Getting Started Guide

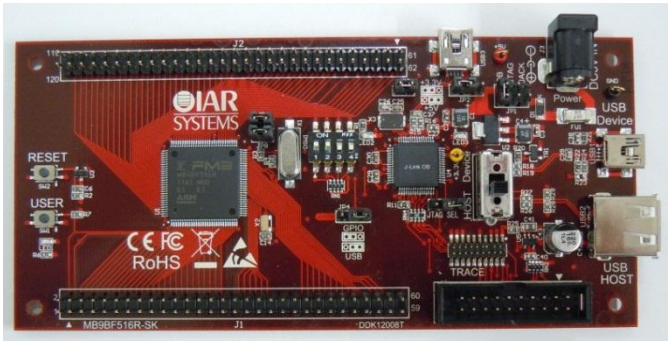
IAR KickStart Kit™ for Fujitsu MB9BF516R

This guide briefly describes how to get started using IAR Embedded Workbench® for ARM with IAR J-Link OB (on-board) debug interface to run an example application on the MB9BF516R-SK target system.

For more detailed information, see the *IAR Embedded Workbench IDE User Guide* and the *C-SPY Debugging Guide,* which are available from the Help menu in the IAR Embedded Workbench IDE and IAR Information Center.

Features of the MB9BF516R-SK evaluation board

- MB9BF516R ARM 32-bit Cortex-M3 device
- J-Link-OB (J-Link for ARM is mounted on the evaluation board controlled via USB)
- Standard 20-pin JTAG connector
- Trace connector
- 3 choices of power supply: JTAG pin 19, Power jack, USB (On-board debugger)
- Power jack
- USB driver and connector (Host, Device)
- Reset button
- User button
- Power LED
- User LED
- Dimensions: 140 x 65 mm
- RoHS compliant



Install IAR Embedded Workbench for ARM

The installation DVD contains all the software and documentation you need to start building and running embedded applications on the MB9BF516R-SK evaluation board. We recommend that you follow the installation instructions on the DVD and use the default directories for installation.

1. Insert the installation DVD. The installation program will start automatically.
2. First choose which board you are working with, and then move on to the **CHOOSE SOFTWARE** page.
3. Select the IAR Embedded Workbench for ARM installation of your choice. We recommend the Kickstart edition which has no time limit.

Figure 1 - Choose software

4. You will be directed to an online Product Registration page to get your license number and key, which will be delivered to you via e-mail within a few minutes. After this you will be able to install the software. Note that it may take several minutes for the installation files to unpack.

Install the J-Link USB driver

Before you can use the J-Link OB over the USB port, the J-Link USB driver must be installed.

1. Connect your computer and the J-Link-OB(USB3) using the USB cable. The Power LED on the evaluation board should be lit.
2. If this is the first time that you are using the J-Link, Windows will start the Install wizard. Choose **Install from a specific location**. If the installation wizard does not start automatically, see note below.
3. When asked to locate the USB drivers, click the browse button and navigate to the `\IAR Systems\Embedded Workbench 6.x Kickstart\arm\drivers\JLink\x86` or `x64` directory, depending on your computer system.
4. Click **Finish**. The J-Link USB driver is now installed.

Note: If the installation wizard does not start automatically, or you get a message that the driver has not been installed properly, please navigate to `\arm\drivers\Jlink\` and start the `InstDrivers` application. This will install the J-Link USB driver and the LED should stay lit steadily.

Set up the evaluation board

After you have installed the software and the J-Link USB drivers, you need set the jumpers, see Table-2. The MB9BF516R-SK evaluation board can be powered from four different sources. You can select the power source by JP1.

- Power jack. Use an external power supply to feed 5V power to the evaluation board.
- JTAG connector. Some debug probes, like IAR J-Link, supply 5V through pin 19.
- USB connector for on-board debugger (J-Link OB).

Run example projects

To take full advantage of the examples, you must have some working knowledge of IAR Embedded Workbench IDE. For a quick introduction, see the **GETTING STARTED** and the **TUTORIALS** in the **IAR Information Center for ARM**, see Figure-2.

1. From the **Start** menu, start IAR Embedded Workbench IDE by choosing **All Programs>IAR Systems>IAR Embedded Workbench for ARM 6.x Kickstart>IAR Embedded Workbench**. You will get straight into the **IAR Information Center for ARM**.
2. Click **EXAMPLE PROJECTS**.

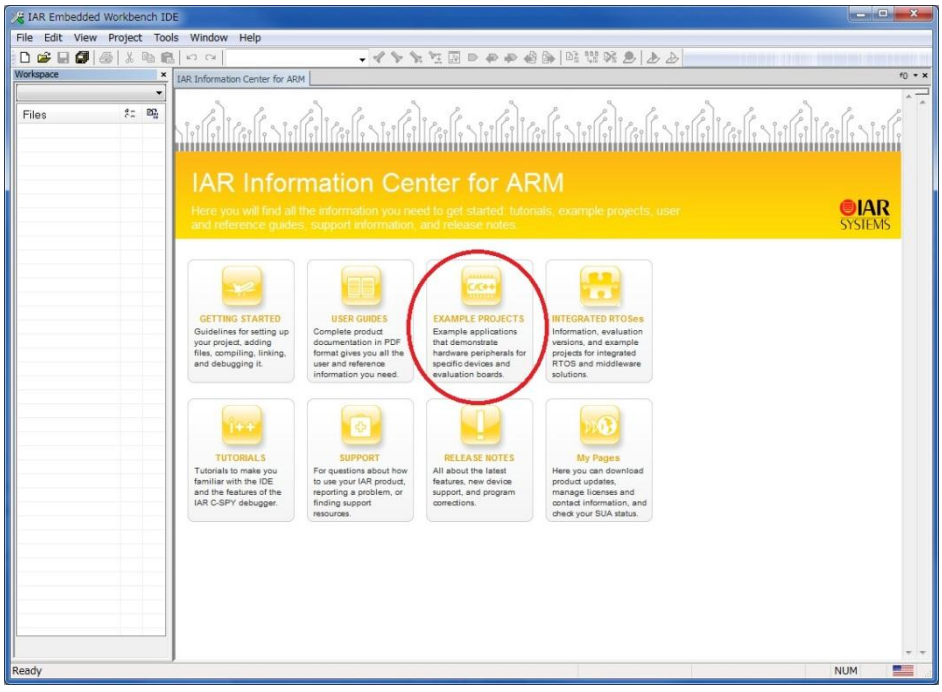


Figure 2 - IAR Information Center for ARM

3. Select **Fujitsu>MB9BF51X> IAR MB9BF516R-SK** evaluation board.
4. Open an example project; for example, `Blinking LED` (click the icon).
5. Choose a destination folder to save a copy of this project for testing, so that the original project will not be updated for any changes you made during testing.
6. Follow the instructions in the `Example description` to configure the board, and choose your build configuration, for example **RAM Debug**.

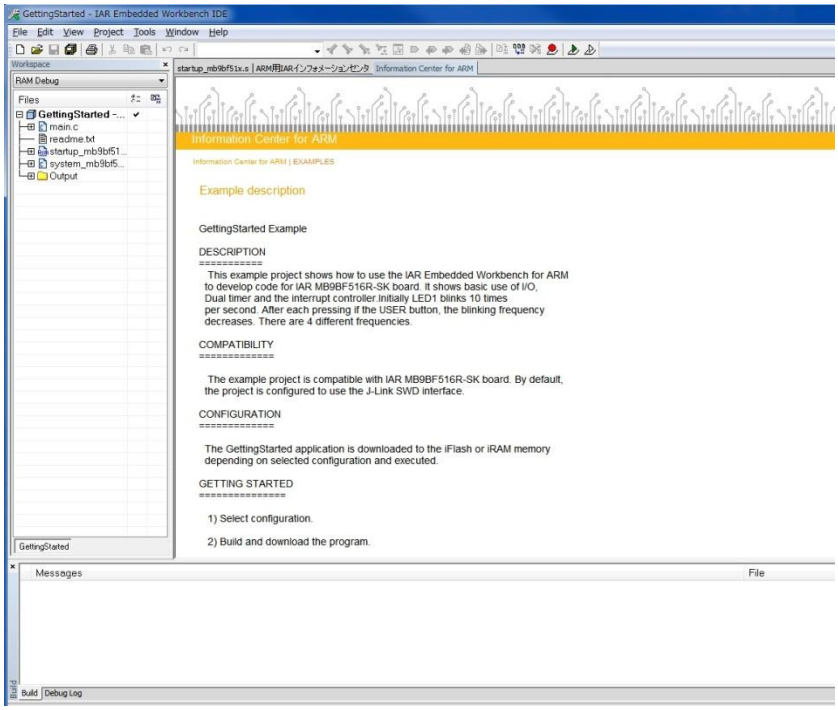


Figure 3 - Example description and Build configuration

7 Choose **Project>Make** or click the button on the toolbar. The project should compile with no errors or warnings.

8 To download your program, choose **Project>Download and Debug** or click the button.

9 The file `main.c` is now open in the editor window. Choose **Debug>Go** or click the button to start the application.

10 To stop C-SPY, choose **Debug>Break** or click the button.

11 To exit C-SPY, choose **Debug>Stop Debugging** or click the button.

12 Now you can try other example projects included, just click **Help>Information Center** to bring up the **IAR Information Center** again.

