

## 1 Introduction

ETM trace is a high-speed trace. It offers a powerful debug mode to solve the most difficult problems. This document introduces how to enable ETM trace for i.MXRT10XX silicon and the basic steps of using utrace debugger.

## 2 Installing software

The TRACE32 installation package can be found from [https://www.lauterbach.com/frames.html?download\\_overview.html](https://www.lauterbach.com/frames.html?download_overview.html). Download the *TRACE32\_201909.7z* to the computer and install it.

1. Because the installation package is relatively large, you can install software components according to the target processor to save hard disk space.
2. You can find installed driver at *C:\T32\bin\windows64\drivers*.

## 3 Connecting hardware

The TRACE32 debugger hardware always consists of:

- Universal debugger hardware
- Debug cable specific to the processor architecture

Figure 1 is a schematic diagram of hardware connection.

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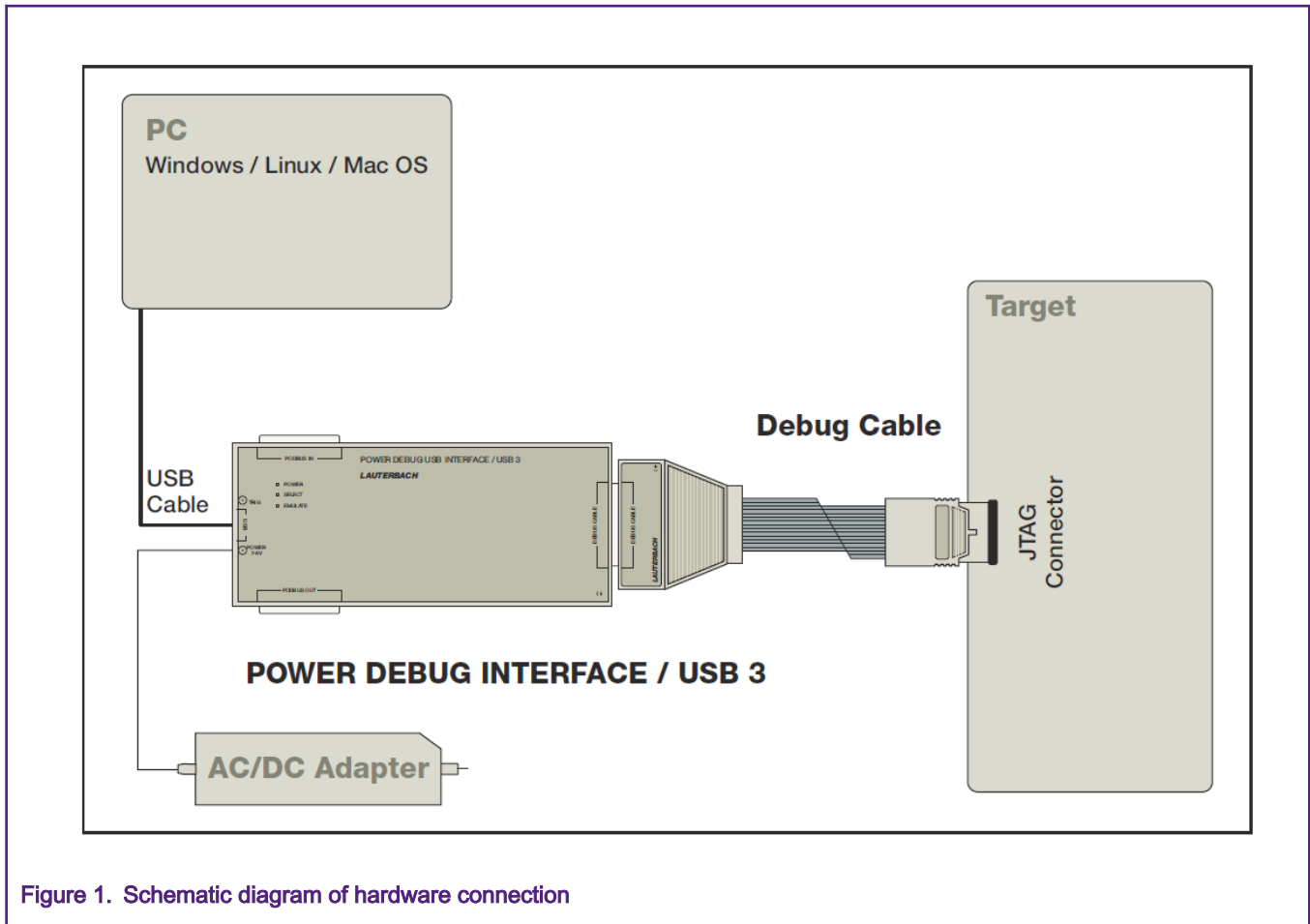


