AN0044
Application Note

Segger J-Scope on AT32 MCU

Introduction

This application note introduces how to use J-Scope on AT32 MCUs.

In actual applications, it is relatively complex to use serial host or MDK logic analyzer to display data in the form of waveform. Instead, Segger J-Scope is more easy-to-use, with hardware to be connected to J-Link only.

Note: The corresponding code in this application note is developed on the basis of V2.x.x BSP provided by Artery. For other versions of BSP, please pay attention to the differences in usage.

Applicable products:

Part number	AT32Fxx family

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1 Segger J-Scope

1.1 Introduction

J-Scope is a free-of-charge software to analyze and visualize data on a microcontroller in real-time, while the target is running.
Sampling can be done using either SEGGER High-Speed-Sampling (HSS) or SEGGER RTT technology.

1) In HSS mode: Use J-Scope to directly load executable files of MDK or IAR, which is easy but has a low sampling rate.
2) In RTT mode: Add Segger RTT component to the user program, which is more complex but more practical with a higher sampling rate.

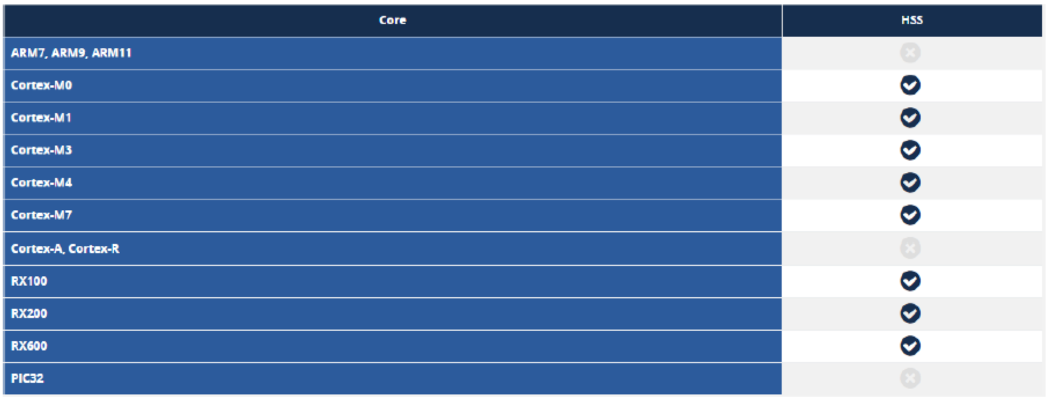
1.2 Software/hardware version

Hardware-JLINK: JLINK BASE V9 and above are required; JLINK PRO/JLINK ULTRA V4 and above are required.
Software-MDK: MDK4 or MDK5. This application note uses MDK5.

1.3 Applicable devices

1) J-Scope supports the below devices in HSS mode.

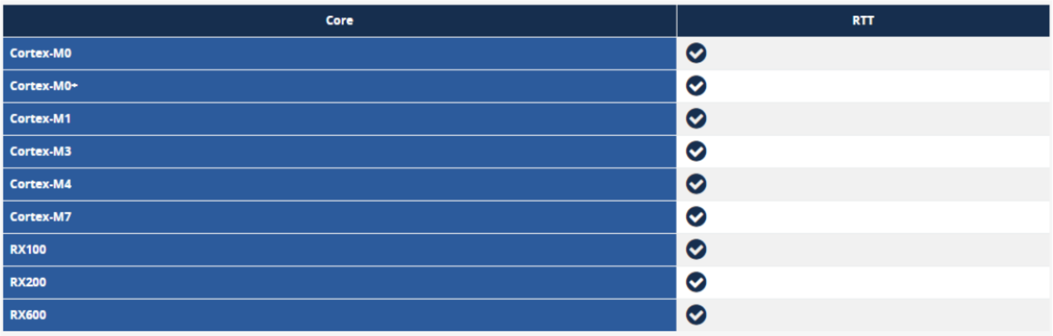
Figure 1. Applicable devices in HSS mode



Core	HSS
ARM7, ARM9, ARM11	✗
Cortex-M0	✓
Cortex-M1	✓
Cortex-M3	✓
Cortex-M4	✓
Cortex-M7	✓
Cortex-A, Cortex-R	✗
RX100	✓
RX200	✓
RX600	✓
PIC32	✗

2) J-Scope supports the below devices in RTT mode.

Figure 2. Applicable devices in RTT mode



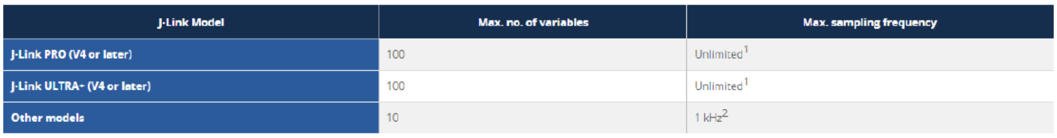
Core	RTT
Cortex-M0	✓
Cortex-M0+	✓
Cortex-M1	✓
Cortex-M3	✓
Cortex-M4	✓
Cortex-M7	✓
RX100	✓
RX200	✓
RX600	✓

1.4 J-Link sampling rate

Data in Figure 3 below is applicable to HSS mode, while RTT mode does not have such limitations. Basically, the sampling rate in RTT mode can be high enough as long as it supported by J-Link.

For JLINK BASE, the data for “other models” is applicable, which means that HSS mode supports 10 variables, with the maximum sampling rate of 1 KHz.

Figure 3. J-Link sampling rate



J-Link Model	Max. no. of variables	Max. sampling frequency
J-Link PRO (V4 or later)	100	Unlimited[1]
J-Link ULTRA+ (V4 or later)	100	Unlimited[1]
Other models	10	1 kHz[2]

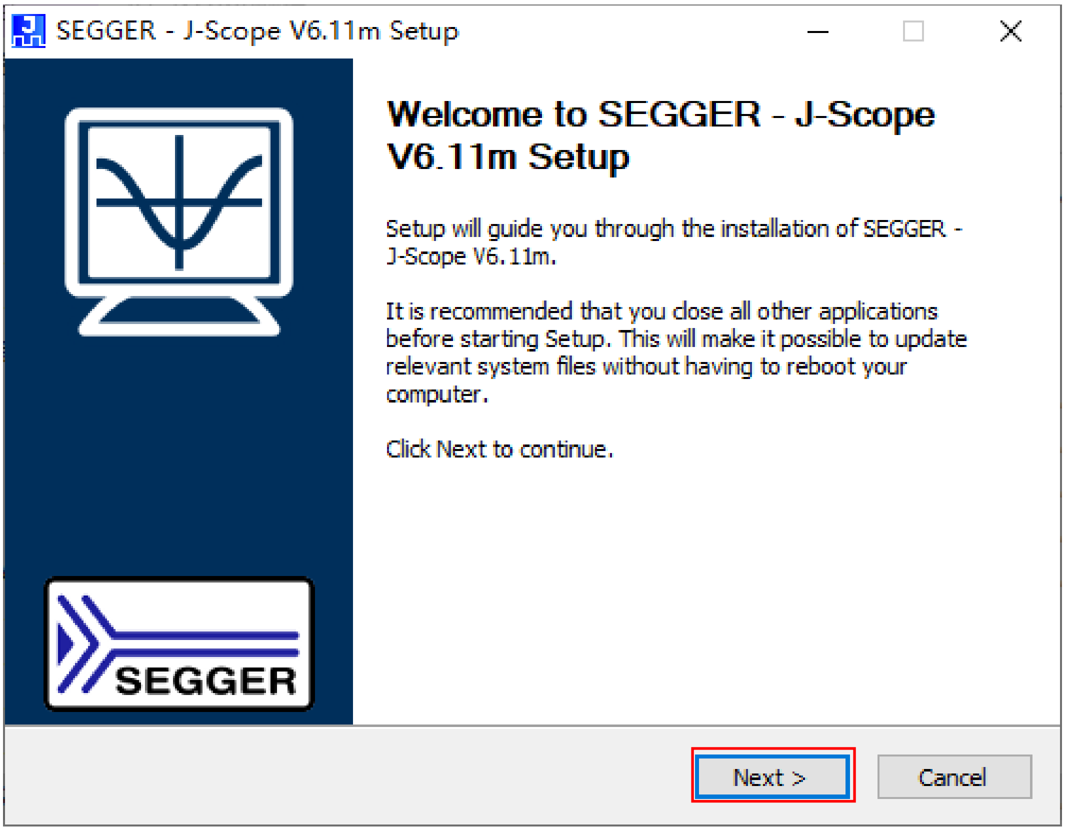
2 J-Scope preparation

This section uses MDK5 and AT32F403A for demonstration.

2.1 J-Scope setup

1) Unzip xx\AN0044_Segger_Jscope_on_AT32_MCU \JScopeTool\Setup_JScope_V6xxm.zip;
2) Double click Setup_JScope_V6xxm.exe to start setup;
3) Click "NEXT";

Figure 4. J-Scope setup – Click "Next"



SEGGER - J-Scope V6.11m Setup

Welcome to SEGGER - J-Scope V6.11m Setup

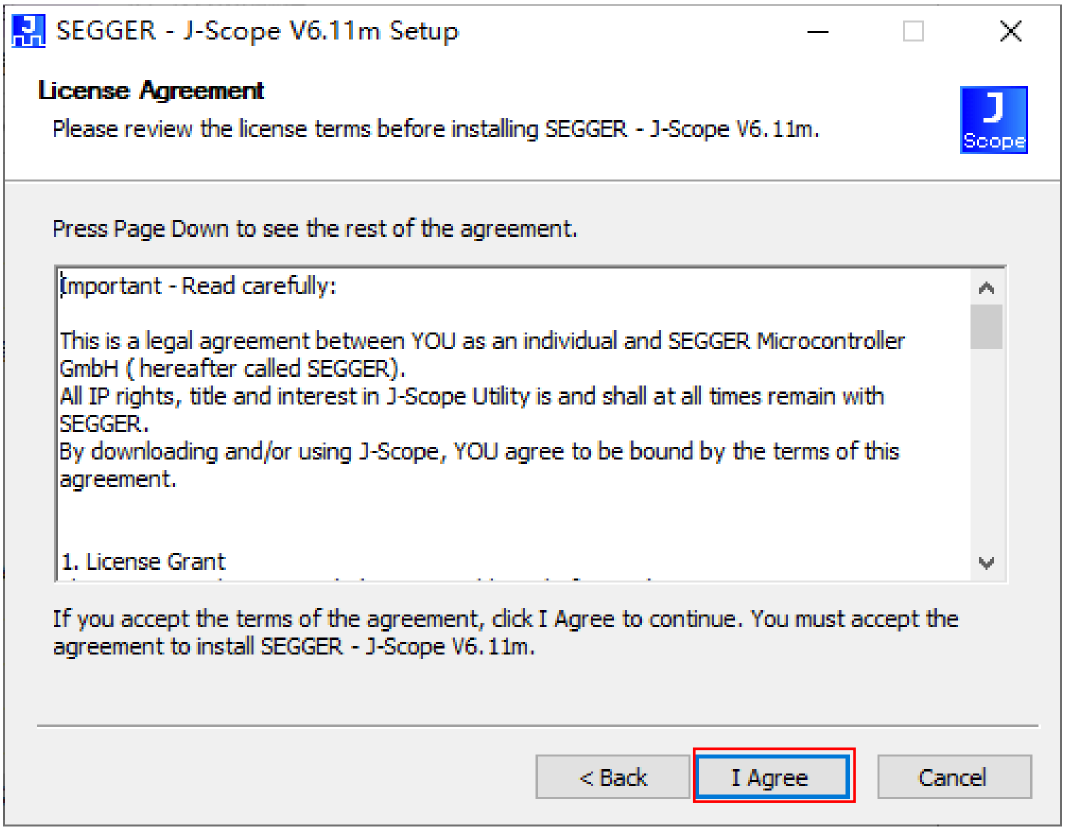
Setup will guide you through the installation of SEGGER - J-Scope V6.11m.

It is recommended that you close all other applications before starting Setup. This will make it possible to update relevant system files without having to reboot your computer.

Click Next to continue.

4) Click “I Agree”;

Figure 5. J-Scope setup – Click “I Agree”


SEGGER - J-Scope V6.11m Setup
License Agreement
Please review the license terms before installing SEGGER - J-Scope V6.11m.
J
Scope
Press Page Down to see the rest of the agreement.
< Back
I Agree
Cancel

Important - Read carefully:

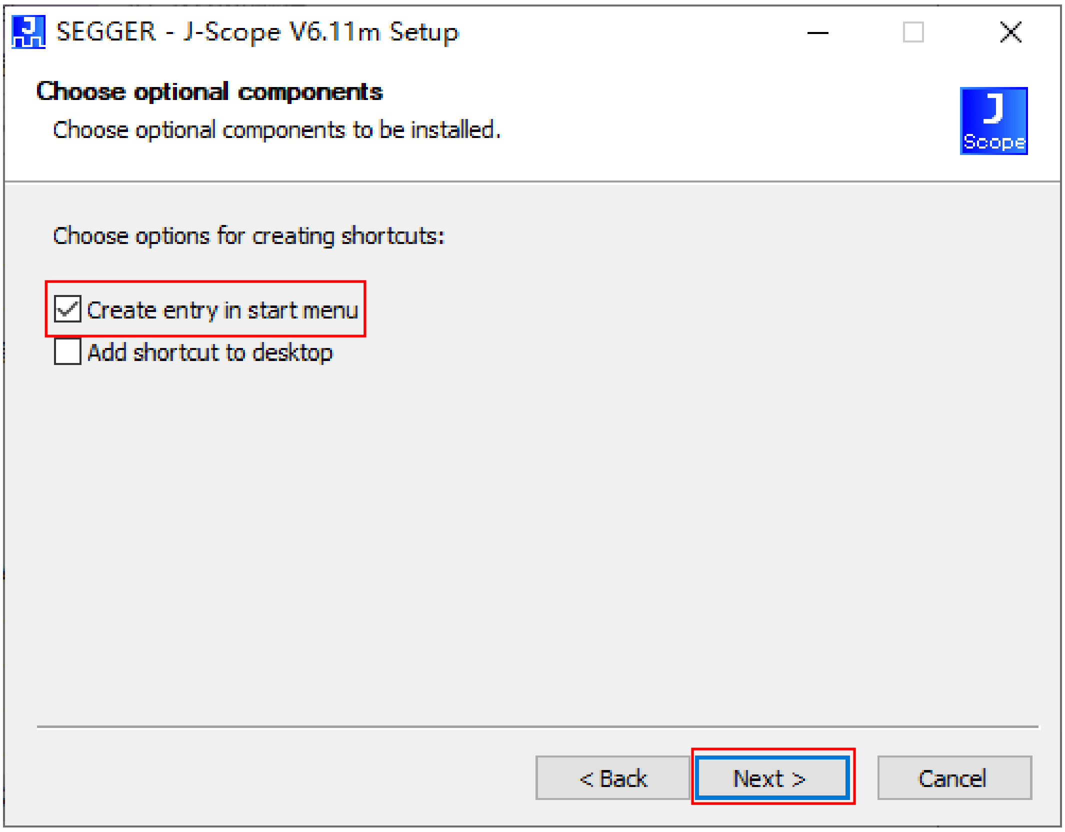
This is a legal agreement between YOU as an individual and SEGGER Microcontroller GmbH (hereafter called SEGGER).
All IP rights, title and interest in J-Scope Utility is and shall at all times remain with SEGGER.
By downloading and/or using J-Scope, YOU agree to be bound by the terms of this agreement.