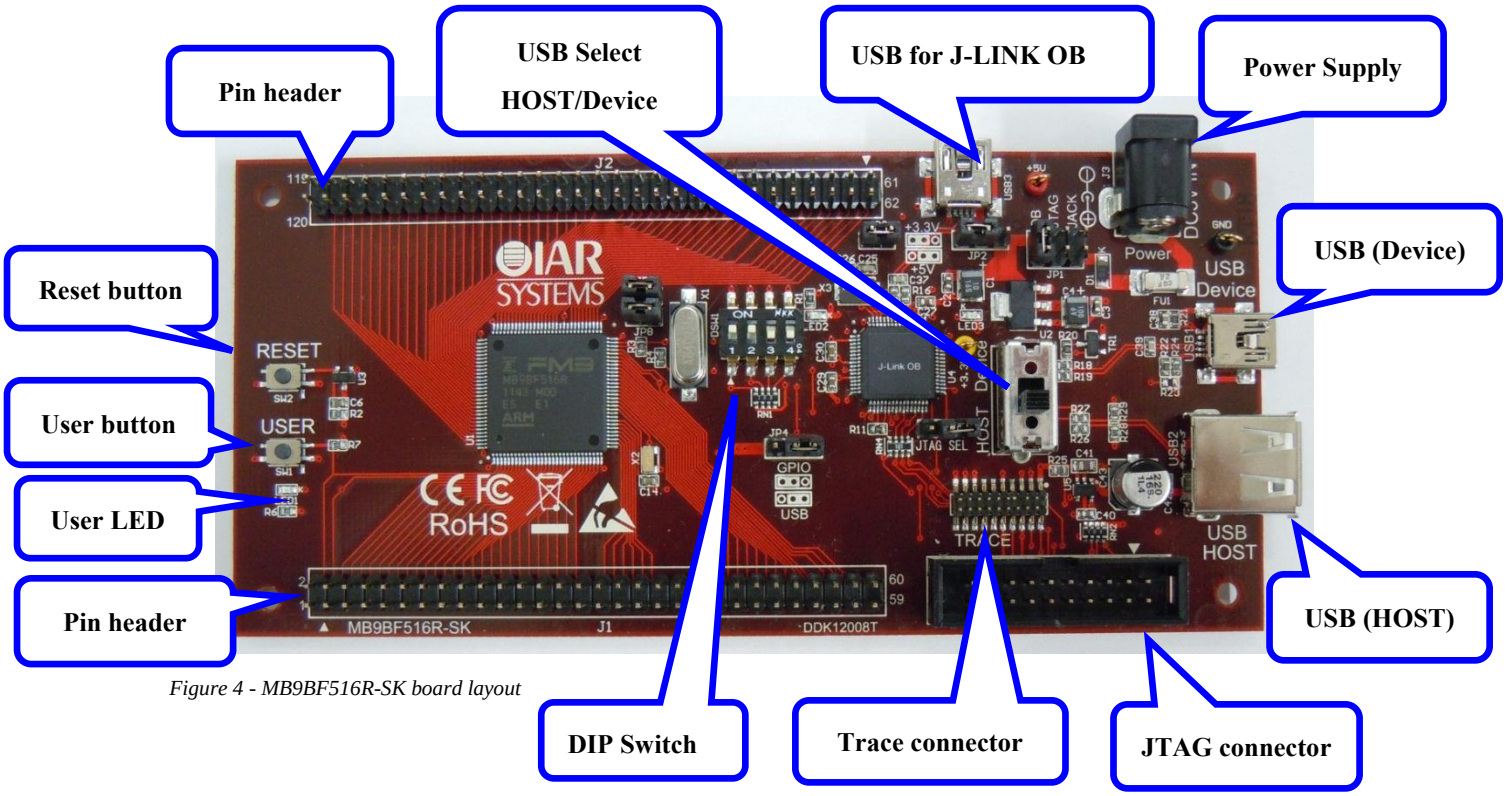


Figure 4 - MB9BF516R-SK board layout

Connector description

Connector	PCB	Description
JTAG	JTAG	JTAG connector
TRACE	TRACE	TRACE connector
USB1	USB Device	USB Device connector
USB2	USB HOST	USB HOST connector
USB3	USB	USB connector for on-board debugger
J1	J1	Pin header (MCU external pin)
J2	J2	Pin header (MCU external pin)
J3	J3	Power Supply 5V DC

Table 1 - Connector description

Switches description

Switches	Description
DSW1	1: MD0 of MB9BF516R SW-ON: L, SW-OFF: H 2: MD1 of MB9BF516R SW-ON: L, SW-OFF: H 3: P21 of MB9BF516R SW-ON: L, SW-OFF: H 4: P22 of MB9BF516R SW-ON: L, SW-OFF: H
USB Select	Host / Device
RESET(SW1)	Reset button
USER(SW2)	User button

Table 2 - Switches description

Jumper descriptions

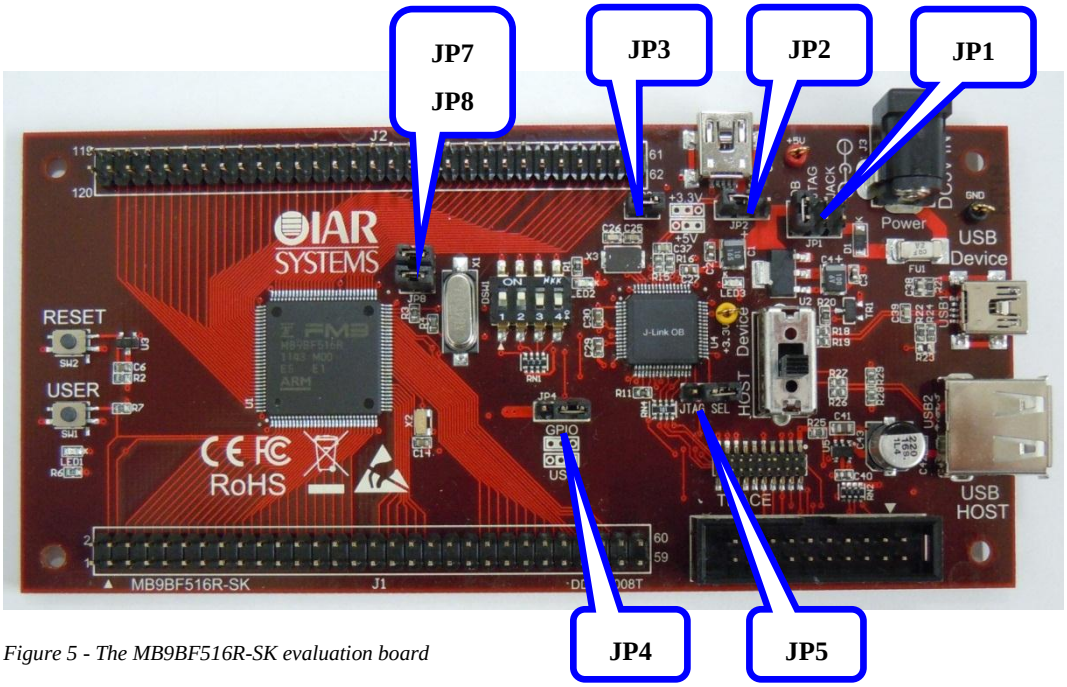


Figure 5 - The MB9BF516R-SK evaluation board

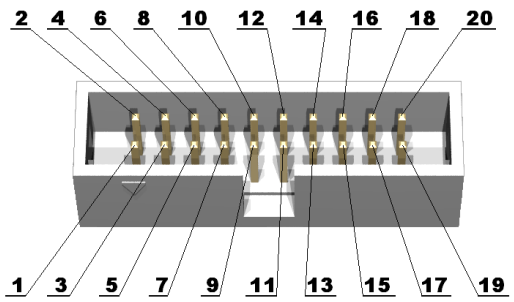
Jumper description

Jumper	PCB	Description
JP1	OB JTAG JACK	USB 5V power supply JTAG 5V power supply (pin 19) Power jack 5V power supply
JP2		MCUVCC 3.3V/5V 1-2: +3.3V 2-3: +5V
JP3		Enabel Power supply for MCU ON (close) / OFF (open)
JP4	GPIO USB	1-2: use P81/UDP0 and P80/UDM0 pin as GPIO (P81, P80) 2-3: use P81/UDP0 and P80/UDM0 pin as USB (UDP0, UDM0)
JP5	JTAG SEL	Select ICE (debugger) External JTAG ICE (close) / On-board debugger (open)
JP7		Connect P21 of MB9BF516R to DIP-SW (DSW1-3).
JP8		Connect P22 of MB9BF516R to DIP-SW (DSW1-4).

