

# e-Link32/e-Link32 Pro User's Guide

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# 1 Overview

The purpose of this user's guide is to familiarise users with the Holtek e-Link32/e-Link32 Pro Debug Adapter. The guide includes information on how to setup and use the e-Link32/e-Link32 Pro with the Keil MDK-ARM and IAR EWARM.

## Introduction

The Holtek e-Link32/e-Link32 Pro connects the target board (via Serial Wire) to the PC's USB port. Users can then program and debug their embedded programs on the target board.

The e-Link32/e-Link32 Pro provides the following key features.

- Supports HT32 Series MCUs
- Serial Wire Debug interface
- Integrates with Keil & IAR IDE
- USB powered
- 10-pin Cortex Debug Connector
- Three LEDs used to display the USB, ERROR and RUN status
- Single RESET button
- Serial communication with the target MCU (for e-Link32 Pro only)



Figure 1. e-Link32/e-Link32 Pro Debug Adapter Appearance



## **Hardware Description**

The e-Link32/e-Link32 Pro supports a Serial Wire Mode interface. There are only two pins, SWCLK (Serial Wire Clock) and SWDIO (Serial Wire Debug Data Input/Output), which are used for programming and debugging. However there are another two USB Virtual COM Ports for the e-Link32 Pro Serial Communication <sup>(Note)</sup>. The following illustration shows the debug connector.

1	3	5	7	9
2	4	6	8	10

## Figure 2. SWD 10-Pin Connector

## Table 1. SWD 10-Pin Connector Pins

Pin#	Description	Pin#	Description
1	3.3V	2	SWDIO
3	GND	4	SWCLK
5	GND	6	Reserved
7	NC (VCOM_RXD <sup>(Note)</sup> )	8	NC (VCOM_TXD <sup>(Note)</sup> )
9	GND	10	Reset

Note: The serial communication function is only available for the e-Link32 Pro, Pin7 and Pin8 are NC pins for the e-Link32.

## Hardware Configuration

As the MCU has a wide operating voltage range, the SWD and other interface IO voltages of the MCU may be different from the e-Link32/e-Link32 Pro which both operate at 3.3V. To accommodate this problem a Level Shifter is integrated within the e-Link32/e-Link32 Pro to handle different voltage level situations. However, users can also use different power supply modes according to their various target board circuits and application purposes. For example:

SWD/RESET/UART interface voltage determined by the target board power supply (hardware factory default value):

The VDD power supply on the SWD interface is supplied by the target board. The SWD, RESET and UART interface IO voltages of the e-Link32/e-Link32 Pro will be processed by the Level Shifter to ensure that their voltage level is the same as the target board.

■ MCU with independent IO power supply:

The SWD interface voltage is different from the RESET signal. For example, the SWD interface operates at 1.8V while the RESET signal operates at 3.3V.



■ Target board power supply provided by the e-Link32/e-Link32 Pro:

The VDD power supply on the SWD interface is supplied with 3.3V by the e-Link32/e-Link32 Pro. In this case, the e-Link32/e-Link32 Pro and the target board MCU will both operate at 3.3V. Users must take care to ensure that the target board can operate at 3.3V and that the current does not exceed the e-Link32/e-Link32 Pro allowed current. This configuration is usually used to simplify the power supply mode during programming. Therefore, the target board does not require an additional power supply.

The following content describes how to adjust the e-Link32 or e-Link32 Pro resistance jumper to meet different power requirements.

SWD/RESET/UART interface voltage determined by target board power supply (hardware factory default value):

The VDD (Pin 1) power supply on the SWD interface is supplied by the target board. The SWD, RESET and serial communication  $^{(Note)}$  logic voltages refer to the target board V<sub>DD</sub> voltage.

# Table 2. Power Configuration – SWD/RESET/UART Interface Voltage determined by the Target Board Power Supply

Jumper	State	Description
R19	Short	Factory default, 10kΩ resistor
R12	NC	Factory default

Note: The serial communication function is only available for the e-Link32 Pro.

