

Nuvoton Nu-Link Debug Adapter User Manual

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1 Introduction

Nuvoton's Nu-Link Debug Adapter is an USB debugger and programmer based on the SWD (Serial Wire Debug) signal interface and can be applied to the development of Nuvoton NuMicro[™] Family chips. As shown in Table 2-1, there are three types of the Nu-Link Debug Adapter in accordance with different specifications, including Nu-Link-Pro, Nu-Link, and Nu-Link-Me. The three types are called "Nu-Link Adapter" in general if no specific conditions are mentioned.

The Nu-Link Adapter supports ICP (In-Circuit Programming) based on the SWD (Serial Wire Debug) signal interface. The user can employ the NuMicro[™] ICP Programming Tool to update chip firmware for mass production. The Nu-Link Adapter also supports the third-party development tools, such as Keil RVMDK, IAR EWARM, and CooCox CoIDE.

For simplicity and clarity, parts of specific terms in this user manual are contracted or abbreviated, as listed in the following table.

Short Name	Full Name			
Nu-Link Adapter Nuvoton Nu-Link Debug Adapter				
NuMicro™ Family	Nuvoton NuMicro™ Family			
ICP Tool	Nuvoton NuMicro™ ICP Programming Tool			
Keil RVMDK	Keil ARM RealView Microcontroller Development Kit (MDK-ARM®)			
IAR EWARM	IAR Embedded Workbench for ARM			
CooCox CoIDE	CooCox Integrated Development Environment			
SWD	Serial Wire Debug			
ICP	In-Circuit Programming			

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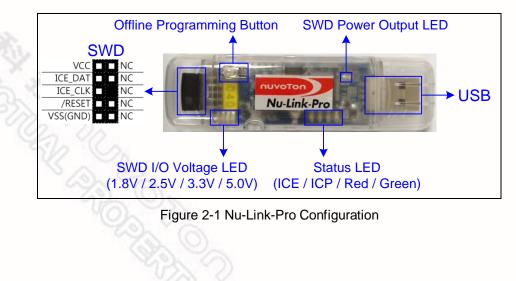
2 Hardware Specifications

The Nu-Link Adapter provides an USB connector and a SWD signal interface for connecting to the target chip. The user can connect the Nu-Link Adapter to an USB port of a PC to debug and program target chips through the development software tools. As shown in Table 2-1, there are three specifications for the Nu-Link Adapter, in which debugging, Online/Offline Programming, and SWD I/O voltage settings may be supported depending on the specifications (refer to the Appendix for details).

Type Function	Nu-Link-Pro	Nu-Link	Nu-Link-Me
Debugging	~	~	S D M
Online Programming	~	~	210
Offline Programming	~	~	Yon a
Multi SWD I/O Voltage	~		ES-
SWD I/O Voltage Support	1.8V, 2.5V, 3.3V, 5.0V	5.0V	3.3V (default), 5.0V (3.3V for On-board version only)

2.1 Nu-Link-Pro

The Nu-Link-Pro is a full-functional debugger and programmer with debugging, online/offline programming, and SWD I/O voltage setting functions. As shown in Figure 2-1, the Nu-Link-Pro includes an USB port that can be connected to a computer host, a set of Status LEDs, an offline programming button, a SWD port that can be connected to a target chip for debugging and programming (the voltage level of the SWD port can be adjusted through software as 1.8V, 2.5V, 3.3V, or 5.0V), a set of SWD I/O voltage LEDs and SWD Power Output LEDs.





2.2 Nu-Link

The Nu-Link is a basic debugger and programmer with debugging and online/offline programming functions. As shown in Figure 2-2, the Nu-Link includes an USB port that can be connected to a computer host, a set of Status LEDs, an offline programming button, and a SWD port that can be connected to a target chip for debugging and programming (the default voltage of the SWD port as 5.0V).

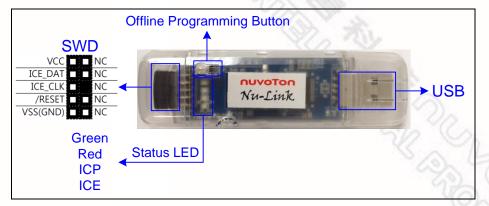


Figure 2-2 Nu-Link Configuration

2.3 Nu-Link-Me

The Nu-Link-Me is a simple debugger and programmer with debugging and online programming functions, which is only shipped with the NuTiny-SDK kits and can be used stand-alone for developing the customized NuMicro[™] Family system. As shown in Figure 2-3, the Nu-Link-Me includes an USB port that can be connected to a computer host, a set of Status LEDs, a Power Switch to switch the voltage of Nu-Link-Me between 3.3V and 5.0V (the default as 3.3V), a SWD port that can be connected to a target chip for debugging and programming (whose voltage is adjustable with the Nu-Link-Me). A Cortex Debug port is provided in parts of the version only for connecting to Keil's MCBNUC1XX board. The pins of the Cortex Debug port conform to those of the SWD port, except the pin order.

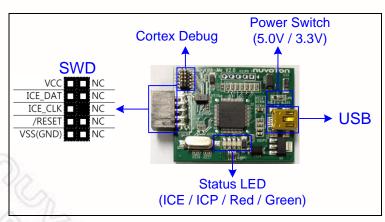


Figure 2-3 Nu-Link-Me Configuration

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2.4 Nu-Link-Me (On-board Version)

The main functions of the Nu-Link-Me on-board version, including debugging and online programming, are the same as those of the Nu-Link-Me. The Nu-Link-Me on-board version is provided with all NuMicro[™] Family series. The user does not need to prepare s debugger when using a learning board. The Nu-Link-Me on-board version includes an USB port that can be connected to a computer host, a set of Status LEDs, and a SWD port connected to the chip on the learning board (default) for debugging and programming (external connection is not supported). The SWD port voltage is always 3.3V.