Table 3 - Jumper description

JTAG

The JTAG connector allows the software debugger to communicate via a JTAG (Joint Test Action Group) port directly with the core. Instructions can be inserted and executed by the core thus allowing MB9BF516R memory to be programmed with code and executed step by step by the host software. For more details, refer to the IEEE Standard 1149.1 - 1990 Standard Test Access Port and Boundary Scan Architecture and MB9BF516R datasheets and its user manual.



Pin #	Signal name	Signal type	Description
1	VTreF		Target reference voltage – Connected to +3.3V/+5V.
2	VCC		Power supply – Computex ICE provide power through this pin
3	nTRST	Input	JTAG reset – The TRST pin can be used to reset the test logic within the Embedded ICE logic
4	NC		
5	TDI	Input	Test Data In – This is the serial data input for the shift register.
6	NC		
7	TMS	Input	Test Mode Select – The TMS pin selects the next state in the TAP state machine.
8	NC		
9	TCK	Input	Test Clock – This allows shifting of the data input, on the TMS and TDI pins. It is a positive edge triggered clock with the TMS and TCK signals that define the internal state of the device.
10	GND		
11	RTCK		Return test clock signal – Some targets must synchronize the JTAG inputs to internal clocks. To assist in meeting this requirement, you can use a returned, and retimed, TCK to dynamically control the TCK rate. J-Link supports adaptive clocking, which waits for TCK changes to be echoed correctly before making further changes. Connect to RTCK if available, otherwise to GND
12	GND		
13	TDO	Output	Test Data Output – This is the serial data output from the shift register. Data is shifted out of the device on the negative edge of the TCK signal
14	GND		
15	nRST		Target CPU reset signal. Typically connected to the RESET pin of the target CPU, which is typically called nRST, nRESET or RESET.
16	GND		
17	NC		
18	GND		
19	VCC		Power supply - J-Link or some other ICE provide power through this pin.
20	GND		

Table 4 - JTAG signals and descriptions

Trace connector

Pin #	Signal name	Signal type	Description
1	VTreF	Output	Target reference voltage - Connected to +3.3V/+5V.
2	SWDIO/TMS	I/O / Input	Serial wire date input / output / JTAG mode set - Connected to SWDIO/TMS of MB9BF516R.
4	SWCLK/TCK	Input	Serial wire clock / JTAG clock - Connected to SWCLK/TCK of MB9BF516R.
6	SWO/TDO	Output	Serial Wire Output trace port / Test data out - Connected to SWO/TDO of MB9BF516R
8	TDI	Input	JTAG data input - Connected to TDI of MB9BF516R.
10	nRESET	Input	JTAG reset - Connected to RESET of MB9BF516R.
12	TRACECLK	Output	Trace clock - Connected to TRACECLK of MB9BF516R
14	TRACEDATA[0]	Output	Trace data pin 0 - Connected to TRACE0 of MB9BF516R
16	TRACEDATA[1]	Output	Trace data pin 1 - Connected to TRACE0 of MB9BF516R
18	TRACEDATA[2]	Output	Trace data pin 2 - Connected to TRACE0 of MB9BF516R
20	TRACEDATA[3]	Output	Trace data pin 3 - Connected to TRACE0 of MB9BF516R
7,11,13,	NC		
3,5,9,15,17,19	GND		

Table 5 - Trace signals and descriptions

USB Connector (USB1:USB-Device)

Pin #	Signal name	Signal type	Deccription
1	VBUS	Input	Connected to P60-pin of MB9BF516R
2	USB1_N	Input/Output	USB Data-
3	USB1_P	Input/Output	USB Data+
4	NC		
5	GND		GND
6	SHIELD		

Table 6 - USB signals

USB Connector (USB2:USB-HOST)

Pin #	Singnal name	Signal type	Description
1	VBUS	Output	USB +5V
2	USB2_N	Input/Output	USB Data-
3	USB2_P	Input/Output	USB Data+
4	GND		GND
5	SHLD1		
6	SHLD2		

Table 7 - USB signals

USB Connector for On-board Debugger (USB3)

Pin #	Signal name	Signal type	Deccription
1	VBUS	Input	+5V Input
2	USB3_N	Input/Output	USB Data-
3	USB3_P	Input/Output	USB Data+
4	NC		
5	GND		GND
6	SHIELD		

Table 8 - USB signals for On-board debugger

MCU External pin 1（J1：Pin header）

Pin #	Signal name	Pin #	Signal name
1	MCUVCC	31	MCUVCC
2	P50	32	P40
3	P51	33	P41
4	nUFLG	34	P42
5	P53	35	P43
6	P54	36	P44
7	P55	37	P45
8	P56	38	NC
9	P57	39	NC
10	P58	40	NC
11	P59	41	NC
12	P5A	42	NC
13	P5B	43	nRES
14	P30	44	P48
15	P31	45	P49
16	P32	46	P4A
17	P33	47	P4B
18	P34	48	P4C
19	P35	49	P4D
20	P36	50	P4E
21	P37	51	P70
22	P38	52	P71
23	P39	53	P72
24	P3A	54	P73
25	P3B	55	P74
26	P3C	56	MD1
27	P3D	57	MD0
28	P3E	58	NC
29	P3F	59	NC
30	GND	60	GND

Table 9 - Signal description

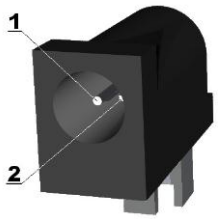
MCU External Pin 2（J2：Pin header）

Pin #	Signal name	Pin #	Signal name
61	MCUVCC	91	MCUVCC
62	P10	92	TRST
63	P11	93	TCK
64	P12	94	TDI
65	P13	95	TMS
66	P14	96	TDO
67	P15	97	TRACE0
68	P16	98	TRACE1
69	P17	99	TRACE2
70	AVCC	100	TRACE3
71	AVRH	101	TRACECLK
72	AGND	102	P0A
73	P18	103	P0B
74	P19	104	P0C
75	P1A	105	P0D
76	P1B	106	P0E
77	P1C	107	P0F
78	P1D	108	P68
79	P1E	109	P67
80	P1F	110	P66
81	P28	111	P65
82	P27	112	P64
83	P26	113	P63
84	P25	114	nUBPON
85	P24	115	P61
86	P23	116	P60
87	P22	117	USBVCC0
88	P21	118	UDM0
89	P20	119	UDP0
90	GND	120	GND

Table 10 - Signal description

Power jack (J3)

There is a standard 2.1 mm power jack mounted on the board. The power input should be DC +5V.



Pin #	Signal name	Description
1	Power input	+5V
2	GND	GND

Table 11 - Power jack signals and descriptions

Creating a new application

You can create new application as following procedures without an example application.

