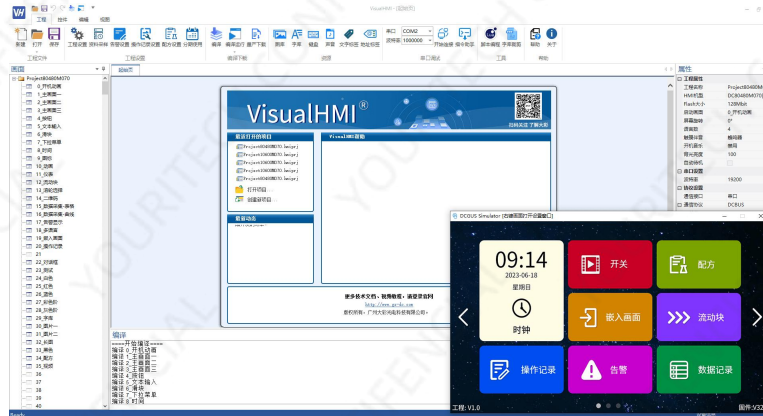


Figure 7-1 VisualHMI main interface

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 microcontroller and HMI communication

After the project is downloaded to the HMI, the single-chip microcomputer and the HMI establish a communication connection with the HMI through serial ports and other means, and communicate and interact according to the established communication protocol.

7.1 HMI Simulator

"HMI Simulator" is an HMI simulation software developed by YOURITECH. 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 The serial port of the user's single-chip microcomputer is debugged online with 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.

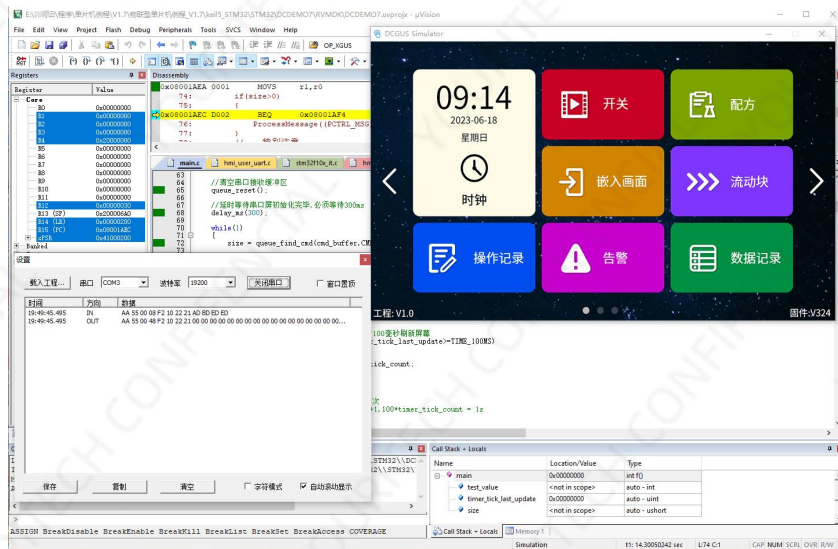


Figure 7-3: The Keil development environment is bound to debug with the virtual HMI

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.