Figure 1. Schematic diagram of hardware connection

1. Taking i.MX RT1010 Validation Board (RAM) as an example, [Figure 2](#) shows the i.MX RT1010 validation board hardware connection.

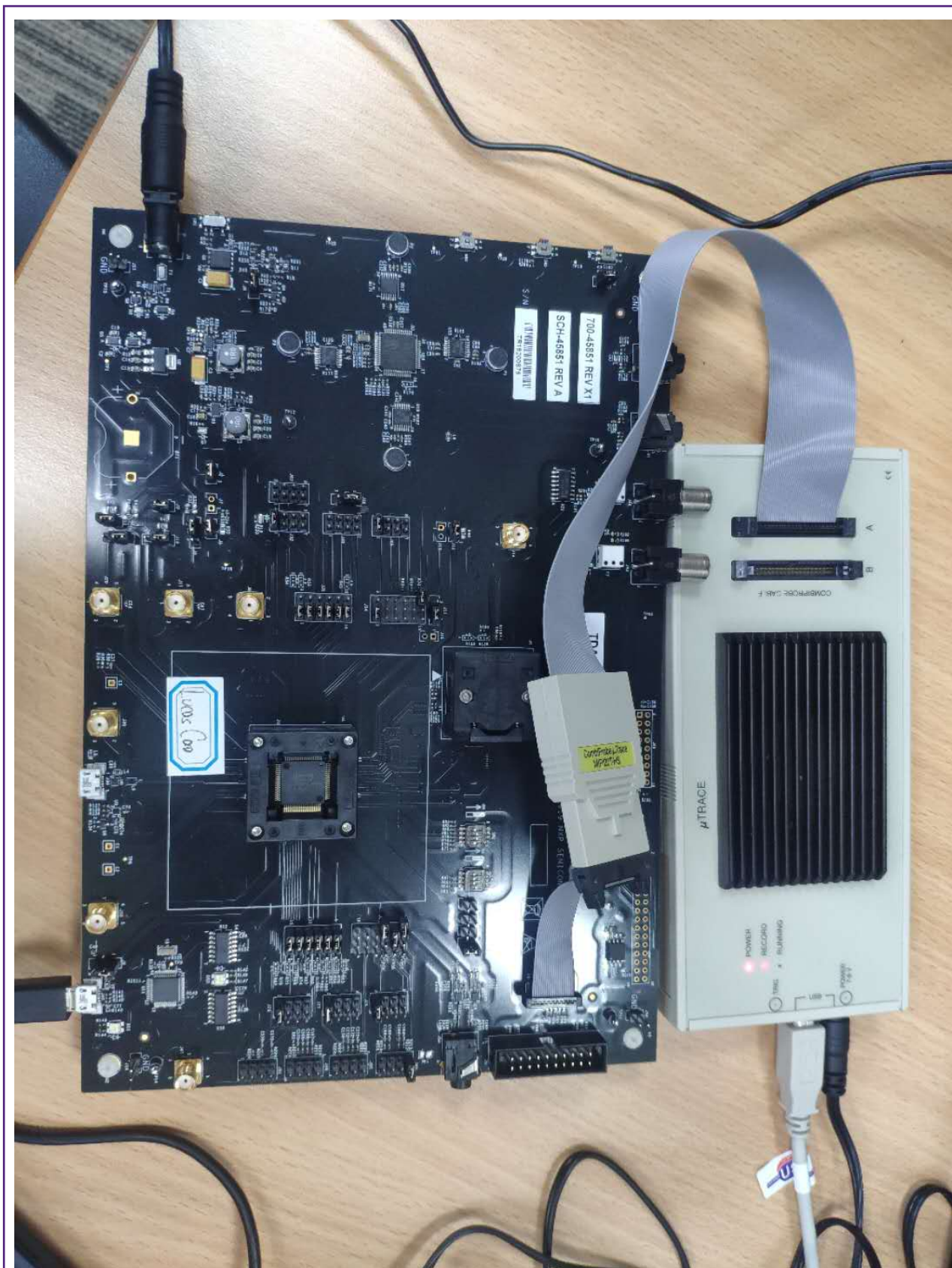


Figure 2. i.MX RT1010 validation board hardware connection

- Write `efuse` to i.MX RT1010, change the debugging mode to JTAG, and solder the related resistors: R62, R63, R64, R65, R67, as shown in Figure 3.

