Quick-start Guide **RL78/F14 RDK**





SimuQuest





Thank you for your interest in the Renesas Demonstration Kit for the RL78/F14 MCU, Version 1.0.

- Before you get started, please first familiarize yourself with this document. You can also view and print an electronic copy from the following link: http://am.renesas.com/products/mpumcu/rl78/rl78f1x/index.jsp
- This document will guide you through all the necessary steps to unlock the full potential of the RDK.



Introduction

The Renesas RL78/F14 RDK offers a quick and easy way to demonstrate, evaluate, and develop embedded applications based on the RL78/F14 MCU. This full-featured kit has an on-board USB debugging interface, LIN & CAN interface, 512kbit EEPROM with I2C interface, LCD display, and full I/O. Extensive software support is available from Renesas in-house and third-parties.

This Quick-start Guide demonstrates how to use the IAR Embedded Workbench for Renesas RL78 from IAR Systems and QuantiPhi Renesas Edition, developed by SimuQuest, to create a simple application in minutes.

This RDK also supports a motor control extension board, allowing users to quickly develop advanced motor control applications configured in QuantiPhi Renesas Edition and a powerful new configuration and driver generation tool developed by SimuQuest.

Toolchain Installation

*NOTE: You need an internet connection in order to download and register the software tools needed to run the RDK.

We recommend you select the default installation options, unless you already have the same versions of the software installed or you are an advanced user. Please be aware that the full installation may take up to one hour, depending on the performance of your PC.

- 1. Please visit http://am.renesas.com/products/mpumcu/rl78/rl78f1x/index.jsp
- 2. On the right side of the webpage, find the icon of RL78/F14 RDK and click on it. A registration page will open. Please fill it to register your RDK.
- 3. Once you have completed the RDK registration, the software toolchain download page will open. The following step will require two software tools to use the RDK. They are IAR Embedded Workbench for Renesas RL78 and QuantiPhi Renesas Edition.
- 4. Click on the icon of IAR Systems; the download page for IAR Embedded Workbench for Renesas RL78 will open.
- 5. Follow the instructions to download and install IAR Embedded Workbench for Renesas RL78. Registration may be required to get the license to unlock the software. During the installation of IAR, you will be prompted to choose between a size-limited or time-limited license. The size-limited license will never expire, but the size of your projects cannot exceed 16KB. The time-limited license has no size or other restrictions, but it will expire after 30 days.
- 6. Click on the QuantiPhi Renesas Edition icon and the download page will open. User registration is required before activating the download.
- 7. Follow the instructions to download and install QuantiPhi Renesas Edition.



Build Your First Application

Once the software toolchain installation has finished, you are ready to build your first application for the RL78/F14 RDK.

I. Using QuantiPhi

1. Start menu – Open QuantiPhiRE RL78

Open QuantiPhi from the Start menu.



2. QuantiPhi – New Project (1)

Create a new project.



3. QuantiPhi – New Project (2)

Choose the RDK option.





4. QuantiPhi – New Project (3)

Name the project; then click finish. Use the default project directory, which will not match the one pictured.

teps N	Name and Location
Choose Project Name and Location	Project Name: QphiCANdemo Project Location: C: (Projecta/QuantPhi Browse
	Project Folder: C:\"Projects\QuantiPhi\QphiCANdemo
	Please provide the name for the project (Project Name) and the location where the folder can be created (Project Location). This interface will show you the resulting name of the projects folder (Project Folder), You can use the Browse button to select the location or just paste text into the Project Location. After clicking Finish, you are ready to configure the RDK board. You will open the project tree by double-clicking the project name. And then double-click the Renewsas Demonstration KIt (RDK) item to configure your project for the RDK.
1711	

5. QuantiPhi - RDK

Double-click on Renesas Demonstration Kit (RDK).



6. QuantiPhi - RDK Apply

Apply the schematic.

Renesas Demonstration Kit (RDK)	Vari
Apply Settings	_
This Apply button can be used to update you be used to modify the nin settions in your Out	



7. QuantiPhi - Compiler

Under Code Generation, choose "IAR RL78" as the compiler.

