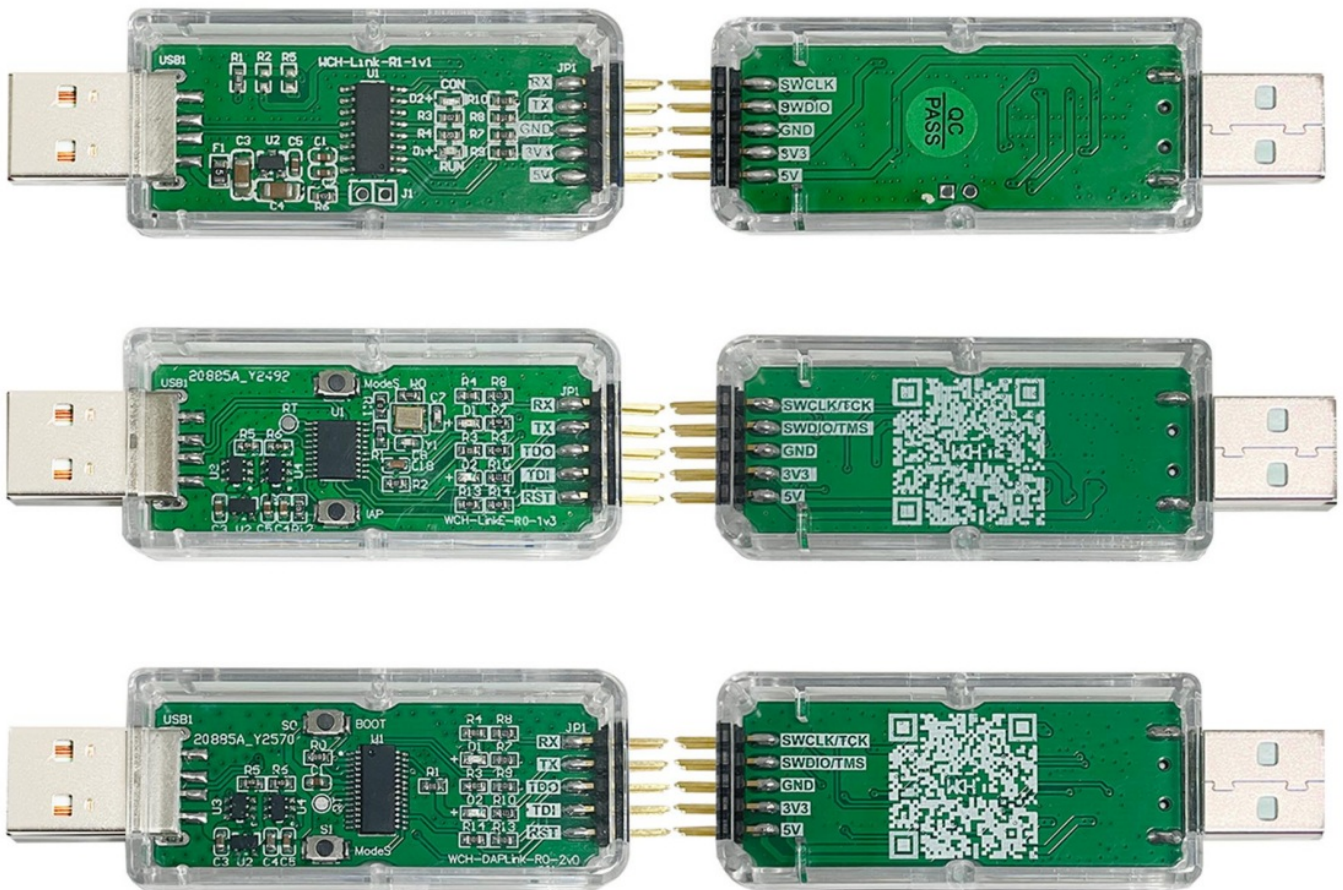


WCH-Link Emulation Debugger Module User Manual

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WCH-Link Emulation Debugger Module



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WCH-Link

Module introduction

WCH-Link module can be used for online debugging and downloading of WCH RISC-V MCU, and also for online debugging and downloading of ARM MCU with SWD/JTAG interface. It also comes with a serial port for easy debugging output. There are 3 kinds of WCH-Link including WCH-Link, WCH LinkE and WCHDAPLink, as shown in Figure 1.