1 Select **Project > Create new project**

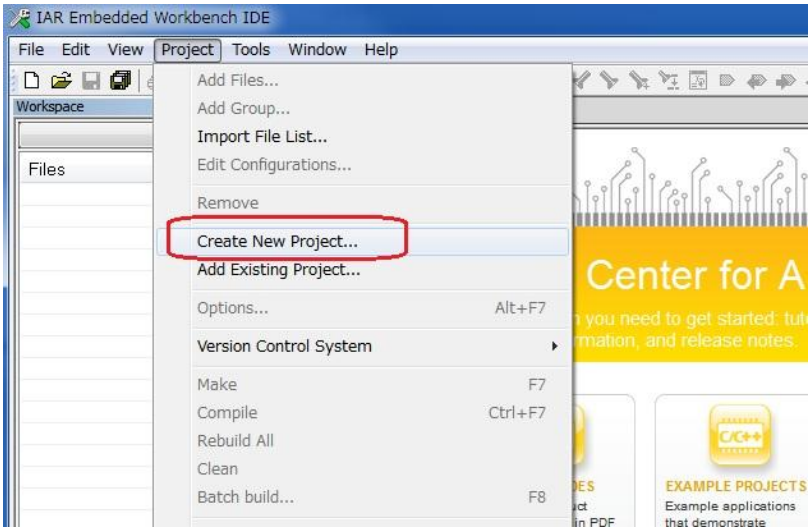


Figure 6 - Create a new project

2 Click on the + mark on the left side of **C** in the project template

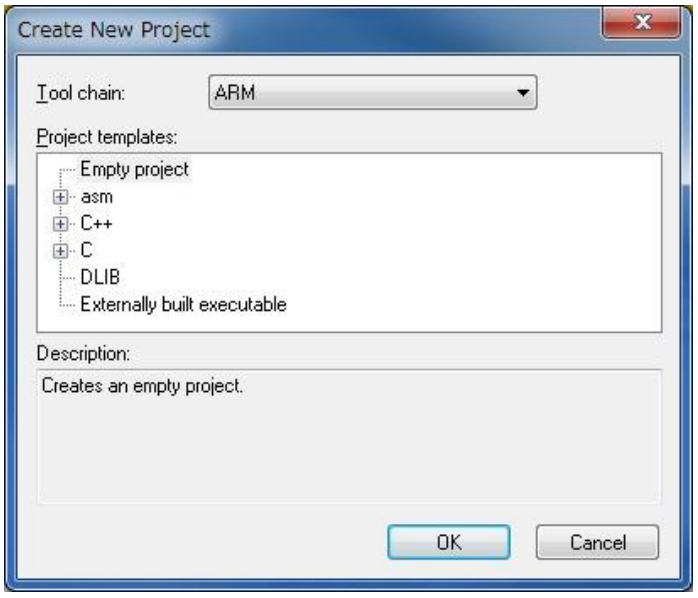


Figure 7 - Select Create a C project

3 Select `main` and click **OK**.

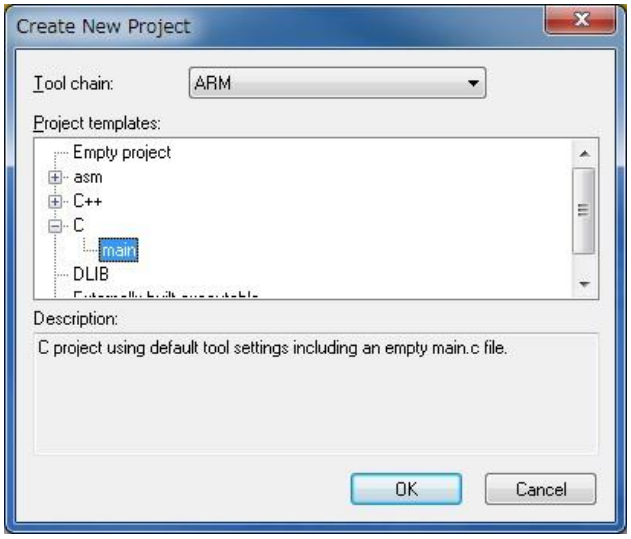


Figure 8 - Create a C project

Designate a folder where this project is stored and click **Save**. In this example a project named `NewProject` is created.

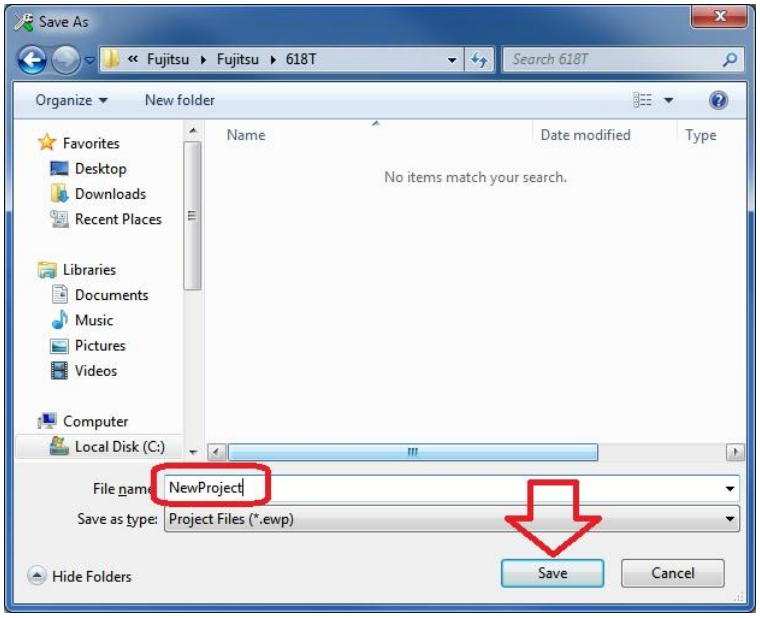


Figure 9 - save your new project

4 The new project has been created.

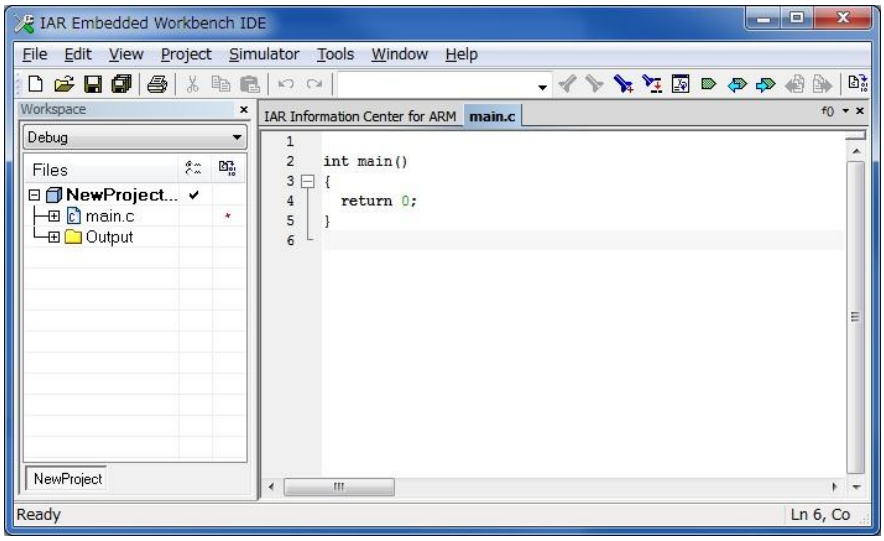


Figure 10 - The new project have been created

5 Edit the main program

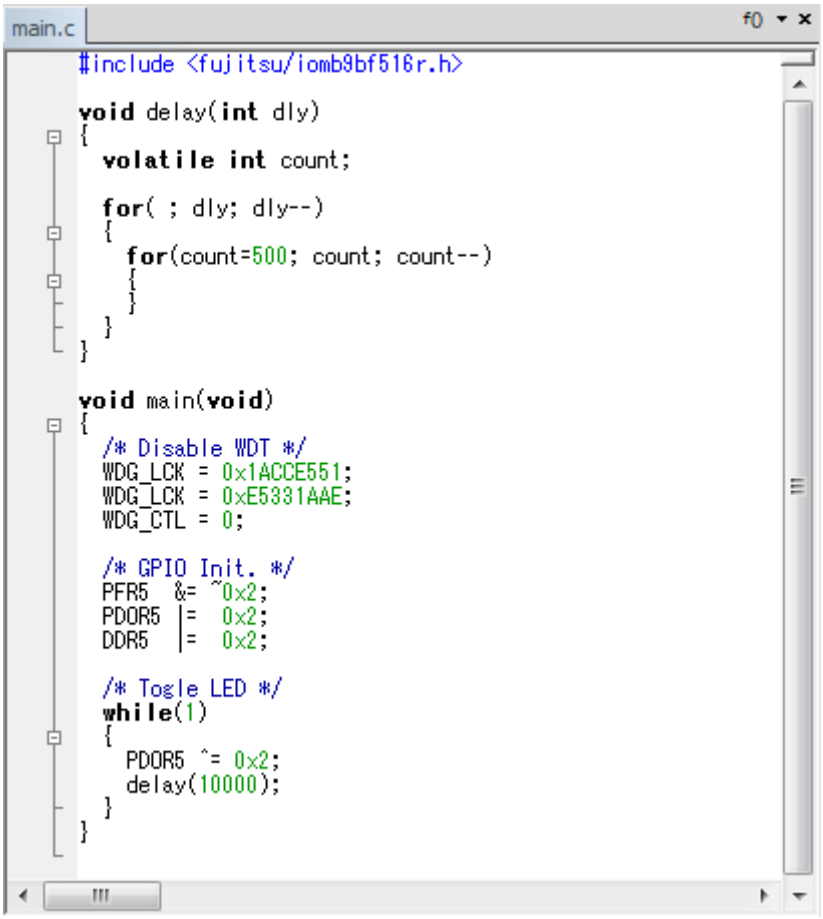


Figure 11 - Edit the main program

6 Select **File > Save Workspace**

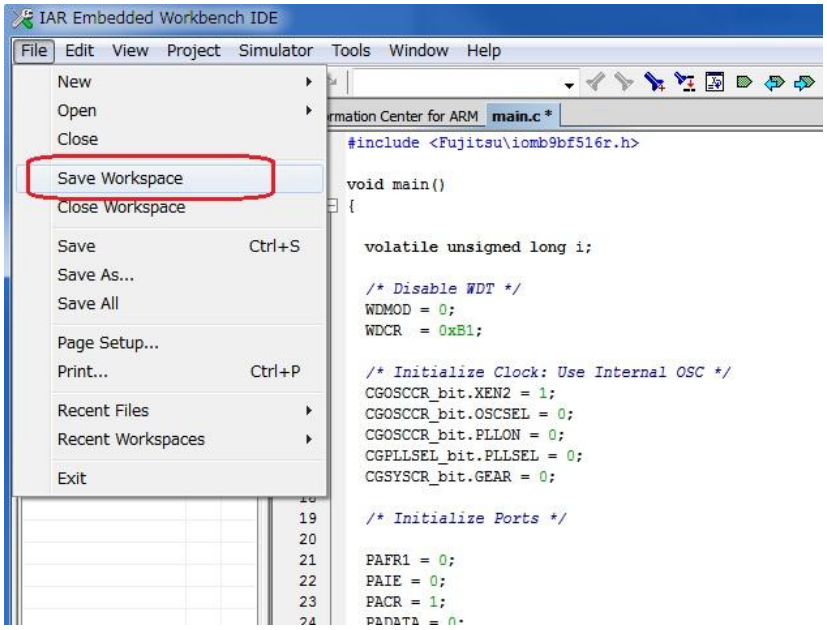


Figure 12 - Save Workspace

7 The **Save Workspace As…** screen is shown. Enter the name of your project, in our case `NewProject`**,** which name is same as the name of the project. Click **Save**.