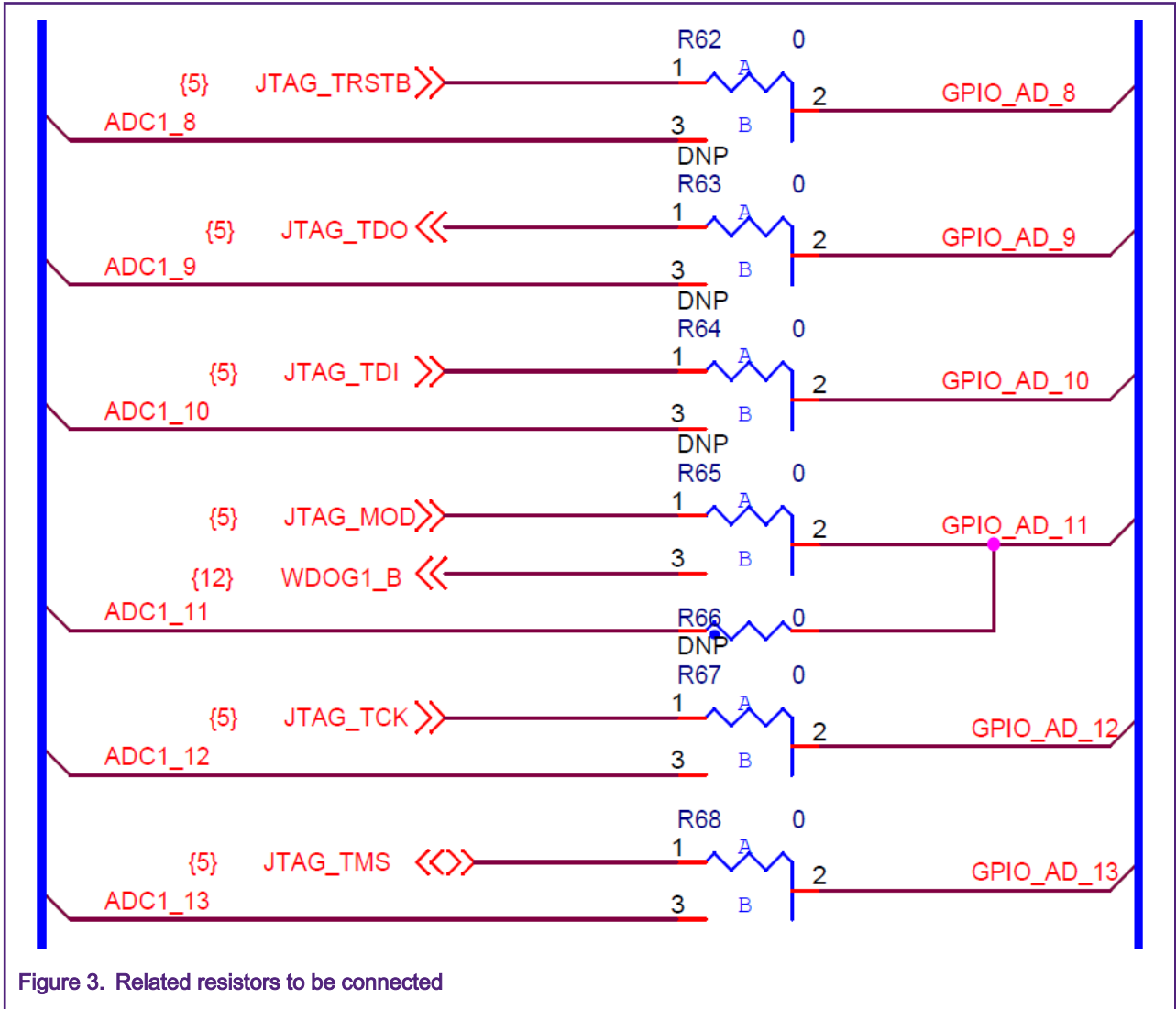


Figure 3. Related resistors to be connected

- Weld trace-related resistors, TRACE\_CLK (R59), TRACE0 (R57), TRACE1 (R73), TRACE2 (R72), and TRACE3 (R69). Disconnect other signal jumpers on the signal line, as shown in Figure 4.