Figure 1 WCH-Link physical diagram

Figure 1 WCH-Link physical diagram

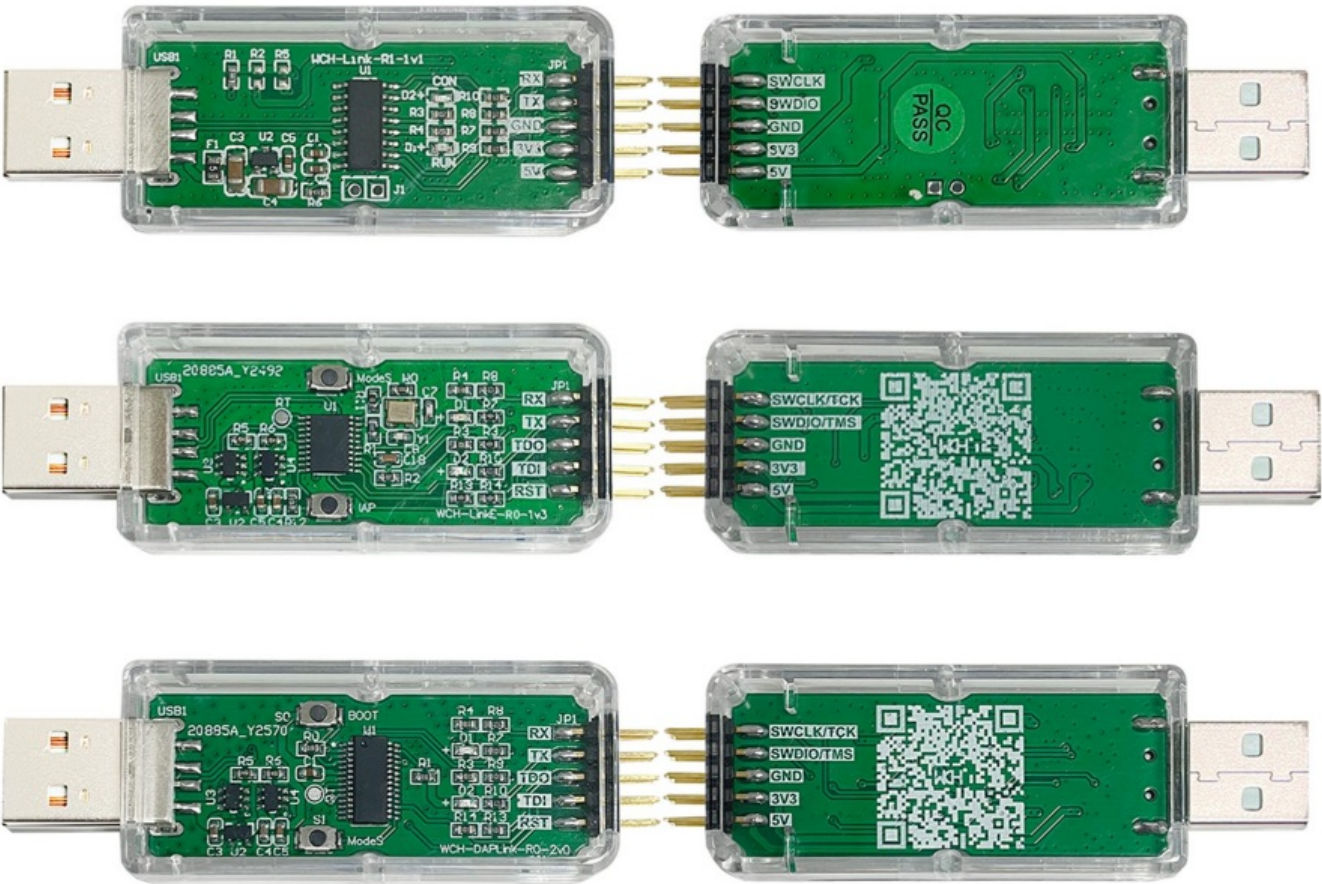


Figure 2 WCH-Link mode

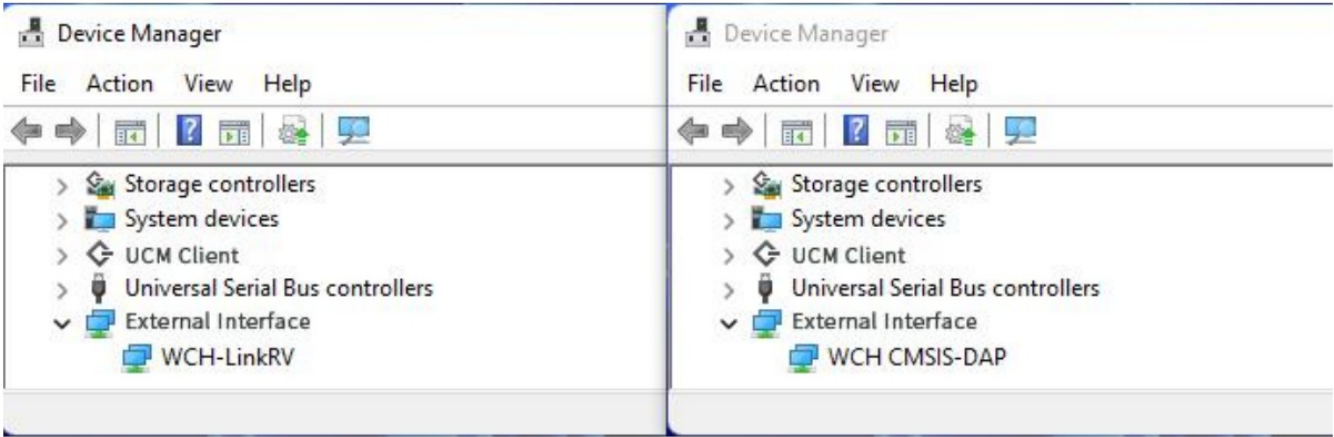



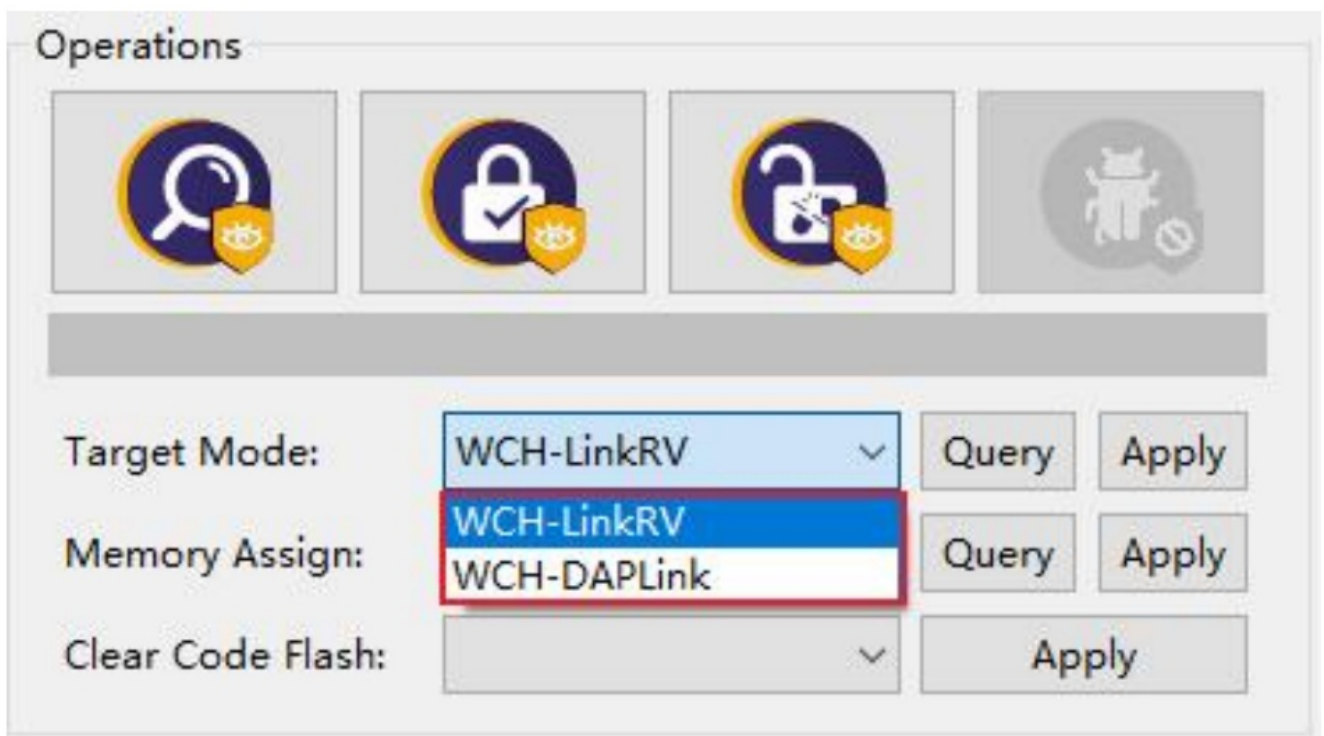
Table 1 WCH-Link mode

Mode	Status LED	IDE	Support chip
RISC-V	Blue LED is always off when idle	MounRiver Studio	WCH RISC-V core chips that support single/dual line debugging
ARM	Blue LED is always on when idle	Keil/MounRiver Studio	ARM core chips that support SWD/JTAG protocol

Mode Switching

Way 1: Use MounRiver Studio software to switch Link mode. (This method is applicable to WCH-Link and WCH-LinkE)

1. Click arrow  in the shortcut toolbar to bring up the project download configuration window
2. Click Query on the right side of Target Mode to view the current Link mode
3. Click Target Mode option box, select the target Link mode, click Apply.



Way 2: Use WCH-Link Utility tool to switch Link mode.

1. Click Get on the right side of Active WCH-Link mode to view the current Link mode
2. Click Active WCH-Link mode option box, select the target Link mode, click Set

Connected WCH-Link List:	<div>▼</div>	Refresh	
Active WCH-Link Mode:	<div>WCH-LinkRV ▼</div> <div> WCH-LinkRV WCH-LinkDAP-WINUSB WCH-LinkDAP-HID </div>	Get	Set
Operation Result:		Result Collect:	Succ:0 Total:0 Clear

Way 3: Use ModeS key to switch Link mode. (This method is applicable to WCH-LinkE-R0 1v2 and WCHDAPLink-R0-2v0 and above)

1. Press and hold the ModeS key to power up the Link.

Notes:

1. The blue LED flashes when downloading and debugging.
2. The Link maintains the switched mode for subsequent use.
3. Scan the QR code in the picture on the back of Link to open the WCH-Link emulator debugger module website.
4. WCH-Link simulation debugger module URL <https://www.wch.procn/ducts/WCHLink.html>
5. MounRiver Studio Access URL: <http://mounriver.com/>
6. WCH-Link Utility Access URL: https://www.wch.cn/downloads/WCHLinkUtility_ZIP.html
7. WCHISPTool Access URL: https://www.wch.cn/downloads/WCHISPTool_Setup_exe.html
8. WCH-Link and WCH-LinkE support LinkRV and LinkDAP-WINUSB mode switching; WCH-DAPLink supports LinkDAP-WINUSB and LinkDAP-HID mode switching.

Serial port baud rate

Table 2 WCH-Link serial port supports baud rate

1200	2400	4800	9600	14400
19200	38400	57600	115200	230400

Table 3 WCH-LinkE serial port supports baud rate

1200	2400	4800	9600	14400	19200
38400	57600	115200	230400	460800	921600

Table 4 WCH-DAPLink serial port supports baud rate

1200	2400	4800	9600	14400	19200
38400	57600	115200	230400	460800	921600

Notes:

1. Figure 1 in the row of pins RX and TX for the serial port transceiver pins, serial port support baud rate is shown in the table above.
2. CDC driver needs to be installed under Win7.
3. If you re-unplug Link, please re-open the serial debugging assistant.

Function comparison

Table 5 Link functions and performance comparison table

Function items	WCH-Link-R1-1v1	WCH-LinkE-R0-1v3	WCH-DAPLink-R0-2v0
RISC-V mode	√	√	×
ARM-SWD mode-HID device	×	×	√
ARM-SWD mode-WINUSB device	√	√	√
ARM-JTAG mode -HID device	×	×	√
ARM-JTAG mode -WINUSB device	×	√	√
ModeS key to switch mode	×	√	√

2-wire way upgrade firm ware offline	×	√	√
Serial port upgrade firm ware offline	√	×	×
USB upgrade firmware offline	√	×	√
Controllable 3.3V/5V power output	×	√	√
High-speed USB2.0 to J TAG interface	×	√	×
Download tools	MounRiver Studio WCH-LinkUtility Keil uVision5	MounRiver Studio WCH-LinkUtility Keil uVision5	WCH-LinkUtility Keil uVision5
Keil supported versions	Keil V5.25 and above	Keil V5.25 and above	Supported in all versions of Keil

Pin connections

Table 6 Link supported chip model

Common chip models	WCH-Li nk	WCH-Li nkE	WCH-DAPLi nk
CH32V003	×	√	×
CH32V10x/CH32V20x/cCH32V30x/CH569/CH573/CH583	√	√	×
CH32F10x/CH32F20x/CH579/friendly chips that support SWD protocol	√	√	√
friendly chips that support JTAG interface	×	√	√

Table 7 Common chip pin connections

Common chip models	SWDIO	SWCLK
CH569	PA11	PA10
CH579	PB16	PB17
CH573/CH583	PB14	PB15
CH32V003	PD1	—
CH32V10x/CH32V20x/CH32V30x/CH32F10x/CH32F20x	PA13	PA14

Table 8 STM32F10xxx JTAG interface pinout

JTAG interface pin name	JTAG debug interface	Pinout
TMS	JTAG mode selection	PA13
TCK	JTAG clock	PA14
TDI	JTAG data input	PA15
TDO	JTAG data output	PB3

Notes:

1. Link maximum supported line length: 30cm, if the download process is unstable, try to turn down the download speed.
2. JTAG mode, WCH-LinkE-R0-1v3, WCH-DAPLink-R0-2v0 hardware version began to support, the previous hardware version does not support.
3. WCH-LinkE high-speed version is only for CH32F20x/CH32V20x/CH32V30x to speed up.
4. Except for CH32 series chips, if you want to use Link for downloading or debugging, you need to use the official ISP tool to open the 2-wire debug interface, and you need to pay attention to Link mode when using it.

Keil download and debug

Device switching

WCH-DAPLink supports two modes, ARM mode-WINUSB device and ARM mode-HID device, and you can switch between the two device modes with the WCH-LinkUtility tool (or by powering up the Link after long pressing the ModeS key.) WCH-Link and WCH-LinkE only support ARM mode-WINUSB device mode.


The screenshot shows the WCH-LinkUtility tool interface. It features a 'Connected WCH-Link List:' section with a dropdown menu currently showing 'DAP Link [#1]'. Below this is the 'Active WCH-Link Mode:' section, which has a dropdown menu with four options: 'WCH-LinkDAP-WINUSB' (highlighted in blue), 'WCH-LinkRV', 'WCH-LinkDAP-WINUSB' (highlighted in red), and 'WCH-LinkDAP-HID' (highlighted in red). To the right of the dropdowns are buttons for 'Refresh', 'Get', and 'Set'. Below the dropdowns is an 'Operation Result:' section with a green checkmark icon. To the right of this is a 'Result Collect:' section with a text box showing 'Succ:0 | Total:0' and a 'Clear' button.