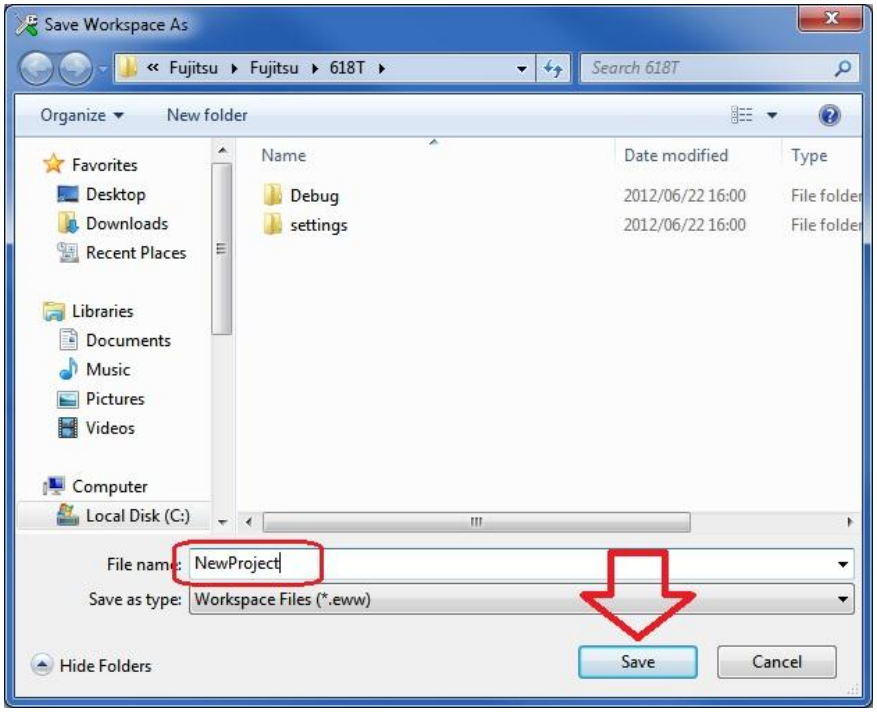


Figure 13 - Save Workspace As...