■ MCU with independent IO power supply - for e-Link32 Pro only:

Similar to the previous configuration mode, the only difference is that the RESET IO voltage level is determined by the pull-high resistor of the target board nRST.

#### Table 3. Power Configuration – MCU with Independent IO Power Supply

Jumper	State	Description
R19	NC	Remove R19
R12	NC	Factory default

■ Target board power supply provided by the e-Link32/e-Link32 Pro:

The VDD (Pin 1) power supply on the SWD interface is provided with 3.3V by the e-Link32/ e-Link32 Pro. The SWD, RESET and serial interface <sup>(Note)</sup> communication logic voltages refer to the e-Link32/e-Link32 Pro voltage.

## Table 4. Power Configuration – Target Board Power Supply Provided by e-Link32/ e-Link32 Pro

Jumper	State	Description
R19	Short	Factory default, 10kΩ resistor
R12	Short	Add a 0Ω resistor

Note: The serial communication function is only available for the e-Link32 Pro.



## **Dynamically Switching Power Configuration**

Users can connect a switch on J4 to dynamically select the following power configurations.

## Table 5. Power Supply Switch – J4

J4	Description
+3U3 UCC	SWD/RESET/UART interface voltage determined by the target board power supply
+3U3 UCC	Target board power supply provided by the e-Link32/e-Link32 Pro

## e-Link32/e-Link32 Pro Schematic Diagram

This section shows the entire e-Link32 and e-Link32 Pro circuit diagrams.

- e-Link32 v1.0
- e-Link32 Pro v1.0









Figure 4. e-Link32 Pro v1.0



# 2 MDK\_ARM (KEIL) Setup and Use

## e-Link32/e-Link32 Pro for Keil Installation

The following steps show how to install the e-Link32/e-Link32 Pro for Keil:

Double-click "HT32\_Setup\_Keil\_vxx.exe" to open the Keil Boot program and press the "Yes" button to continue.



Figure 5. HT32\_Setup\_Keil\_vxx.exe Installation Introduction



■ The default installation path of the Keil Boot program is "C:\Program Files (x86)\HT32\_Setup\_ Keil". Select the desired installation path and press the "Next" button to continue.

Setup - HT32_Setup_Keil	
Select Destination Location Where should HT32_Setup_Keil be installed?	
Setup will install HT32_Setup_Keil into the follow	wing folder.
To continue, click Next. If you would like to select a diffe	erent folder, click Browse.
C:\Program Files (x86)\HT32_Setup_Keil	Browse
At least 18.1 MB of free disk space is required.	
	Next > Cancel

## Figure 6. HT32\_Setup\_Keil\_vxx.exe Installation Path

Press the "Install" button to start the installation.

👸 Setup - HT32_Setup_Keil	
Ready to Install Setup is now ready to begin installing HT32_Setup_Keil on your compute	r.
Click Install to continue with the installation, or click Back if you want to r change any settings.	review or
Destination location: C:\Program Files (x86)\HT32_Setup_Keil	*
4	
< Back Install	Cancel

Figure 7. HT32\_Setup\_Keil\_vxx.exe Installation Process



Once the installation has finished, the following screen will appear. Press the "Next" button to install the "Holtek e-Link32 USB Driver".



## Figure 8. Holtek e-Link32 USB Driver Installation Introduction

■ The default installation path of the Holtek e-Link32 USB Driver is "C:\Program Files (x86)\ Holtek HT32 Series\e-Link32 USB Driver". Select the desired installation path and press the "Next" button to install.



## Figure 9. Holtek e-Link32 USB Driver Installation Path



Once the installation has finished, the following screen will appear. Press the "Finish" button to enter the next Keil Plugin installation process.



## Figure 10. Holtek e-Link32 USB Driver Installation Completion

■ If the Holtek e-Link32 Keil Plugin has already been installed, users will be prompted to uninstall any older versions. Press the "Yes" button to continue.



Figure 11. Holtek e-Link32 Keil Plugin Old Version Uninstallation



Once the uninstallation has finished in the previous step, a Holtek e-Link32 Keil Plugin installation window will appear. Press the "Next" button to continue.