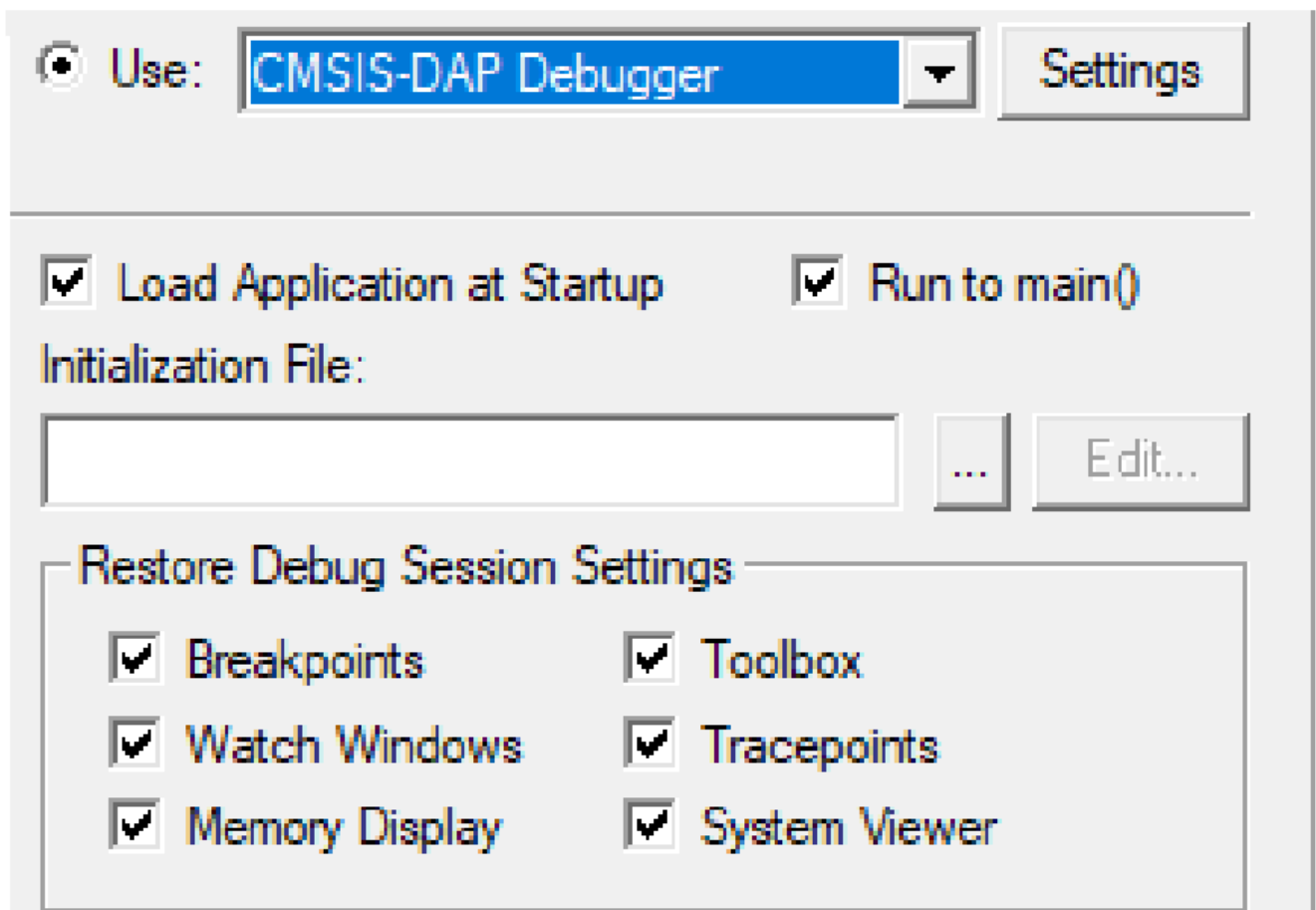
Table 9 WCH-DAPLink device

Device	Support Link	Keil supported versions
ARM mode-WINUSB device	WCH-Link WCH-LinkE WCH-DAPLink	Keil V5.25 and above ARM CMSIS V5.3.0 and above
ARM mode-HID device	WCH-DAPLink	Supported in all versions of Keil

Note: WCH-Link, WCH-LinkE and WCH-DAPLink are factory defaulted to WINUSB device mode.

Download configuration

1. Click the magic wand  in the toolbar to bring up the Options for Target dialog box, click Debug and select the emulator model.



2. Click the Use option box and select CMSIS-DAP Debugger
3. Click the Settings button to bring up the Cortex-M Target Driver Setup dialog box

Debug | Trace | Flash Download | Pack

CMSIS-DAP - JTAG/SW Adapter

WCH CMSIS-DAP

Serial No: CD2B8F065206

Firmware Version: 2.0.0

☒ SWJ Port: SW

Max Clock: 10MHz

SW Device

IDCODE	Device Name	Move
0x2BA01477	ARM CoreSight SW-DP	Up Down

☒ Automatic Detection ID CODE:

☐ Manual Configuration Device Name:

Add Delete Update AP: 0x00

Debug

Connect & Reset Options

Connect: Normal Reset: SYSRESETREQ

☒ Reset after Connect

☐ Log Debug Accesses ☐ Stop after Reset

Cache Options

☒ Cache Code

☒ Cache Memory

Download Options

☐ Verify Code Download


☐ Download to Flash

Serial No: Display the identifier of the debug adapter being used. When multiple adapters are connected, you can specify the adapter by using the drop-down list. SW Device: Show the device ID and name of the connected device. Port: Set the internal debug interface SW or JTAG. (Both interfaces are supported by WCH-LinkE-R0-1v3 and WCH-DAPLink-R0-2v0). Max Clock: Set the clock rate to communicate with the target device.

- Click Flash Download for download configuration.

Debug | Trace | Flash Download | Pack

Download Function

 ☒ Erase Full Chip ☒ Program

☐ Erase Sectors ☒ Verify

☐ Do not Erase ☒ Reset and Run

RAM for Algorithm

Start: 0x20000000 Size: 0x00001000

Programming Algorithm

Description	Device Size	Device Type	Address Range
CH32F1xx Flash	64k	On-chip Flash	08000000H - 0800FFFFH


Start: Size:

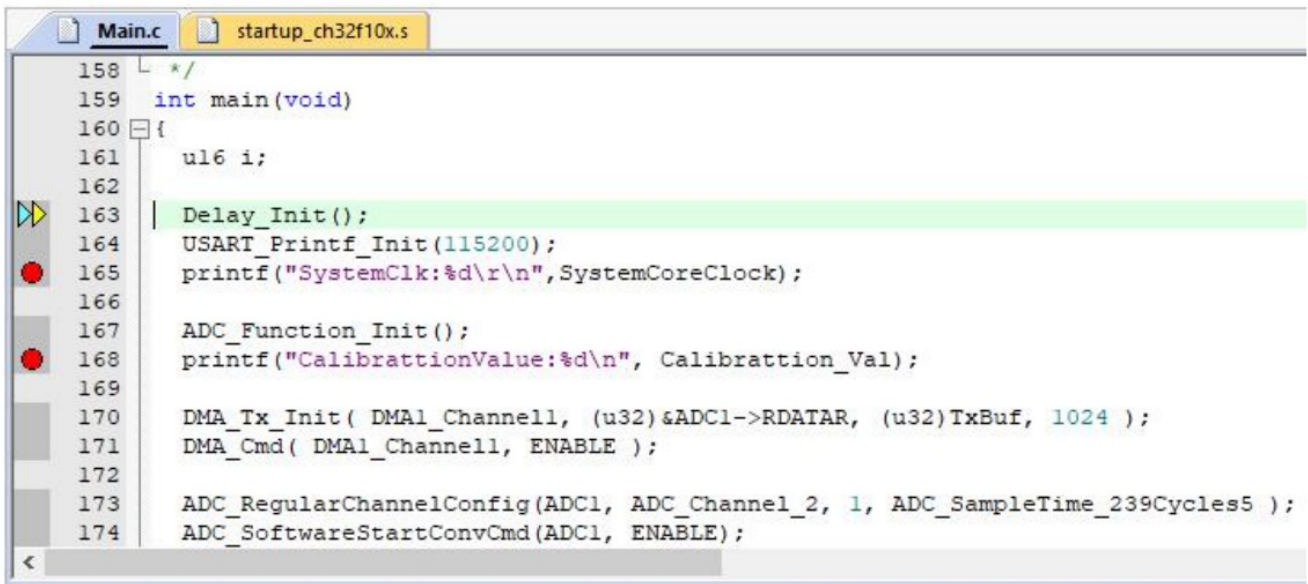
Add Remove

Download Function: Configuration options RAM for Algorithm: Configure the starting address and size of RAM space Our CH32F103 series chip RAM space size is 0x1000, CH32F20x series chip RAM space size is 0x2800. Programming Algorithm: Add algorithm file The algorithm file has been added automatically after installing the chip device package, click OK.

- After completing the above configuration, click OK to close the dialog box. Click the icon in the toolbar to burn in the code.

Debug

1. Click the Debug button  in the toolbar to enter the debug page
2. Set breakpoints



```
158  /*
159  int main(void)
160  {
161      ul6 i;
162
163      Delay_Init();
164      USART_Printf_Init(115200);
165      printf("SystemClk:%d\r\n",SystemCoreClock);
166
167      ADC_Function_Init();
168      printf("CalibrattionValue:%d\n", Calibrattion_Val);
169
170      DMA_Tx_Init( DMA1_Channel1, (u32)&ADC1->RDATAR, (u32)TxBuf, 1024 );
171      DMA_Cmd( DMA1_Channel1, ENABLE );
172
173      ADC_RegularChannelConfig(ADC1, ADC_Channel_2, 1, ADC_SampleTime_239Cycles5 );
174      ADC_SoftwareStartConvCmd(ADC1, ENABLE);
```

3. Basic debug commands



RST Reset: Perform a reset operation on the program.



Run: Cause the current program to start running at full speed until the program stops when it encounters a breakpoint.



Step: Execute a single statement and if a function is encountered, it will go inside the function.



Step Over: Execute a single statement that does not go inside the function if it encounters a function, but runs the function at full speed and jumps to the next statement.




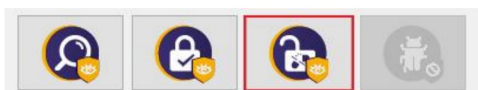
Step Out: Run all the contents after the current function at full-speed until the function returns to the previous level.

4. Click the Debug button  in the toolbar again to exit debug.

MounRiver Studio Download and Debug

Download configuration

1. Click the arrow  in the toolbar to bring up the project download configuration window
2. Click the Disable Read-Protect button to disable the chip read protection



3. Target configuration, the main elements are as follows.

Target

MCU Type: CH32V00x

Program Address: 0x08000000


CLK Speed: High

Target File: obj\ADC_DMA.hex Browse...

4. Configuration Options


Options


☒ Erase All ☒ Program ☒ Verify ☒ Reset and run

5. Click Apply and Close to save the download configuration. Click on the icon  in the toolbar to burn the code, and the result will be displayed in the Console.

Debug

1. Enter the debugging page

Way 1: Click the Debug button  in the toolbar to enter the debug page directly.

Way 2: Click the arrow  in the toolbar and select Debug Configurations to pop up the debug configuration page. Double-click GDB Open OCD MRS Debugging to generate the obj file, select the obj file and click the Debug button at the bottom right corner to enter the debugging page.

Debug Configurations

Create, manage, and run configurations

Name: ADC_DMA obj

type filter text

- GDB OpenOCD Debugging
- GDB OpenOCD MRS Debugging
 - ADC_DMA obj

Filter matched 3 of 5 items

Main Debugger Startup Source Common SVD Path

OpenOCD Setup

☒ Start OpenOCD locally

Executable path: \${eclipse_home}\toolchain\OpenOCD\bin\openocd.exe Browse... Variables...