Standby Code Generation Gode Generatio	Include the groject path in the comment at the Generate a project.xml file with the generated of Include the date and time in project.xml Select Compiler Select Compiler LAR.RL78 Compiler Location: LAR.RL78 (6.0) @ C: ¹
	Q. Search for Compiler Insta Preprocessor Defines

8. QuantiPhi - Generate Code

Generate the code.



9. QuantiPhi - Note Directory

Note the generated code directory (at the top of the code generation log). Yours will differ from the one pictured.

05/12/2014	03: 0:021	Code Generation Initiated 5/12/14 3:20 PM
05/12/2014	03:20:021	Generation directory: C:\Toojaata\QuantiPhi\OphiCANdemo\quantiphi_output
05/12/2014	03:20:03]	Generating qp_pre.h [ok]
05/12/2014	03:20:03]	Generating gp_compiler.h [ok]
05/12/2014	03:20:03]	Generating gp_device.h [ok]
05/12/2014	03:20:03]	Generating qp_global_config.h (ok)
05/12/2014	03:20:03]	Generating qp_standard_include.h [ok]
05/12/2014	03:20:03]	Generating qp.c [ok]
05/12/2014	03:20:03]	Generating qp.h [ok]
05/12/2014	03:20:03]	Generating qp_mcu_stdlib.c [ok]
05/12/2014	03:20:03]	Generating qp_mcu_stdlib.h [ok]
05/12/2014	03:20:04]	Generating qp_can_api.c [ok]
	05/12/2014 05/12/2014 05/12/2014 05/12/2014 05/12/2014 05/12/2014 05/12/2014 05/12/2014 05/12/2014	05/12/2014 03:20:02] 05/12/2014 03:20:03] 05/12/2014 03:20:03] 05/12/2014 03:20:03] 05/12/2014 03:20:03] 05/12/2014 03:20:03] 05/12/2014 03:20:03] 05/12/2014 03:20:03] 05/12/2014 03:20:03]

II. Using the RDK board

1. Connect the USB cable to the RDK.

CN9 is a female mini-USB connector on the RDK. It can be used as a debug interface and/or power supply to the board, if the board will be powered by USB close jumper J14. In either case, connect a mini-USB cable to CN9.



2. Connect power to the RL78 RDK (if power will not be supplied by USB).

If the board will not be powered via USB, remove jumper J14. Connect a banana cable between CN8, the black banana jack on the RDK, and the power supply ground. Connect a banana cable between a 12V power supply and CN6, the red 12V (outermost) banana jack on the RDK board.

3. Plug in power

If the RDK is not powered from the USB connection, the red 'BAT' LED will illuminate next to the red banana jack on the RDK board when the power supply is turned on.

III. Using IAR

1. Start menu - Open IAR

Open IAR for RL78 from Start menu.

X	IAR Embedded Workbench	•
1	Renesas Flash Programmer V2.03	

2. IAR - New Project

Create a new project.

ile Edit View	Project Tools Window Help	
🗅 🚅 🖬 🕼	Add Files	
/orkspace	Add Group	
	Import File List	
Files	Add Project Connection	
	Edit Configurations	
	Remove	
	Create New Project	
	Add Existing Project	

3. Create New Project

Choose an RL78 C project.

reate New Proj	ect		
Tool chain:	RL78	•	
Project templates	ε		
Empty proje	ect		
Asm			
C++			
-C			
E-DLib	uilt executable		
E Kleinally D	uiit executable		
Description:			
Creates a C proj	ect.		
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4. Save As

Save it in the directory one level up from the quantiphi_output directory you noted previously.

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Organize - New folde	r		855	- 0
MC-78F0712- * Micom MICON	Projects library QphiCANdemo		Arrange by: Fo	lder 👻
MICON test	Name		Date modified	Туре
PG-FP5 setup pinkos PJ4_AB-050_p PWM_even_c Qt QuantiPhi GM905 MICON	Quantiphi_output	m	5/12/2014 3:20 PM	File folde
	ANdemo			
File name: Qphi Save as type: Project				
Hide Folders		1	Save	ancel

5. Add Files

Right-click on the project to add files.