1. License Grant

If you accept the terms of the agreement, click I Agree to continue. You must accept the agreement to install SEGGER - J-Scope V6.11m.

5) Tick “Create entry in start menu” and then click “NEXT”;

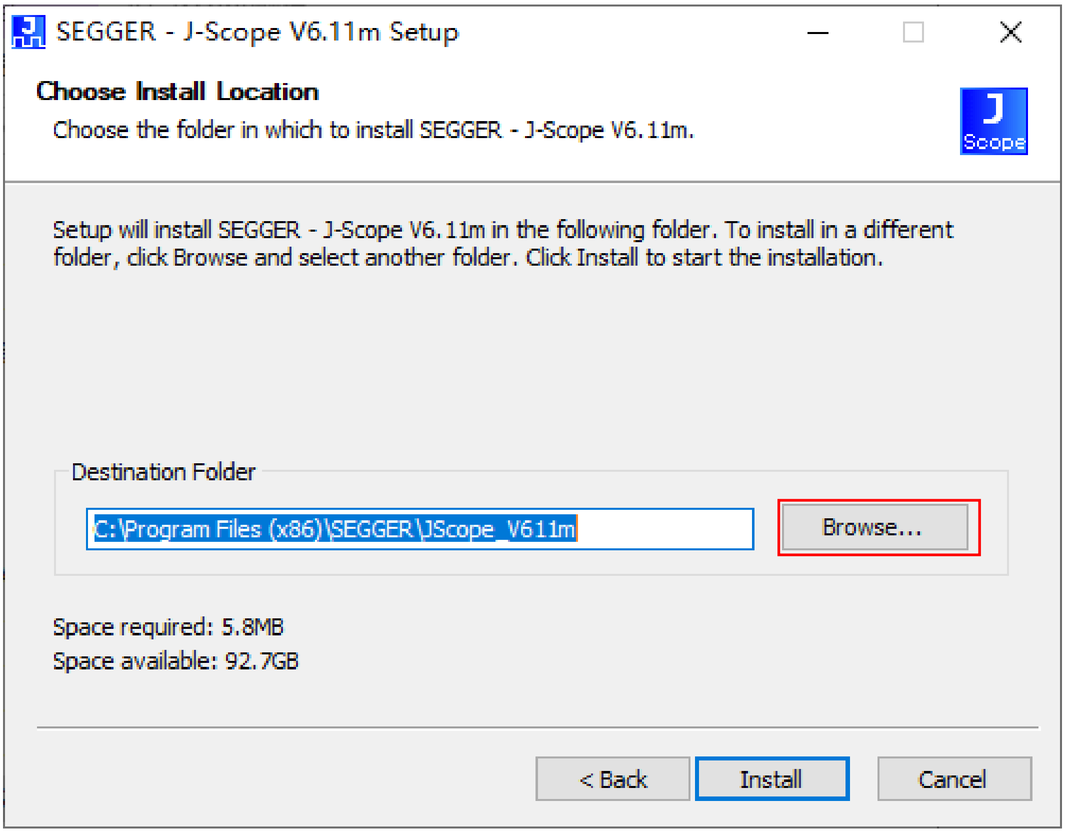
Figure 6. J-Scope setup – Create shortcuts


SEGGER - J-Scope V6.11m Setup
Choose optional components
Choose optional components to be installed.
J
Scope
Choose options for creating shortcuts:
< Back
Next >
Cancel

☑ Create entry in start menu
☐ Add shortcut to desktop

6) Click “Browse” and select the destination folder;

Figure 7. J-Scope setup – Browse and Destination Folder



SEGGER - J-Scope V6.11m Setup

Choose Install Location

Choose the folder in which to install SEGGER - J-Scope V6.11m.

Setup will install SEGGER - J-Scope V6.11m in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

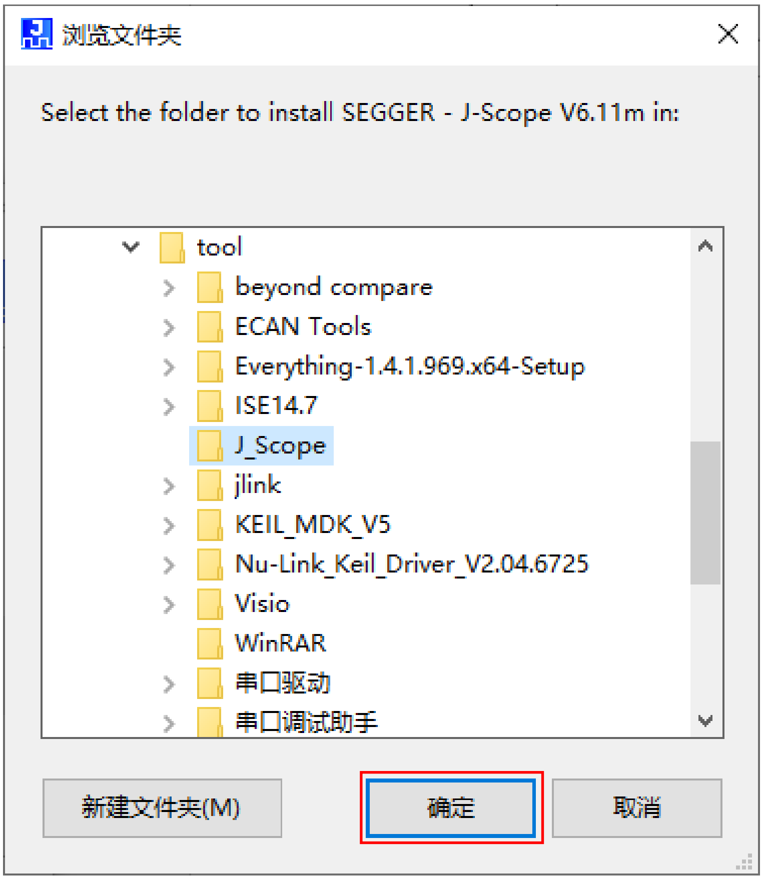
Destination Folder: C:\Program Files (x86)\SEGGER\JScope_V611m

Space required: 5.8MB

Space available: 92.7GB

7) Select the installation path and click “OK”. Users can choose the desired installation path. In this example, it is “D:\tool\J_Scope”.

Figure 8. J-Scope setup – Select installation path

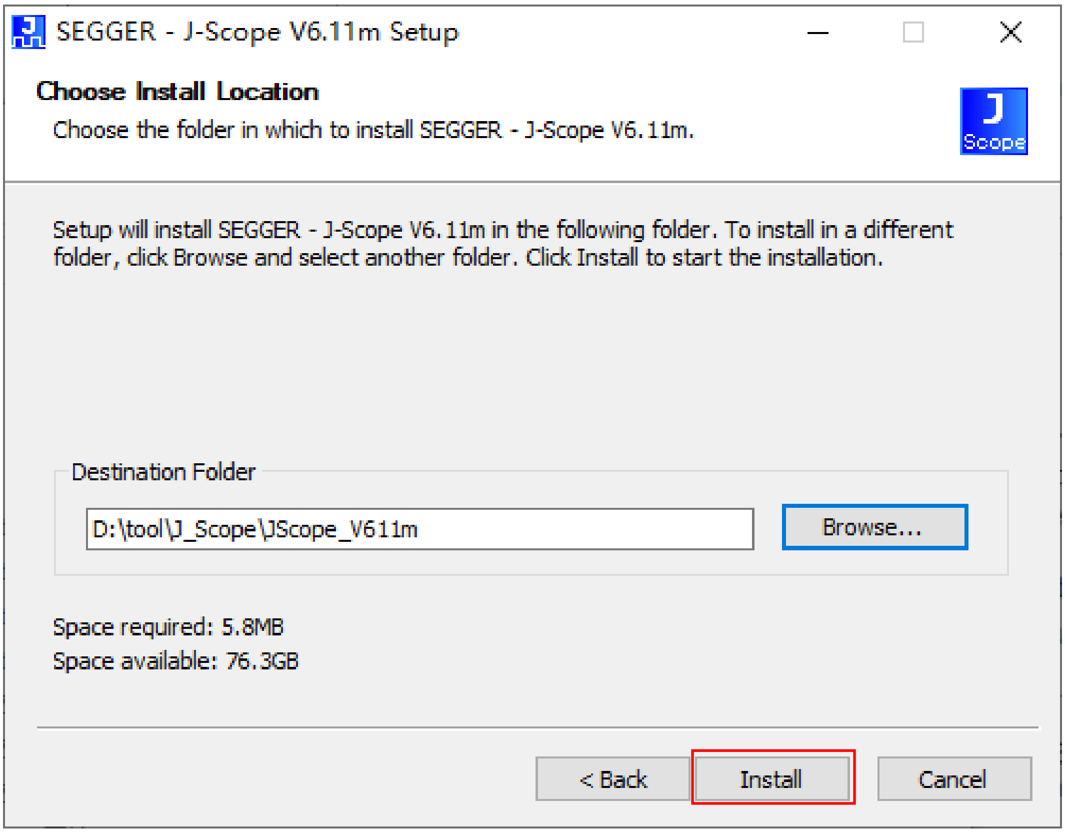


浏览文件夹

Select the folder to install SEGGER - J-Scope V6.11m in:

8) Click “Install”;

Figure 9. J-Scope setup – Install


SEGGER - J-Scope V6.11m Setup

Choose Install Location

Choose the folder in which to install SEGGER - J-Scope V6.11m.

Setup will install SEGGER - J-Scope V6.11m in the following folder. To install in a different folder, click Browse and select another folder. Click Install to start the installation.

Destination Folder

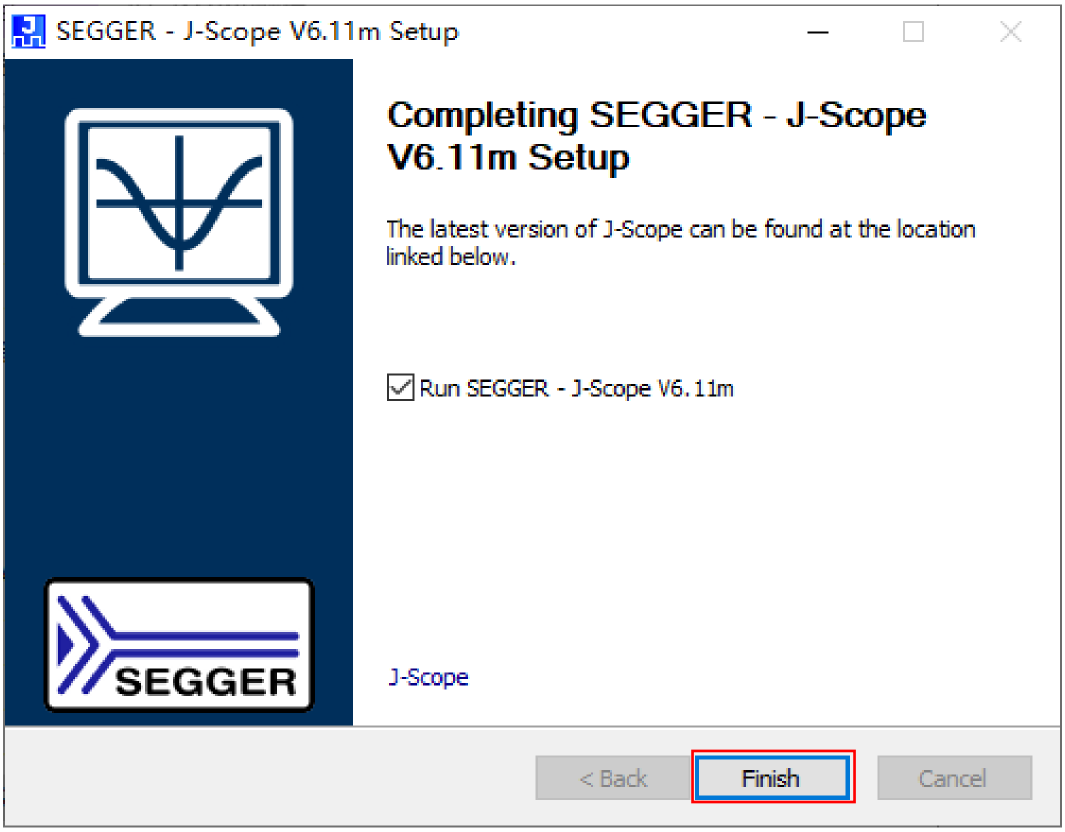
D:\tool\J_Scope\JScope_V611m

Space required: 5.8MB

Space available: 76.3GB

9) Click “Finish” to complete setup.

Figure 10. J-Scope setup – Finish


SEGGER - J-Scope V6.11m Setup

Completing SEGGER - J-Scope V6.11m Setup

The latest version of J-Scope can be found at the location linked below.

☑ Run SEGGER - J-Scope V6.11m

J-Scope

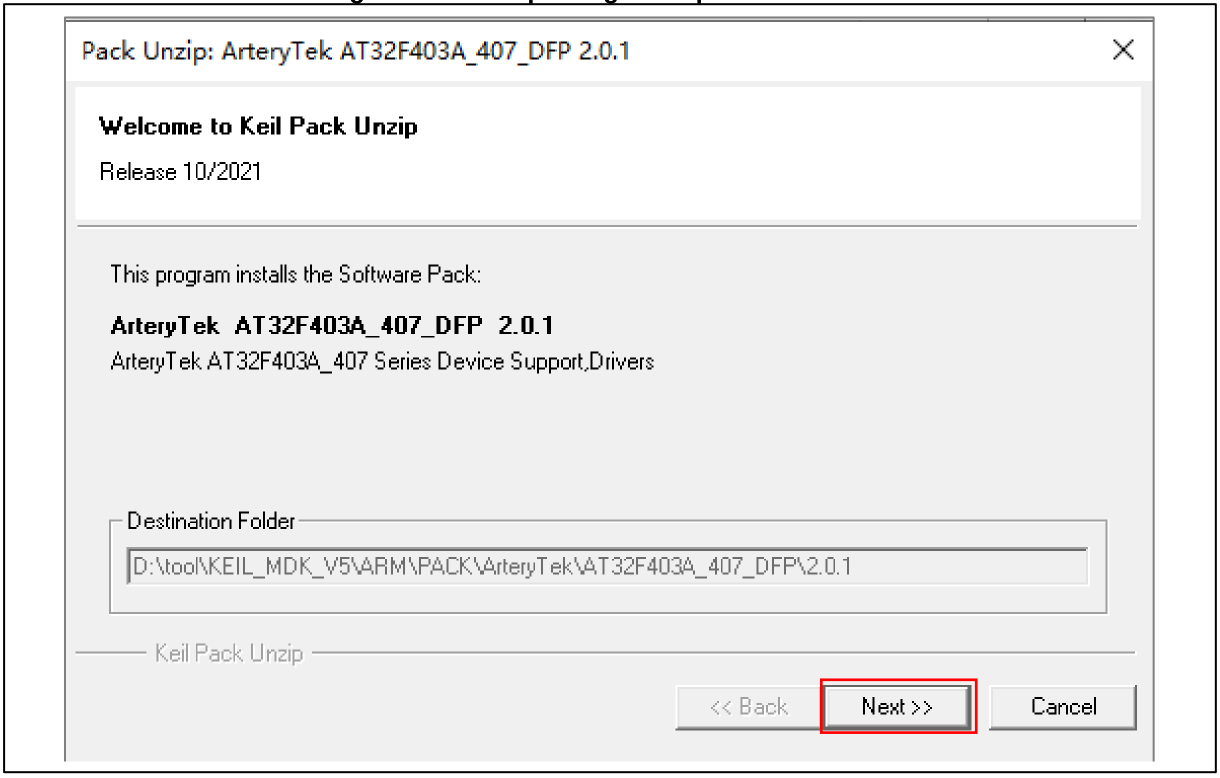
2.2 Install AT32 related package

1) Unzip xx\AN0044_Segger_Jscope_on_AT32_MCU_2.x.x\JScopeTool\PACKs_V2.x.x.zip;
2) Unzip Keil5_AT32MCU_AddOn.zip;
3) Install ArteryTek.AT32F403A_407_DFP.2.x.x.pack and Segger_AT32MCU_AddOn.exe.