Actual executable: D:\MounRiver\MounRiver_Studio\toolchain\OpenOCD\bin\openocd.exe
(to change it use the [global](#) or [workspace](#) preferences pages or the [project](#) properties page)

GDB port: 3333

Telnet port: 4444

Tcl port: 6666

Config options: -f "\${eclipse_home}\toolchain\OpenOCD\bin\wch-riscv.cfg"

☐ Skip download before debug

☒ Allocate console for OpenOCD ☐ Allocate console for the telnet connection

GDB Client Setup

☒ Start GDB session

Executable name: \${eclipse_home}\toolchain\RISC-V Embedded GCC\bin\riscv-none-embed-gdb.exe Browse... Variables...

Revert Apply

Debug Close

2. Set breakpoints

```

132 * @return none
133 */
134 int main(void)
135 {
136     ul6 i;
137
138     Delay_Init();
139     USART_Printf_Init(115200);
140     printf("SystemClk:%d\r\n", SystemCoreClock);
141
142     ADC_Function_Init();
143
144     DMA_Tx_Init(DMA1_Channel1, (u32)&ADC1->RDATAR, (u32)TxBuf, 10);
145     DMA_Cmd(DMA1_Channel1, ENABLE);
146
147     ADC_RegularChannelConfig(ADC1, ADC_Channel_2, 1, ADC_SampleTime_241Cycles);
148     ADC_SoftwareStartConvCmd(ADC1, ENABLE);
149     Delay_Ms(50);
150     ADC_SoftwareStartConvCmd(ADC1, DISABLE);
151
152     for(i = 0; i < 10; i++){
153         printf("%04d\r\n", TxBuf[i]);
154         Delay_Ms(10);
155     }
156

```

3. Basic debug commands



Reset: Perform a reset operation on the program.



Run: Make the current program start running at full speed until the program stops when it meets a breakpoint.



Terminate: Exit debugging.



Step Into: Execute a single statement, and if a function is encountered, it will go inside the function.



Step Over: Execute a single statement, and if it encounters a function, it will not go inside the function, but run the function at full speed and skip to the next statement.



Step Return: Run all contents after the current function at full speed until the function returns to the previous level.

4. Click button, exit the debug.

Other functions

Set chip Read-Protect



Query chip read-protect status



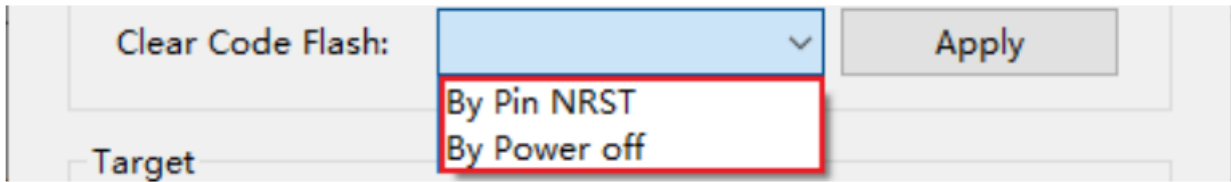
Enable chip read-protect status



Disable chip read-protect status

Code Flash full erase

MounRiver Studio can erase all the user areas of the chip by controlling the hardware reset pin or by repowering the chip. To control erase by re-powering, Link is required to power the chip; to control erase by hardware reset pin, the reset pins of the chip and Link need to be connected. (Supported by WCH-LinkE and WCH-DAPLink only)



Disable 2-wire SDI


For chips other than CH32 series, code and data protection can be enabled by disabling the 2-wire SDI.



Disable the 2-wire SDI

WCH-LinkUtility Download

Download configuration

1. Click the icon , connect to Link
2. Select the chip model



MCU Core: RISC-V Series: CH32V00X Address: 0x08000000

3. Configuration options

☒ Erase All ☒ Program ☒ Verify ☒ Reset and Run


4. Tick Disable MCU Code Read-Protect, disable the chip read-protect.

☐ Enable MCU Code Read-Protect ☒ Disable MCU Code Read-Protect

5. Click icon  to add firmware
6. Click icon  to execute download

Other functions

Query chip information

Click icon  to query chip information

Name	Value
MCU UID	17-9f-ab-cd-7f-b4-bc48
Flash Size	16KB
Read Protect	
Link Version	V2.8

Set chip Read-Protect



Query chip read-protect status



Enable chip read-protect status



Disable chip read-protect status

Read chip Flash



Click icon to read chip Flash

Chip Flash
Addr: 0x
Size: 0x
Data Width:
☐ Show ASCII

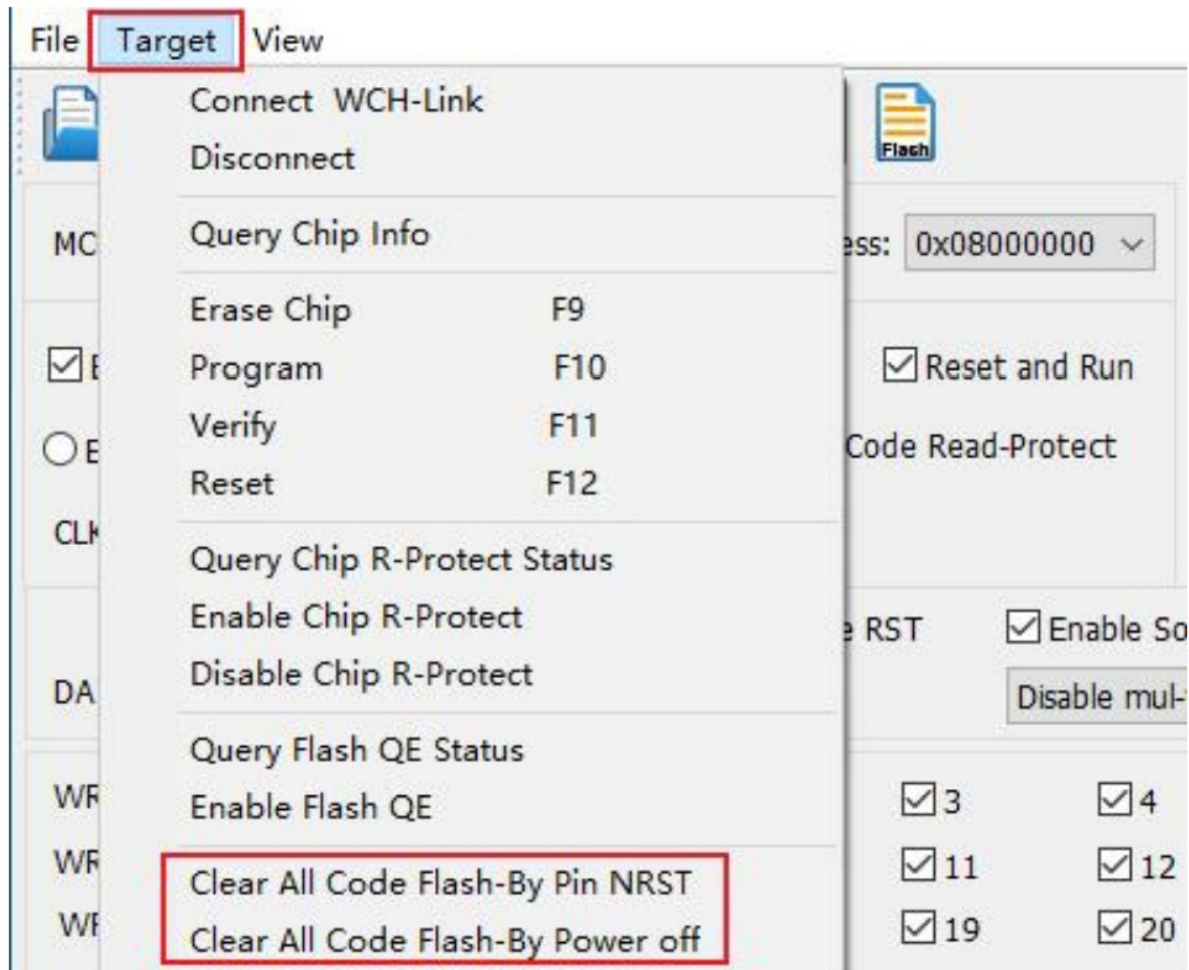
```

3FA0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
3FB0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
3FC0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
3FD0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
3FE0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
3FF0:FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF
4000:

```

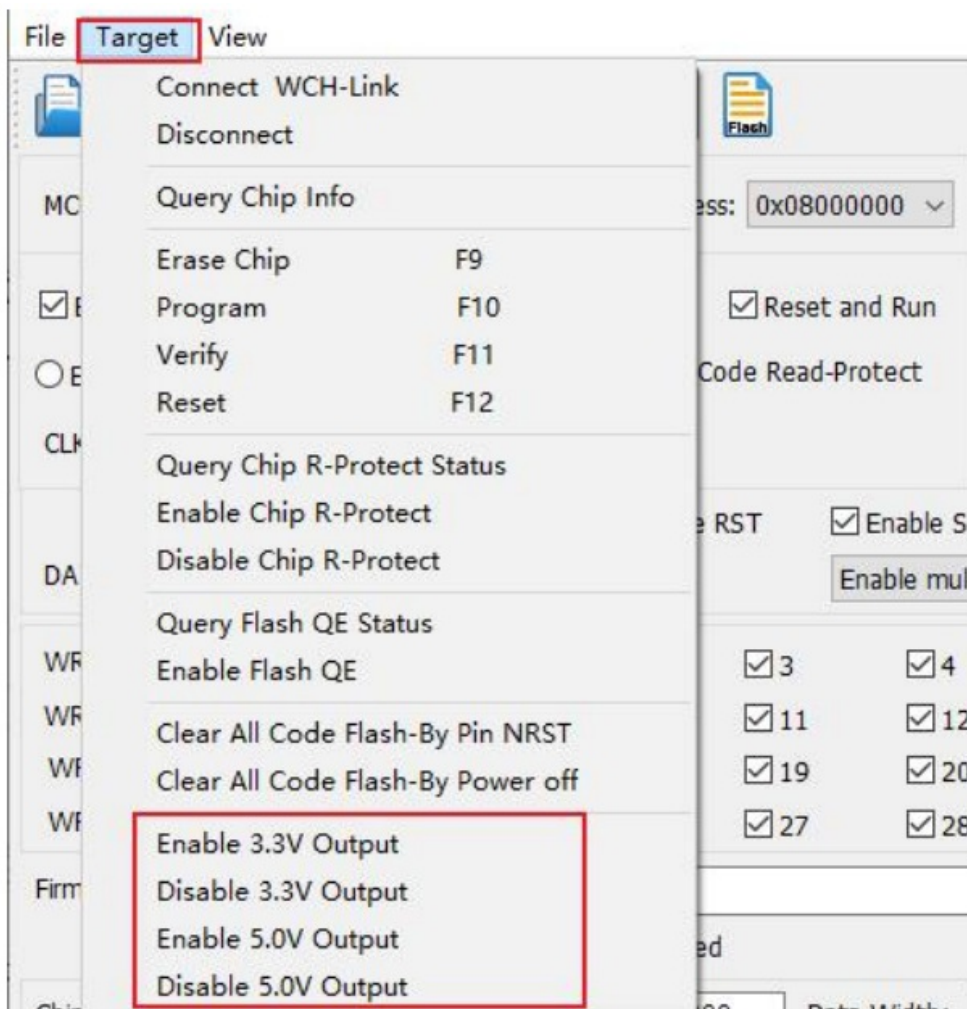
Code Flash full erase

The WCH-LinkUtility tool can erase all user areas of the chip by controlling the hardware reset pin or by repowering the chip. To control erase by re-powering, Link is required to power the chip; to control erase by hardware reset pin, the reset pins of the chip and Link are required to be connected. (Supported by WCHLinkE and WCH-DAPLink only).