The learning boards that support the Nu-Link-Me on-board version are listed below:

- Nu-LB-NUC140
- Nu-LB-M051
- Nu-LB-Mini51

2.5 Nu-Link Adapter Hardware Specifications

The Nu-Link Adapter hardware comparison is shown in Table 2-2.

Device	Description	Nu-Link-Pro	Nu-Link	Nu-Link-Me	on-board ver.
USB	Connected to an USB port of a PC to use the Nu-Link Adapter or download offline programming firmware	r	r	~	v
SWD	Connected to the target chip for debugging and programming	~	~	v	
Status LED	Display the operation status of the Nu- Link Adapter	~	~	~	v
Offline Programming Button	Click this button to proceed with offline programming	~	~		
SWD Power Output LED	Display the power output status of SWD VCC pins	~			
SWD I/O Voltage LED	Display the SWD VCC and I/O voltage	~			
Power Switch	Power switch between the power output of the Nu-Link-Me power (e.g. between the SWD VCC and I/O pins)			✓* ¹	
Cortex Debug	Able to connect to Keil's MCBNUC1XX board for debugging and programming			✓* ¹	

Table 2-2 Nu-Link Adapter Hardware Comparison

*¹Only supported in parts of the version.

Power Status	Target System Power	SWD Power LED	SWD I/O Voltage LED				
	em Power	r Output D	1.8V	2.5V	3.3V	5.0V	
SWD port I/O and VCC voltage as 1.8V	-	On	On	SD	Y.C	25	
SWD port I/O and VCC voltage as 2.5V	-	On	On	On	(a)	15	
SWD port I/O and VCC voltage as 3.3V	-	On	On	On	On	2-6	
SWD port I/O and VCC voltage as 5.0V	-	On	On	On	On	On	
SWD port I/O voltage as 1.8V	✔(1.8V)	-	On	-	-	-02	
SWD port I/O voltage as 2.5V	✔(2.5V)	-	On	On	-	-	
SWD port I/O voltage as 3.3V	✔(3.3V)	-	On	On	On	-	
SWD port I/O voltage as 5.0V	✔(5.0V)	-	On	On	On	On	

Table 2-3 SWD I/O Voltage LEDs and SWD Power Output LEDs Status List

Table 2-4 Status LEDs Difference List

Nu-Link Adapter Operation Status	Status LED						
	ICE	ICP	Red	Green			
Boot	Flash×3	Flash×3	Flash×3	Flashx3			
One Nu-Link Adapter selected to connect	Flash×4	Flash×4	Flash×4	On			
ICE Online (Not connected with a target chip)	On	Any	-	-			
ICE Online (Connected with a target chip)	On	Any	-	On			
ICE Online (Failed to connect with a target chip)	On	Any	Flash	On			
During Offline Programming	-	On	-	Flash Slowly			
Offline Programming Completed	On	-	-	-			
Offline Programming Completed (Auto mode)	On	On	-	-			
Offline Programming Failed	On	Flash	-	-			

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3 Main Functions

The Nu-Link Adapter provides complete debugging and programming functions for NuMicro[™] Family and supports a number of third-party development tools. The detailed function support is listed in Table 3-1.

Software	ICP Tool	Keil RVMDK	IAR EWARM	CooCox CoIDE				
Debugging		~	~	~				
Breakpoints		~	· ·	~				
Direct Register Control Interface		~	~	✓*1				
Semihost		>	~ ~	200				
Online Programming	~	~	~	C.				
Offline Programming* ²	~			S.				
Software Serial Number	~			2				
Wide Voltage Programming* ³	~	~	~					
Multi Nu-Link Adapter Support	~	~	~					
Nu-Link Adapter Driver Installation		~	~					
				1				

*¹ Core registers view is supported; peripherals view is not supported.

*² Supported for Nu-Link and Nu-Link-Pro.

*³ Supported for Nu-Link-Pro.



3.1 Debugging

This section briefly describes the debugging function supported by the Nu-Link Adapter. For more details, please refer to the related user manuals.

3.1.1 Debug Mode

The Nu-Link Adapter supports debugging for the NuMicro[™] Family chips based on the SWD signal interface. The third-party tools that support using the Nu-Link Adapter for chip debugging include Keil RVMDK, IAR EWARM, and CooCox CoIDE. Some more functions supported in Debug mode are described as follows.

3.1.2 Breakpoints

In Debug mode, the user can add breakpoints in the code for debugging. During the real-time simulation of the Nu-Link Adapter, the chip simulation will be stopped at a specific breakpoint. Figure 3-1 shows the breakpoint settings in Keil RVMDK Debug mode. The red labels on lines 052 and 059 indicate the breakpoints inserted; the yellow arrow refers to the code to be executed next and shows the register value of Program Counter (PC) (i.e. "R15(PC)=0x00000D04" in the Registers pane in Figure 3-1).

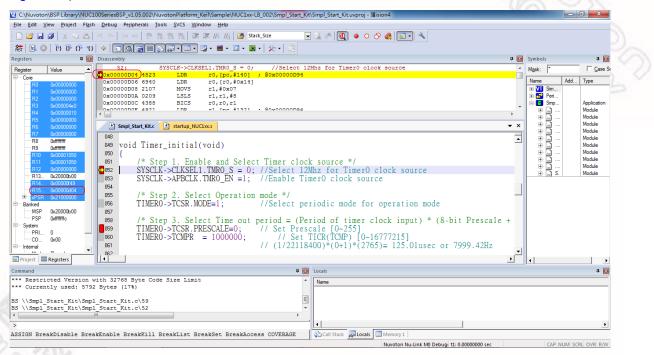


Figure 3-1 Setting Breakpoints in Keil RVMDK Debug Mode

3.1.3 Direct Register Control Interface

The Direct Register Control Interface can be used to display the register content in a target chip and manipulate the registers. Take Keil RVMDK Debug mode for example, invoke the **Debug** command and select a register from the "function register list" (e.g. ADC, CAN, CLK, etc.) to open the Direct Register Control Interface of the selected register, as shown in Figure 3-2.