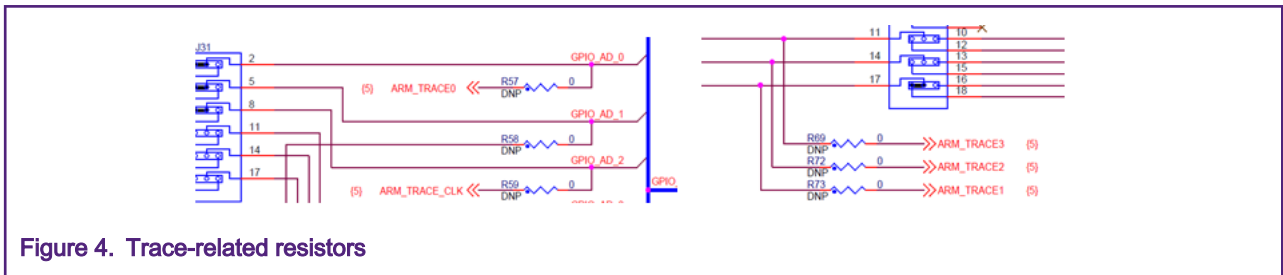


Figure 4. Trace-related resistors

## 4 Operating software

- Select **CPU->System settings** and then click **CPU** to select the CPU type, as shown in Figure 5.