■ The Keil Plugin installation path is subject according to that of Keil4/Keil5. The default installation path of the Keil4/Keil5 is "C:\Keil\_xx". Select the desired installation path and press the "Next" button to install.



Figure 13. Holtek e-Link32 Keil Plugin Installation Path



Once the installation has finished, press the "Finish" button to enter the next Holtek HT32 Keil Support Package installation process, then press the "Next" button to continue.





■ The Keil Support Package installation path is subject to that of the Keil4/Keil5. The default installation path of the Keil4/Keil5 is "C:\Keil\_xx". Select the desired installation path and press the "Next" button to install.



Figure 15. Holtek HT32 Keil Support Package Installation Path



Once the installation has finished, press the "Finish" button to enter. The completed window will be displayed after which the "Finish" button should be selected to restart the computer.

j Setup - HT32_Setup_Keil	
	Completing the HT32_Setup_Keil Setup Wizard
	To complete the installation of HT32_Setup_Keil, Setup must restart your computer. Would you like to restart now?
	• Yes, restart the computer now
	© №o, I will restart the computer later
	Einish

## Figure 16. Keil Installation Completion

- Connect the e-Link32/e-Link32 Pro to the PC's USB port.
- Open the PC's "Device Manager" to check the connection status of the e-Link32/e-Link32 Pro.
- If the e-Link32 is connected, a connection device named "Holtek e-Link32 Debug Interface" will appear on the "Device Manager" window. This will confirm that the installation has been successful.



## Figure 17. e-Link32 Device Name



■ If the e-Link32 Pro is connected, a connection device named "HID-compliant device" will appear on the "Device Manager" window, and the corresponding Virtual COM Port will also be found, confirming that the installation was successful.

HID-compliant device
HID-compliant device
USB 輸入裝置
USB 輸入裝置
USB 輸入裝置
USB 輸入裝置
🚛 具 HID 功能的取用者控制装置
Holtek USB Virtual COM Port (COM27)

Figure 18. e-Link32 Pro Device Name

## e-Link32/e-Link32 Pro with Keil4 Setup and Use

Open the Keil uVision4 project, click "Options for Target", then click the "Debug" option to select "Holtek e-Link32 Debugger" for e-Link32 or select "CMSIS-DAP Debugger" for e-Link32 Pro.

	Output Listing	; Vser  C/C++	Asm Li	nker I	lebug	Utilities		
○ Use <u>S</u> imulaties Limit Speed	x coReal-Time	Settings	● <u>U</u> se:	Holtek e Altera Bl	e-Link32 aster Co	Debugger rtex Debugger	-	Settings
Load Applic Initialization File:	ation at Startup	Load.	Stellarıs Signum J-LINK / ULINK F NULink Sil abs I	ILDI Systems J-TRAC Pro Corte Debugge IDA Det	JTAGjet E Cortex x Debugger er ugger		o main() Edit	
Restore Debu Breakpo Watch V Memory	3 Session Settings nts 🔽 Tooll /indows & Performanc Display	e-Link32 pro <sup>box</sup> e-Link32 <sub>se Analyzer</sub>	Restore	ST-Link CMSIS-I Fast Mo Holtek e ston win mory Dis	Debugg DAP Deb dels Deb -Link32 dows :play	er ougger Debugger	~	
CPU DLL:	Parameter:		Driver DLL	.: F	<sup>o</sup> aramete	er:		
			SARMCM	3.DLL				
SARMCM3.DLI								





After the bebugger is selected, click the "Settings" button on the right side to open the corresponding setting window. Confirm that the setting is successful when the device ID is read. The e-Link32 setting window is shown below:

ebug Flash Download e-Link32 USB Adapter	SWD Device
Max Clock: 1MHz	IDCODE Device Name           IDCODE         Device Name           0x0BC11477         ARM CoreSight SW-DP
Semihosting	Reset Option: SYSRESETREQ Cache Options

## Figure 20. Keil4 e-Link32 Setting Window

The e-Link32 Pro setting window is shown below: Select SW mode as the Port type.