2.2.1 ArteryTek.AT32F403A_407_DFP.2.x.x.pack

1) Double click *ArteryTek.AT32F403A_407_DFP.2.x.x.pack*;
2) Click "NEXT";

Figure 11. AT32 package setup – Click "NEXT"



Pack Unzip: ArteryTek AT32F403A_407_DFP 2.0.1

Welcome to Keil Pack Unzip

Release 10/2021

This program installs the Software Pack:

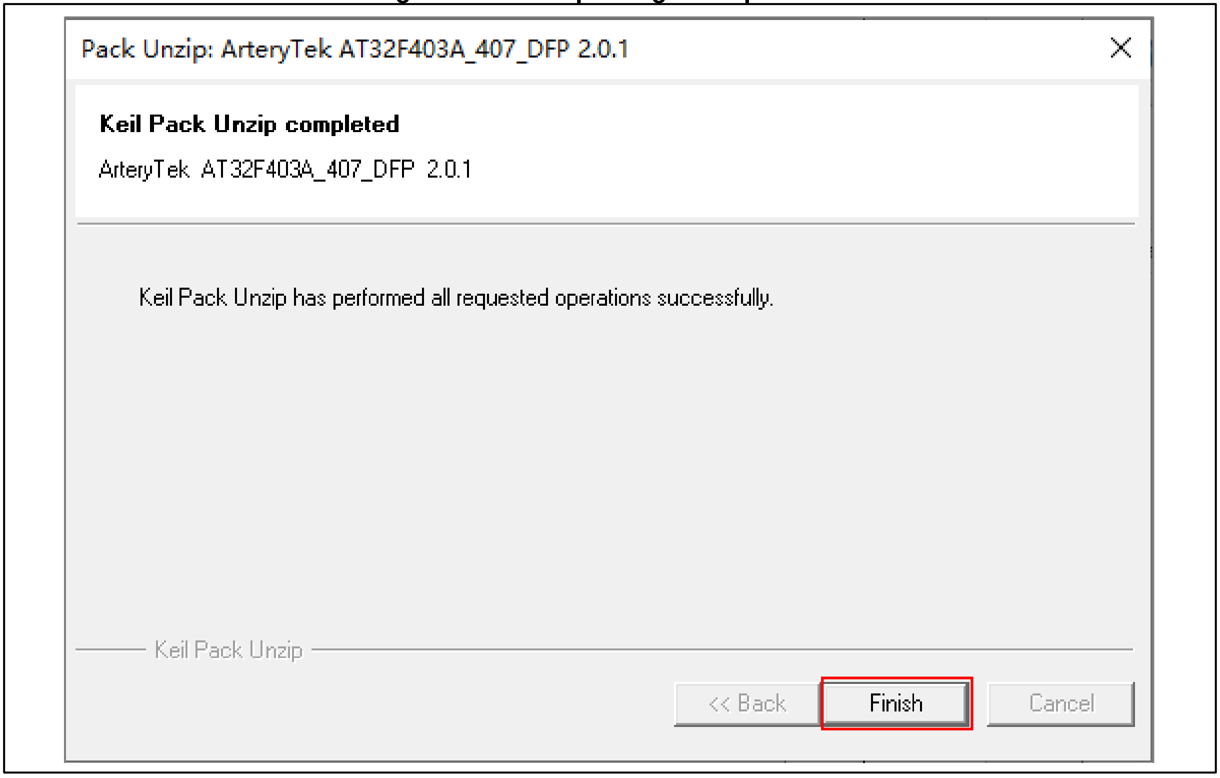
ArteryTek AT32F403A_407_DFP 2.0.1

ArteryTek AT32F403A_407 Series Device Support,Drivers

Destination Folder: D:\tool\KEIL_MDK_V5\ARM\PACK\ArteryTek\AT32F403A_407_DFP\2.0.1

3) Click "Finish" to complete installation

Figure 12. AT32 package setup – Finish



Pack Unzip: ArteryTek AT32F403A_407_DFP 2.0.1

Keil Pack Unzip completed

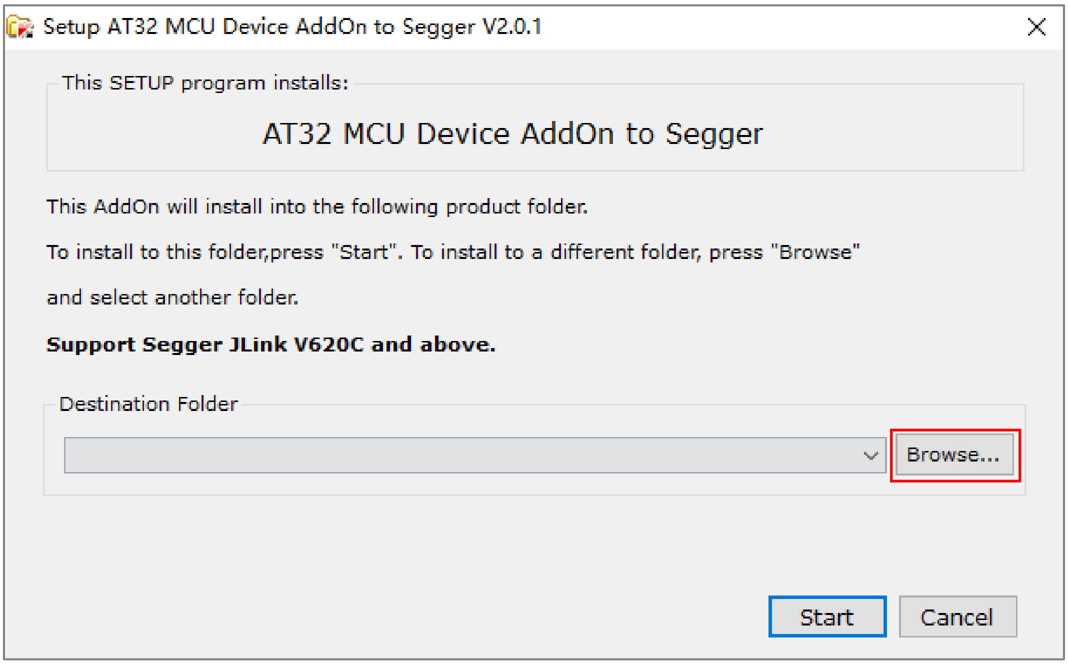
ArteryTek AT32F403A_407_DFP 2.0.1

Keil Pack Unzip has performed all requested operations successfully.

2.2.2 Segger_AT32MCU_AddOn.exe

1) Double click *Segger_AT32MCU_AddOn.exe*;
2) Click “Browse” and select the destination folder;

Figure 13. AT32 package setup – Click “Browse”



Setup AT32 MCU Device AddOn to Segger V2.0.1

This SETUP program installs:

AT32 MCU Device AddOn to Segger

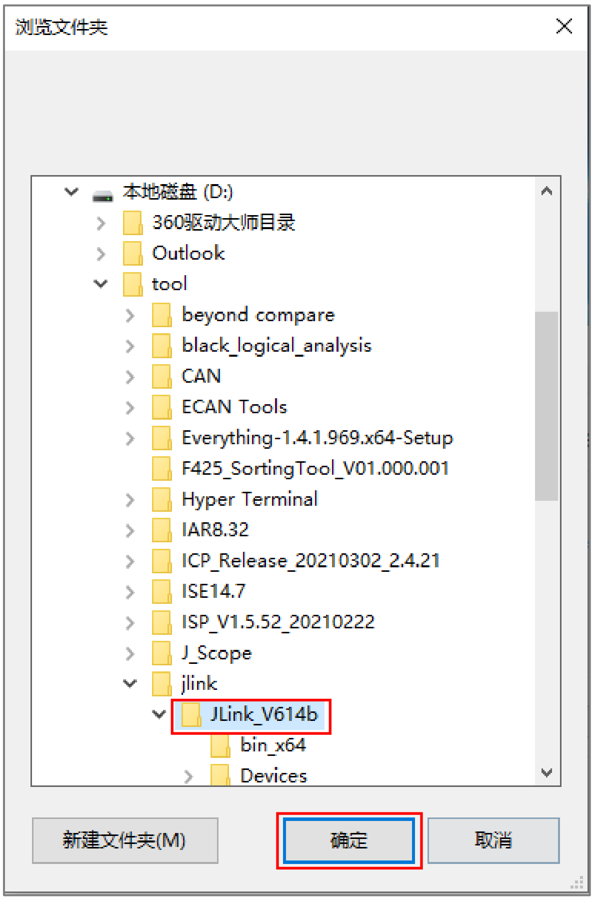
This AddOn will install into the following product folder.

To install to this folder,press "Start". To install to a different folder, press "Browse" and select another folder.

Support Segger JLink V620C and above.

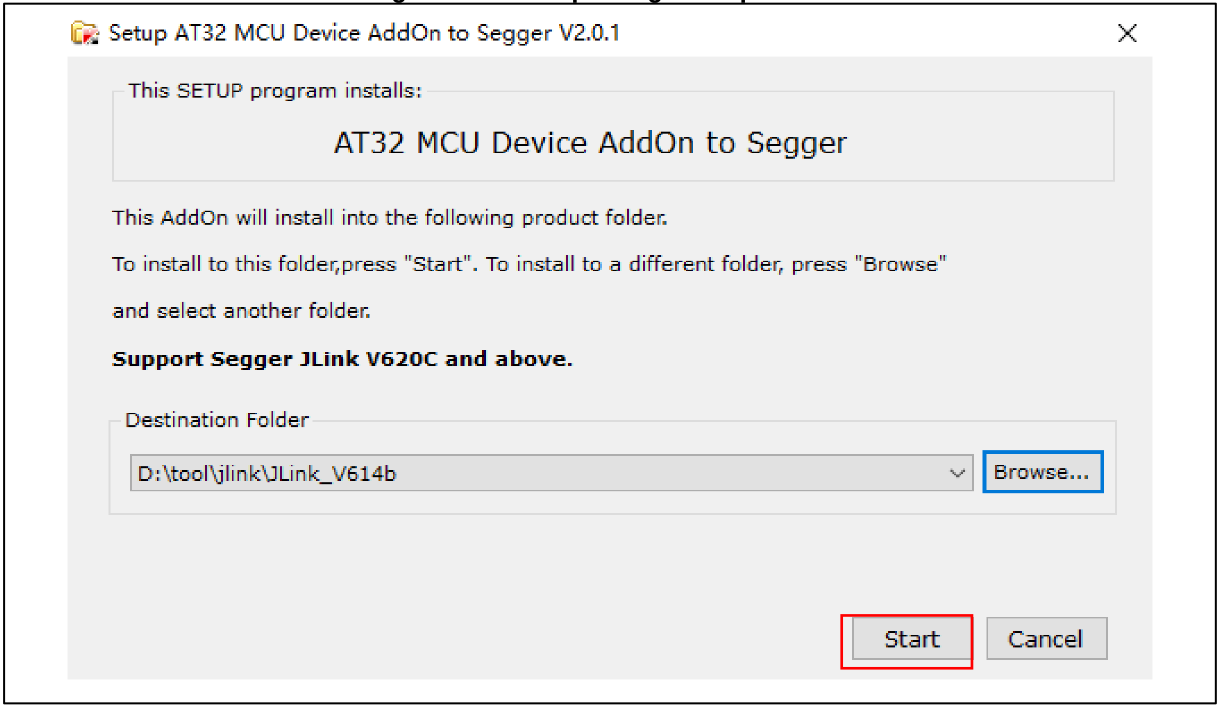
3) Select the installation path. Select the J-Link installation path; otherwise, the *JLinkDevices.xml* cannot be found.

Figure 14. AT32 package setup – Destination Folder



4) Click “Start” to start setup;

Figure 15. AT32 package setup – Click "Start"



Setup AT32 MCU Device AddOn to Segger V2.0.1

This SETUP program installs:

AT32 MCU Device AddOn to Segger

This AddOn will install into the following product folder.

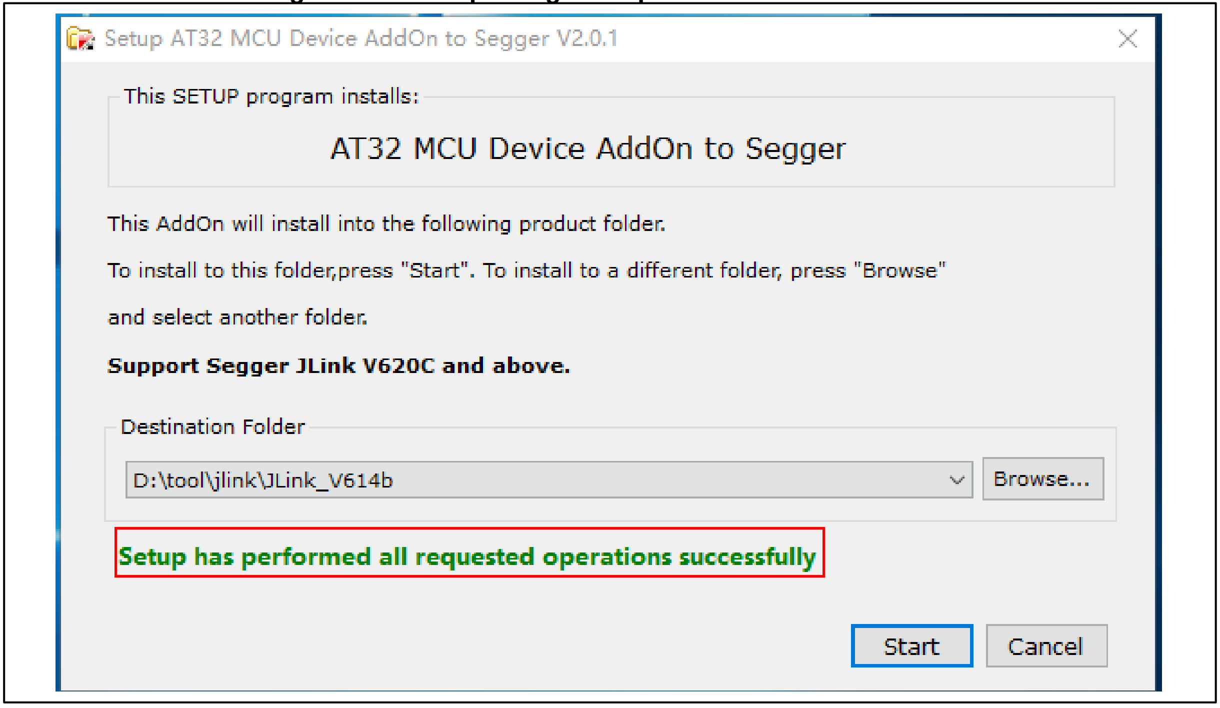
To install to this folder,press "Start". To install to a different folder, press "Browse" and select another folder.