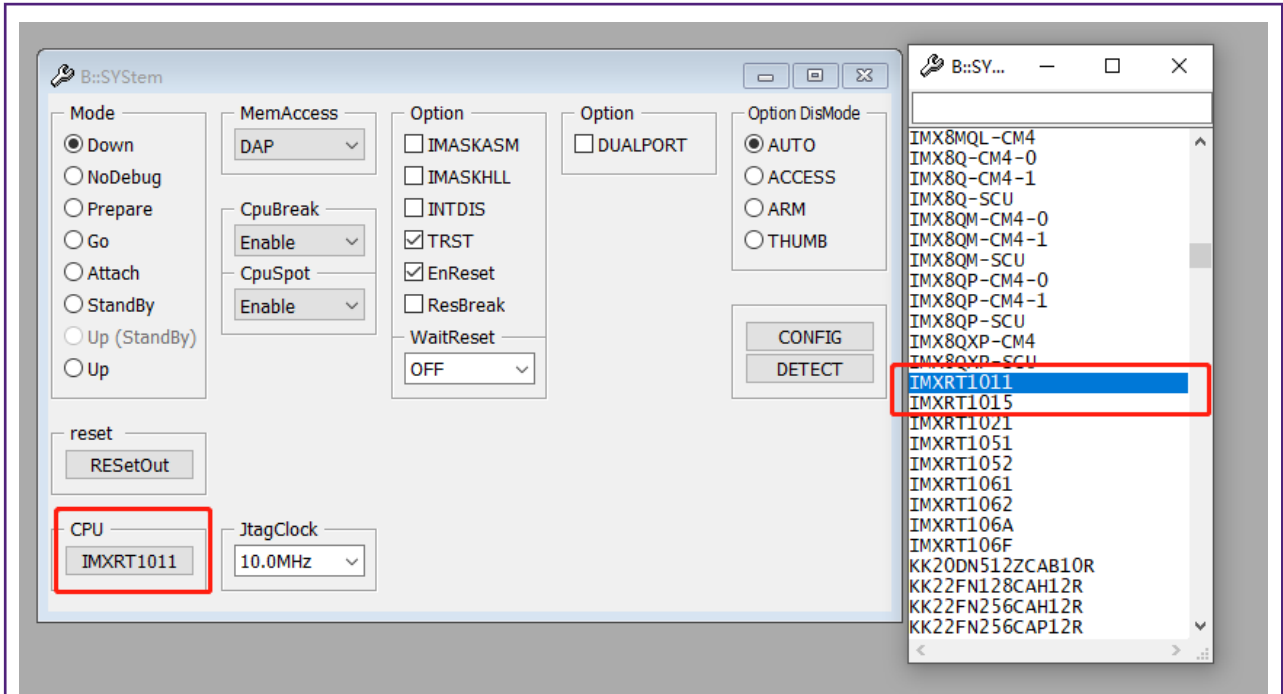


Figure 5. Selecting CPU type

2. Set debug port type to **JTAG**, as shown in Figure 6.

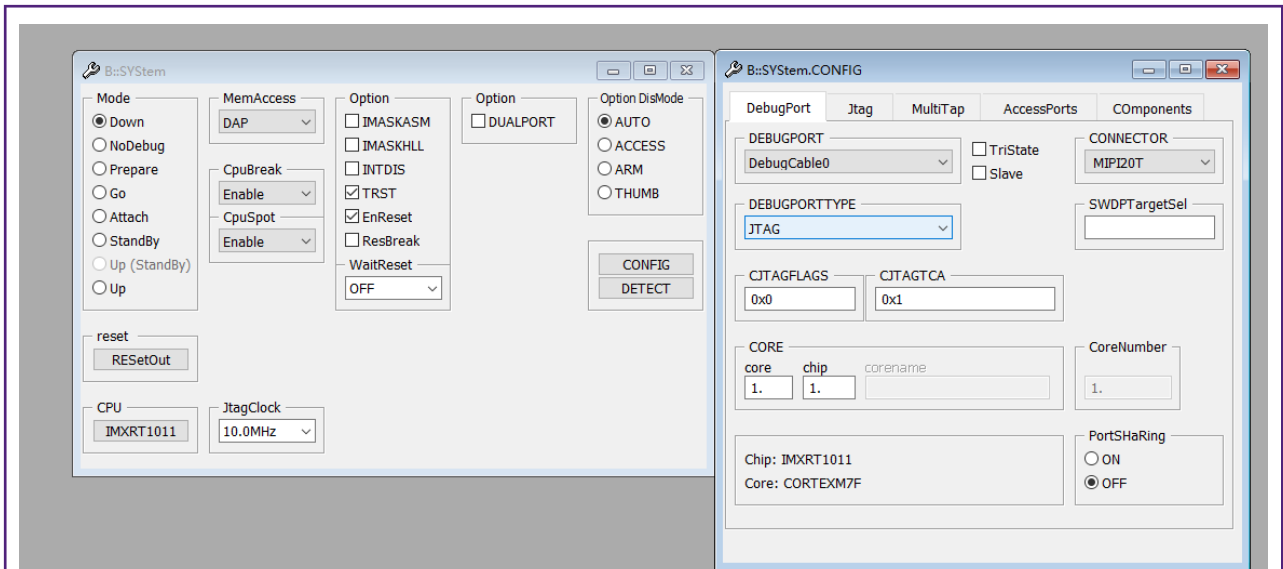


Figure 6. Setting debug port type to JTAG

3. On the **Mode** tab, select **Up** to debug the simulation. Restart the CPU to establish the communication between the debugger and the CPU.

## 5 Generating APP

Taking SDK\_2.6.1\_EVK-MIMX\_RT1010 as an example, perform the following operations to generate an application.

1. Open IAR hello\_world projects.
2. Set it to the debug mode.

- Set the suffix of the generated file to `.elf`, as shown in [Figure 7](#).