Vorkspace Debug	×	IAR Inf	ormation Center for Renesas RL78
Files	2: B2		* * This is a template fi
OphiCANc Main.c	Options		Copyright 2011 IAR S
La 🖸 Output	Make Compile Rebuild All	\$Revision: 205 \$	
	Clean Stop Build		nt main(void) return 0;
	Add		Add Files
	Remove Rename		Add "main.c"



6. Add Files – OphiCANdemo

Add all the .c files in the quantiphi_output directory. (The .h files can be added as well, but are not necessary.)

rganize • New folde	H			811	• 💷
LVI test * MC-78F0712-	Projects library			Arrange by	Folder •
Micom MICON	Name	Date modified	Туре	Size	
MICON test	Joitmap_font.c	5/12/2014 3:20 PM	Notepad++ Docu	6 KB	
BG-FP5 setur	font_8x8.c	5/12/2014 3:20 PM	Notepad++ Docu	66 KB	
pinkos	font_8x16.c	5/12/2014 3:20 PM	Notepad++ Docu	101 KB	
PJ4_AB-050_F	font_helvr10.c	5/12/2014 3:20 PM	Notepad++ Docu	41 KB	
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a Qt	font_winfreesystem14x16.c	5/12/2014 3:20 PM	Notepad++ Docu	44 KB	
🎍 QuantiPhi 🗉	font_x5x7.c	5/12/2014 3:20 PM	Notepad++ Docu	35 KB	
🎍 GM905 🚽	font_x6x13.c	5/12/2014 3:20 PM	Notepad++ Docu	50 KB	
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settings	gp_can_api.c	5/12/2014 3:20 PM	Notepad++ Docu	72 KB	
RDK test co *	an can chk.c	5/12/2014 3:20 PM	Notenad++ Docu	7 KB	
File n	ame: "st7579_lcd.c" "bitmap_font.c" "font	8x8.c" "font 8x16.c" "font hel	n10.c" "font logos. *	Source Files (".c;".c	pp:/.cc*.ht*

7. Project Options

Right-click on the project and choose Options.



8. Select Device

Select the R5F10PMF Options for node "QphiCANdemo" × device from the Target Category: tab under General General Options RL78 core S1 - Unspecified Options. C/C++ Compile Assembler RL78 core S2 - Unspecified Target Output Library Configuration Custom Build RL78 core S3 - Unspecified **Build Actions** RL78 - R5F10PAD RL78 - D1A Linker Debugger . Device RL78 - R5F10PAE RL78 - Dxx . D. E1 E20 RL78 core 1 - Unspecified RL78 - R5F10PBD RL78 - F12 . RL78 - R5F10PBE IECUBE Code model RL78 - F13 . Simulator TK RL78 - R5F10PGD RL78 - F14 . Near . RL78 - R5F10PGE Use far runtime library calls RL78 - Fxx . RL78 - G10 RL78 - R5F10PGF . Data model RL78 - R5F10PGG RL78 - G12 . Near RL78 - R5F10PGH RL78 - G13 . Near constant location Start addre RL78 - R5F10PGJ RI 78 - G14 . Mirror ROM 0 + 0xF1000 RL78 - R5F10PLE RL78 - G1A . RL78 - R5F10PLF RL78 - G1C . RL78 - R5F10PLG RL78 - G1D . RL78 - R5F10PLH RL78 - G1E ٠ RL78 - R5F10PLJ RL78 - Gxx . RL78 - R5F10PME RL78 - 11A . RL78 - R5F10PMF RI 78 - RSEINDANG RL78 - 11B .



9. Add "Include Directory"

Add **\$PROJ_DIR\$\quantiphi_output** to the include directories on the Preprocessor tab of the C/C++ Compiler category (type it manually in the text box).