Support Segger JLink V620C and above.

Destination Folder: D:\tool\jlink\JLink_V614b

5) If AT32 package is installed successfully, a message in green font will display.

Figure 16. AT32 package setup – Successful installation



Setup AT32 MCU Device AddOn to Segger V2.0.1

This SETUP program installs:

AT32 MCU Device AddOn to Segger

This AddOn will install into the following product folder.

To install to this folder,press "Start". To install to a different folder, press "Browse" and select another folder.

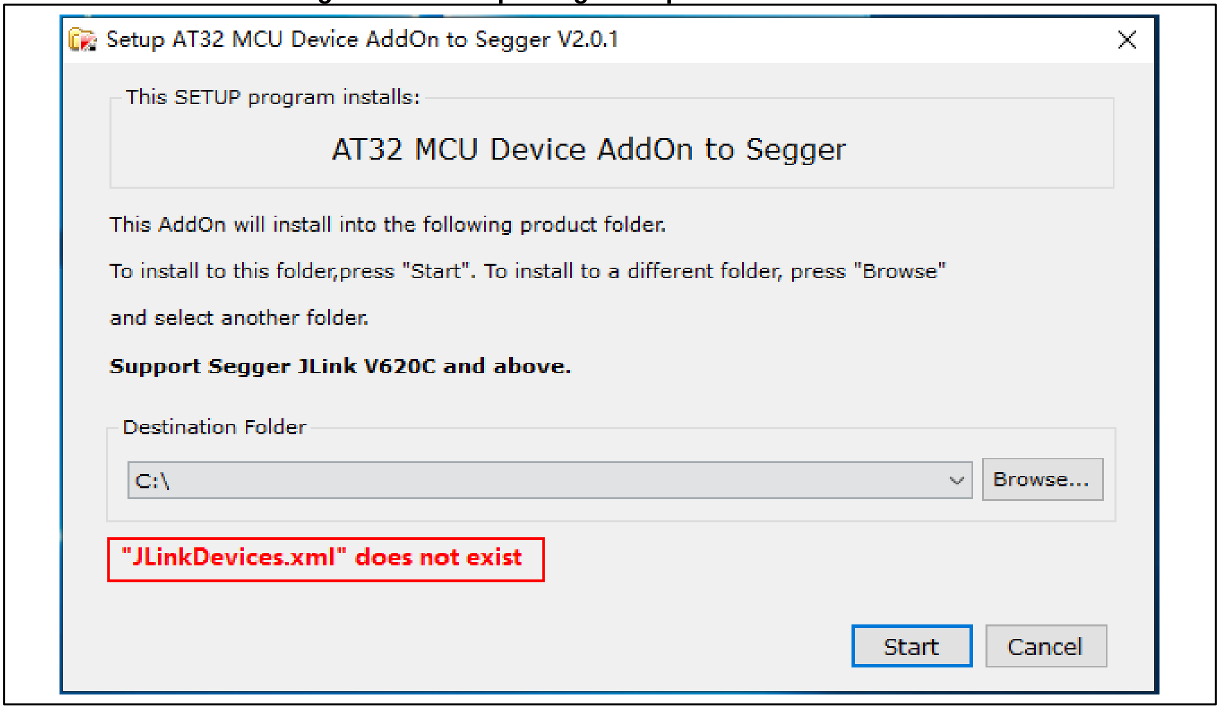
Support Segger JLink V620C and above.

Destination Folder: D:\tool\jlink\JLink_V614b

Setup has performed all requested operations successfully

6) In case of setup failure, a message in red font will display and indicate the cause (in this example, the *JLinkDevices.xml* is not found due to a wrong installation path). Users need to re-install, and select the correct installation path (i.e., J-Link installation path).

Figure 17. AT32 package setup – Installation failure



Setup AT32 MCU Device AddOn to Segger V2.0.1

This SETUP program installs:

AT32 MCU Device AddOn to Segger

This AddOn will install into the following product folder.

To install to this folder,press "Start". To install to a different folder, press "Browse"

and select another folder.

Support Segger JLink V620C and above.

Destination Folder

C:\

"JLinkDevices.xml" does not exist

3 High-Speed Sampling (HSS)

3.1 HSS mode

Load the "xxx.axf" file generated by MDK or "xxx.out" file generated by IAR to the J-Scope software.

Hardware connection: Use the standard download interface (VCC, GND, SWDIO, SWCLK and NRST) or 3-wire JLINK-OB (GND, SWDIO, SWCLK) for connection.

Advantages: It can be connected to the target board while the target is running, without additional resources, and users do not need to write the target board code.

Disadvantages: Compared with RTT mode, it has a lower sampling rate (basically fixed to 1 KHz), which is only applicable to variables with a change speed lower than 1 KHz.

3.2 Application method

This example uses MDK5 and AT32F403A for demonstration.

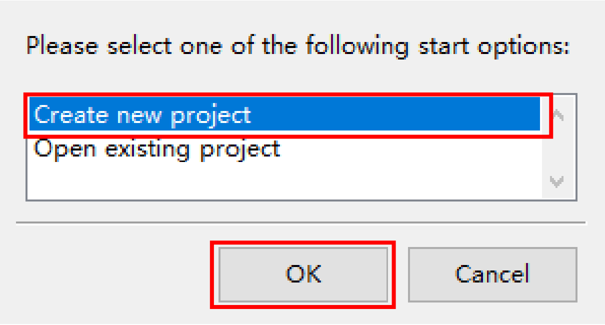
3.2.1 Generate executable file

Open MDK project; compile and download program, and then generate an executable HSS.axf file.

3.2.2 Create new project

Open J-Scope, and create a new project.

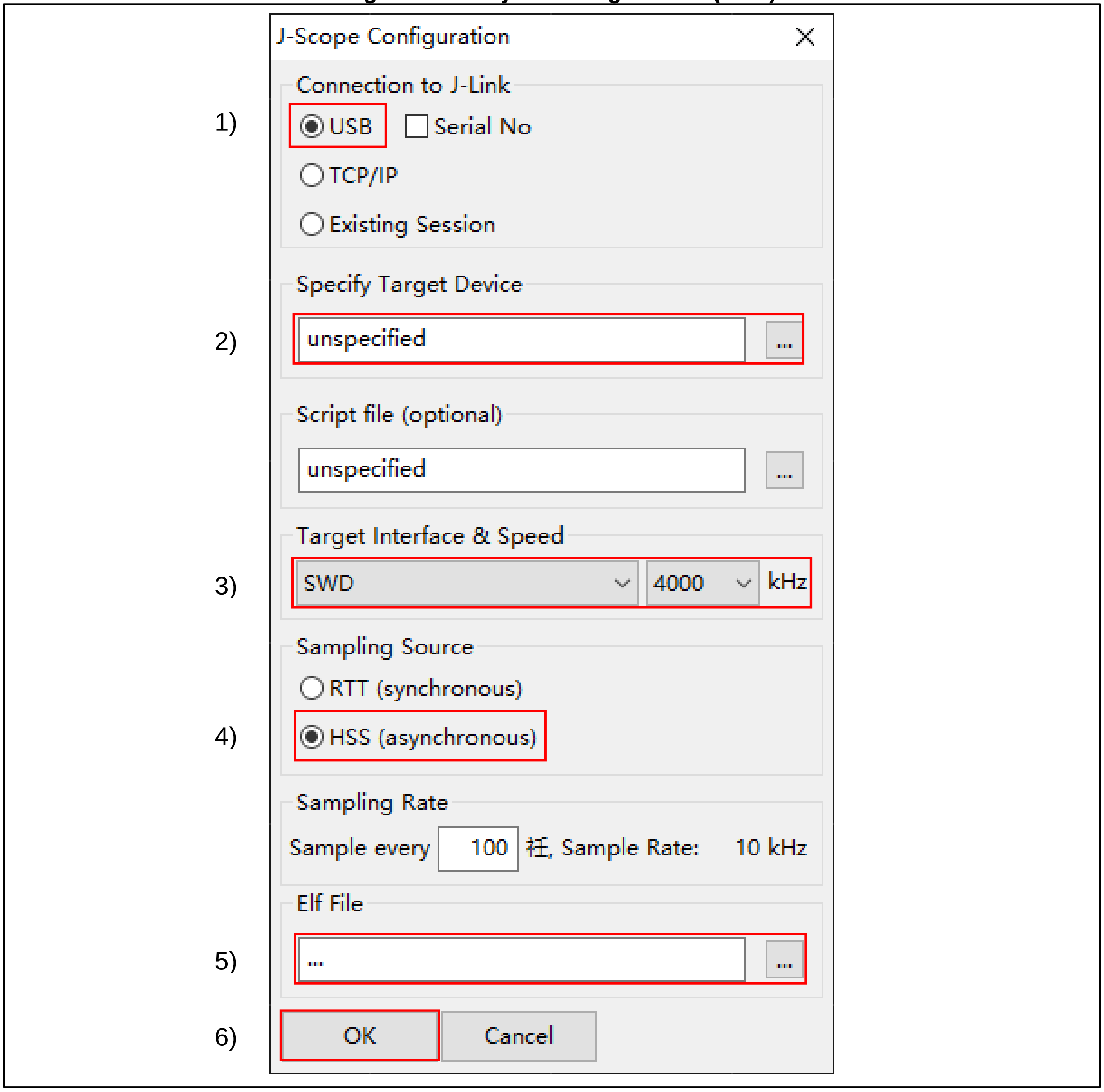
Figure 18. Create new project (HSS)



Please select one of the following start options:

3.2.3 Configure project

Figure 19. Project configuration (HSS)



J-Scope Configuration

Connection to J-Link

● USB ☐ Serial No

○ TCP/IP

○ Existing Session

Specify Target Device: unspecified

Script file (optional): unspecified

Target Interface & Speed: SWD 4000 kHz

Sampling Source

○ RTT (synchronous)

● HSS (asynchronous)

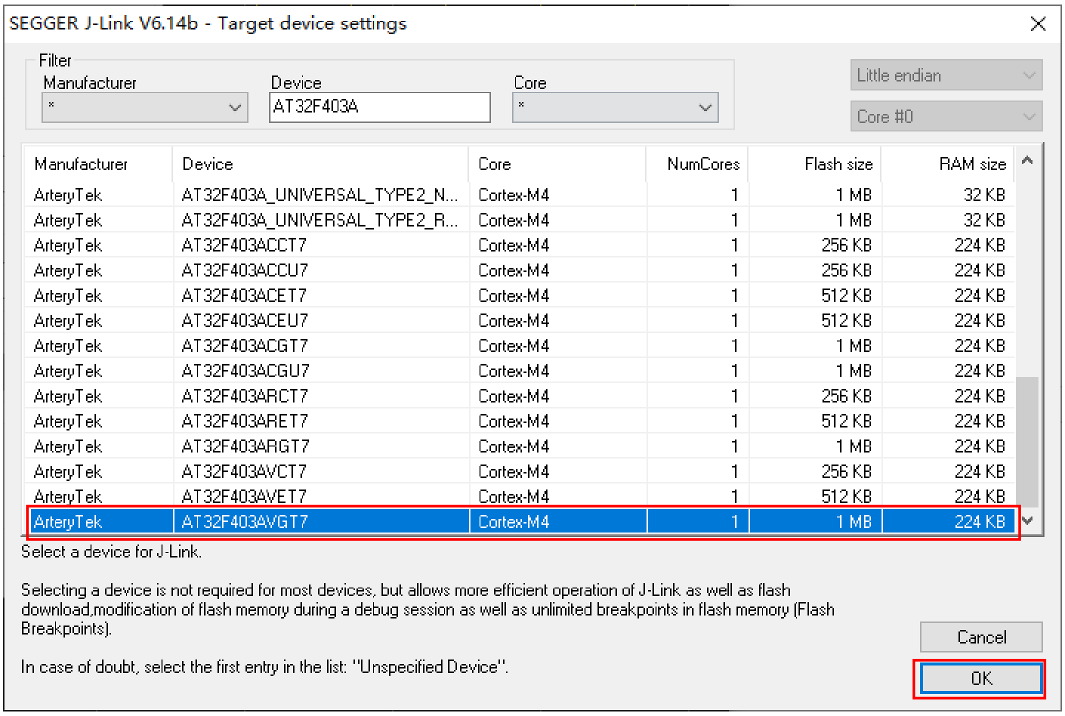
Sampling Rate

Sample every 100 祍, Sample Rate: 10 kHz

Elf File: ...

1) J-Link interface: Select J-Link USB interface;
2) Target device: Select AT32F403AVGT7;

Figure 20. Target device selection (HSS)



SEGGER J-Link V6.14b - Target device settings

Filter

Manufacturer: *

Device: AT32F403A

Core: *

Manufacturer	Device	Core	NumCores	Flash size	RAM size
ArteryTek	AT32F403A_UNIVERSAL_TYPE2_N...	Cortex-M4	1	1 MB	32 KB
ArteryTek	AT32F403A_UNIVERSAL_TYPE2_R...	Cortex-M4	1	1 MB	32 KB
ArteryTek	AT32F403ACCT7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403ACCU7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403ACET7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403ACEU7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403ACGT7	Cortex-M4	1	1 MB	224 KB
ArteryTek	AT32F403ACGU7	Cortex-M4	1	1 MB	224 KB
ArteryTek	AT32F403ARCT7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403ARET7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403ARGT7	Cortex-M4	1	1 MB	224 KB
ArteryTek	AT32F403AVCT7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403AVET7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403AVGT7	Cortex-M4	1	1 MB	224 KB

Select a device for J-Link.

Selecting a device is not required for most devices, but allows more efficient operation of J-Link as well as flash download,modification of flash memory during a debug session as well as unlimited breakpoints in flash memory (Flash Breakpoints).

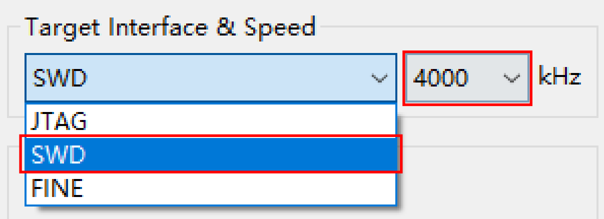
In case of doubt, select the first entry in the list: "Unspecified Device".

3) Target interface and speed:

Target interface: Select SWD or JTAG according to the application configuration. This example selects SWD.

J-Link speed: This example selects 4000 KHz.

