

RL78/I1C(512KB) Continuous Metrology FOTA

FOTA demonstration package

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1. Introduction

This Operation Guide provides:

- An overview of the Continuous Metrology FOTA Project for the RL78/I1C (512KB) Fast Prototyping Board.
- Instructions for powering, connecting, and running the Continuous Metrology FOTA Project.
- Instructions for modifying and building the Continuous Metrology FOTA Project using the CS+ Integrated Development Environment (CS+ IDE).



Figure 1: FOTA Demo Overlooking

1.1. Assumptions and Advisory Notes

- 1. Tool experience: It is assumed that the user has prior experience working with IDEs such as CS+ and terminal emulation programs such as Tera Term.
- 2. Subject Knowledge: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, and Code Generator in CS+ to create and modify the example project as described in this document.
- 3. The screenshots provided throughout this document are for reference. The actual screen content may differ depending on the version of software and development tools.

2. Required Environments

Hardware Requirements:

- 1. RL78/I1C (512KB) Fast Prototyping Board [RTK5RL10N0CPL000BJ]
- RL78/I1C (512KB) FPB Signal Board [Not for sale]. (Refer to Hardware User Guide R01TU0344ES0100.)
- 3. Coin-cell battery [CR2032 (3V)]
- 4. Micro USB Device Cable
- 5. PC with at least 1 USB port

Software Requirements:

- Windows® 10 operating system
- USB Serial Drivers (included in Windows 10)
- Tera Term (or similar) terminal console application
- CS+ Ver. 8.05.00 (or above)



Figure 2: Hardware components

3. Overview of Continuous Metrology FOTA Project

The Continuous Metrology FOTA Project allows the user to:

- Monitor the simulated voltage and current signals generated by the FPB Signal Board.
- Perform calibration of the Meter Metrology based on the simulated signals.
- Transfer an updated Image of the User Application through UART.
- Activate the transferred image without MCU reset using the Bank-Swap feature. (7.1. **Bank-Swap Functions**).

or

• Activate the transferred image through an MCU Reset. (7.2. Fast FOTA Bank-Swap Command).

3.1. Continuous Metrology FOTA Start-up Flowchart



Figure 3: Continuous Metrology FOTA Project Flowchart

The User Application has two possible start-up procedures. On normal start-up after Power-On-Reset or after pressing the reset button on the Fast Prototyping Board, the Meter Metrology will be initialized followed by the hardware peripherals.

If the start-up is following a Bank-Swap command, only the hardware peripherals are initialized as the Meter Metrology does not stop running during Bank-Swap. This is the principle of Continuous Metrology FOTA, where measurements are not interrupted by the image updating process.

The Infinite Loop describes the normal operation state of the User Application. Commands are issued to the application during this state, such as Image Transfer and Bank-Swap.

4. Running the Continuous Metrology FOTA Project

This section lists the instructions to communicate and program the RL78/I1C (512KB) Fast Prototyping Board and run the Continuous Metrology FOTA Project.

4.1. Extracting the Packages

The Example Project package contains two sub-folders:

 RFP RI78I1C Production, containing the Renesas Flash Programmer project i1c_512k_production.rpj, and main MOT file of rI78i1c_production.mot, which version is "v0.0.1".

Note: This MOT file is generated from the sample project of R01TU0357ES0100.

2. New Application File, containing the MOT files of rl78i1c0 v001.mot, rl78i1c0 v002.mot, and rl78i1c0 v003.mot. These files are used in the Image Transfer function. Their versions are "v0.0.1", "v0.0.2" and "v0.0.3", respectively.

Note: These MOT files are generated from the sample project of R01TU0357ES0100.



4.2. RTK5RL10N0CPL000BJ Board Outline

Figure 4: Outline of Board when Connecting to Host PC

• The RST button will trigger a hardware reset of the MCU.

4.3. **Programming the MCU**

- 1. Set the on-board dip switch (SW3) into "**Debug**" and connect the Micro USB cable into the Micro USB connector on the RL78 I1C(512KB) Fast Prototyping Board.
- 2. Connect the other end of the Micro USB cable (USB Head) into the host PC. LED1 (ACT) will start blinking, indicating that the RL78 I1C(512KB) Fast Prototyping Board is in "**Debug**" mode.
- 3. While LED3 (POWER) will light up solid green, indicating that the RL78 I1C(512KB) Fast Prototyping Board is powered.
- 4. Open the project [**i1c_512k_production.rpj**] in the RFP RI78I1C Production directory in Renesas Flash Programmer. This project will flash the [**rl78i1c_production.mot**] binary file to the MCU.
- 5. Click the Start button to initiate the download.