Category: General Options C/C++ Compiler Assembler	Multi-file Compilation Discard Unused Publics
Custom Build	Language 2 Optimizations Output List Preprocessor Diagnost
Debugger E1 E20 IECUBE Simulator TK	Additional include directories: (one per line) SPROJ_DIRstquantiphi_output
	Preinclude file:
	Defined symbols: (one per line) Preprocessor output to file Preserve comments Generate #line directives

10. Choose Debugger

Choose the TK debugger from the Setup tab in the Debugger category. Click OK.

ategory:						Factory Settin
eneral Options						
C/C++ Compiler Assembler						
Custom Build	Setup	Images	Extra Options	Plugins		
Build Actions	Driver			V	Run to:	
Debugger	TK		•		main	
E1 E20 IECUBE Simulator TK	Dev	up macros Use macro ice descri Override d \$TOOLK	p file:	debugge	er^ior5f10pmf.ddf	



11. Add Include

Add the following include in main.c:

#include "qp.h"

```
IAR Information Center for Renesas RL78 main.c *

IAR Information Center for Renesas RL78 main.c *

This is a template file.
Copyright 2011 IAR Systems AB.
SRevision: 205 $

int main( void )

f
return 0;
}
```

12. Add Code

Add the following code inside main():

QP_Init();

__enable_interrupt();

/* Turn on blue stage of (R)GB LED */

PM5_bit.no5 = 0;

P5_bit.no5 = 1;

while(1) {

/* Main program loop */

}

13. Download to Board

Click the "Download and Debug" button on the toolbar. The file should save automatically, and a build will be performed.

File Edit View Project Emulator Tools	Window Help
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Vorkspace	X IAR Information Center for Renesas RL78 main.c*



14. Save Workspace As

Name the workspace.

Organize New folde	r	12	• 0
Kostal test *	Projects library QphiCANdemo	Arrange by: Fol	lder 🔻
Libraries	Name	Date modified	Туре
MC-78F0712-	Lebug	5/12/2014 3:29 PM	File fold
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😹 MICON 🗌	settings	5/12/2014 3:41 PM	File fold
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PG-FP5 setup			
pinkos			
PJ4_AB-050_F	*m		
File name: Ophio	ANdemo.eww		0
Save as type: Works	mana Files /* must	6	

15. TK Hardware Setup (R5F10PMF)

Configure the debugger as shown.

ID Code			Time u	nit		OK
FFFFFFFFFFFFFFF	FFFFF		Insec	-		
Erase flash be	fore next ID ch	eck	nisee			Cancel
Main clock		Sub	clock			
Clock board			Clock board			Default
External		0	External			Derault
System			System		Fa	il-safe break
8.00	MHz		32.768	👻 kHz		View setup
Flash programming	Target pow	er off	Low-voltag	e	Power sup	ply
Permit	O Permit		🔘 On		Target	
Not Permit	Not Per	mit	 Off 		[. arger	
Pin mask		Per	pheral break	Target		Target connect
WAIT TARG	ET RESET		A (timer)	O Cor	nect	T00L0 -
NMI INTER	NAL RESET		B (serial etc.)	O Not	Connect	10020
Memory map						
Start address:	Length:		Type:			
0x0	960	٠	Intern	al ROM	•	Add
0x00000 - 0x17FFF I						
0xFDF00 - 0xFFEFF	Internal RAM 8	192 b	Ites			
						Remove
						Remove All

Note: Make sure SW1 is set properly to enable the TK debugger.

(SW1-1)TK-SEL must be ON.

(SW1-2)TK-MUXENn must be OFF.

Also, if you get an error when you try to connect the first time, check "Erase flash before next ID check" and try again.



16. TK Flash Write

The program will load to the board.

Starting debugger session: Loading debug file
TK: Writing flash

17. Run

Run the program.



Note: Once the board is re-flashed, you can switch TK-SEL (SW1-1) back to OFF to run the code (without the TK debugger in place).

18. Add Additional Code

Add code as needed to main(). Basic setup is complete.

IV. Notes for using CS+

1. CS+ is also supported by this RDK. When connecting with CS+ the first time, an incorrect ID error message may be displayed. This can be solved by opening the debugger settings and setting "Erase flash ROM when starting" to "Yes".

2. If the TK debugger USB driver cannot be found in CS+, select the E1 driver.









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