Figure 21. Target interface and speed (HSS)



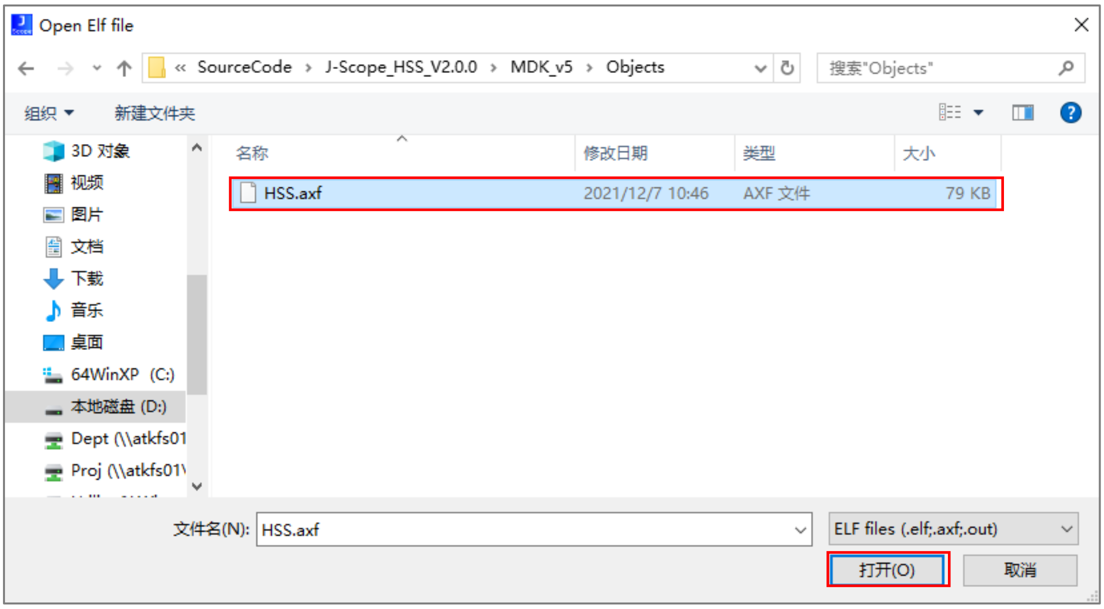
Target Interface & Speed

SWD | 4000 kHz

4) Mode selection: Select HSS.

5) Executable file: Select the HSS.axf file in the path of MDK program.

Figure 22. Select executable file (HSS)



Open Elf file

« SourceCode › J-Scope_HSS_V2.0.0 › MDK_v5 › Objects

名称	修改日期	类型	大小
HSS.axf	2021/12/7 10:46	AXF 文件	79 KB

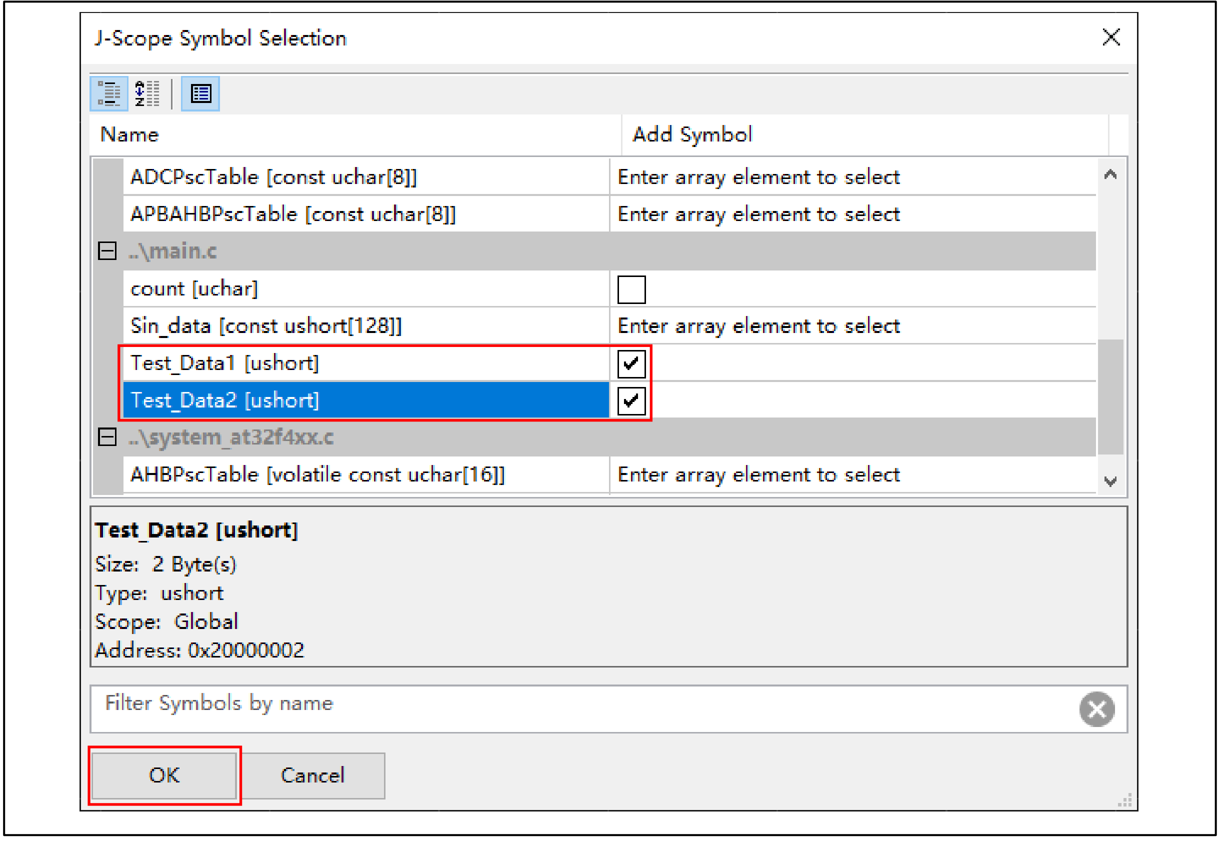
文件名(N): HSS.axf

ELF files (.elf;.axf;.out)

6) Configuration is finished, and click “OK”.

3.2.4 Select variables

1) Select and tick the desired variables;
2) Click “OK”;



J-Scope Symbol Selection

Name	Add Symbol
ADCPscTable [const uchar[8]]	Enter array element to select
APBAHBPscTable [const uchar[8]]	Enter array element to select
⊟ ..\main.c	
count [uchar]	☐
Sin_data [const ushort[128]]	Enter array element to select
Test_Data1 [ushort]	☑
Test_Data2 [ushort]	☑
⊟ ..\system_at32f4xx.c	
AHBPscTable [volatile const uchar[16]]	Enter array element to select

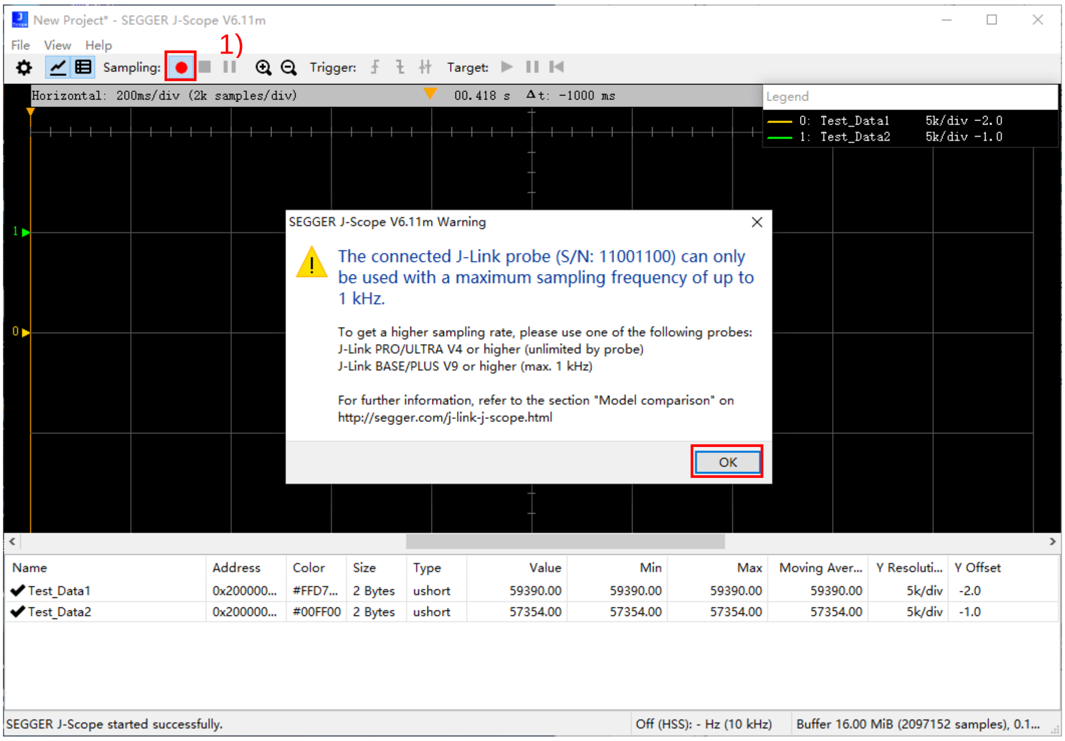
Test_Data2 [ushort]
Size: 2 Byte(s)
Type: ushort
Scope: Global
Address: 0x20000002

Figure 23. Variable selection (HSS)

3.2.5 Start to run

1) Click the red dot, and data will be displayed;
2) A warning message pops up; click “OK”.

Figure 24. Start to run (HSS)


New Project* - SEGGER J-Scope V6.11m
File View Help
Sampling:
1)
Trigger:
Target:
Horizontal: 200ms/div (2k samples/div)
00.418 s
Δt: -1000 ms
Legend
0: Test_Data1 5k/div -2.0
1: Test_Data2 5k/div -1.0
1
0
OK

SEGGER J-Scope V6.11m Warning

The connected J-Link probe (S/N: 11001100) can only be used with a maximum sampling frequency of up to 1 kHz.

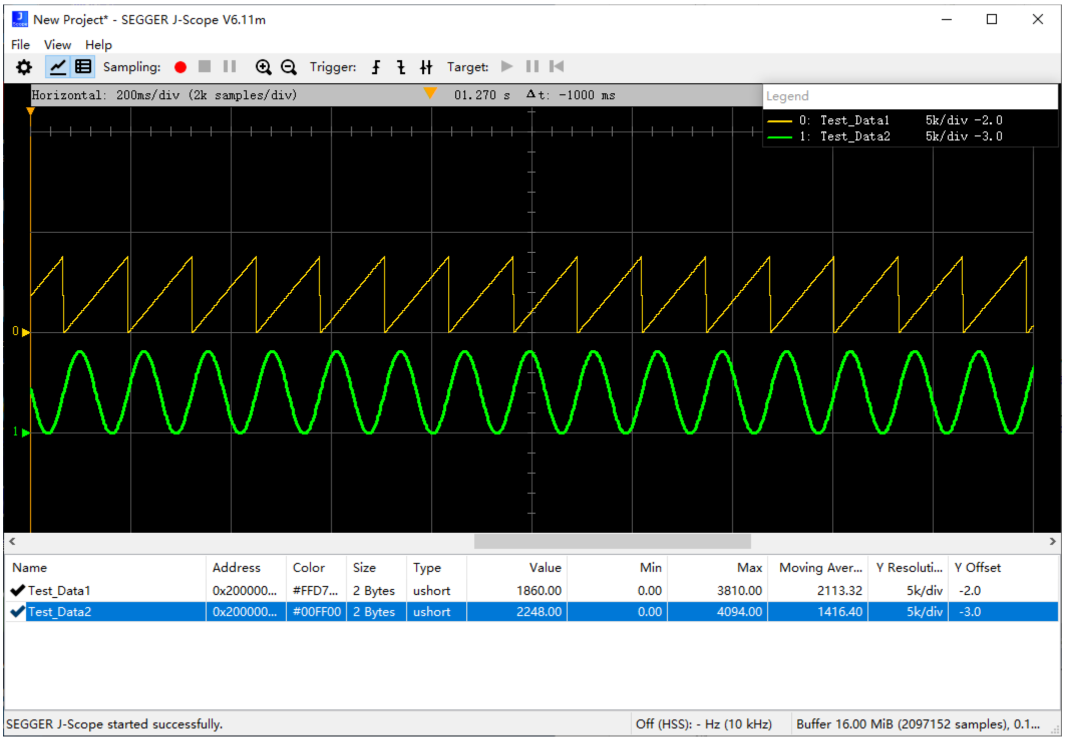
To get a higher sampling rate, please use one of the following probes:
J-Link PRO/ULTRA V4 or higher (unlimited by probe)
J-Link BASE/PLUS V9 or higher (max. 1 kHz)

For further information, refer to the section "Model comparison" on http://segger.com/j-link-j-scope.html

Name	Address	Color	Size	Type	Value	Min	Max	Moving Aver...	Y Resoluti...	Y Offset
✓ Test_Data1	0x200000...	#FFD7...	2 Bytes	ushort	59390.00	59390.00	59390.00	59390.00	5k/div	-2.0
✓ Test_Data2	0x200000...	#00FF00	2 Bytes	ushort	57354.00	57354.00	57354.00	57354.00	5k/div	-1.0

SEGGER J-Scope started successfully. Off (HSS): - Hz (10 kHz) Buffer 16.00 MiB (2097152 samples), 0.1...

Figure 25. Generated waveform (HSS)


New Project* - SEGGER J-Scope V6.11m
File View Help
Sampling:
Trigger:
Target:
Horizontal: 200ms/div (2k samples/div)
01.270 s
Δt: -1000 ms
Legend
0: Test_Data1 5k/div -2.0
1: Test_Data2 5k/div -3.0
0
1

Name	Address	Color	Size	Type	Value	Min	Max	Moving Aver...	Y Resoluti...	Y Offset
✓ Test_Data1	0x200000...	#FFD7...	2 Bytes	ushort	1860.00	0.00	3810.00	2113.32	5k/div	-2.0
✓ Test_Data2	0x200000...	#00FF00	2 Bytes	ushort	2248.00	0.00	4094.00	1416.40	5k/div	-3.0

SEGGER J-Scope started successfully. Off (HSS): - Hz (10 kHz) Buffer 16.00 MiB (2097152 samples), 0.1...

4 Real Time Transfer (RTT)

4.1 RTT mode

The RTT mode, similar to data upload over serial port, requires RTT component migration, uplink buffer configuration, and data transmission.

Hardware connection: Use the standard download interface (VCC, GND, SWDIO, SWCLK and NRST) or 3-wire JLINK-OB (GND, SWDIO, SWCLK) for connection.

Advantages:

- It has a higher sampling rate (up to 2 MB/s) than HSS mode; and support 1 MB/s sampling rate even if the target has a 512-byte buffer.
- Data acquisition is synchronized with the execution of the target board application because the application decides when to sample the data.
- Timestamp and other data can be added to the data sample.

Disadvantages:

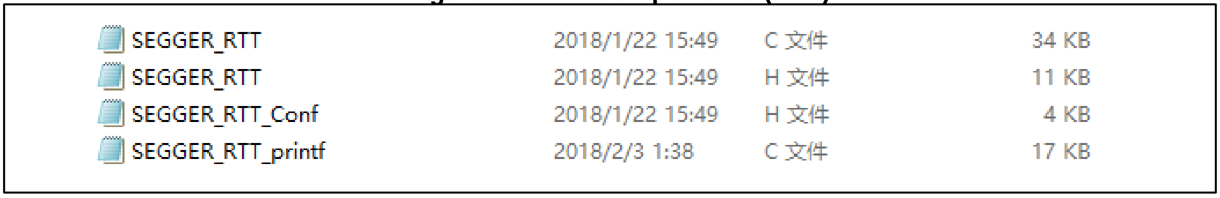
- It requires migration of RTT components, which is more complex than HSS mode.