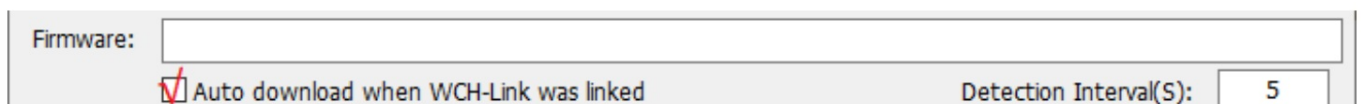
Power output controllable

WCH-LinkUtility tool can control Link power output. Click on Target and choose to turn on/off the power supply 3.3V/5V output in the drop-down list. (Supported by WCH-LinkE and WCH-DAPLink only)



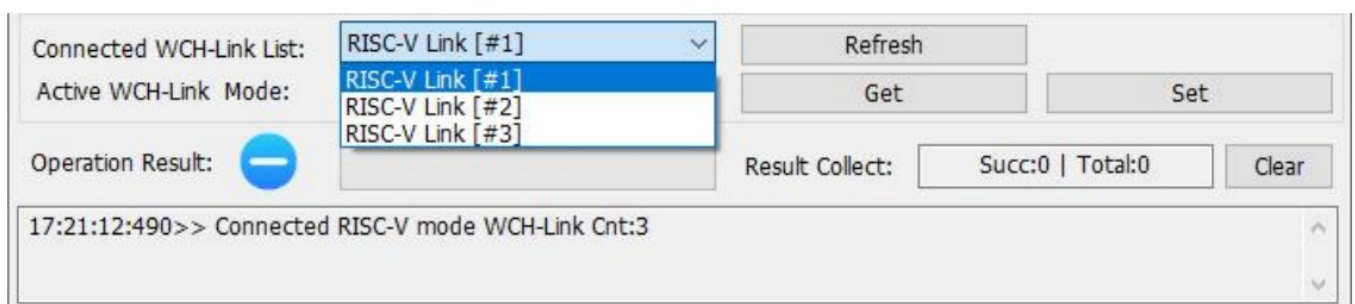
Automatic continuous download

Tick Auto download when WCH-Link was linked to enable automatic continuous download of the project.



Multi-Device Download

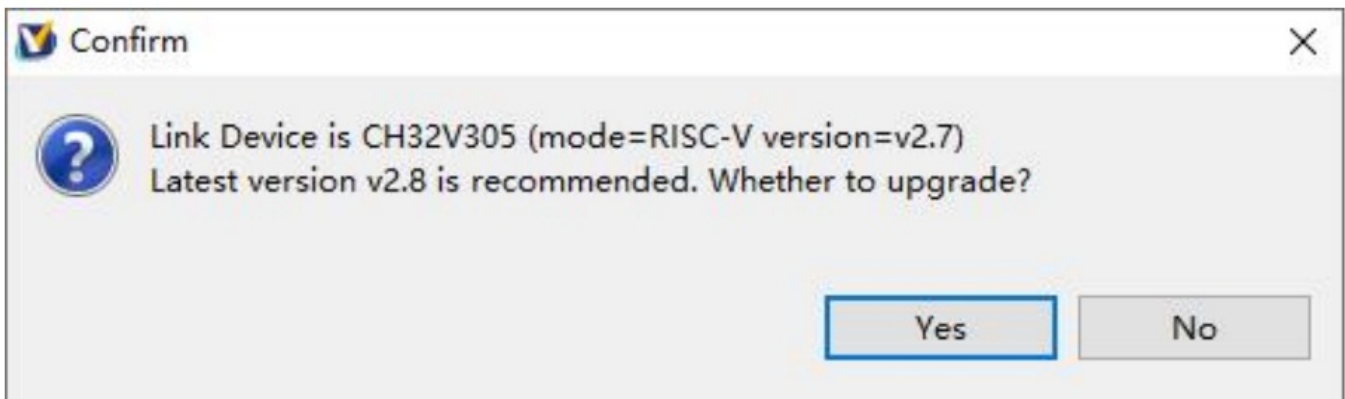
The WCH-LinkUtility tool can recognize multiple Link devices. When multiple Links are connected, the Connected WCH-Link List option box allows you to select a specific Link device for downloading.



Firmware update methods

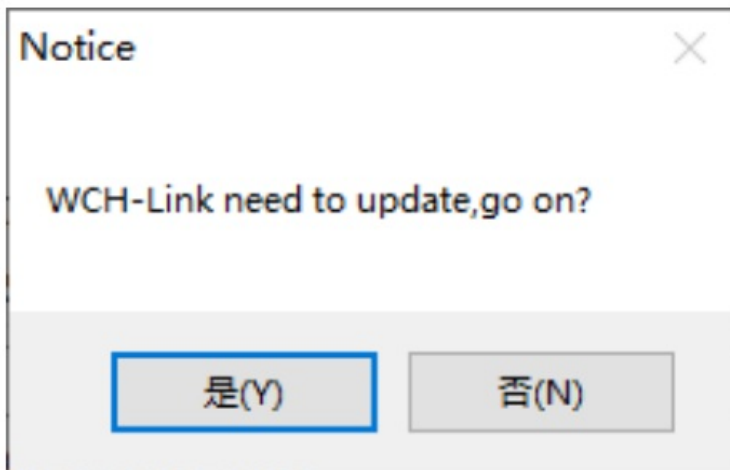
MounRiver Studio online update

If the firmware needs to be updated, MounRiver Studio will have a pop-up window to remind you when you click the download button, click Yes to start the update.



WCH-LinkUtility online update

If the firmware needs to be updated, WCH-LinkUtility will have a pop-up window to remind you when you click the download button, click Yes to start the update.



Notes:

1. WCH-LinkE supports manual online update, the steps are as follows.
 - Power up the Link after long press the IAP button until the blue LED blinks.
 - MounRiver Studio/WCH-LinkUtility will have a pop-up window to remind you when you click the download button, click Yes to start the update.
2. If the Link firmware update is abnormal, please update the firmware by offline update.

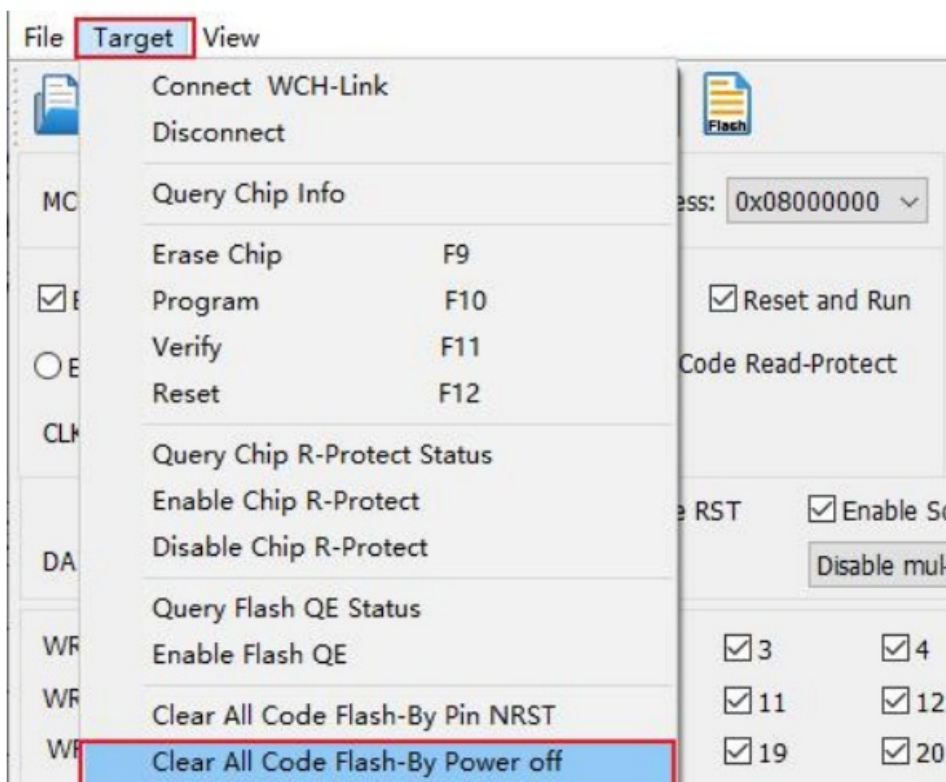
WCH-LinkUtility offline update (2-wire approach to offline update)


1. Connect WCH-LinkE with Link to be updated

WCH-LinkE	Link to be updated
3V3	3V3
GND	GND
SWDIO	SWDIO
SWCLK	SWCLK


WCH-LinkE power on, select the Link chip model to be updated (WCH-LinkE main control chip is CH32V30x, WCH-DAPLink main control chip is CH32V20x)

2. To be updated Link into IAP mode (long press the IAP button to power up the Link, that is, through the USB port connected to the computer to power up)
3. Click Target->Clear All Code Flash-By Power off to erase all the user area of the chip.



4. Click icon  diaable chip read-protect

Name	Value
MCU UID	
Flash Size	
Read-Protect	Disable
Link Version	

- Click icon , add Link offline updated firmware
- Configuration options (Program + Verify + Reset and Run)

☐ Erase All
☒ Program
☒ Verify
☒ Reset and Run

- Click icon  to execute download

Notes:

- The Link to be updated is limited to WCH-LinkE and WCH-DAPLink.
- Two WCH-LinkE are required for this method.
- When Link enters IAP mode, the blue LED flashes.