8 Click **Project** > **Option** to select the correct options for your project

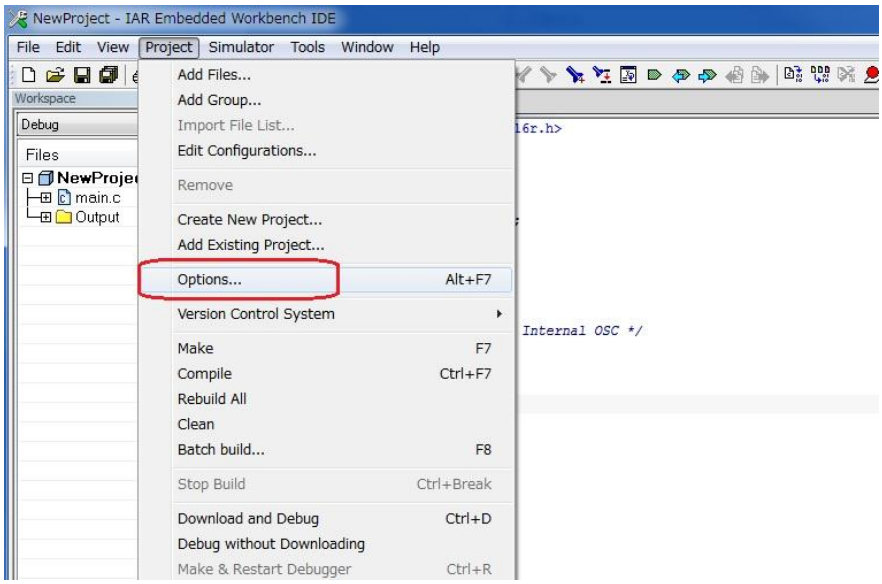


Figure 14 - Setting the project options

9 Select a device in **General Option** and the **Target** tab, click 

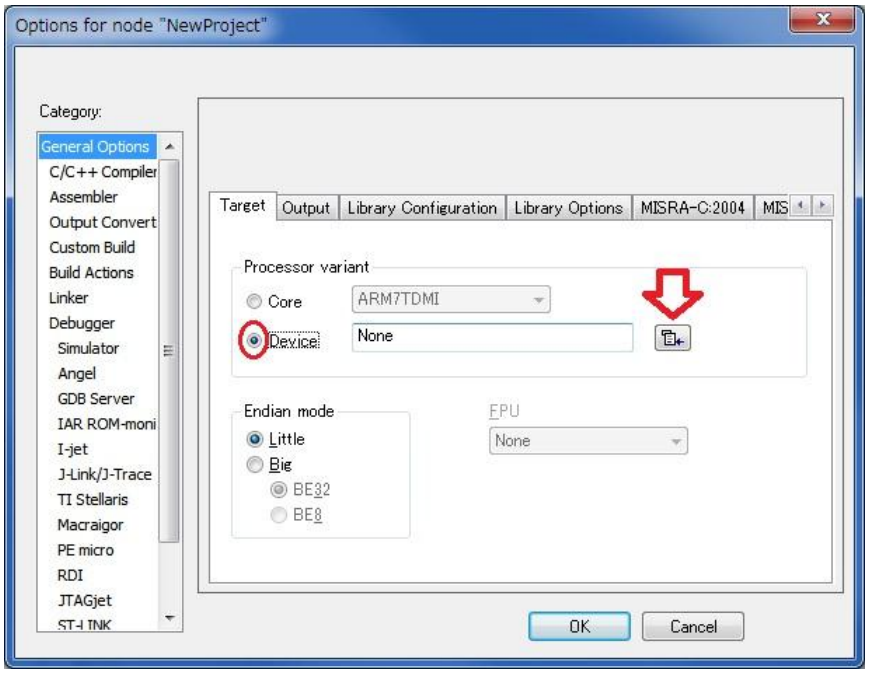


Figure 15 - Select a device

10 Select **Fujitsu MB9BF516R**

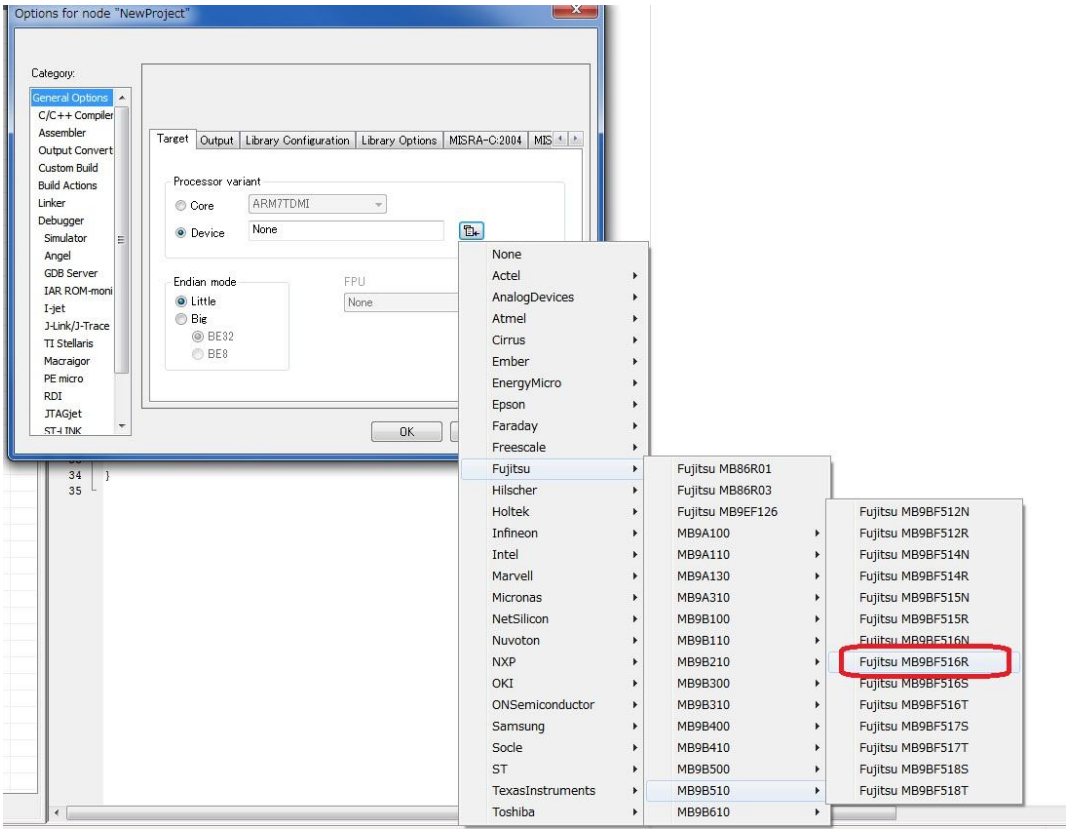


Figure 16 - Select your device

11 Confirm that **Fujitsu MB9BF516R** is selected.

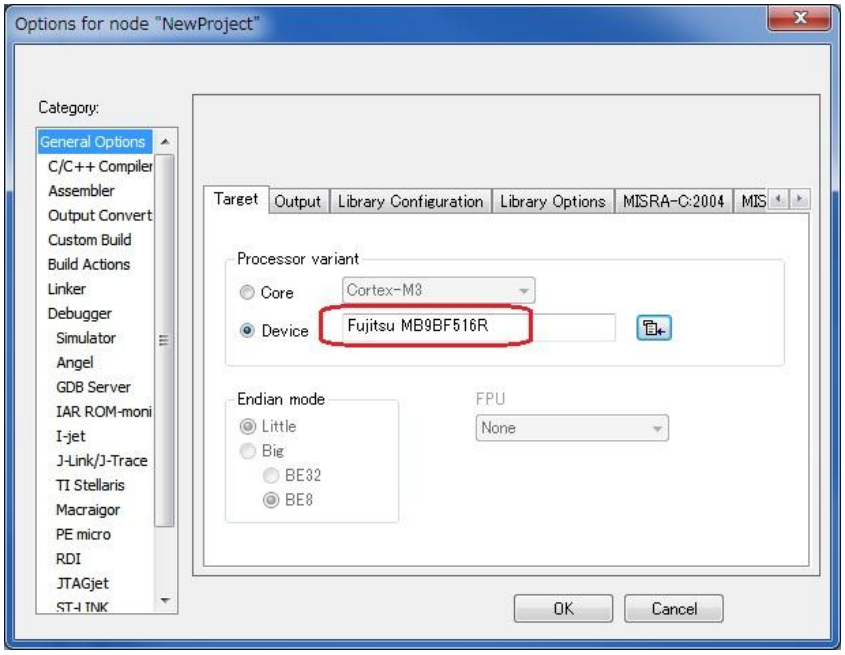


Figure 17 - Confirm your device

12 Select and set the linker configuration file (`.icf` file). Change to **Category: Linker.**

13 If you select the default `.icf` file for your device, open the **Config** tab and check the **Override default** option.

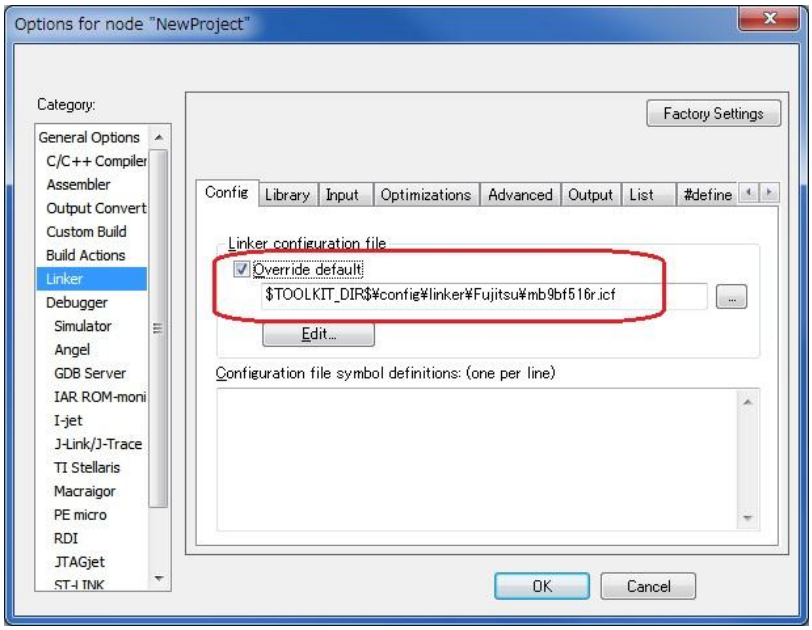


Figure 18 - Confirm your device

14 If you select your original setting, make a copy of the template linker command file from `\IAR Systems\Embedded Workbench 6.x Kickstart\arm\config\generic_cortex.icf` to your stored folder and rename it as `MB9BF516R.icf`**.**

Or, make a copy of the template linker command file from `\IAR Systems\Embedded Workbench 6.x Kickstart\arm\config\linker\Fujitsu\mb9bf516r.icf` to your stored folder and rename it as `MB9BF516R.icf`.

15 Change to **Category: Linker**, open the **Config** tab and check the **Override default** option.

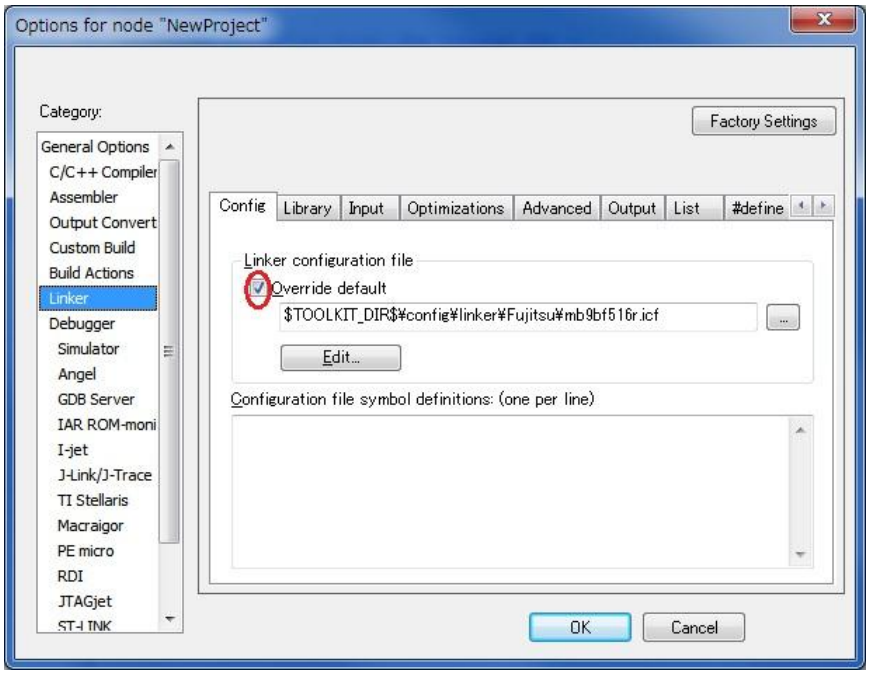


Figure 19 - Setting the Linger configuration file

16 Write `$PROJ_DIR$` in the **override default** text box, and click ... . `$PROJ_DIR$` mean that it is found in the project folder.