4.2 Application method

4.2.1 Port RTT components

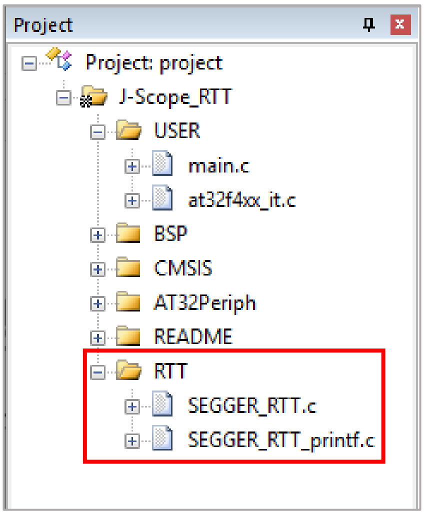
1) Copy the below four files to the MDK project path, and add to the MDK project.

Figure 26. RTT components (RTT)



SEGGER_RTT	2018/1/22 15:49	C 文件	34 KB
SEGGER_RTT	2018/1/22 15:49	H 文件	11 KB
SEGGER_RTT_Conf	2018/1/22 15:49	H 文件	4 KB
SEGGER_RTT_printf	2018/2/3 1:38	C 文件	17 KB

Figure 27. Add RTT components to MDK project (RTT)



2) Call the below function to configure the uplink buffer.

```
SEGGER_RTT_ConfigUpBuffer(1, "JScope_u4u2", buf, 2048, SEGGER_RTT_MODE_NO_BLOCK_SKIP);
```

- Parameter 1: buffer index—select 1
- Parameter 2: data format—fixed to “JScope_xy”

Table 1. Data format

Type (x)	Data size (y)	Description
t	4	Each packet sent will be preceded by a timestamp, with 32-bit variables, in terms of μs.
i	1, 2, 4	8/16/32-bit, with symbol variables
u	1, 2, 4	8/16/32-bit, without symbol variables

For example:

"JScope_u4u2": Include 32-bit unsigned data and 16-bit unsigned data, and the data is arranged in the sequence of u4u2.

"JScope_t4i4u2": Include 32-bit timestamp, 32-bit signed data and 16-bit unsigned data, and the data is arranged in the sequence of t4i4u2.

- Parameter 3: buffer selection
- Parameter 4: buffer size
- Parameter 5: mode—in RTT mode, the last parameter only supports SEGGER_RTT_MODE_NO_BLOCK_SKIP and SEGGER_RTT_MODE_BLOCK_IF_FIFO_FULL. In this case, select SEGGER_RTT_MODE_NO_BLOCK_SKIP.

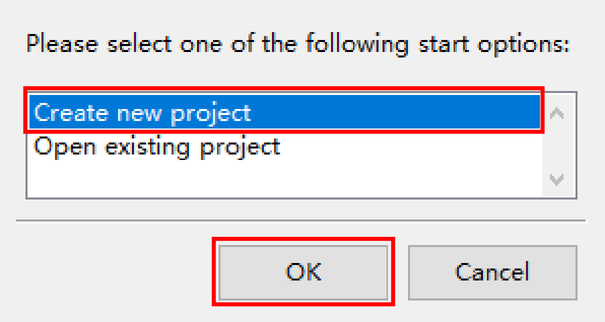
3) Call the “SEGGER_RTT_Write” function to send data.

```
SEGGER_RTT_Write(1, &Test_Data1, 4);
SEGGER_RTT_Write(1, &Test_Data2, 2);
```

4) Compile and download the application.

4.2.2 Open J-Scope and create new project

Figure 28. Create new project (RTT)



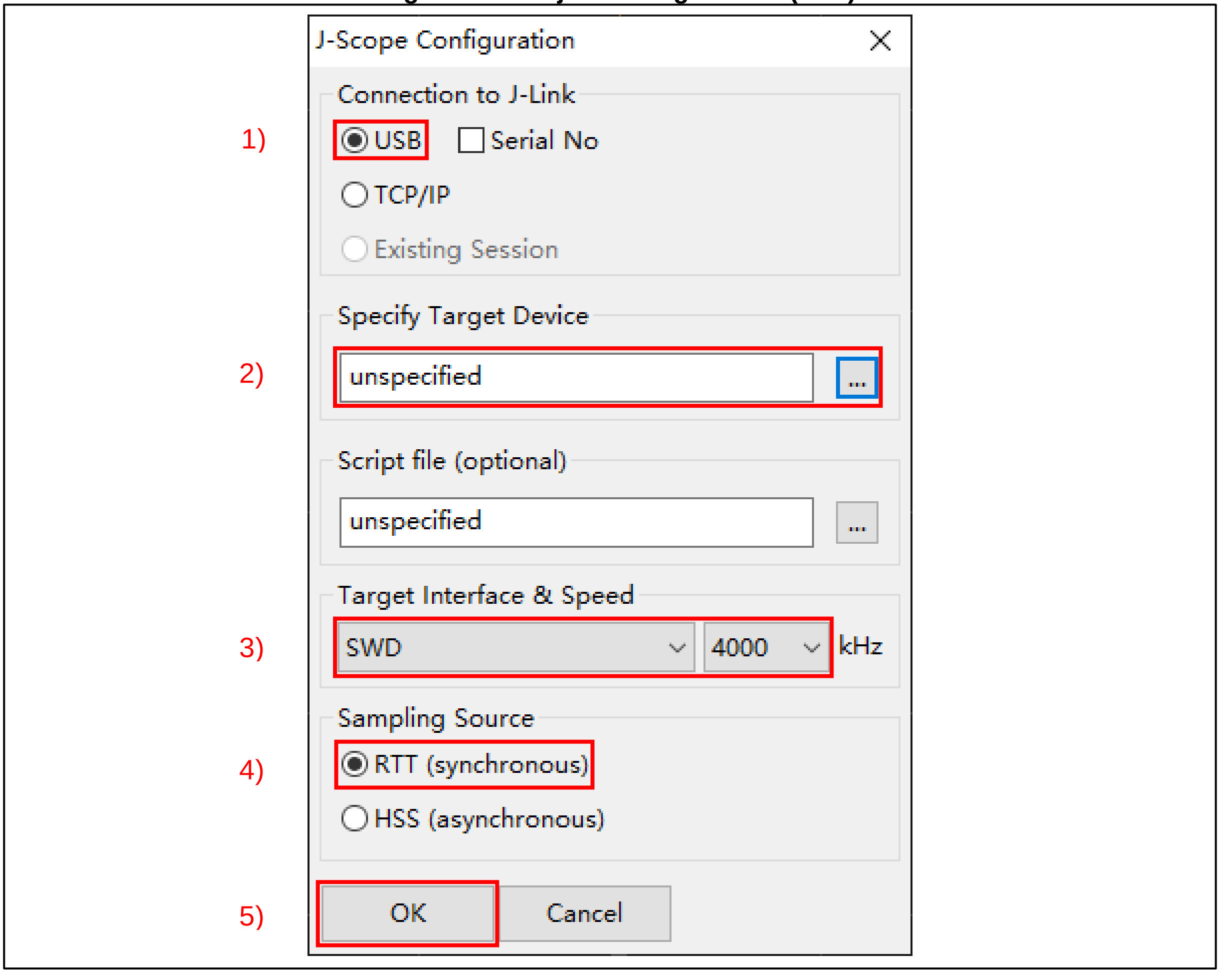
Please select one of the following start options:

Create new project

Open existing project

4.2.3 Configure project

Figure 29. Project configuration (RTT)



J-Scope Configuration

Connection to J-Link

● USB ☐ Serial No

○ TCP/IP

○ Existing Session

Specify Target Device: unspecified

Script file (optional): unspecified

Target Interface & Speed: SWD 4000 kHz

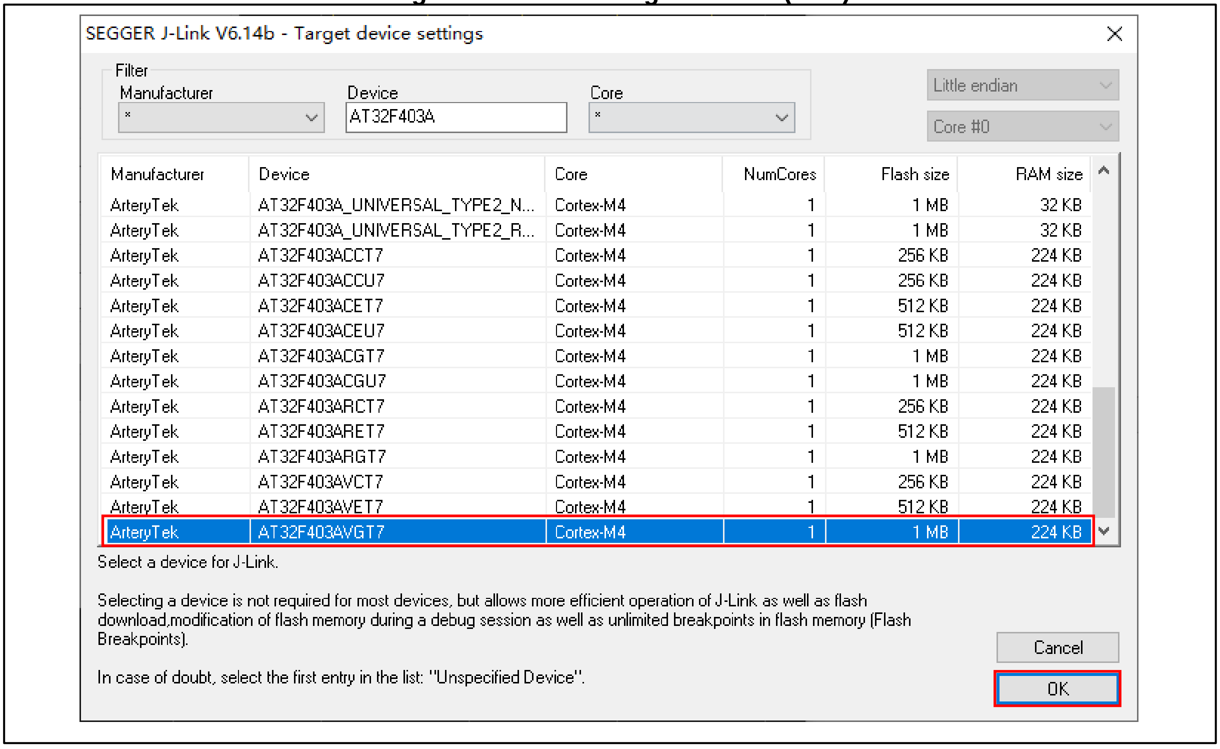
Sampling Source

● RTT (synchronous)

○ HSS (asynchronous)

1) J-Link interface: Select J-Link USB interface;
2) Target device: Select AT32F403AVGT7;

Figure 30. Select target device (RTT)



SEGGER J-Link V6.14b - Target device settings

Filter

Manufacturer: *

Device: AT32F403A

Core: *

Little endian

Core #0

Manufacturer	Device	Core	NumCores	Flash size	RAM size
ArteryTek	AT32F403A_UNIVERSAL_TYPE2_N...	Cortex-M4	1	1 MB	32 KB
ArteryTek	AT32F403A_UNIVERSAL_TYPE2_R...	Cortex-M4	1	1 MB	32 KB
ArteryTek	AT32F403ACCT7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403ACCU7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403ACET7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403ACEU7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403ACGT7	Cortex-M4	1	1 MB	224 KB
ArteryTek	AT32F403ACGU7	Cortex-M4	1	1 MB	224 KB
ArteryTek	AT32F403ARCT7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403ARET7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403ARGT7	Cortex-M4	1	1 MB	224 KB
ArteryTek	AT32F403AVCT7	Cortex-M4	1	256 KB	224 KB
ArteryTek	AT32F403AVET7	Cortex-M4	1	512 KB	224 KB
ArteryTek	AT32F403AVGT7	Cortex-M4	1	1 MB	224 KB

Select a device for J-Link.

Selecting a device is not required for most devices, but allows more efficient operation of J-Link as well as flash download,modification of flash memory during a debug session as well as unlimited breakpoints in flash memory (Flash Breakpoints).

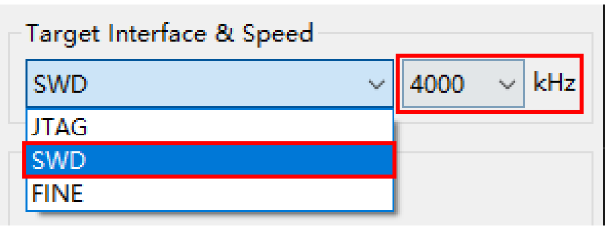
In case of doubt, select the first entry in the list: "Unspecified Device".

3) Target interface/speed:

Target interface: Select SWD or JTAG according to the application configuration. This example selects SWD.

J-Link speed: This example selects 4000 KHz.

Figure 31. Select interface/speed (RTT)



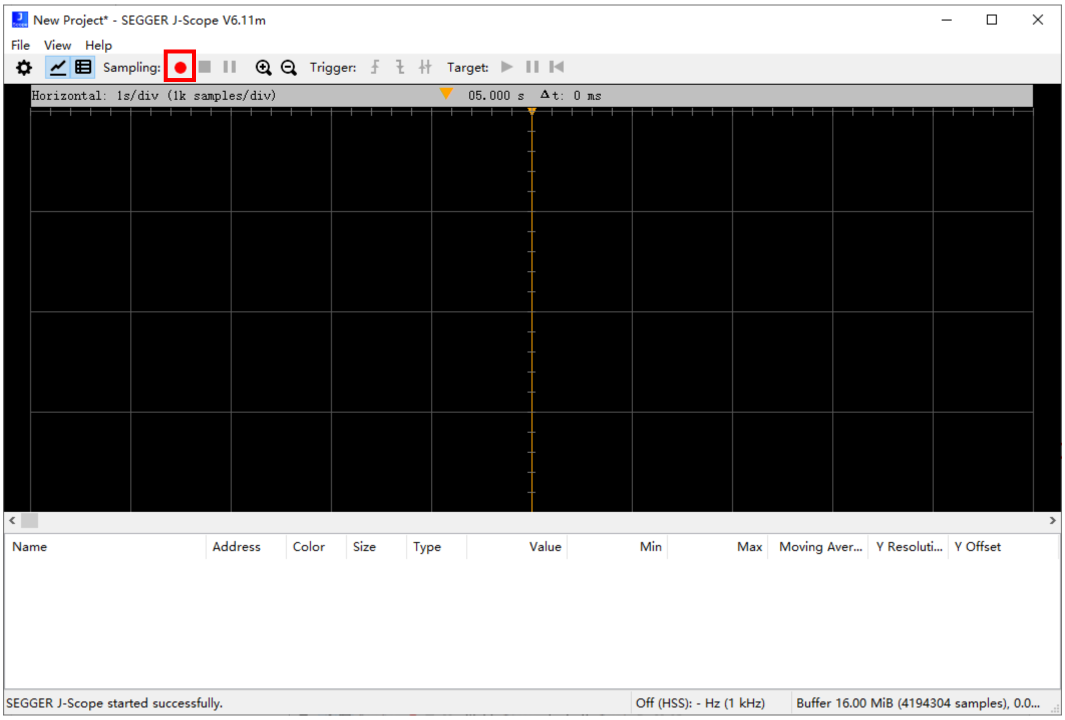
4) Mode selection: Select RTT;

5) Configuration is finished, and click “OK”.