WCHISPStudio serial port offline update

- Connect WCH-Link with USB to TTL module

WCH-Link	USB to TTL module
TX	RX
RX	TX
GND	GND

USB to TTL module power on, WCH-Link into BOOT mode (short connection J1 in Figure 1 will Link power on)

- Select chip model: CH549, download interface: serial port, device list: select the serial port number corresponding to the USB to TTL module

Chip Option

Chip Series	CH54x	Chip Model	CH549
Download Port	SerialPort		
Dev List	COM11		

Q Search

3. Add Link offline updated firmware to target program file
4. Download configuration

Chip Config

Code and data protection mode	Enable
Enable P5.7 as manual reset input pin	Enable
Long Delay Time	Disable
Run The Target Program After Download	Enable
Clear DataFlash	Enable
Clear CodeFlash	Enable
LVR threshold	4.0V
NoKey serial port download	Enable
Download Cfg Pin	P51

5. Click the download button
6. Click on the download and wait for the device to access the field, then plug the WCH-Link into the USB port, the ISP tool automatically began to download

Note: Serial port offline update is only supported by WCH-Link.

WCHISPStudio USB offline update

1. To update the Link into BOOT mode (short connect J1 in Figure 1 or long press BOOT key and then power up the Link)
2. WCHISPStudio tool will automatically pop up the adaptation window
3. Add Link offline upgrade firmware to the target program file
4. Download configuration

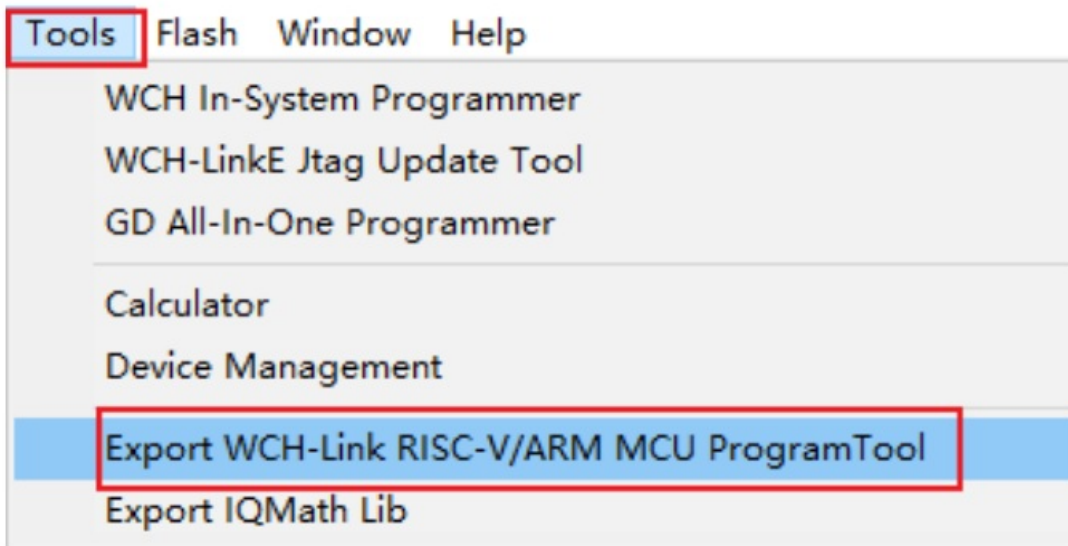
Chip Config		
Code and data protection mode	Enable	
Enable P5.7 as manual reset input pin	Enable	
Long Delay Time	Disable	
Run The Target Program After Download	Enable	
Clear DataFlash	Enable	WCH-Link
Clear CodeFlash	Enable	
LVR threshold	4.0V	
NoKey serial port download	Enable	
Download Cfg Pin	P51	

Chip Config		
DI_Baud	115200	
Stop-Mode RST	Disable	
Standby-Mode RST	Disable	
Soft-Ctrl IWDG	Enable	
RRP	Disable	
Clear CodeFlash	Enable	WCH-DAPLink
Perform a soft reset After Download	Enable	
User data DATA0	0x00	
User data DATA1	0x00	
Write protection control bit WRP0	0xFF	
Write protection control bit WRP1	0xFF	
Write protection control bit WRP2	0xFF	

5. Click the download button.

Notes:

1. USB offline update is only supported by WCH-Link and WCH-DAPLink.
2. WCH-LinkE-R0-1v3 and WCH-DAPLink-R0-2v0 are only available for firmware version v2.8 and above.
3. WCH-LinkUtility tool can be exported through MounRiver Studio software.



4. Link offline upgrade firmware is located in the MounRiver Studio installation path and WCH-LinkUtility installation path.

MounRiver > MounRiver_Studio > update > Firmware_Link	WCH-LinkUtility > Firmware_Link
名称	名称
① FIRMWARE_CH32V203.bin	① FIRMWARE_CH32V203.bin
② FIRMWARE_CH32V305.bin	② FIRMWARE_CH32V305.bin
③ FIRMWARE_CH549.bin	③ FIRMWARE_CH549.bin
④ FIRMWARE_DAP_CH549.bin	④ FIRMWARE_DAP_CH549.bin
firmware_version.txt	firmware_version.txt
⑤ WCH-DAPLink_APP_IAP.bin	⑤ WCH-DAPLink_APP_IAP.bin
wchlink.wcfg	wchlink.wcfg
⑥ WCH-Link_APP_IAP_ARM.bin	⑥ WCH-Link_APP_IAP_ARM.bin
⑦ WCH-Link_APP_IAP_RV.bin	⑦ WCH-Link_APP_IAP_RV.bin
⑧ WCH-LinkE-APP-IAP.bin	⑧ WCH-LinkE-APP-IAP.bin

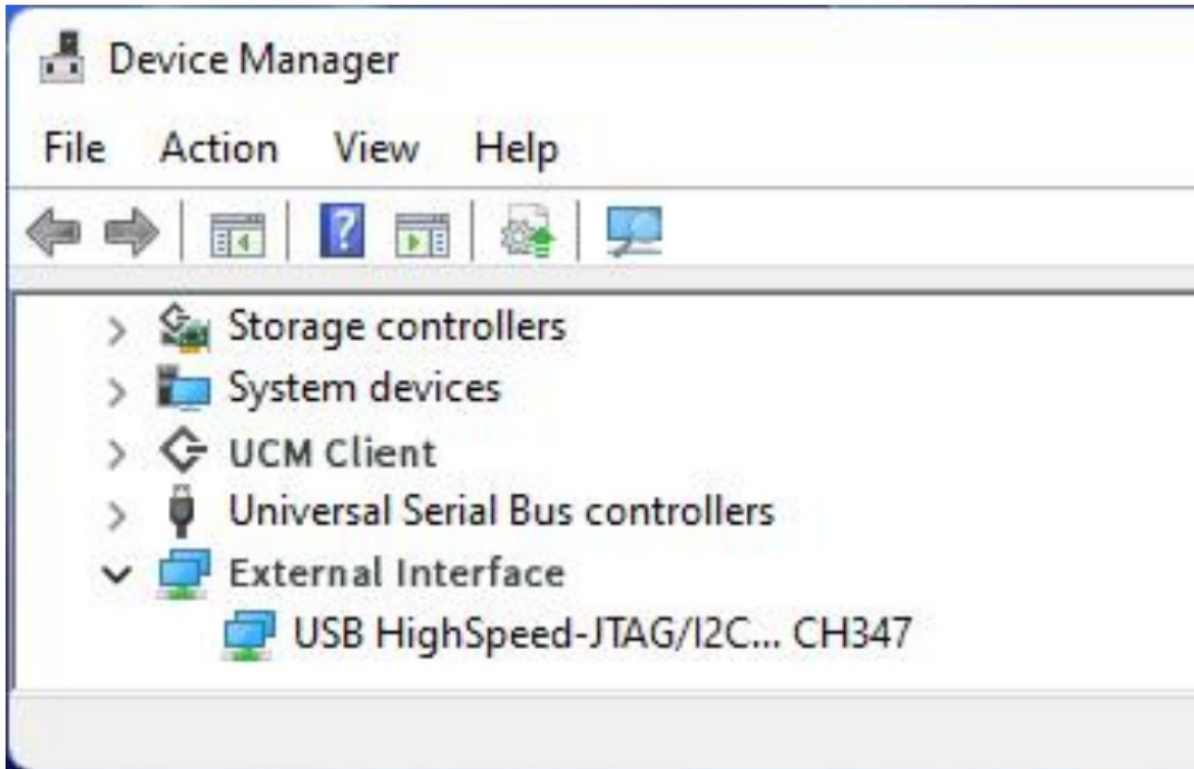
1. WCH-DAPLink upgrade firmware
2. WCH-LinkE upgrade firmware
3. WCH-Link RISC-V mode upgrade firmware
4. WCH-Link ARM mode upgrade firmware
5. WCH-DAPLink offline upgrade firmware
6. WCH-Link ARM mode offline upgrade firmware
7. WCH-Link RISC-V mode offline upgrade firmware
8. WCH-LinkE offline upgrade firmware

WCH-LinkE high-speed JTAG

Module overview

The WCH-LinkE-R0-1v3 provides a JTAG interface that supports 4-wire connections (TMS, TCK, TDI and TDO wires) for extending the JTAG interface for computers to operate CPUs, DSPs, FPGAs, CPLDs and other devices.

Figure 3 WCH-LinkE high-speed JTAG mode



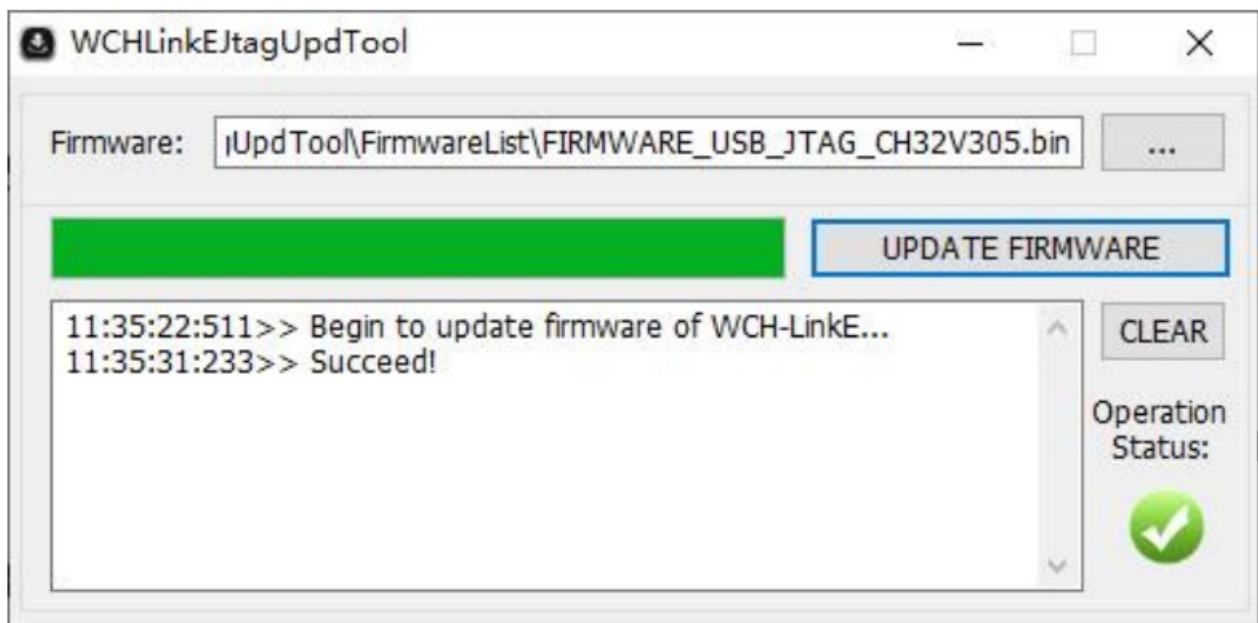
Module features

- As Host/Master host mode.
- I JTAG interface provides TMS wire, TCK wire, TDI wire and TDO wire.
- I Support high-speed USB data transfer.
- I Flexible operation of CPU, DSP, FPGA and CPLD devices through computer API cooperation.