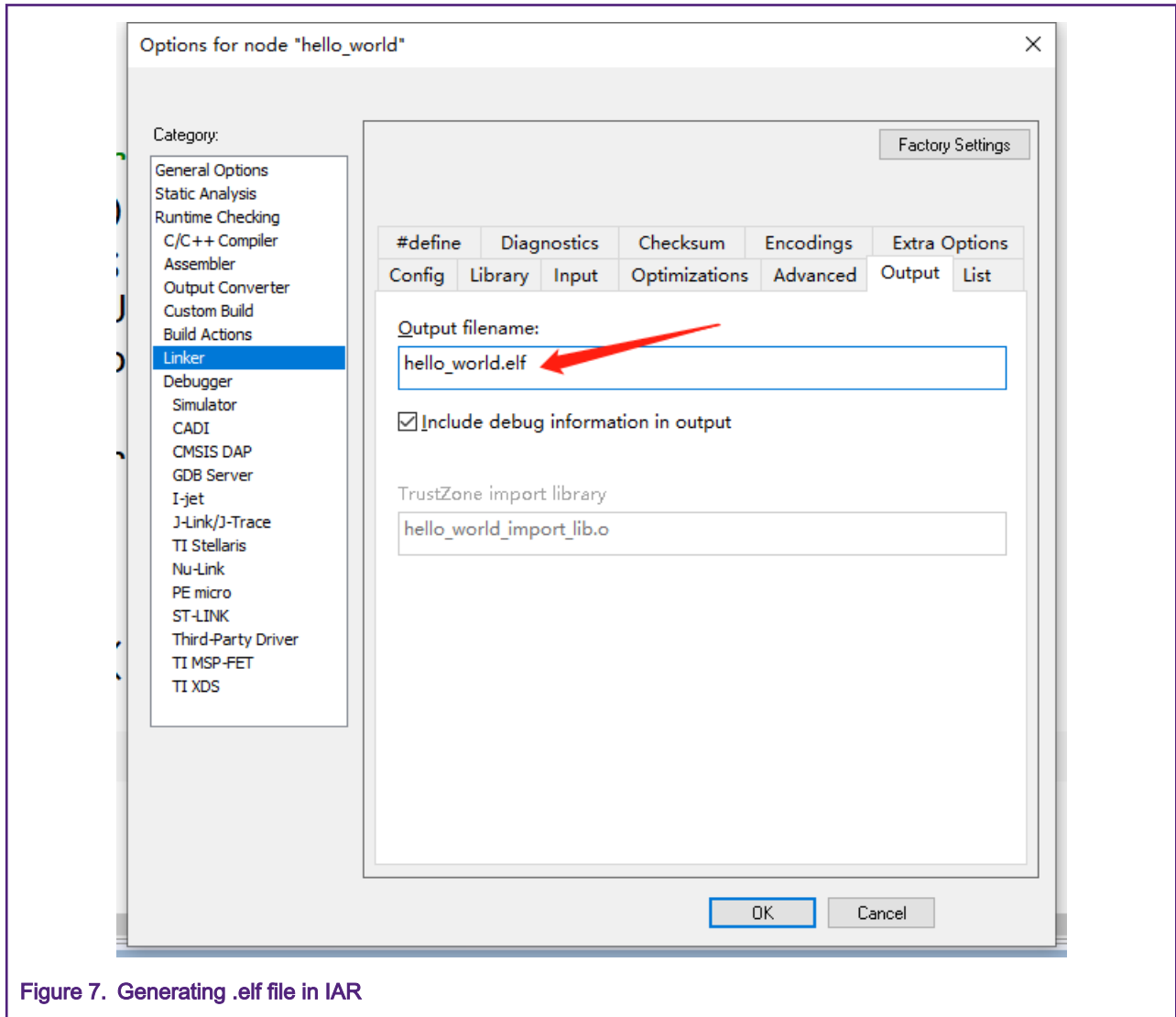


Figure 7. Generating `.elf` file in IAR

Now, you will see the generated `hello_world.elf` file is in the debug folder.

## 6 Creating script

We should save the following script as a `.cmm` format file and name it to `hello_world.cmm`.

```
WinCLEAR

; -----
; initialize and start the debugger
RESet
SYStem.RESet
SYStem.CPU IMXRT1010
SYStem.CONFIG.DEBUGPORTTYPE JTAG
SYStem.Option DUALPORT ON
SYStem.MemAccess DAP
SYStem.JtagClock CTCK 10MHz
Trace.DISable
SYStem.Up
```

```

; -----
; load demo program (uses internal RAM only)
Data.LOAD.Elf "~~~~/hello_world.elf"

; -----
; initialize OFFCHIP trace (ETM, ITM)
IF COMBIPROBE() || UTRACE() || Analyzer()
(
; set PinMux and enable Clocks
; TRACECLK - IOMUX_GPIO_AD_02 - ALT7
; TRACEDATA0 - IOMUX_GPIO_AD_00 - ALT7
; TRACEDATA1 - IOMUX_GPIO_AD_13 - ALT7
; TRACEDATA2 - IOMUX_GPIO_AD_12 - ALT7
; TRACEDATA3 - IOMUX_GPIO_AD_11 - ALT7
Data.Set AD:0x401F8040 %Long 0x7
Data.Set AD:0x401F8048 %Long 0x7
Data.Set AD:0x401F8088 %Long 0x7
Data.Set AD:0x401F808C %Long 0x7
Data.Set AD:0x401F8090 %Long 0x7

TPIU.PortSize 1
TPIU.PortMode Continuous
ITM.DataTrace CorrelatedData
ITM.ON
ETM.Trace ON
ETM.COND ALL
ETM.ON
)
IF COMBIPROBE() || UTRACE()
(
Trace.METHOD CAnalyzer
Trace.AutoInit ON
IF VERSION.BUILD.BASE() >= 74752.
(
CAnalyzer.AutoFocus
)
ELSE
(
; for uTrace & Combiprobe use manual calibration
; CAnalyzer.ClockDELAY Large
)
)
IF Analyzer()
(
Trace.METHOD Analyzer
Trace.AutoInit ON
Trace.AutoFocus
)
; -----
; start program execution
Go.direct main
WAIT !STATE.RUN()

; -----
; setup ITM based datatrace of variable ch
;Var.Break.Set ch /Write /TraceData

; -----
; open some windows