4.2.4 Start to run

Click the red dot, and data will be displayed

Figure 32. Start to run (RTT)



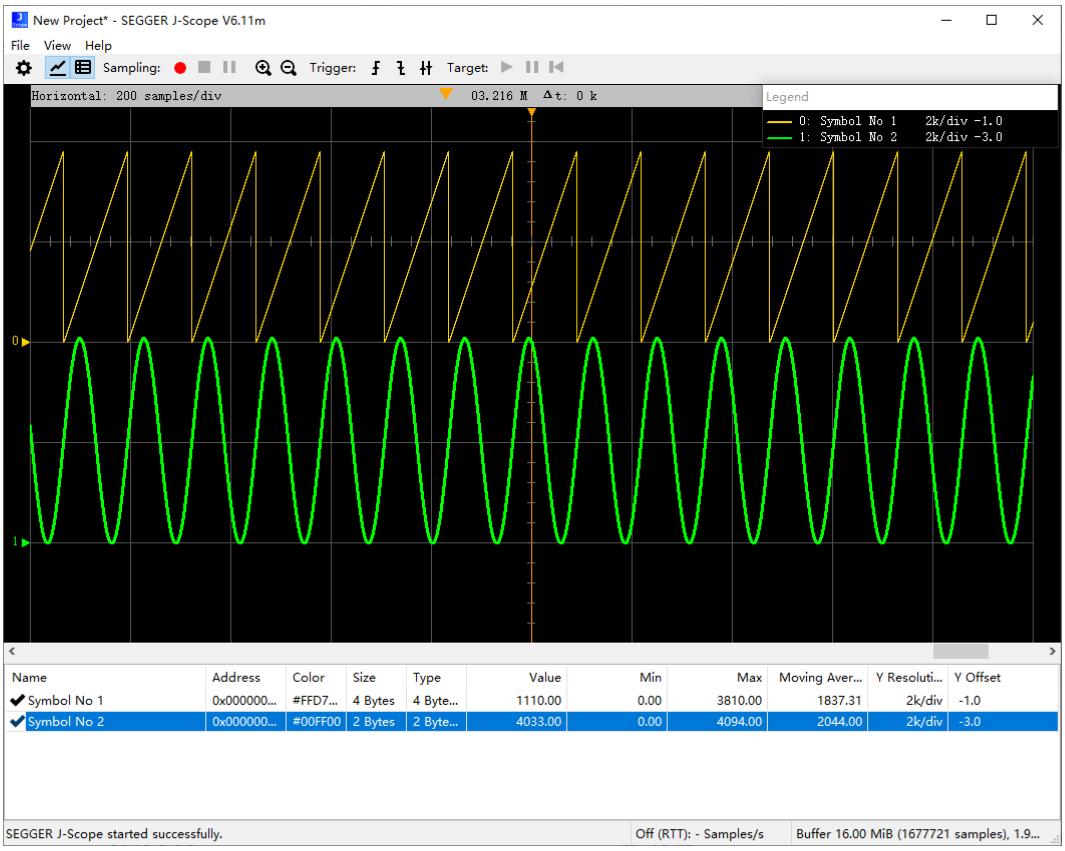
Horizontal: 1s/div (1k samples/div) 05.000 s Δt: 0 ms

SEGGER J-Scope started successfully.

Off (HSS): - Hz (1 kHz)

Buffer 16.00 MiB (4194304 samples), 0.0...

Figure 33. Generated waveform (RTT)


New Project* - SEGGER J-Scope V6.11m
File
View
Help
Sampling:
Trigger:
Target:
Horizontal: 200 samples/div
03.216 M
Δt: 0 k
Legend
0: Symbol No 1 2k/div -1.0
1: Symbol No 2 2k/div -3.0
0
1

Name	Address	Color	Size	Type	Value	Min	Max	Moving Aver...	Y Resoluti...	Y Offset
✓ Symbol No 1	0x000000...	#FFD7...	4 Bytes	4 Byte...	1110.00	0.00	3810.00	1837.31	2k/div	-1.0
✓ Symbol No 2	0x000000...	#00FF00	2 Bytes	2 Byte...	4033.00	0.00	4094.00	2044.00	2k/div	-3.0

SEGGER J-Scope started successfully.

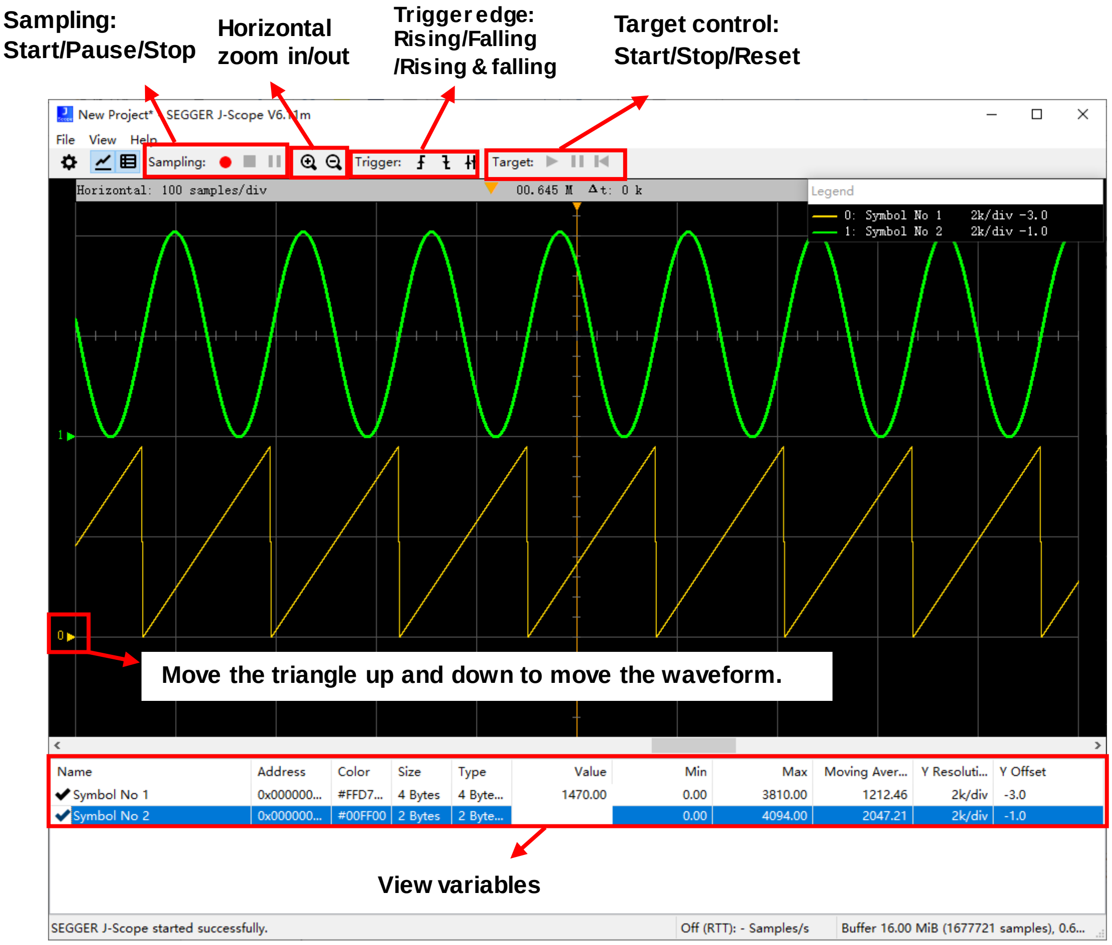
Off (RTT): - Samples/s

Buffer 16.00 MiB (1677721 samples), 1.9...

5 J-Scope software

5.1 Overview

Figure 34. J-Scope interface


New Project* - SEGGER J-Scope V6.xxm
File View Help
Sampling:
Trigger:
Target:
Horizontal: 100 samples/div
00.645 M Δt: 0 k
Legend
0: Symbol No 1 2k/div -3.0
1: Symbol No 2 2k/div -1.0
1
0

Sampling: Start/Pause/Stop

Horizontal zoom in/out

Trigger edge: Rising/Falling /Rising & falling

Target control: Start/Stop/Reset

Move the triangle up and down to move the waveform.

Name	Address	Color	Size	Type	Value	Min	Max	Moving Aver...	Y Resoluti...	Y Offset
✓ Symbol No 1	0x000000...	#FFD7...	4 Bytes	4 Byte...	1470.00	0.00	3810.00	1212.46	2k/div	-3.0
✓ Symbol No 2	0x000000...	#00FF00	2 Bytes	2 Byte...		0.00	4094.00	2047.21	2k/div	-1.0

View variables

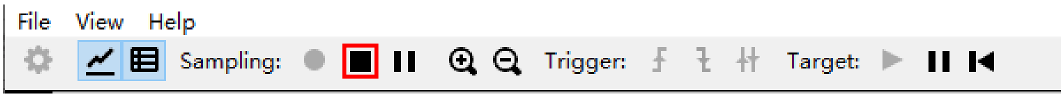
SEGGER J-Scope started successfully. Off (RTT): - Samples/s Buffer 16.00 MiB (1677721 samples), 0.6...

5.2 Export data

J-Scope can export data in CSV format or RAW format.

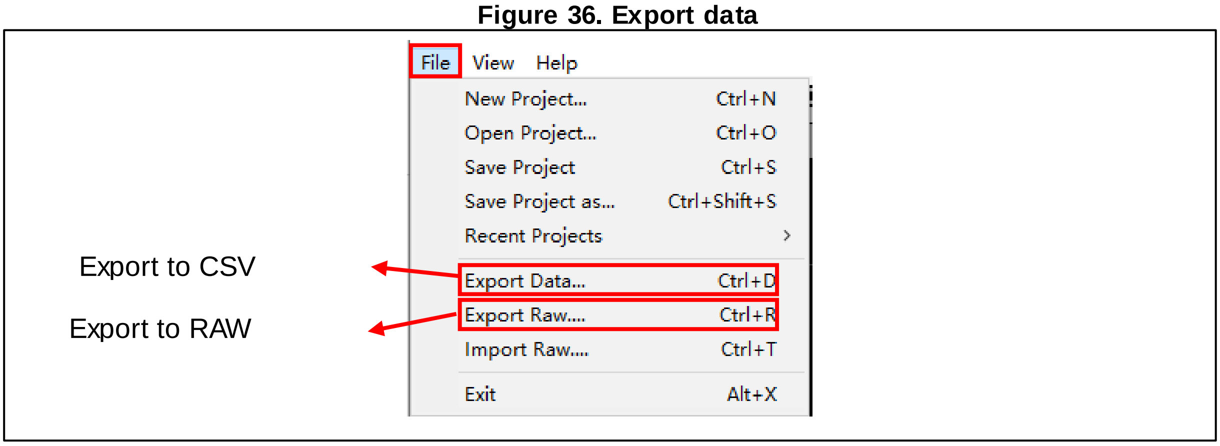
1) Stop running first if data sampling is in progress.

Figure 35. Stop running



2) Click File->Export Data.

Figure 36. Export data

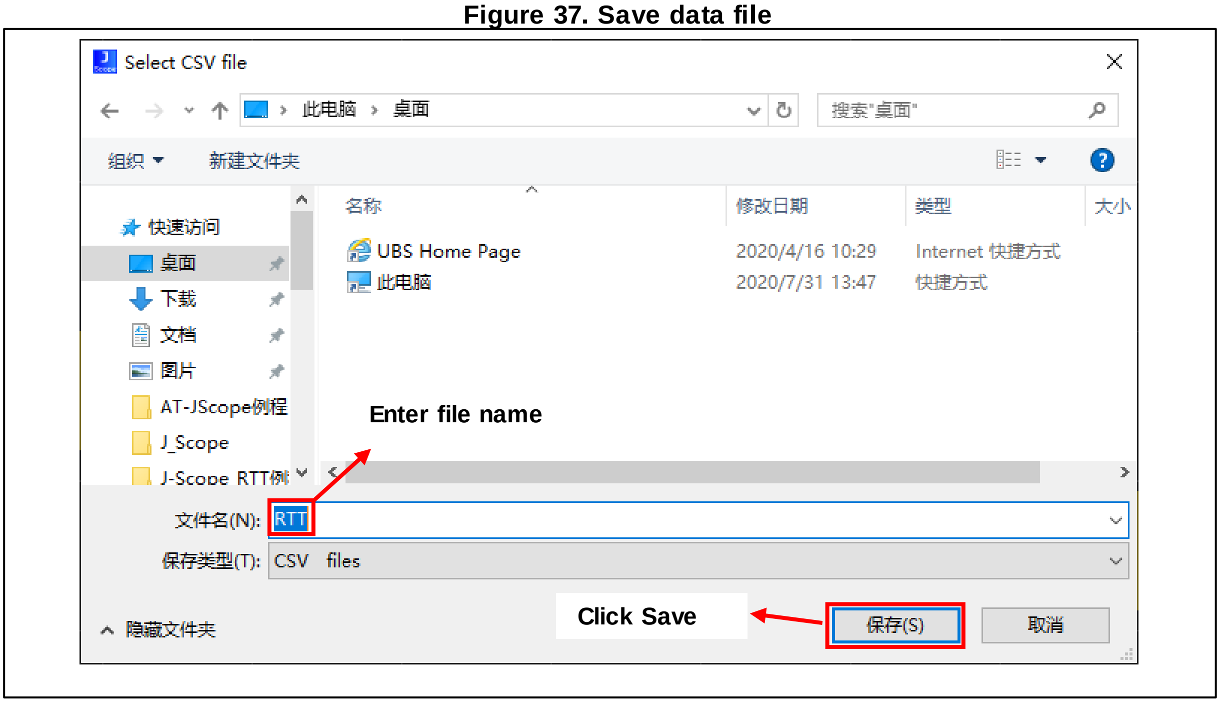


Export to CSV

Export to RAW

3) Enter the file name-> click “Save”.

Figure 37. Save data file



文件名(N): RTT

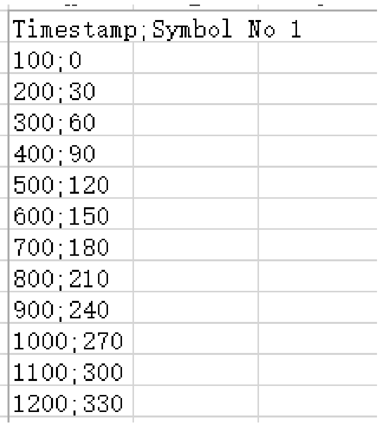
保存类型(T): CSV files

Enter file name

Click Save

4) Open RTT.CSV to view the stored data, as shown in Figure 38 below.