Module switching

The WCH-LinkE-R0-1v3 can be upgraded to high-speed JTAG mode via the WCHLinkEJtagUpdTool tool, download the steps as follows.

1. WCH-LinkE-R0-1v3 into IAP mode (long press the IAP button to power up the Link, i.e., connect to the computer through the USB port to power up), at this time the blue LED flashes.
2. Open WCHLinkEJtagUpdTool tool, execute the download (WCH-LinkE high-speed JTAG upgrade firmware has been automatically added).
3. Firmware update is complete, at this time the blue LED is always on.





Notes.

1. WCHLinkEJtagUpdTool get URL: <https://www.wch.cn/downloads/WCHLinkEJtagUpdToolZIP.html>
2. The firmware can be updated offline by WCH-LinkUtility tool, please refer to manual 6.3 WCH-LinkUtility Offline Update for details.
3. WCH-LinkE high-speed JTAG offline update firmware is located in the WCHLinkEJtagUpdTool installation path.

WCHLinkEJtagUpdTool > FirmwareList

名称

- ①  FIRMWARE_USB_JTAG_CH32V305.bin
- ②  WCH-LinkE-USB-JTAG-APP-IAP.bin

1. WCH-LinkE high-speed JTAG upgrade firmware
2. WCH-LinkE high-speed JTAG offline upgrade firmware

Download process

1. In WCH-LinkE high-speed JTAG mode, the Bit program file is first downloaded to the FPGA via JTAG, and the Bit file will operate the SPI controller of the FPGA to convert the JTAG data to SPI data for writing to Flash, and this step is to write the BIN file to realize its program curing process.
2. Here the FPGA is Xilinx xc7a35t. Write the CFG file and use "openocd -f" to call it. Name the CFG file as usb20jtag.cfg and save it to the location of the openocd.exe file.
Specify WCH-LinkE high-speed JTAG debugger adapter driver ch347 ch347 vid_pid 0x1a86 0x55dd

Set TCK clock frequency adapter speed 10000

Specify TARGET, loading the JTAG-SPI driver in Open OCD

source [find cpld/xilinx-xc7.cfg]

source [find cpld/jtagspi.cfg]

Set IR command of TARGET

set XC7_JSHUTDOWN 0x0d

set XC7_JPROGRAM 0x0b

set XC7_JSTART 0x0c

set XC7_BYPASS 0x3f

Download process

Init

First download the Bit file to TARGET

load 0 bscan_spi_xc7a35t.bit

reset halt

Detect Flash information

flash probe 0

Download Bin file to Flash flash write_image erase test. bin 0x0 bin

Effective firmware operation irscan xc7.tap \$XC7_JSHUTDOWN irscan xc7.tap \$XC7_JPROGRAM runtest 60000 runtest 2000 irscan xc7.tap \$XC7_BYPASS runtest 2000 exit .

3. Run the command: openocd.exe -f usb20jtag.cfg in Windows terminal and execute it as follows.

```
D:\MounRiver\MounRiver_Studio\toolchain\OpenOCD\bin>openocd.exe -f usb20jtag.cfg
Open On-Chip Debugger 0.11.0+dev-02415-gfad123a16-dirty (2022-12-13-09:38)
Licensed under GNU GPL v2
For bug reports, read
    http://openocd.org/doc/doxygen/bugs.html
Info : only one transport option, autoselect 'jtag'
Info : clock speed 10000 kHz
Info : JTAG tap: xc7.tap tap/device found: 0x0362d093 (mfg: 0x049 (Xilinx), part: 0x362d, ver: 0x0)
[xc7.proxy] target successfully examined.
Info : JTAG tap: xc7.tap tap/device found: 0x0362d093 (mfg: 0x049 (Xilinx), part: 0x362d, ver: 0x0)
Info : Found flash device 'issi is25lp128d' (ID 0x18609d)
Info : sector 0 took 0 ms
Info : sector 1 took 0 ms
Info : sector 2 took 0 ms
Info : sector 3 took 0 ms
Info : sector 4 took 0 ms
Info : sector 5 took 0 ms
Info : sector 6 took 0 ms
Info : sector 7 took 15 ms
Info : sector 8 took 0 ms
Info : sector 9 took 0 ms
Info : sector 10 took 0 ms
Info : sector 11 took 0 ms
Info : sector 12 took 0 ms
Info : sector 13 took 16 ms
Info : sector 14 took 0 ms
Info : sector 15 took 0 ms
Info : sector 16 took 0 ms
Info : sector 17 took 0 ms
Info : sector 18 took 0 ms
Info : sector 19 took 16 ms
Info : sector 20 took 0 ms
Info : sector 21 took 0 ms
Info : sector 22 took 0 ms
Info : sector 23 took 0 ms
Info : sector 24 took 0 ms
Info : Close the CH347.
```

4. The download is over and the device is running normally.

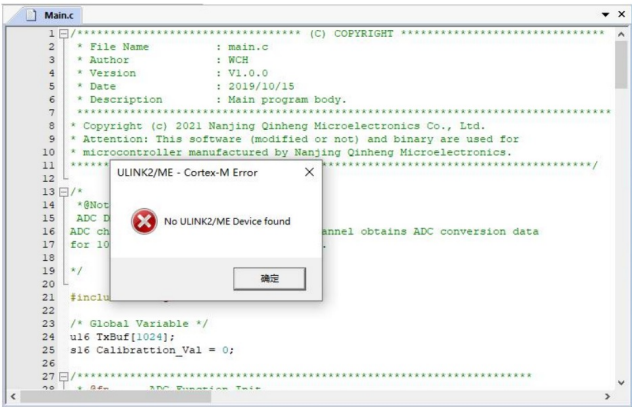
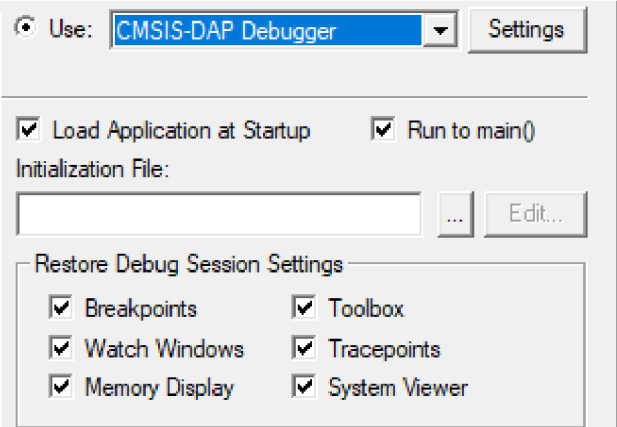
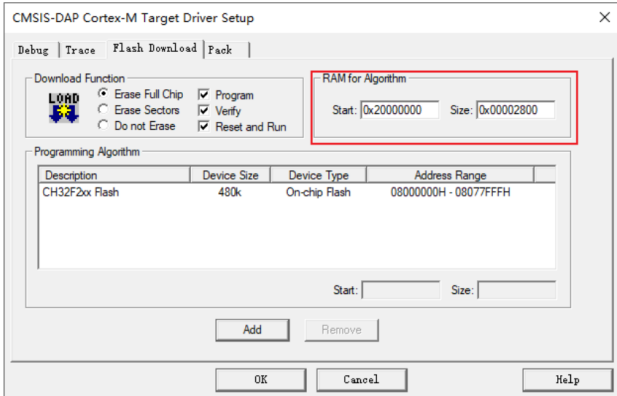
Notes.

1. conversion role of the Bit file, with the help of Github open source project:

<https://github.com/quartiq/bscanspibitstreams>

2. openocd.exe file location: MounRiver\MounRiver_Studio\toolchain\OpenOCD\bin

Typical problem statement

Error Alert	Solution
<p>Use Keil software to download</p> 	<p>1. Please refer to manual 3.2 Download configuration to complete Keil download configuration.</p> 
<p>Use Keil software to download</p> 	<p>1. The RAM space size of our CH32F20x series chips is 0x2800.</p> 

Use MounRiver Studio software to download



```
Download Output Console
14:03:21:759 >> Attempt to open link device and upgrade firmware if necessary...
14:03:21:896 >> Link Device is CH32V305. Already the latest version v2.8, no need to upgrade

14:03:21:930 >> Starting to Send Chip Type...
14:03:21:985 >> Board chip status error
Board chip status error

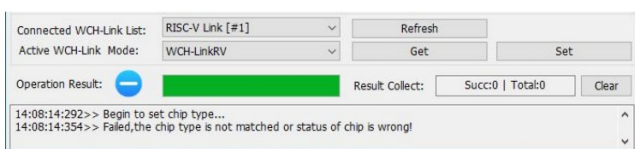
14:03:21:985 >> Starting to Close Link...
14:03:21:998 >> Close Link Success
-----End-----
```

1. Check whether the chip's two-wire debug interface is correctly connected to Link.
2. Check whether the Debug function of the chip is turned on (if not, it can be turned on through the ISP tool).
3. Check whether the user program inside the chip is open to sleep function and whether there is an operation of FLASH related functions(if open, you can enter BOOT mode and download through two lines).
4. Check whether the two-wire debug interface of the user program inside the chip is multiplexed as a common GPIO port (if multiplexed, you can enter BOOT mode and download through two wires).

Note:

1. For CH32 series chips, if the download is not successful, you can enter BOOT mode (BOOT0 to VCC, BOOT1 to GND) and download through Link.
2. For 3 and 4, the problem can be solved by WCH-Link Utility tool to erase all the user area of the chip (refer to Chapter 5 of the manual for WCH-Link Utility download).