Cortex-I Target Driver Se	etup	×
Debug Flash Download		
CMSIS-DAP - JTAG/SW Adapter	SW Device Move Move	
Serial No: FFFFFFF	SWDI0 Ox0BC11477 ARM CoreSight SW-DP	
Firmware Version: 1.0	Down	
SWJ Fort SW	Automatic Detection ID CODE:     Manual Configuration Device Name:	
	Add Delete Update AP: 0x00	
Debug Connect & Reset Options Connect: Normal ▼ Rese ▼ <u>R</u> eset after Connect	et: Autodetect	
	OK Cancel Help	

#### Figure 21. Keil4 e-Link32 Pro Setting Window



Click "Flash Download" to check the "Programming Algorithm", if there is no content or the content is not correct, then press the "Add" button.

ownload Function C Erase Full Chip Erase Sectors C Do not Erase	<ul> <li>✓ Program</li> <li>✓ Verify</li> <li>✓ Reset and F</li> </ul>	RAM for A Start:	Algorithm Dx20000000 Size: 0x0800
rogramming Algorithm			
Description	Device Size	Device Type	Address Range
HT32 Series Flash	1M	On-chip Flash	00000000H - 0001FBFFH
HT32 Series Flash Options	4k	On-chip Flash	1FF00000H - 1FF003FFH
		Start: [	Size:
	Add	Remove	

Figure 22. Keil4 - Flash Download Setup

## e-Link32 Pro with Keil5 Setup and Use (No Support e-Link32)

Open the Keil uVision5 project, click "Options for Target", and select "CMSIS-DAP Debugger" in the "Debug" option.

evice   Target   Output   Listing   User   C/C++   .	Asm Linker Debug Utilities
C       Use Simulator       with restrictions       Settings         Limit Speed to Real-Time       ✓       Load Application at Startup       ✓       Run to main()         Initialization File:        Edit       Edit         Restore Debug Session Settings       ✓       Toolbox         ✓       Breakpoints       ✓       Toolbox         ✓       Watch Windows & Performance Analyzer       ✓       Memory Display	Image: CMSIS-DAP Debugger       ▼       Settings         Stellaris ICDI       Signum Systems JTAGjet       >         J-LINK / J-TRACE Cortex       >       main()         Initializatio       NULINK Po Cortex Debugger       >         SiLabs UDA Debugger       SiLabs UDA Debugger       >         SiLabs UDA Debugger       >       >         Fast Models Debugger       >       >         Image: PelMicro Debugger       >       >         Image: Watch winnows       >       >         Image: Watch winnows       Image: Watch winnows       >
CPU DLL: Parameter: SARMCM3.DLL Dialog DLL: Parameter: DARMCM1.DLL PCM0+	Driver DLL: Parameter: SARMCM3.DLL Dialog DLL: Parameter: TARMCM1.DLL pCM0+

## Figure 23. Keil5 Debugger Selection



■ After the bebugger is selected, click the "Settings" button on the right side to select the SW options. Confirm that the setting is successful when the device ID is read.

Holtek CMSIS-DAP	-	IDCODE	Device Name		Move
Serial No: FEFEFEF	SWDIO	⊙ 0x0BC11477	ARM CoreSight SW-D	P	Up
	-				Down
	- C A	tomatic Detection	ID CODE:		-
SWJ Port: SW	1   20				
Max Clock		anual Configuration	Device Name:		
SW	Add	i Delete U	pdate	A	P: 0x00
D.I					
Debug Connect & Reset Options		[`	Cache Options	Download Option	s
oonnoor a nooor optione					
Connect: under Reset	Reset: Autodet	ect 🔻	Cache Code	Verify Code D	ownload

## Figure 24. Keil5 Debugger Setup

Click "Flash Download" to check "Programming Algorithm", if there is no content or the content is not correct, then press the "Add" button.