C:\Nuvoton\BSP Library\NUC10	00SeriesBSP_v1.05.002\NuvotonPlatform_Keil\	ample\NUC1xx-LB_002\Smpl_Start_Kit\Smpl_Start_Kit.uvproj - 猩ision4	
File Edit View Project Flash	Debug Peripherals Tools SVCS Window	Help	
	Enable/Disable Breakpoint Ctrl+F9	/# //# 🖄 Stack_Size 💽 🐋 🥙 🔞 💿 🔿 🏤 💷 🔍	
10° 10 10 10 10 10	Disable All Breakpoints	■ • ■ • ■ • <u>≫</u> • <u></u>	
Registers 🛛 🛱 🔝	Kill All Breakpoints Ctrl+Shift+F9		Symbols 📮 🖬
Register Value _	OS Support	j<60000;j++);	Mask: Case Sensitive
Core R0 0x0000000	Execution Profiling		Name Address Type
R1 0x00008db5		,#0x00	VI Simulator V
R2 0x0000ea60	Memory Map	00000EC2 ,r1,#1	Peripheral Smpl_Start
R3 0x0000002 R4 0x00000000	Inline Assembly	* ************************************	Module Module
R5 0x0000001	Function Editor (Open Ini File)	•	Here Module
R6 0x0000000	PWM •	• ×	
<mark>R7 0x00000000</mark> 	ADC		■
R9 0xffffff	CAN		Br and J.Z. J. J. Module
R10 0x00001050	CLK		
R11 0x00001050 R12 0x00000000	CMP		Br 🔜
R13 0x20000b00	EBI	/U,J++),	mini Smpl_S Module
R14 0x00000f63	FMC		
R15 0x00000ec0 ■ xPSR 0x81000000	GCR		
🖶 Banked	GPIO		
MSP 0x20000b00	12C		
PSP 0xffffffc ⊟ System	125		
PRI 0		*/	
CO 0x00	INT	bunt=0; oop=12:	
B-Internal		· · · · · · · · · · · · · · · · · · ·	
E Project Registers	PDMA_GCR		•
Command	PS2	🛛 🖬 Locals	4 🖬
Load "C:\\Nuvoton\\BSP L	RTC	NuvotonPlatform_Keil\\S: _ Name	
	SCS		
*** Restricted Version w: *** Currently used: 5792			
-	TMR01	•	
۲ (III)	TMR23	P P	
>	UART •		
ASSIGN BreakDisable Bread	k USB	et BreakAccess COVERAGE	
ļ,	WDT	Nuvoton Nu-Link M0 Debugi t1: 0.0000000	sec CAP NUM SCRL OVR R/W

Figure 3-2 Direct Register Interface Control Related Options in Keil RVMDK Debug Mode

The Direct Register Control Interface for CLK is shown in the left part of Figure 3-3, where the left column shows the register address, the middle column shows the register name, and the right column shows the register value. The Direct Register Control Interface for PWRCON is shown in the right part of the Figure 3-3, where the left column shows the function bit(s), the middle column shows the function name, and the right column shows the function value.

Detailed Operation:

Double-clicking a "register value" will open the register control details, as shown in the right part of Figure 3-3.

Moving the cursor over a "register name" or "control value" will show the tip. The "register value" or "control value" can be modified directly. The Nu-Link Adapter will then modify the content of the target chip.

CLK				×		1 /	PM	/RCON		×
ſ		CLK			$\overline{\mathcal{V}}$			0x50(000200 PWRCON	0x 0000001D
	0x50000200	PWRCON	0x 000					[0]	Internal 22.1184MH 1 = Enable 22.1184 0 = Disable 22.1184	MHz Oscillation
	0x50000204 0x50000208	AHBCLK	0x 000	08005				[1] [2]	OSC22M_EN	1b 1 V
	0x5000020C 0x50000210	CLKSTATUS	0x 000 er Number F	00038	\setminus			[3] [4]	OSC10K_EN PD_WU_DLY	1b 1 •
	0x50000214 0x50000218	CLIDIV	0x 000	FFSFF		\backslash		[5] [6]	PD_WU_INT_EN PD_WU_STS	1b 0 • 1b 0 •
	0x5000021C 0x50000220	CLKSEL2 PLLCON	0x 000 0x 000					[7] [8]	PWR_DOWN_EN PD_WAIT_CPU	1b 0 • 1b 0 •
	0x50000224	FRODIV	0x 000	00000					ok	Cancel

Figure 3-3 Direct Register Control Interface in Keil RVMDK Debug Mode



3.1.4 Semihost

When using the Semihost function, the message of the NuMicro™ Family microcontroller can be output through UART to the debug window by the Nu-Link Adapter. That is, the message is output without the GPIO. Figure 3-4 shows the debug messages in the "UART #1" form, which are the messages output by the Nu-Link Adapter.

Follow the steps below to use the Semihost (taking the Keil RVMDK and NUC100 series as example).

Step 1: Modify the strings in the "startup_NUC1xx.s" as follows.

;SEMIHOSTED	SETL	{FALSE}	; Delete this line
;↓Modify			
SEMIHOSTED	SETL	{TRUE}	; Add this line

Step 2: Modify the strings in the "system_NUC1xx.h" as follows.

//#define DEBUG ENABLE SEMIHOST // Delete this line //↓Modify #define DEBUG_ENABLE_SEMIHOST // Add this line

Step 3: Invoke Rebuild to rebuild a project and enter Debug mode.

- Step 4: In Debug mode, invoke View \rightarrow Serial Windows \rightarrow UART #1, as shown in Figure 3-4.
- Step 5: Press F5 to program the target chip, and the debug messages are output to the UART #1 form.