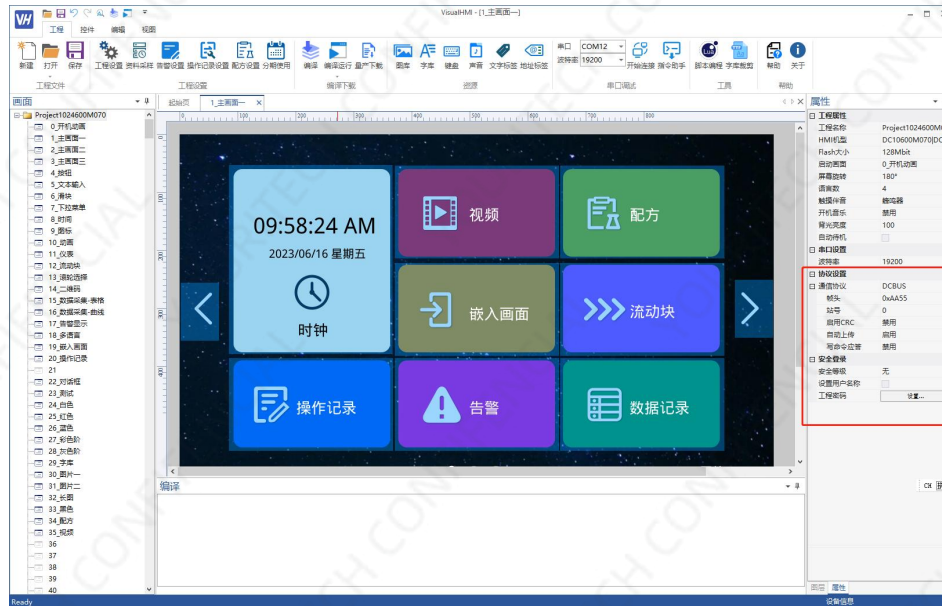


Figure 8 -1 Protocol configuration



9. LUA Script Configuration

The HMI series launched by YOURITECH 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.

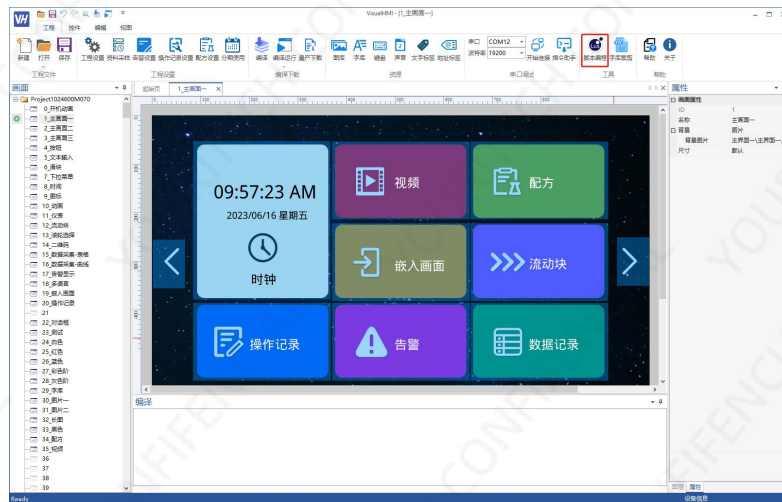


Figure 9- 1 LUA Script Programming



```

1  [SourceEditor - main.lua]
2  -- Lua脚本加密
3
4  -- 数据类型定义
5  VT_W = 1 -- 变量地址
6  VT_R = 2 -- 常量地址
7
8
9  local useraddr = 0x0000 -- 用户地址, 对应工程地址表
10 device = 0x0001 -- 设备名称
11 temp_value = 0x0002 -- 温度
12 time_sec = 0x0003 -- 时间秒数
13 master_addr = 0x0004 -- 主设备地址
14 channel_addr = 0x0005 -- 文本颜色
15 channel_name = 0x0006 -- 通道名称
16 channel_addr = 0x0007 -- 通道地址
17 channel_name = 0x0008 -- 通道名称
18 channel_name = 0x0009 -- 通道名称
19 music_idrate = 0x000A -- 音乐ID
20 music_idrate = 0x000B -- 音乐ID
21 music_progress = 0x000C -- 音乐进度
22 loop = 0x000D -- 循环
23 switch_codes = 0x000E -- 二值切换
24 codes_addr = 0x000F -- 代码地址
25 button_addr = 0x0010 -- 按钮地址
26 video_addr = 0x0011 -- 视频地址
27 error_addr = 0x0012 -- 错误地址
28
29
30 local sysaddr = 0x0013 -- 系统参数地址, 对应工程系统地址表
31 screen_idrate = 0x0014 -- 屏幕ID
32 music_endplay = 0x0015 -- 音乐结束播放
33 music_endrate = 0x0016 -- 音乐结束速率
34 music_playtime = 0x0017 -- 音乐播放时间
35 music_playtime = 0x0018 -- 音乐播放时间
36 syslang = 0x0019 -- 系统语言
37 syslang = 0x001A -- 系统语言
38 syslang = 0x001B -- 系统语言
39
40

```

Figure 9 - 2 LUA Script Programming



12. Packaging With Physical Dimensions

Unit Weight					
Net weight (KG)	0.15				
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)
Box	116*100*36	1	1	1	0.18
Box 1	616*523*275	2	32	64	13.90

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.



13. Disclaimer

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