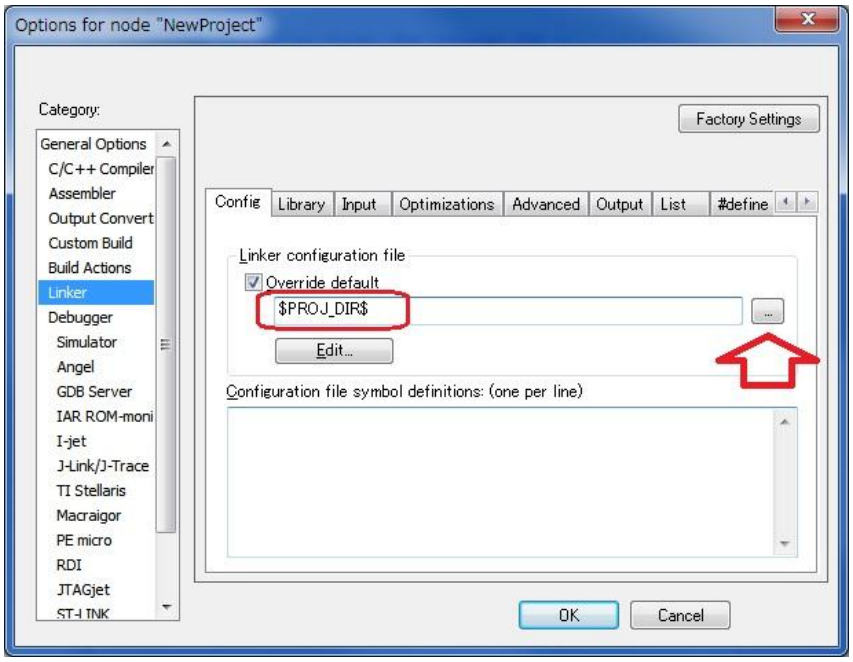


Figure 20 - Use the linker in the project folder

17 Select `MB9BF516R.icf` which you earlier created and click **Open**.

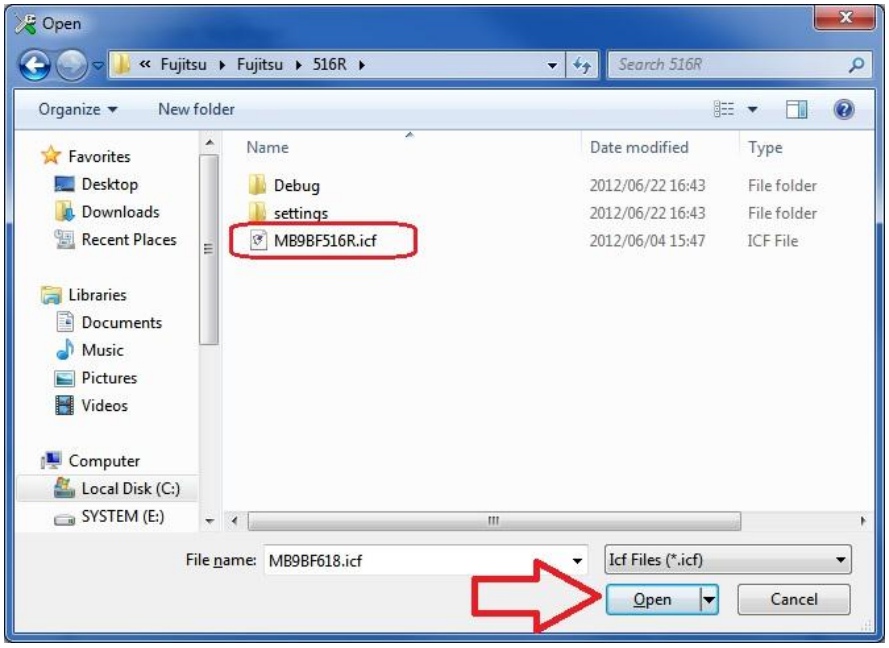


Figure 21 - Select the linker file in your project folder

18 Click **Edit** to edit the linker configuration.

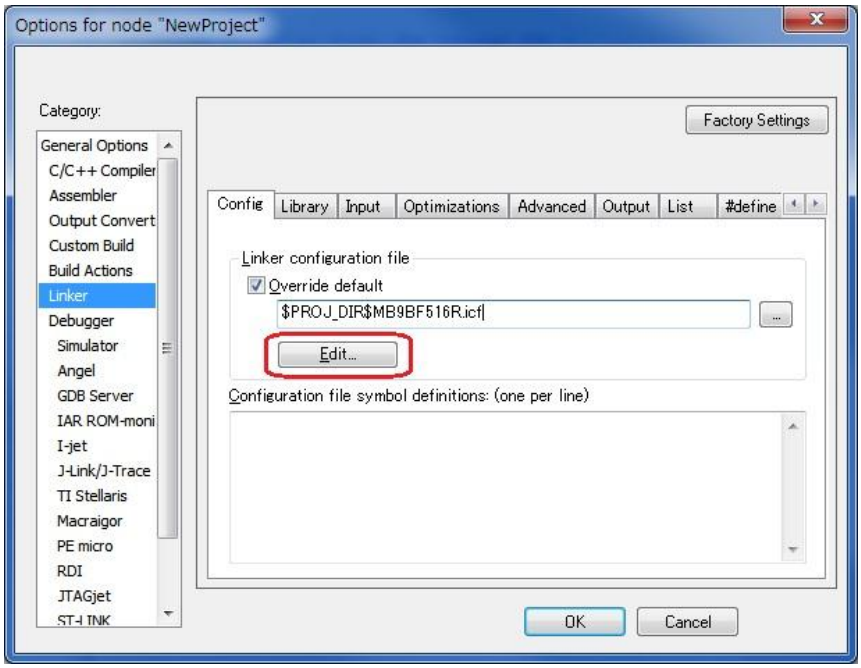


Figure 22 - Edit the linker file

19 The **Linker configuration file editor** is shown and you should enter the following:

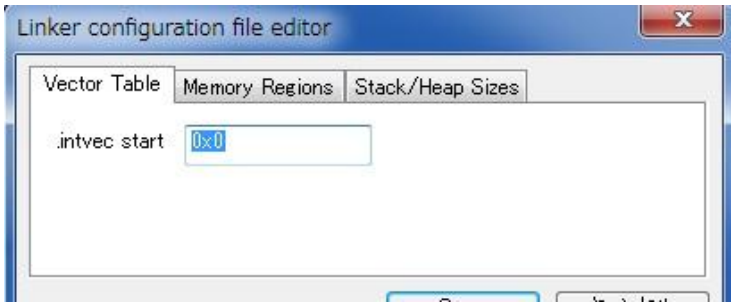


Figure 23 - Setting the Vector Table

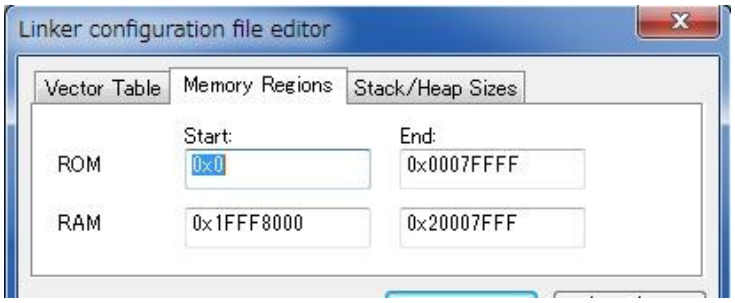


Figure 24 - Setting the ROM/RAM address

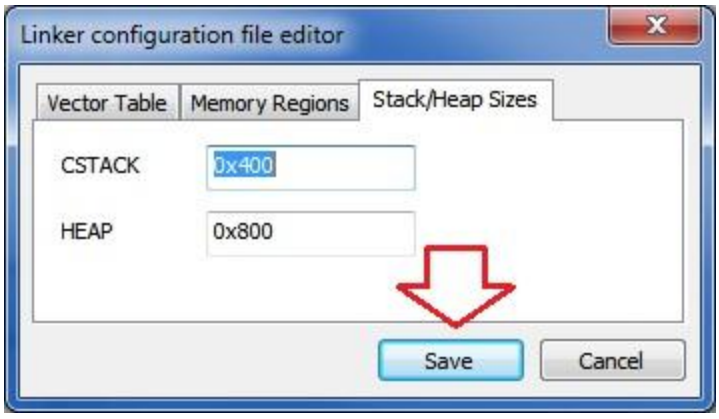


Figure 25 - Setting the Stack/Heap sizes

After you are done with the linker configuration file editor, click on **Save**.

20 It is now time to build the project by clicking on the **Build** button.

Figure 26 - Build your project

21 After correcting possible errors in your code it is time to define your debugger as J-Link. Open **Project > Option> Category: Debugger,** open the **Setup** tab and change the driver to **J-Link/J-Trace.**

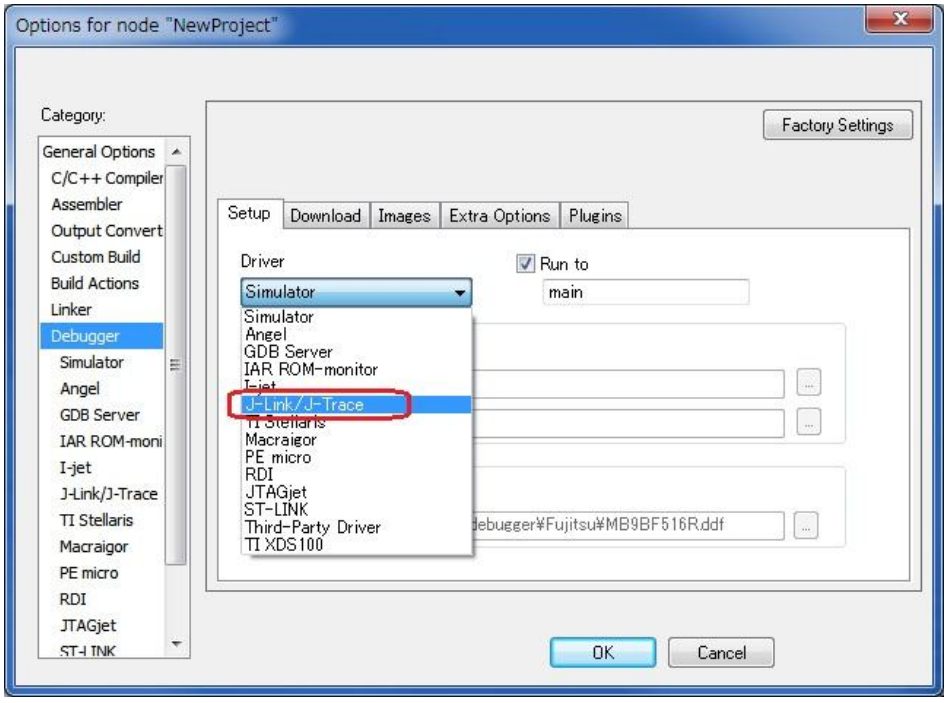


Figure 27 - Setting the debugger option

22 Open the **Download** tab and check **Verify download** (red circle), then check the **Use flash loader(s)** (blue circle)**,** because this example uses flash area.