😢 C:\Nuvoton\BSP Library\NUC100SeriesBSP.v1.05.002\NuvotonPlatform_Keil\Sample\Driver\Smpl_DrvADC\Smpl_DrvADC.uvproj - 運ision4				X
File Edit View Project Flash Debug Peripherals Tools SVCS Window Help				
📄 📴 😺 Status Bar 🕒 作 悠 悠 悠 洋 洋 // // 🞯 Stack_Size 🗨 🔍 🖉 🔍 🖉 🔍 🖉				
왕 비 Toolbars · · · · · · · · · · · · · · · · · · ·				
Registers E Project Window	a 🖂	Symbols		a 🖂
Register 😚 Books Window (*	Mask:		Case Se
Core () Functions Window uint _ two STR UART T param;		Name	Addr	Туре
R0 0→ Templates Window				type
By Source Browser Window /* Unlock the locked registers before access */		🔹 🔁 Perip		
R3 🖻 Build Output Window 242 0000 MOVS r0, r0	ſ	🛉 🗗 Smpl		Application Module
R4 🙀 Find In Files Window				Module
Bit DivADCc Istartup_NUClxx.s Istartup_NUClxx.s Driver version: 10302		÷ 📄		Module Module
Conversion rate: 695652 samples/second		÷ 🖬 :		Module
R9 Symbol Window Main function */				Module Module
Main function */			5	Module
R12 Watch Windows , uint8 t u80ption; [1] ADC single mode test				
Rit Memory Windows STR UART T parama; [2] ADC single mode test				
Serial Windows Serial Windows Wart #1 [3] ADC continuous scan mode test				
Barked Analysis Windows UART #2 Sect registers before a [4] ADC compare function test [4] ADC c				
MSt [4] yult PSF Trace > 2 UART=3 Please choose a test item.				
System Viewer > Debug (print) Viewer at e 32MHz				
Pril * Toolbox Window DrvSYS_Open(3200000);				
Full Screen /* HCLK clock source (): external 4~710	F.			
Project Periodic Window Update	Þ	Г		
Command a 🔟 Locals				4
Load "C:\\Nuvoton\\BSF Library\\NUC100SeriesBSP_v1.05.002\\NuvotonPlatform_Keil\\S& Name			Value	
u80ption			<out of="" scop<="" td=""><td>.e></td></out>	.e>
*** Restricted Version with 32768 Byte Code Size Limit ** Ourently used: 1608 Bytes (51%)			struct DRVL	ART_S
۲				
>				
ASSIGN BreakDisable BreakEnable BreakKill BreakList BreakSet BreakAccess COVERAGE 🛛 🚱 Call Stack 💭 locals 🗐 Memory 1				
Show or hide the Serial 1 Nuvoton Nu-Link M0 Debugy t1: 0.0000000 sec		CAP	NUM SCRL	OVR R/W

Figure 3-4 Semihost Options in Keil RVMDK Debug Mode THE OFFICE

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3.2 Programming

This section will briefly describe the programming function supported by the Nu-Link Adapter. For more details, please refer to the related user manuals.

3.2.1 Online Programming

Online Programming means that the Nu-Link Adapter can download the firmware of the NuMicro[™] Family single chip to the target chip through software programs, as shown in Figure 3-5.

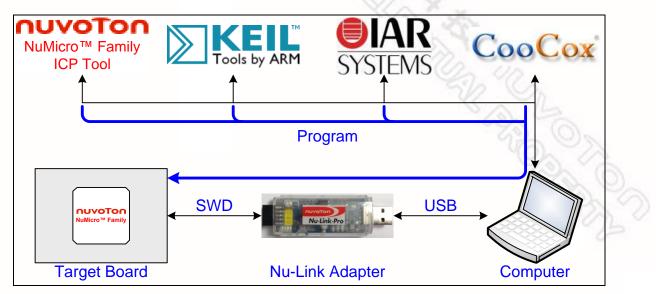


Figure 3-5 Online Programming Flow Diagram

3.2.2 Offline Programming

Offline Programming means that the Nu-Link Adapter can update the firmware of the NuMicro[™] Family single chip directly without accessing software programs (as shown in Figure 3-6). Offline programming is useful for mass production since the original code or firmware file does not need to be delivered and only the Nu-Link Adapter is needed for mass production. In addition, the Nu-Link Adapter supports "Limited Offline Programming," which can effectively control the authorized number of the firmware. For details, please refer to the ICP Tool User Manual.

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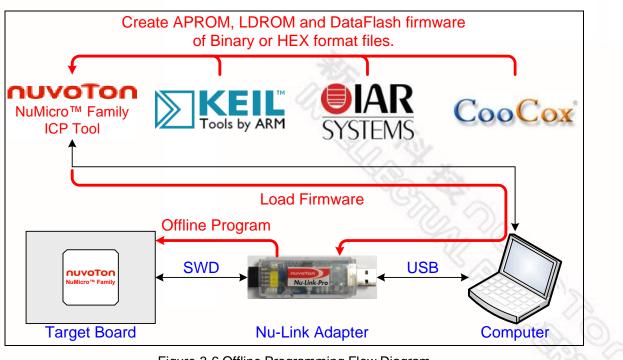


Figure 3-6 Offline Programming Flow Diagram

3.2.3 Software Serial Number (SN)

The Software Serial Number (SN) function provided by the ICP Tool enables users to specify the value in the "Increase SN from" and "Write address in flash" fields for the target chip during online/offline programming. Take the NUC140VE3CN chip for example, the user can specify a set of "Increased Serial Number (SN)" and "Write Address" to any of APROM, LDROM, and Data Flash, and the written Serial Number (SN) will be automatically incremented (as shown in Figure 3-7).