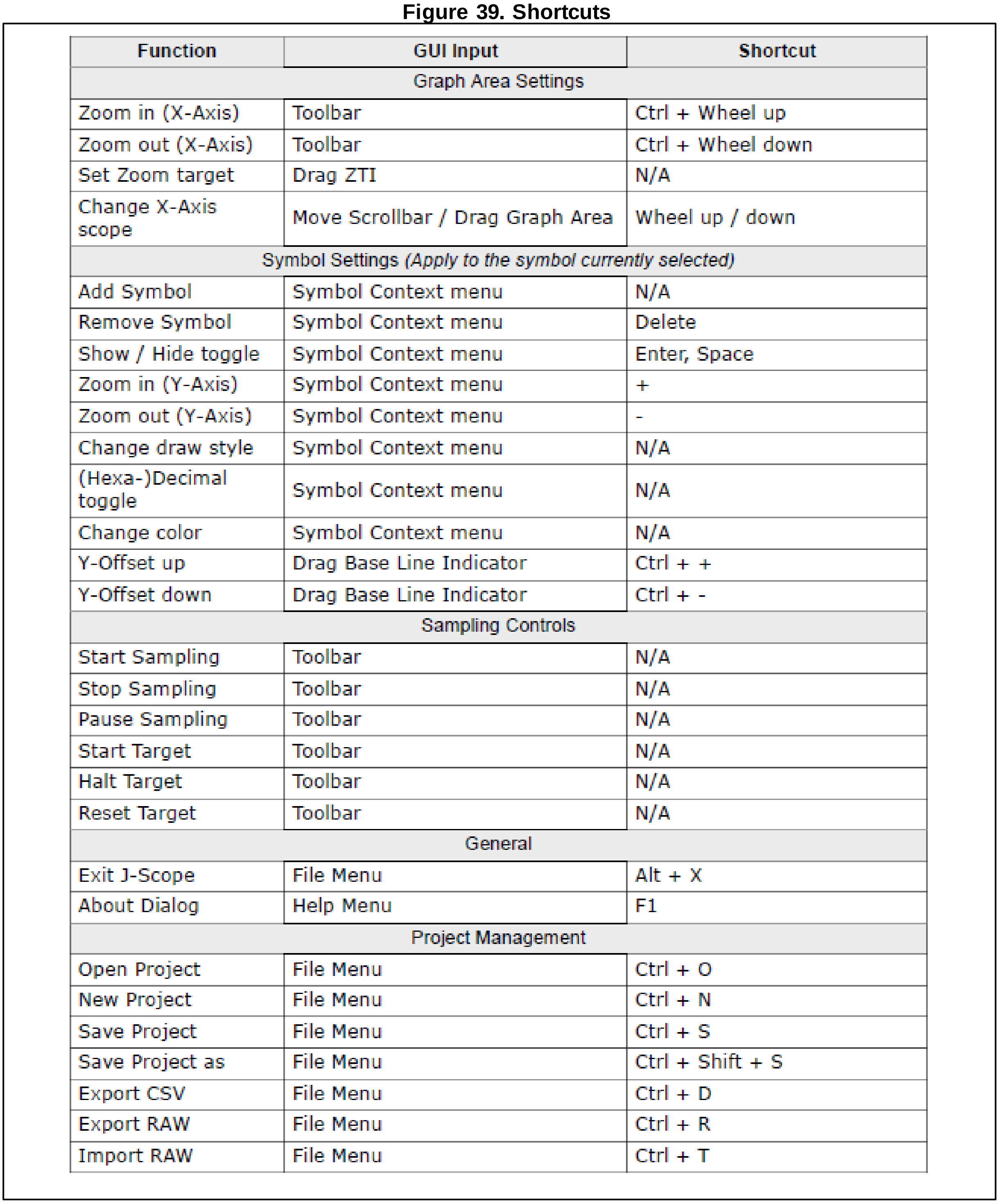
Figure 38. Open data file



Timestamp;Symbol No 1
100;0
200;30
300;60
400;90
500;120
600;150
700;180
800;210
900;240
1000;270
1100;300
1200;330

5.3 Shortcuts

Figure 39. Shortcuts



Function	GUI Input	Shortcut
Graph Area Settings		
Zoom in (X-Axis)	Toolbar	Ctrl + Wheel up
Zoom out (X-Axis)	Toolbar	Ctrl + Wheel down
Set Zoom target	Drag ZTI	N/A
Change X-Axis scope	Move Scrollbar / Drag Graph Area	Wheel up / down
Symbol Settings *(Apply to the symbol currently selected)*		
Add Symbol	Symbol Context menu	N/A
Remove Symbol	Symbol Context menu	Delete
Show / Hide toggle	Symbol Context menu	Enter, Space
Zoom in (Y-Axis)	Symbol Context menu	+
Zoom out (Y-Axis)	Symbol Context menu	-
Change draw style	Symbol Context menu	N/A
(Hexa-)Decimal toggle	Symbol Context menu	N/A
Change color	Symbol Context menu	N/A
Y-Offset up	Drag Base Line Indicator	Ctrl + +
Y-Offset down	Drag Base Line Indicator	Ctrl + -
Sampling Controls		
Start Sampling	Toolbar	N/A
Stop Sampling	Toolbar	N/A
Pause Sampling	Toolbar	N/A
Start Target	Toolbar	N/A
Halt Target	Toolbar	N/A
Reset Target	Toolbar	N/A
General		
Exit J-Scope	File Menu	Alt + X
About Dialog	Help Menu	F1
Project Management		
Open Project	File Menu	Ctrl + O
New Project	File Menu	Ctrl + N
Save Project	File Menu	Ctrl + S
Save Project as	File Menu	Ctrl + Shift + S
Export CSV	File Menu	Ctrl + D
Export RAW	File Menu	Ctrl + R
Import RAW	File Menu	Ctrl + T

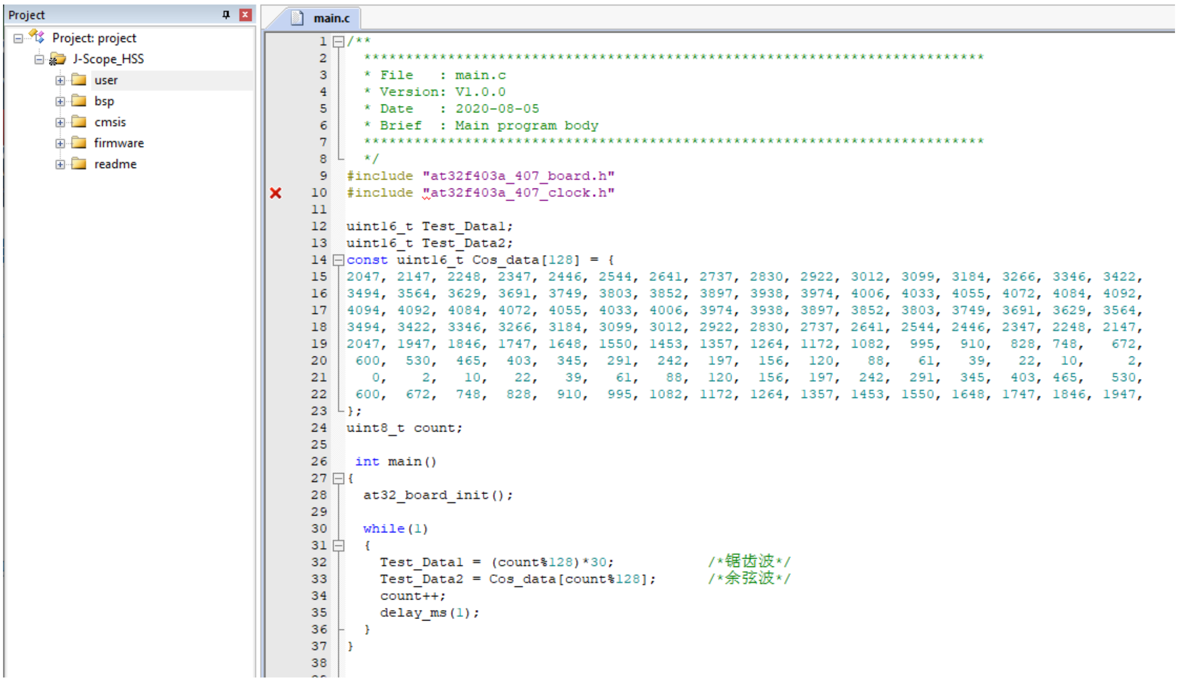
6 Demo program

Note: All projects are based on keil 5. For usage in other compiling environment, please refer to the corresponding environment (IAR6/7, keil 4/5) in AT32xxx*_Firmware_Library_V2.x.x\project\at_start_xxx\templates and complete proper modifications.*

6.1 HSS mode

1) Unzip and open xx\AN0044_Segger_Jscope_on_AT32_MCU_2.0.0\SourceCode\J-Scope_HSS_V2.0.0;
2) Define two global variables (Test_Data1 and Test_Data2);
3) Create a J-Scope project; select sampling variables (Test_Data1 and Test_Data2) and then click Start to run.

Figure 40. J-Scope HSS



```c
/**
  **************************************************************************
  * File   : main.c
  * Version: V1.0.0
  * Date   : 2020-08-05
  * Brief  : Main program body
  **************************************************************************
  */
#include "at32f403a_407_board.h"
#include "at32f403a_407_clock.h"

uint16_t Test_Data1;
uint16_t Test_Data2;
const uint16_t Cos_data[128] = {
2047, 2147, 2248, 2347, 2446, 2544, 2641, 2737, 2830, 2922, 3012, 3099, 3184, 3266, 3346, 3422,
3494, 3564, 3629, 3691, 3749, 3803, 3852, 3897, 3938, 3974, 4006, 4033, 4055, 4072, 4084, 4092,
4094, 4092, 4084, 4072, 4055, 4033, 4006, 3974, 3938, 3897, 3852, 3803, 3749, 3691, 3629, 3564,
3494, 3422, 3346, 3266, 3184, 3099, 3012, 2922, 2830, 2737, 2641, 2544, 2446, 2347, 2248, 2147,
2047, 1947, 1846, 1747, 1648, 1550, 1453, 1357, 1264, 1172, 1082,  995,  910,  828, 748,   672,
 600,  530,  465,  403,  345,  291,  242,  197,  156,  120,   88,   61,   39,   22, 10,     2,
   0,    2,   10,   22,   39,   61,   88,  120,  156,  197,  242,  291,  345,  403, 465,   530,
 600,  672,  748,  828,  910,  995, 1082, 1172, 1264, 1357, 1453, 1550, 1648, 1747, 1846, 1947,
};
uint8_t count;

 int main()
{
  at32_board_init();

  while(1)
  {
    Test_Data1 = (count%128)*30;            /*锯齿波*/
    Test_Data2 = Cos_data[count%128];       /*余弦波*/
    count++;
    delay_ms(1);
  }
}
```

6.2 RTT mode

1) Unzip and open xx\AN0044_Segger_Jscope_on_AT32_MCU\SourceCode\ J-Scope_RTT_V1.x.x.
2) Port RTT components;
3) The *main.c* includes the SEGGER_RTT.h file;
4) Define two global variables (Test_Data1 and Test_Data2);
5) Configure the uplink buffer.

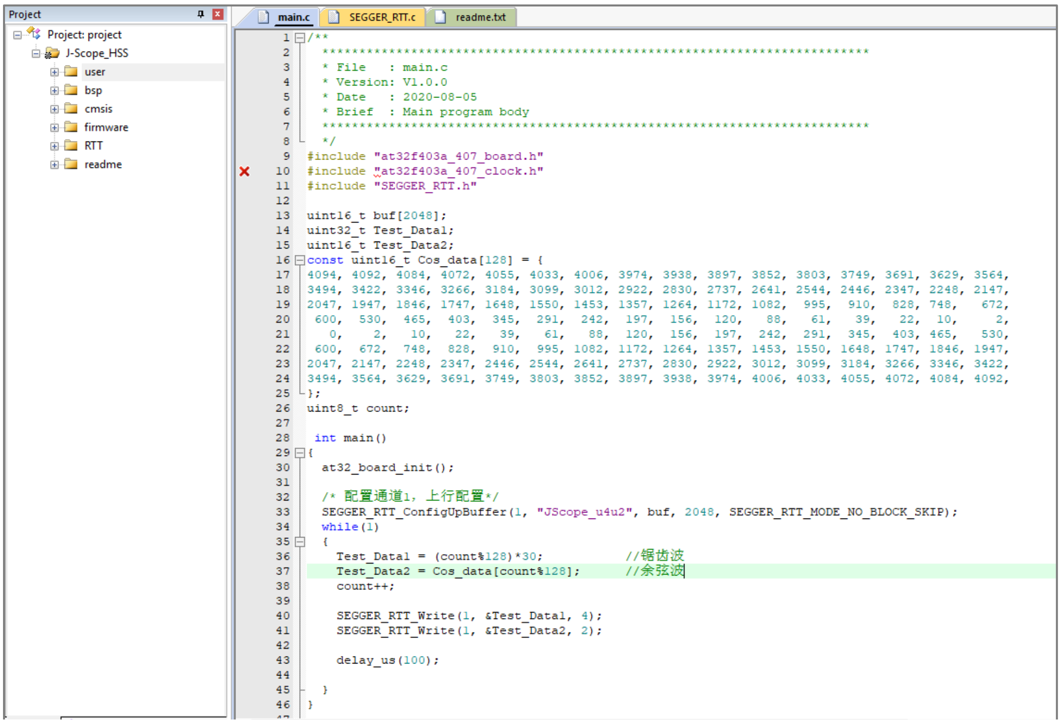
```
SEGGER_RTT_ConfigUpBuffer(1, "JScope_u4u2", buf, 2048, SEGGER_RTT_MODE_NO_BLOCK_SKIP);
```

6) Export data.

```
SEGGER_RTT_Write(1, &Test_Data1, 4);
SEGGER_RTT_Write(1, &Test_Data2, 2);
```

7) Create a J-Scope RTT project, and then click Start to run and generate a waveform.

Figure 41. J-Scope RTT



```c
/**
  **************************************************************************
  * File   : main.c
  * Version: V1.0.0
  * Date   : 2020-08-05
  * Brief  : Main program body
  **************************************************************************
  */
#include "at32f403a_407_board.h"
#include "at32f403a_407_clock.h"
#include "SEGGER_RTT.h"

uint16_t buf[2048];
uint32_t Test_Data1;
uint16_t Test_Data2;
const uint16_t Cos_data[128] = {
4094, 4092, 4084, 4072, 4055, 4033, 4006, 3974, 3938, 3897, 3852, 3803, 3749, 3691, 3629, 3564,
3494, 3422, 3346, 3266, 3184, 3099, 3012, 2922, 2830, 2737, 2641, 2544, 2446, 2347, 2248, 2147,
2047, 1947, 1846, 1747, 1648, 1550, 1453, 1357, 1264, 1172, 1082,  995,  910,  828, 748,   672,
 600,  530,  465,  403,  345,  291,  242,  197,  156,  120,   88,   61,   39,   22,  10,     2,
   0,    2,   10,   22,   39,   61,   88,  120,  156,  197,  242,  291,  345,  403, 465,   530,
 600,  672,  748,  828,  910,  995, 1082, 1172, 1264, 1357, 1453, 1550, 1648, 1747, 1846, 1947,
2047, 2147, 2248, 2347, 2446, 2544, 2641, 2737, 2830, 2922, 3012, 3099, 3184, 3266, 3346, 3422,
3494, 3564, 3629, 3691, 3749, 3803, 3852, 3897, 3938, 3974, 4006, 4033, 4055, 4072, 4084, 4092,
};
uint8_t count;

 int main()
{
  at32_board_init();

  /* 配置通道1, 上行配置*/
  SEGGER_RTT_ConfigUpBuffer(1, "JScope_u4u2", buf, 2048, SEGGER_RTT_MODE_NO_BLOCK_SKIP);
  while(1)
  {
    Test_Data1 = (count%128)*30;           //锯齿波
    Test_Data2 = Cos_data[count%128];      //余弦波
    count++;

    SEGGER_RTT_Write(1, &Test_Data1, 4);
    SEGGER_RTT_Write(1, &Test_Data2, 2);

    delay_us(100);

  }
}
```

7 Revision history

Table 2. Document revision history

Date	Version	Revision note
2021.11.02	2.0.0	Initial release.