Ownload Function     Ownl	<ul> <li>✓ Program</li> <li>✓ Verify</li> <li>✓ Reset and F</li> </ul>	RAM for A Start: C	Vgorithm 0x20000000 Size: 0x1000	
Description	Device Size	Device Type	Address Bange	
HT32 Series Flash HT32 Series Flash Options	1M 4k	On-chip Flash On-chip Flash	00000000H - 0001FFFFH 1FF00000H - 1FF00FFFH	
		Start:	Size:	
			-1	

## Figure 25. Keil5 – Flash Download Setup



# **3** IAR Setup and Use

## e-Link32/e-Link32 Pro for IAR Installation

The following steps show how to install the e-Link32/e-Link32 Pro for IAR:

Double-click "HT32\_Setup\_IAR\_vxx.exe" to open the IAR Boot program and press the "Yes" button to continue.



Figure 26. HT32\_Setup\_IAR\_vxx.exe Installation Introduction



■ The default installation path of the IAR Boot program is "C:\Program Files (x86)\HT32\_Setup\_IAR". Select the desired installation path and press the "Next" button to continue.

Setup - HT32_Setup_IAR	
Select Destination Location Where should HT32_Setup_IAR be installed?	
Setup will install HT32_Setup_IAR into the following folder	r.
To continue, click Next. If you would like to select a different folde	r, click Browse.
C:\Program Files (x86)\HT32_Setup_IAR	Browse
At least 18.1 MB of free disk space is required.	
Ne	ext > Cancel

#### Figure 27. HT32\_Setup\_IAR\_vxx.exe Installation Path

Press the "Install" button to start the installation.

Set	tup - HT32_Setup_IAR   Eady to Install Setup is now ready to begin installing HT32_Setup_IAR on your computer.
	Click Install to continue with the installation, or click Back if you want to review or change any settings.
	Destination location: C:\Program Files (x86)\HT32_Setup_IAR
	<ul> <li>✓</li> </ul>
	< Back Install Cancel

Figure 28. HT32\_Setup\_IAR\_vxx.exe Installation Process



Once the installation has finished, the following screen will appear. Press the "Next" button to install the "Holtek e-Link32 USB Driver".



#### Figure 29. Holtek e-Link32 USB Driver Installation Introduction

■ The default installation path of the Holtek e-Link32 USB Driver is "C:\Program Files (x86)\ Holtek HT32 Series\e-Link32 USB Driver". Select the desired installation path and press the "Next" button to install.



Figure 30. Holtek e-Link32 USB Driver Installation Path



Once the installation has finished, the following screen will appear. Press the "Finish" button to enter the next IAR Plugin installation process.



## Figure 31. Holtek e-Link32 USB Driver Installation Completion

■ If the Holtek e-Link32 IAR Plugin has already been installed, users are prompted to uninstall any older versions. Press the "Yes" button to continue.



Figure 32. Holtek e-Link32 IAR Plugin Old Version Uninstallation



Once the uninstallation has finished in the previous step, a Holtek e-Link32 IAR Plugin installation window will appear. Press the "Next" button to continue.

🕞 Setup - Holtek e-Link32 I/	AR Plugin
	Welcome to the Holtek e-Link32 IAR Plugin Setup Wizard
	This will install Holtek e-Link32 IAR Plugin V2.0.0c on your computer.
	It is recommended that you close all other applications before continuing.
	Click Next to continue, or Cancel to exit Setup.
	Next > Cancel

## Figure 33. Holtek e-Link32 IAR Plugin Installation Introduction

■ The default installation path of the IAR Plugin is "C:\Program Files\Holtek HT32 Series\e-Link32 IAR Plugin". Select the desired installation path and press the "Next" button to install.

😼 Setup - Holtek e-Link32 IAR Plugin	
Select Destination Location Where should Holtek e-Link32 IAR Plugin be installed?	
Setup will install Holtek e-Link32 IAR Plugin into the following fo	lder.
To continue, click Next. If you would like to select a different folder, click	k Browse.
C:\Program Files\Holtek HT32 Series\e-Link32 IAR Plugin	Browse
At least 1.6 MB of free disk space is required.	
< <u>B</u> ack Next >	Cancel

## Figure 34. Holtek e-Link32 IAR Plugin Installation Path



Once the installation has finished, press the "Finish" button to enter the next Holtek HT32 IAR Support Package installation process, then press the "Next" button to continue.