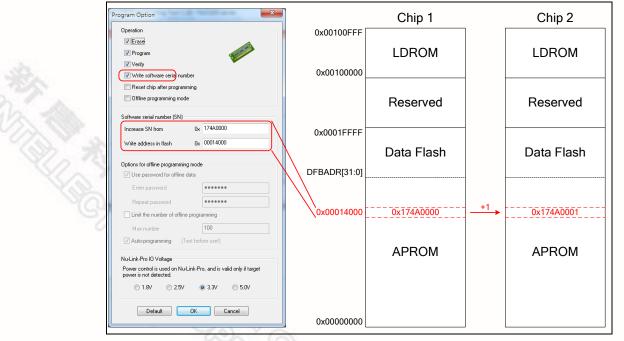


Figure 3-7 Software Serial Number (SN) Settings



3.3 Wide Voltage Programming

The Nu-Link-Pro supports the wide voltage programming function, by which the development software tool can adjust the SWD port voltage as 1.8V, 2.5V, 3.3V, or 5.0V. As shown in Figure 4-2, the pins that can be controlled include VCC, ICE_DAT, ICE_CLK, and /RESET.

Also, as shown in Figure 2-1, the Nu-Link-Pro provides a set of SWD I/O Voltage LEDs and SWD Power Output LEDs for checking the SWD port voltage. Refer to Table 2-3 for more details about the LED status,

3.4 Installing the Nu-Link Adapter Driver

The Nu-Link Adapter supports a variety of functions and third-party software tools (e.g. Keil RVMDK and IAR EWARM). After the software programs are installed, the drivers are also required. You can use the following links: <u>Nu-Link Adapter Driver for Keil RVMDK</u> and <u>Nu-Link Adapter Driver for IAR</u> <u>EWARM</u> to install the latest version. For details about software setup, please refer to section 4.2.

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4 Installation and Setup

This chapter introduces how to connect the Nu-Link Adapter to a computer, and how to set the thirdparty tool to use the Nu-Link Adapter as a debugger and a programmer.

4.1 Connecting to the Nu-Link Adapter

As shown in Figure 4-1, the Nu-Link Adapter is a bridge between an USB and the SWD interface, by which software tools can debug and program the target chip through an USB. The user can plug the Nu-Link Adapter into an USB port of a PC directly or connect using the USB connector.

Through a SWD port, the Nu-Link Adapter can supply power (1.8V, 2.5V, 3.3V, or 5.0V) to a target circuit board. The maximum is 5V/500mA. Refer to Table 2-1 for detailed specifications.

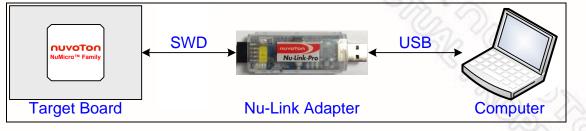


Figure 4-1 Nu-Link Adapter Connection Diagram

SWD Connector:

The SWD connector, which can be applied to all of the NuMicro[™] development tools and evaluation boards, is a 100 mil (2×5) female header, as shown in the left of Figure 4-2.

Cortex Debug Connector:

The Cortex Debug connector, which can be applied to Keil's MCBNUC1XX board, is a 50 mil (2×5) male header, as shown in the right of Figure 4-2.

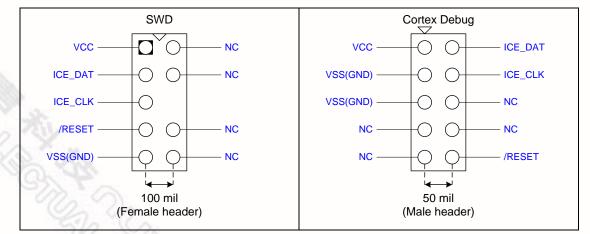


Figure 4-2 SWD and Cortex Debug Connector Pin Diagrams



4.2 Software Setup

This section briefly describes required software settings for connecting to the Nu-Link Adapter. For detailed software operation, refer to the related user manuals.

4.2.1 ICP Tool

- Step 1: Download and install <u>Nuvoton NuMicro™ ICP Programming Tool</u>.
- Step 2: Open the ICP Tool, specify the **UI language** and **target chip**, and then click **Continue**, as shown in Figure 4-3.

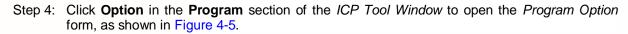
			Ta
	Select UI language:	•	200
	Select target chip:	•	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
U	Quit	Continue >>	
		Supporting Forum http://www.nuvoton-m0.com	

Figure 4-3 Startup Screen of ICP Tool

Step 3: In the ICP Tool window, the connection status is shown as "Disconnected" since the ICP tool has not been connected with the Nu-Link Adapter, as shown in Figure 4-4.

Status Conn Part N		Disconnected					
Load file	DM	File name:	C:\Users\SL File not load.	.Tsai\Deskt	op\Firmware\I	CE_ISP.bin	
APR	ОМ	File name:		Tsai\Deskt	op\Firmware\I	NUC1xx_ICE_M0).bin
Data f	lash	File name:	C:\Users\SL File not load.	.Tsai\Deskt	op\Firmware\I	NUC1xx_ICE_MC)_cks.bin
Configura Setti		Config 0:	0xFFFFFFFF	Config 1	0xFFFFF	FFF Selec	it - 🔍
File data	APROM	Data Flash	On-board F			ffline Flash ROM APROM	Data Flash Info
							● 8 bits ● 16 bits ● 32 bits

Figure 4-4 ICP Tool Main Window



Step 5: In the **Nu-Link Pro IO Voltage** section, specify the power voltage of the SWD port for the target chip, and then click **OK**. To use the offline programming function, the Offline Programming mode option needs to be selected, as shown in Figure 4-5.