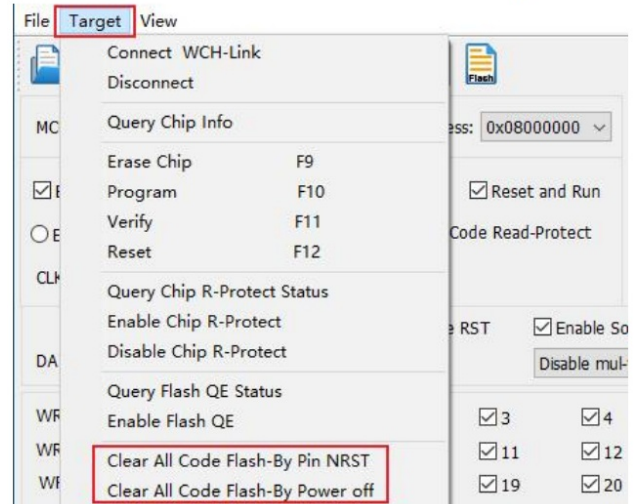
Use the WCH-LinkUtility tool to download



Erase all user areas of the chip

Update firmware using WCHLinkEJtagUpdTool to
 ol
 After updating the firmware according to manual
 7.3 Mode Switching Download Procedure, the blue
 LED on the WCH-LinkE-R0-1v3 does not light up
 and the Device Manager cannot recognize the device.

1. Analysis of the cause, may be the WCH-LinkE-R0-1v3 on the Y1 crystal soldering abnormalities, resulting in the crystal cannot properly start vibration. Therefore, you need to re-solder the Y1 crystal.



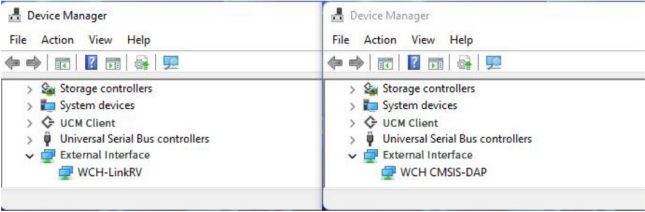
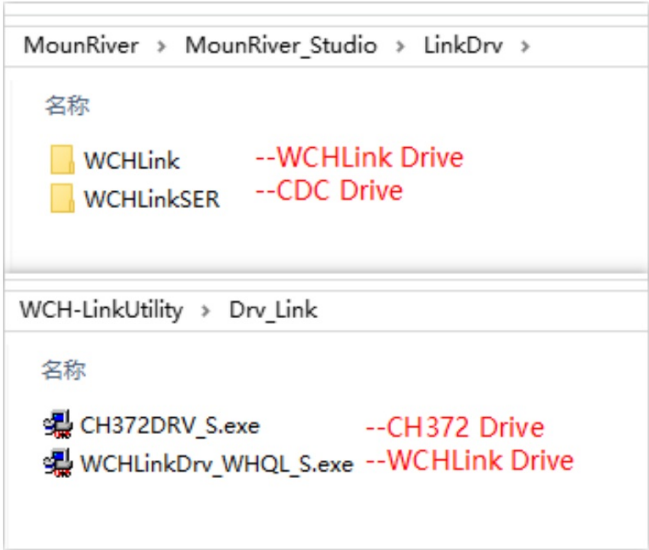
Notes:

1. The debugging function is not supported when the user program turns on the sleep function.
2. If you exit abnormally when using the debug function, it is recommended to re-plug the Link.
3. When using the download and debug functions of CH32F103/CH32F203/CH32V103/CH32V203/ CH32V307, BOOT0 is grounded.
4. When using the debug function of CH569, the user code must be smaller than the configured ROM space, as shown in Table 2-2 of CH569 manual.
5. When using the debug function of CH32 series chip, please make sure the chip is in the read protection off state.

Driver installation

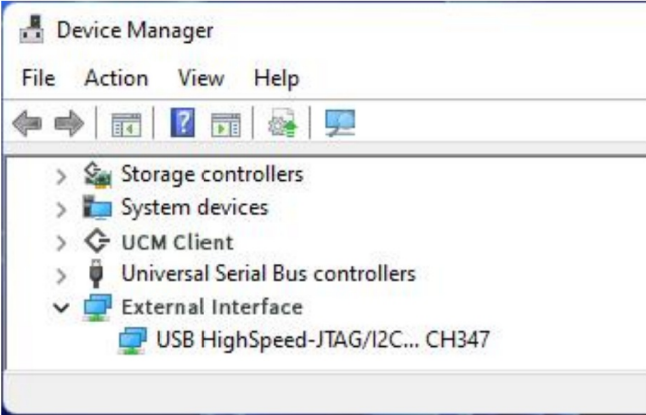
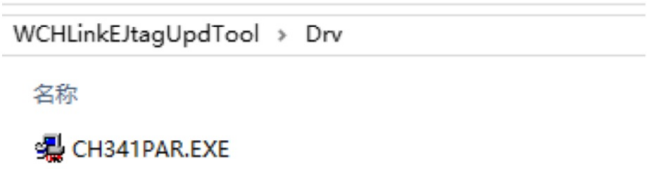
WCH-Link driver

If the driver installation fails, please open the LinkDrv folder under the installation path of MounRiver Studio or the Drv Link folder under the installation path of WCH-LinkUtility and install it manually. SETUP.EXE under the WCHLink folder.

Device manager	Drive path
	

WCH-LinkE high-speed JTAG driver

WCH-LinkE-R0-1v3 is upgraded to high-speed JTAG mode, you need to manually install the WCH-LinkE high-speed JTAG driver to use it properly. Please open the Drv folder under the installation path of WCHLinkEJtagUpdTool and install CH341PAR.EXE manually.

Device manager	Drive pat
	

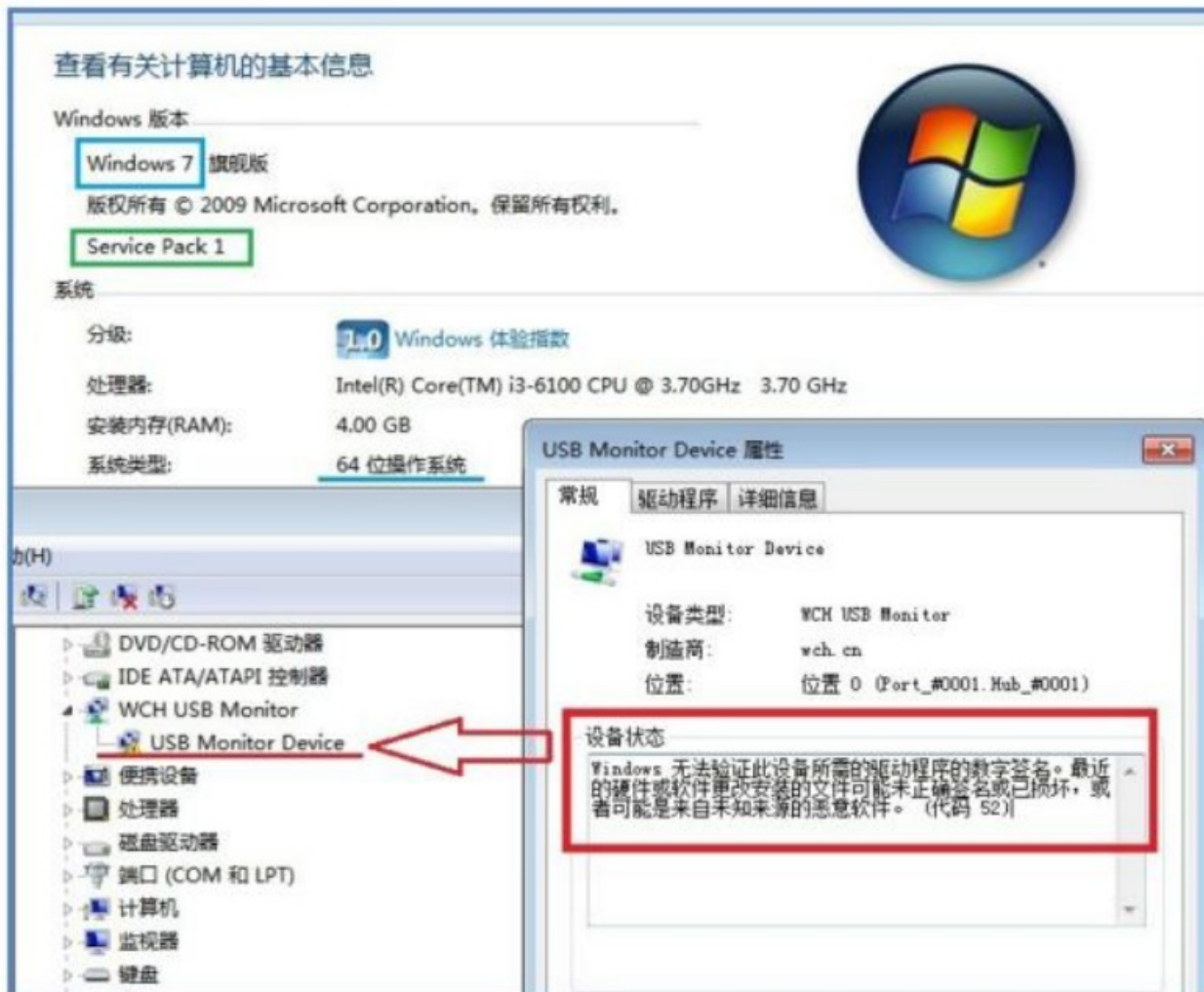
CDC driver

CDC device installation problems under WIN7.

- 1. If the serial port driver is successfully installed, the following steps are not required.
- 2. Confirm that the usbser.sys file is present in path B. If it is missing, copy it from path A to path B.
- 3. Reinstall the CDC driver. (See the above table for the driver path, please install the CDC driver in the corresponding mode)




Note: If the above steps do not solve the problem, please refer to the link below



Reference: <http://www.wch.cn/downloads/InstallNoteOn64BitWIN7ZHPDF.html>

Documents / Resources

	<p>WCH WCH-Link Emulation Debugger Module [pdf] User Manual WCH-Link Emulation Debugger Module, WCH-Link, Emulation Debugger Module, Debugger Module</p>
---	---

References

- [MounRiver Studio](#)
- [WCH -](#)
- [WCH InstallNoteOn64BitWIN7_ZH.PDF -](#)
- [GitHub - quartiq/bscan_spi_bitstreams: FPGA gateware and pre-build bitstreams that expose SPI over JTAG. The protocol is implemented \(among others\) by openocd.](#)
- [WCH WCH-LinkUtility.ZIP -](#)
- [WCH WCHISPTool_Setup.exe -](#)
- [WCH WCHLinkEJtagUpdTool.zip -](#)

- [WCH-Link](#) -

Manuals+.