```



```

WinCLEAR
Mode.Hll
WinPOS 0. 0. 116. 26.
List.auto
WinPOS 120. 0. 100. 8.
Frame.view
WinPOS 120. 14.
Var.Watch
Var.AddWatch %SpotLight ast flags
WinPOS 120. 25.
Trace.List
;WinPOS 0. 32.
;Trace.DRAW.Var %DEFAULT ch

ENDDO

```

## 7 Loading APP

Open the TRACE32 software, select **File->Load File**. Find the generated *hello\_world.elf* file and run it.

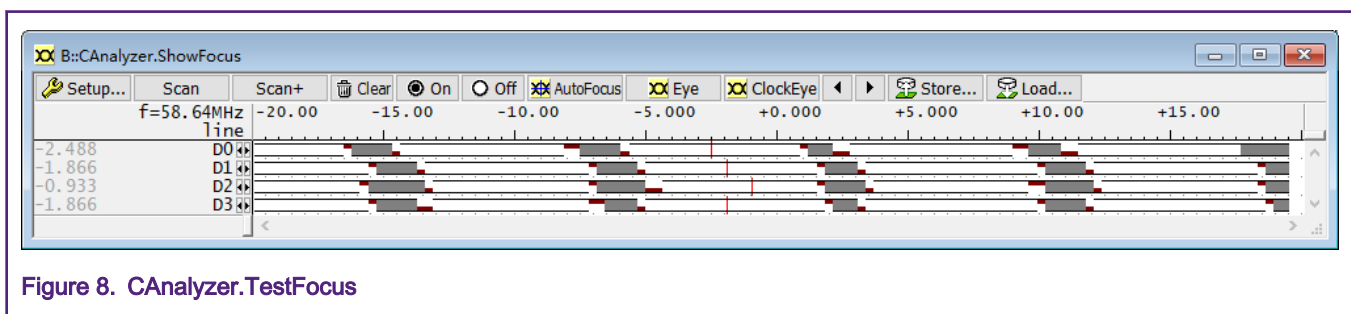
1. Select **View-> List Source** to open the code debugging window.
2. Click **Step** or press **F2** to step through the program.
3. Click **Go** or press **F7** to run the program directly.
4. Click **Break** or press **F8** to pause the program.

## 8 Tracing debug

TRACE32 offers a powerful feature called *Trace.ShowFocus* to analyse the signal integrity of the trace port. The functionality is similar to a sampling scope.

The horizontal axis reflects time line in nano seconds. On the left side, the current delay is shown for each trace signal. The red line shows the sampling point. It can be different for each signal. Data lines are delayed if values smaller than zero are set or not all sampling points are equal. In case of values larger than zero the clock line is delayed.

Pressing **SCAN** to execute *Analyzer.TestFocus* to update the window. [Figure 8](#) shows the example of the best case.



**Figure 8. CAnalyzer.TestFocus**

TRACE32 PowerView provides a timing diagram which shows when the program counters was in which function/symbol range.

In [Figure 9](#), press **Chart** to go to [Figure 10](#).