## Figure 35. Holtek HT32 IAR Support Package Installation Introduction

- Once the installation has finished, press the "Finish" button.
- Connect the e-Link32/e-Link32 Pro to the PC's USB port.
- Open the PC's "Device Manager" to check the connection status of the e-Link32/e-Link32 Pro.
- If the e-Link32 is connected, a connection device named "Holtek e-Link32 Debug Interface" will appear on the "Device Manager" window, confirming that the installation has been successful.



#### Figure 36. e-Link32 Device Name



■ If the e-Link32 Pro is connected, a connection device named "HID-compliant device" will appear on the "Device Manager" window, and the corresponding Virtual COM Port will also be found, confirming that the installation has been successful.



Figure 37. e-Link32 Pro Device Name

## e-Link32/e-Link32 Pro with IAR EWARM Setup and Use

Open the IAR EWARM project, and then open "Options".



#### Figure 38. IAR Options



itegory:	Factory Settings
eneral Options 🛛 🔥	
atic Analysis 👘 👘	
untime Checking	
C++ Compiler	Setup Download Images Extra Options Multicore Plugins
Assembler	
Output Converter	Driver Run to
ustom Build	RDI 🗸 main
uild Actions	Simulator
inker	Angel
)ebugger	CMSIS DAP e-Link32 pro
Simulator	TAR ROM-monitor
Angel	I-jet/JTAGjet
CMSTS DAP	J-Link/J-Trace
GDB Server	TI Stellaris Magneiger
IAR ROM-monitor	PE micro
I-jet/ITAGiet	RDI de Link32
1-Link/1-Trace	ST-LINK Thind-Ponter Deisen \debugger\Holtek\HT32F52352 dd
TI Stallaric	TI MSP-FET
Macraigor	TI XDS
naciaiguí DE micro	
PEINICIO	
DI-LINK	

Click "Debugger" to select "RDI" for e-Link32 or select "CMSIS DAP" for e-Link32 Pro.

Figure 39. IAR Debugger Selection



Setting the selected debugger. Check wheather "e-Link32\_rdi.dll" is selected in "Manufacturer RDI driver" for e-Link32 RDI.

Category:		Factory Settings
Seneral Options	~	
Static Analysis		
Runtime Checking		
C/C++ Compiler		RDI
Assembler		Manufacturar BDT driver
Output Converter		
Custom Build		oltek HT32 Series\e-Link32 IAR Plugin\ <u>e-Link32_rdi.dll</u>
Build Actions		Note
Linker		Allow hardware reset Use the RDI menu to
Debugger		specify additional driver
Simulator		settings. (This menu is evoilable after the RDT
Angel		
CMSIS DAP		Catch exceptions
GDB Server		<u>R</u> eset <u>D</u> ata <u>F</u> IQ
IAR ROM-monitor		Undef Prefetch
I-jet/JTAGjet		
J-Link/J-Trace		Log KUL communication
TI Stellaris		<pre>\$PROJ_DIR\$\cspycomm.log</pre>
Macraigor		
PE micro		
RDI		
ST-LINK		
Third-Party Driver		
TI MSP-FET	~	

Figure 40. IAR e-Link32 Debugger Setup



Category:		Factory Settings
General Options Static Analysis Runtime Checking		
C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator Angel CMSIS DAP GDB Server I DB DOM-secritor	Setup Interface Breakpoint Probe config Auto From fil Explici Interface TTAG SWD	s guration file default Select be configuration meet debug system mber (TAP or 0 with multiple C
IAR ROM-monitor I-jet/JTAGjet J-Link/J-Trace TI Stellaris Macraigor PE micro RDI ST-LINK Third-Party Driver	CPU m Interface Auto detec	umber on O

Switch Interface option to SWD mode for e-Link32 Pro CMSIS DAP.

## Figure 41. IAR e-Link32 Pro Debugger Setup

Once the settings have finished, the corresponding debugger options will appear on the function table.



## Figure 42. IAR e-Link32 Debugger Function Table







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