rogram Option	X
Operation	J
V Erase	A
V Program	1
🔽 Verify	
🔲 Write software serial n	umber
📝 Reset chip after progra	amming
C Offline programming me	ode
Software serial number (SN)
Increase SN from	0x 0AB 40000
Write address in flash	0x 00100010
Options for offline programm Use password for offlin Enter password Repeat password Vinit the number of offlin	ine programming
Max number	100
Auto-programming	(Test before use!)
power is not detected.	Lu-Link-Pro, and is valid only if target V 3.3V 5.0V OK Cancel

Figure 4-5 ICP Tool Programming Options

- Step 4: Return to the ICP Tool window, and then click the Connect button. Go to Step 5 if more than two Nu-Link Adapters are connected with the host. Go to Step 6 if only one Nu-Link Adapter is connected with the host.
- Step 5: If two Nu-Link Adapters have been connected with the computer, a message appears and asks to select one from the two adapters. Clicking **OK** will connect the selected adapter with the host, as shown in Figure 4-6. When a Nu-Link Adapter is selected for connection, the Status LED starts blinking. For the blinking details, refer to the Status LED description of the "Select a Nu-Link Adapter to connect with the host" in Table 2-4.

Nu-Link Select one Nu-Link	
 ID: 7788b24d 	
	<u>A</u>
ОК	Cancel

Figure 4-6 Select One Nu-Link Adapter

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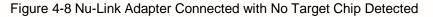
Step 6a: After the **Connect** button is clicked, the ICP Tool will be connected with the Nu-Link Adapter, and a SWD port will be detected. Figure 4-7 shows that the ICP Tool has been connected with the Nu-Link Adapter and a target chip is detected. At this time, the user can start programming the target chip.



Figure 4-7 Nu-Link Adapter Connected with a Target Chip Detected

Step 6b: Figure 4-8 shows that the ICP Tool has been connected with the Nu-Link Adapter with no target chip detected. The ICP tool will continue detecting the target chip until the **Stop Check** button is clicked. At this time, the user cannot program any chip, but can use the offline programming to save the offline programming information in the Nu-Link Adapter.

🥔 Nuvoton NuMi	cro ICP Programming Tool 1.18 - NUC100 series
<u>P</u> roject <u>C</u> hips	<u>I</u> ool <u>L</u> anguage
Πυνο	Ton
Status	
Stop check	Nu-Link-Pro connected (ID: 7788b24d)
Part No.	



Step 7: Click the **Disconnect** button if programming is not needed (as shown in Figure 4-7). Or click the **Stop Check** button to disconnect the ICP Tool with the Nu-Link Adapter and leave the Nu-Link Adapter unused (as shown in Figure 4-8). As such, the Nu-Link Adapter can be connected with another tool.



4.2.2 Keil RVMDK

- Step 1: Install <u>Keil RVMDK</u>. Before setting the Nu-Link Adapter, make sure the <u>Nu-Link Adapter</u> <u>Driver for Keil RVMDK</u> has been downloaded and installed such that the Keil RVMDK can recognize the Nu-Link Adapter.
- Step 2: Open the Keil RVMDK and open the project to be set.

Debugger Settings:

Step 3: Invoke Project \rightarrow Options for Target \rightarrow Output, and enable the Debug Information option, as shown in Figure 4-9.

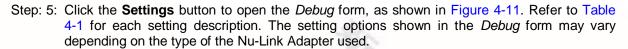
🔯 Options for Target 'Smpl_Start_Kit'	×
Device Target Output Listing User C/C++ Asm Linker Debug Utilities	
Select Folder for Objects Name of Executable: Smpl_Start_Kt	
Crgate Executable: \ob)\Smpl_Start_Kit Create HEX File	Create Batch File
C Create Library: .\obj\Smpl_Start_Kit.LIB	
OK Cancel Defaults	Help

Figure 4-9 Enable Debug Information for Keil RVMDK

Step 4: Invoke Project \rightarrow Options for Target \rightarrow Debug, and make sure the Use: ^{Γ} Nuvoton Nu-Link M0 Debugger option is checked, as shown in Figure 4-10.

C Use Simulator Settings	🔍 🖳 🖳 🔍 Setting
C Load Application at Startup Run to main() Initialization File:	Load Application at Startup Iv Run to main() Initialization File: Edit.
Restore Debug Session Settings Breakpoints I Toolbox Watch Windows & Performance Analyzer Memory Display	Restore Debug Session Settings Breakpoints Toolbox Watch Windows Memory Display
CPU DLL: Parameter: SARMCM3.DLL	Driver DLL: Parameter:
Dialog DLL: Parameter:	Dialog DLL: Parameter:

Figure 4-10 Keil RVMDK Debugger Selection



Nu-Link Pro	Nu-Link & Nu-Link-Me
Debug	Debug
Nu_Link Pro Chip Select Driver Version: 5320 Device Family: Cortex-M Device ID: 06B11477 Port: SW Max Clock: 1MHz	Nu_Link Chip Select Driver Version: 5320 Device Family: Cortex-M Device ID: 0BB11477 Port: SW Max Clock: 1MHz
Power Control IO Voltage C 1.8v C 2.5v Supporting Forum http://www.nuvoton-m0.com	Supporting Forum http://www.nuvoton-m0.com

Figure 4-11 Nu-Link Adapter Parameter Settings

Debug Function	Description
Driver Version	Display the Nu-Link Adapter driver version in the host
Chip Type	Specify the Target chip type
Reset	Select Auto detect to reset the target chip
IO Voltage	Specify the SWD port I/O voltage for the target chip; options include 1.8V, 2.5V, 3.3V, and 5V

Programmer Settings:

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Step 6: Invoke Project \rightarrow Options for Target \rightarrow Utilities, select "Nuvoton Nu-Link M0 Debugger" when the Use Target Driver for Flash Programming option is enabled, and then select the Update Target before Debugging option, as shown in Figure 4-12.