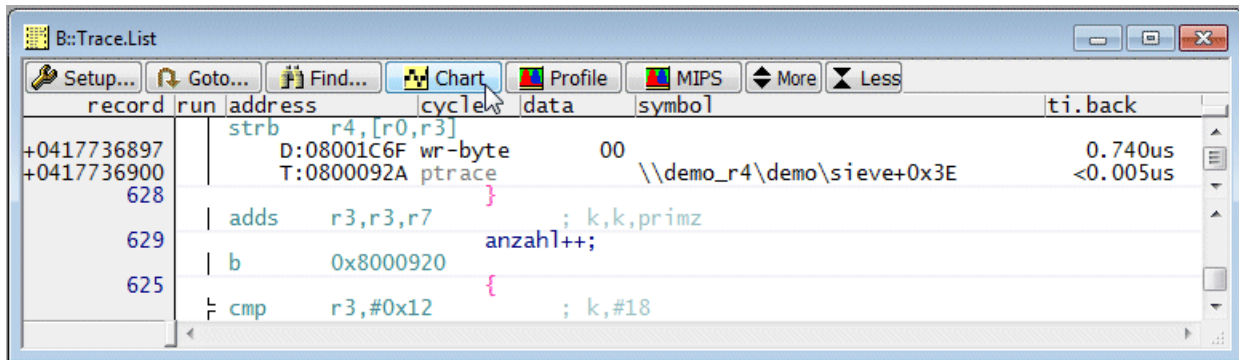


Figure 9. Trace.List window

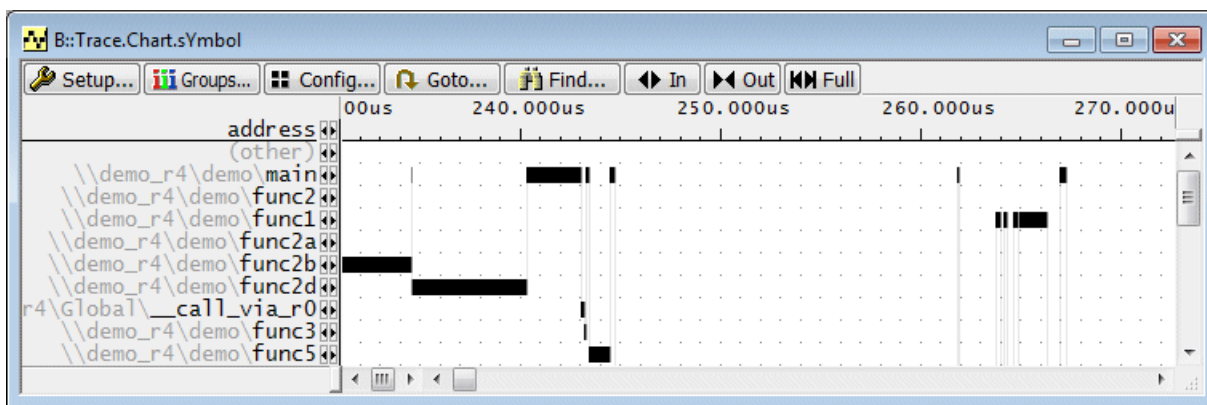


Figure 10. Chart.sYmbol window

## 9 Others

For other i.MX RT platforms, make the following changes.

- **i.MXRT1050 validation board:**

1. Program efuse to change the debugging mode to JTAG.
2. Welding Trace-related resistance, TRACE\_CLK (R140 R592), TRACE0 (R583), TRACE1 (R270), TRACE2 (R294 R547), TRACE3 (R268 R688).

3. Replace the following code in the script:

```

— Data.Set AD:0x401F816C %Long 0x2
— Data.Set AD:0x401F814C %Long 0x3
— Data.Set AD:0x401F8150 %Long 0x3
— Data.Set AD:0x401F8154 %Long 0x3
— Data.Set AD:0x401F8158 %Long 0x3

```

- **i.MXRT1020 validation board:**

1. Program efuse to change the debugging mode to JTAG.
2. Welding Trace related resistance, TRACE\_CLK (R140), TRACE0 (R815).
3. Replace the following code in the script:

```

— ; set PinMux and enable Clocks

```

— Data.Set AD:0x401F80E4 %Long 0x6

— Data.Set AD:0x401F80EC %Long 0x6

---

**NOTE**

For RT1020, it can only enable 1 bit ETM trace due to the SOC limitation.

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