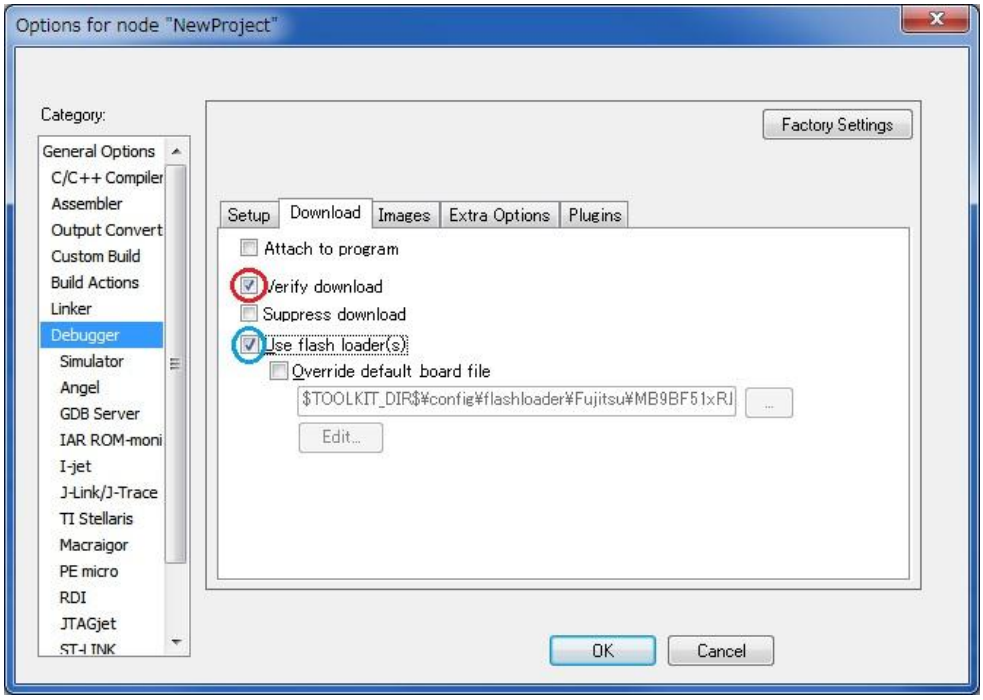


Figure 28 - Debugger download settings

23 Open **Category: J-Link/J-Trace** and the **Connection** tab. Select **SWD** in the **Interface** option.

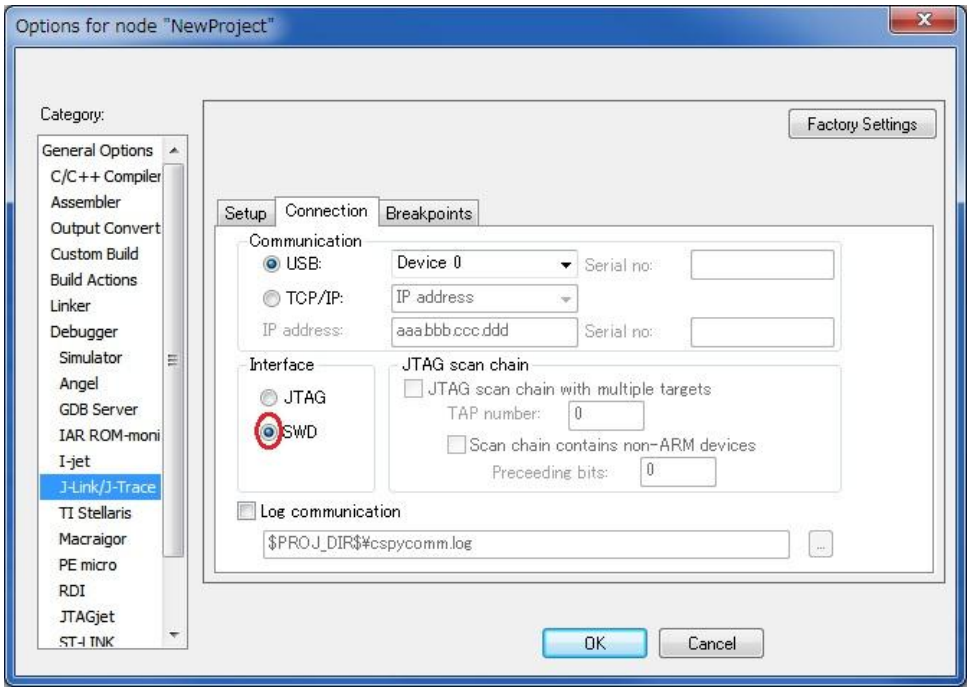


Figure 29 - Setting the debug interface

24 Open the **Setup** tab and set the SWD speed. Click **OK**.

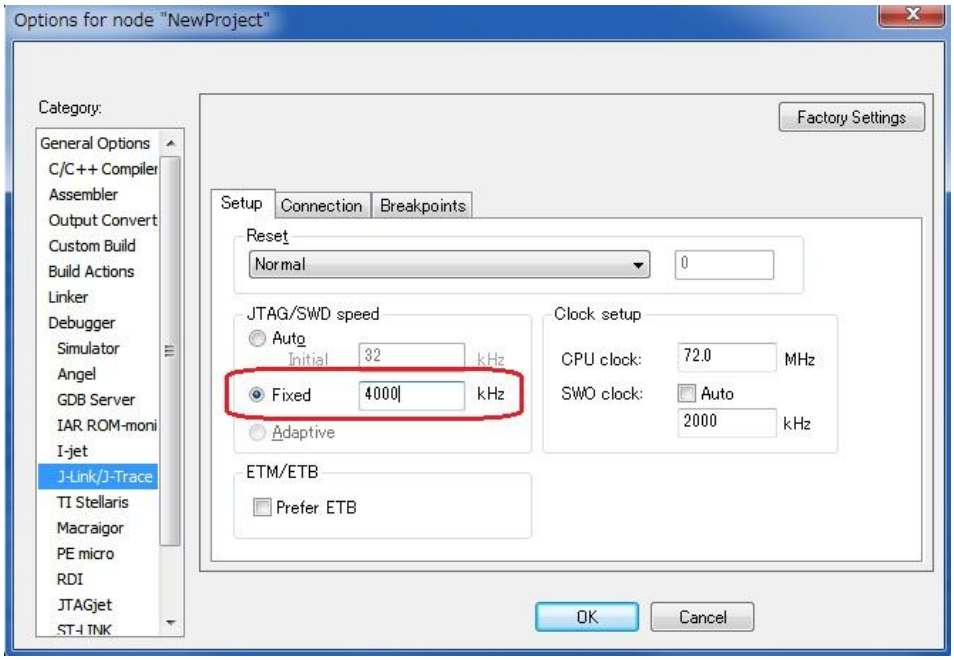


Figure 30 - Setting the debug speed

25 The project options have now been set and you can start C-SPY and debug your program.

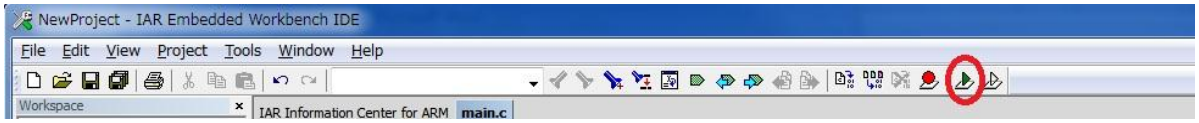


Figure 31 - Start debugging

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Troubleshooting

If you are unable to find the cause of a problem, try resetting the evaluation board by using the reset button on the board. Then restart the C-SPY Debugger in the IAR Embedded Workbench IDE. You can also try disconnecting and reconnecting the power to the evaluation board, pressing the reset button and then restarting C-SPY.

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