👿 Options for Ta	arget 'Smpl_Start_Kit'	×
Device Target	Output Listing User C/C++ Asm Linker Debug Utilities	
Configure Flash	h Menu Command	[]
• Use Targe	t Driver for Flash Programming	
	Nuvoton Nu-Link M0 Debugger 💌 Settings	
Init File:	Edit	
C Use Extern	nal Tool for Rash Programming	
Command:	<u>.</u>	.
Arguments:		
	Run Independent	
	OK Cancel Defaults H	lelp

Figure 4-12 Keil RVMDK Programmer Selection

Step 7: Click the **Settings** button to open the *Flash Download* form, as shown in Figure 4-13 where the user can specify the options before or after programming with the Nu-Link Adapter.

Flash Download for NUC1xx			×
	20000000 1000	ownload Function — C Erase Full Chip C Erase Sectors C Do Not Erase	 ✓ Program Flash ✓ Verify Flash ✓ Reset and Run
Programming Algorithm Description Device Type NUC1xx 128kB R ONCHIP Rash III	Device Size 128K	ss Range 1000H - 0001Fi ▶	Rash Breakpoint I ✓ Enable Rash BP Config0/1 Configure
С		Cancel	

Figure 4-13 Nu-Link Adapter Programming Settings



4.2.3 IAR EWARM

- Step 1: Install <u>IAR EWARM</u>. Make sure that <u>Nu-Link Adapter Driver for IAR EWARM</u> has been downloaded and installed before setting the Nu-Link Adapter such that the IAR EWARM can recognize the Nu-Link Adapter.
- Step 2: Open IAR EWARM, and open the project to be set.
- Step 3: In the **Target** tab of the **General Options** page (through invoking **Project** \rightarrow **Options**), click the button in the right of the **Device** option (make sure the **Device** option is enabled), and select "**Nuvoton** \rightarrow **Nuvoton NUC100** series" as the target chip (NUC100 series is this case), as shown in Figure 4-14.

Options for node "Smp	ol_Start_Kit"
Category: General Options C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator Angel GDB Server IAR ROM-monitor J-Link/J-Trace TI Stellaris FTDI Macraigor PE micro RDI ST-LINK Third-Party Driver TI XDS 100	Target Output Library Configuration Library Options MISRA-C Processor variant • • • Core Corlex: M0 • • Device Nuvoton NUC100 series (NUC100,) • Endian mode EPU • Little Processor • Big • • BE22 • • BE2 •
	OK Cancel

Figure 4-14 IAR EWARM Target Chip Selection

Debugger and Programmer Settings:

Step 4: In the **Setup** tab of the **Debugger** page, select **Third-Party Driver** as the driver, as shown in Figure 4-15.

Category: General Options C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Inker Inker Debugger IAR ROM-monitor J-Link/J-Trace TI Stellaris FTDI Macraigor PE micro RDI ST-LINK Third-Party Driver TI XOS 100	Setup Download Images Extra Options Plugins Driver Images Extra Options Plugins Third-Party Driver Images Images Images Setup macros Images Images Images Use macros Images Images Images Images Devige description file Images Images Images Qvernide default \$TOOLKIT_DIR\$CONFIGVdebugger(Nuvoton\ionuc100_v1.d) Images
---	---

Figure 4-15 Set IAR EWARM as Third-Party Driver for Debugger & Programmer



Options for node "Smp	l_Start_Kit*
Category: General Options C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator Angel GDB Server IAR ROM-monitor J-Link/J-Trace TI Stellaris FTDI Macraigor PE micro RDI ST-LINK Third-Party Driver TI XDS 100	Factory Settings Setup Download Images Extra Options Plugins Attach to program Verify download Suppress download VIse flash loader(s) Qveride default load file \$TOOLKIT_DIR%configUlashloader/Nuvoton/NUC1 Edit
	OK Cancel

Figure 4-16 IAR EWARM Programming Settings

Step: 6: In the Download tab of the Debugger page, select the Override default .board file option if you want the firmware to be downloaded to APROM or LDROM, and then specify the NUC100_APROM.board or NUC100_LDROM.board file (NUC100 series is used in this case). If no file is founded, specify the following path "\$TOOLKIT_DIR\$\config\flashloader\ Nuvoton\", as shown in Figure 4-17.

Dpen		×
COC - K config + flashloader +	Nuvoton • • Search Nuvoton	٩
Organize 🔻 New folder	8== 🗸	
devices	Name	Date mo 🔺
ilashloader	M052_APROM.board	2011/7/4
Actel	M054_APROM.board	2011/7/4
AnalogDevices	M058_APROM.board	2011/7/4
Atmel	M0516_APROM.board	2011/7/4
EnergyMicro	Mini51_APROM.board	2011/7/4
Freescale	Mini51_LDROM.board	2011/7/4
📕 Fujitsu	Nano100_APROM.board	2011/7/4 =
	Nano100_LDROM.board	2011/7/4
Nuvoton	NUC100_APROM.board	2011/7/4
NXP	NUC100_LDROM.board	2011/7/4 👻
		4
File name: NUC100_A	PROM.board Board Files (*.board)	•
	<u>Open</u>	Cancel

Figure 4-17 Select.board File for IAR EWARM

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Driver Plugin File Settings:

Step 7: In the **Third-Party Driver** page, specify the path of the IAR debugger driver plugin "C:\Program Files\Nuvoton Tools\Nu-Link_IAR\Nu-Link_IAR.dll", as shown in Figure 4-18.

Options for node "Smp	ol_Start_Kit"	x
Category: General Options C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger	J_Start_Kit* Factory Settings Third-Party Driver IAR debugger driver plugin C.Vrogreen FilesWavoton ToolsWu-Link_JARWu-Link_IAR.dll	x
	Log communication	
ST-1 INK Third-Party Driver TI XDS100	\$PROJ_DIR\$%cspycomm.log	

Figure 4-18 Set the Path of the IAR EWARM Debugger Driver Plugin

- Step 8: Click **OK** to save the settings and return to the IAR EWARM main window.
- Step 9: Invoke **Nu-Link** to open the *Nu-Link* form, select **SWD** as the Port, and specify the **Nu-Link**-**Pro I/O Voltage** in the **Target power control** section (3.3V in this case), as shown in Figure 4-19.

Nu-Link			
ICE version		Driver version	Build: 5320rc
Port	SWD 🔻	Max clock	4MHz ▼
Target device			
CPU family	Cortex-M0	Device ID	
Device type	NUC100		
🔽 Enable flash	n breakpoints		
Target power co	ontrol		
Power control i detected.	is used on Nu-Link-Pro), and is valid only if t	arget power is not
Nu-Link-Pro I	O Voltage		
1.8V	2.5V	3.3V	S.0V

Figure 4-19 Specify the Port and Target I/O Voltage



4.2.4 CooCox CoIDE

Step 1: Install <u>CooCox CoIDE</u>, which does not require any driver installation.

Step 2: Open CooCox CoIDE and open the project to be set. Please also refer to the <u>CoIDE Quick</u> <u>Start</u>.

Debugger Settings:

Step 3: In the **Debugger** tab of the *Debug Configurations* form (through invoking **Debug** → **Debug Configurations)**, select "**Nu-Link**" as the Adapter, select "**SWD**" as the Port, and click **Apply** to save the settings, as shown in Figure 4-20.

Create, manage, and run confi	gurations	Ť.
type filter text C Cortex-M Application Start_Kit.configuration Launch Group	** Debugger © DownLoad Hardware Adapter Nu-Link Adapter Nu-Link Port Startup Ø Run to main Advance Reset Mode SYSRESETREQ Reset Mode SYSRESETREQ Semihosting Enable Targetinfo Host Name: localhost Port Number: 2009	
Filter matched 3 of 3 items	< m	x Reyert
		Close

Figure 4-20 Specify the Debugger Options for CooCox CoIDE

Programmer Settings:

Step 4: In the **Download** tab of the *Debug Configurations* form (through invoking **Debug** \rightarrow **Debug Configurations)**, select the **Auto Download Before Debugging** or **Verify After Download** option to proceed with a specific programming, and set the Programming Algorithm path as "C:\CooCox\CoIDE\flash\WUC1xx_128.elf", as shown in Figure 4-21.



create, manage, and run confi	gurations	1	ñ
		200	
pe filter text C Cortex-M Application	Spebugger DownLoad		
Start_Kit.configuration Launch Group	☑ Auto Download Before Debugging		
	Verify Verify After Download		
	Erase © Erase Full Chip © Erase Effected © Do not Erase		
	Programming Algorithm		Ξ
	file Path C:\CooCox\CoIDE\flash\NUC1xx_128.elf		
	Add Remove default		
ter matched 3 of 3 items		Apply Revert	
		Close	

Step: 5: To ensure the firmware will be downloaded to APROM or LDROM, select NUC1xx_128.elf or NUC1xx_LDROM.elf file (NUC100 series is used in this case) as shown in Figure 4-22; "32, 64, or 128" in the file name means the capacity of APROM. If no specific file is founded, specify the following path "C:\CooCox\CoIDE\flash\".

Open Solution Solu	CoIDE + flash + + +	Search flash	x P
Organize 🔻 New folder		:≡ ▼ 🔟 🤇	?
Windows7 (C:) SRecycle.Bin boot Cadence CocoCox CoIDE bin CoIDEHelpFileDir configuration data flash source	Name M051_8.elf M051_16.elf M051_22.elf M051_64.elf M051_0.elf Min51_4.elf Min51_8.elf M1051_16.elf NUCLxx_22.elf NUCLxx_128.elf NUCLxx_LDROM.elf	Date modified 2010/12/16 17:25 2010/12/16 17:25 2010/12/16 18:03 2010/12/16 18:03 2010/12/16 18:03 2011/12/16 17:29 2011/11/14 09:21 2011/11/14 09:22 2011/11/14 09:22 2011/11/14 09:22 2011/10/20 16:00 2011/10/20 16:50	
jre + File <u>n</u> ame: NUC1∞,128.el	< f (*	Celf Open Cancel	•

Figure 4-22 Set the Programming Algorithm File for CooCox CoIDE

Step 6: At last, click **Apply** to save the settings, as shown in Figure 4-21.

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5 Appendix

5.1 Nu-Link Adapter Operating Current

When power is supplied via an USB during online programming, the operating current of Nu-Link Adapter is shown in the table below.

Type Parameter		Nu-Lir	nk-Pro		Nu-Link	Nu-Li	nk-Me
SWD I/O Mode Settings	5.0V	3.3V	2.5V	1.8V	-	5.0V	3.3V
USB Input Voltage (V)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
USB Input Current (mA)	101	92	88	84	110	74	60
SWD I/O Voltage (V)	5.06	3.34	2.54	1.83	4.77	4.79	3.37

T E		
Table 5-1 Nu-Link Ada	pter Operating Curren	t (Online Programming)

When power is supplied from a target board (SWD VCC pin) during offline programming, the operating current of Nu-Link Adapter is shown in the table below.

Type Parameter	Nu-Link-Pro			Nu-Link			
Power Supplied from a Target Board	5.0V	3.3V	2.5V	1.8V	5.0V	3.3V	2.5V
Power Supplied via an USB	Off	Off	Off	Off	Off	Off	Off
SWD VCC Input Voltage (V)	5.00	3.30	2.50	1.80	5.00	3.30	2.50
SWD VCC Input Current (mA)	64	86	117	171	100	77	62

Table 5-2 Nu-Link Adapter Operating Current (Offline Programming)



6 Revision History

Revision	Description		Date
V1.00	Preliminary version	92	2012/07/16
		A.	