📓 Renesas Flash Programmer V3.08.01 (Free-of-charge Edition) – 🗆 🗙	🜠 Renesas Flash Programmer V3.08.01 (Free-of-charge Edition) — 🗌 🗙
File Device Information Help	File Device Information Help
Operation Operation Settings Block Settings Rash Options Connect Settings Unique Code	Operation Operation Settings Block Settings Rash Options Connect Settings Unique Code
Project Information Current Project: i1c_512k_production.rpj Microcontroller: R5F10NPL	Project Information Current Project: i1c_512k_production.rpj Microcontroller: R5F10NPL
Program File	Program File
<projectdir>\rf78i1c_production.mot Browse</projectdir>	<projectdir>\rf8i1c_production.mot Browse</projectdir>
CRC-32 : DD208264	CRC-32 : DD208264
Flash Operation	Flash Operation
Program	Program
Start	Start ОК
Renesas Flash Programmer V30801 [1 Jan 2021] (Free-of-charge Edition) Loading Project (D¥Meter¥RL7811C(512KB) Fast Prototyping Board¥FOTA Bootloader¥rfp_Debug¥i1c_ 512k.production/pj)	Code Flash] 0x00074C00 - 0x0007CFFF size : 38 K [Code Flash] 0x0007FC00 - 0x0007FFFF size : 1 K Wring data to the target device fill [Code Flash] 0x0000700 - 0x00007FFF size : 5 K [Code Flash] 0x0000700 - 0x000020FF size : 5 K [Code Flash] 0x0000700 - 0x000020FF size : 5 K [Code Flash] 0x0000700 - 0x000020FF size : 6 K [Code Flash] 0x0000700 - 0x0000413FF size : 6 K [Code Flash] 0x0000700 - 0x00007FFF size : 38 K [Code Flash] 0x0007000 - 0x00007FFF size : 38 K [Code Flash] 0x00077C00 - 0x0007FFF size : 1 K Disconnecting the tool Operation completed.
Clear status and message	Clear status and message

4.4. Running the Example Project

To run the Continuous Metrology FOTA Project, use the following instructions:

- 1. Insert the Coin-cell battery into the battery holder (**BT1**) on the RL78 I1C(512KB) Fast Prototyping Board.
- 2. Set the on-board dip switch (SW3) into "**Serial**" and connect the Micro USB cable into the Micro USB connector on the RL78 I1C(512KB) Fast Prototyping Board.
- 3. Connect the FPB Signal Board to the RL78 I1C(512KB) Fast Prototyping Board.





- 4. Connect the other end of the Micro USB cable (USB Head) into the host PC. LED3 (POWER) will light up solid green, indicating that the RL78 I1C(512KB) Fast Prototyping Board is powered.
- 5. On the host PC, open Windows Device Manager. Expand **Ports (Com & LPT)**, located **USB Serial Device (COMxx)** and note down the COM port number for reference in the next step.

Note: USB Serial Device drivers are required to communicate between the RL78 I1C(512KB) Fast Prototyping Board and the terminal application on the host PC.

Device Manager	8 <u></u>	2
e Action View Help		
🔿 🗊 📴 🗾 🗊 💭		
		-
> 4 Audio inputs and outputs		
> 🤪 Batteries		
> 🗑 Biometric devices		
> 🚯 Bluetooth		
> 👰 Cameras		
> 💻 Computer		
🔉 🔜 Disk drives		
> 🔙 Display adapters		
> 📔 Firmware		
> 🚜 Human Interface Devices		
> 🔤 Keyboards		
Mice and other pointing devices		
> 🛄 Monitors		
> 🛃 Network adapters		
🗸 🛱 Ports (COM & LPT)		
Intel/R) Active Management Technology - SOL (COM3)		
💭 USB Serial Device (COM5)		
> 🗃 Print queues		
> Processors		
> 🦉 Security devices		
> 🔚 Sensors		
> 📲 Software components		
> Software devices		
> 🧃 Sound, video and game controllers		
Gui Storage controllers		

Figure 6: USB Serial Device in Windows Device Manager

6. Open Tera Term, select Serial and COMxx: Serial Device (COMxx) and click OK.

💻 Tera Term - [disconnected] V	T		_	\times
File Edit Seture Control M Tera Term: New control	ndow Help nection		×	^
○ тср/ір	Host: myhost.exa	mple.com	~	
	☑ History Service: ○ Telnet	TCP port#: 22		
	⊚ SSH	SSH version: SSH2	\sim	
	⊖ Other	IP version: AUTO	\sim	
Serial	Port: COM5: USB	Serial Device (COM5)	~	
	OK Cancel	Help		
				~



7. In Tera Term, select Setup and Serial Port... for the Tera Term: Serial port setup and connection window. Configure the setup as follows (38400 baud, 8N1) and click New setting.

COM5	- Tera Term VT		– 🗆 X
File Edit	Setup Control Window	Help	
	Terminal		^
	Window		Tera Term: Serial port setup and connection
	Font	>	
	Keyboard		Port: COM5 V New setting
	Serial port		Speed: 38400 V
	Proxy		Data: 8 bit ~ Cancel
	SSH		Parity: none V
	SSH Authentication		Chan bitst 1 bit Help
	SSH Forwarding		
	SSH KeyGenerator		Flow control: none ~
	TCP/IP		Transmit delav
	General		
	Additional settings		
	Save setup		Device Erizedhy Nemet USB Social Device (COME)
	Restore setup		Device Instance ID: USB\VID_045B&PID_0245\000000000000
	Setup directory		Device Manufacturer: Microsoft Provider Name: Microsoft
	Load key map		Driver Date: 6-21-2006 Driver Version: 10.0.18362.1
			۲ ۲

Figure 8: Setting Up the Serial Port in Tera Term

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- Press the on-board **RST** button once to reset the RL78/I1C(512KB) Fast Prototyping Board.
 Wait for the start-up message to be displayed.

Note: The software will only run if a CR2032 battery is present to power the MCU RTC module.

		+ EPR Continuous ENTA Domo Start-Un
Application Version v0.0.1	 	Application Version v0.0.1



10. Type "?" and press Enter key to observe the possible functions.

CMD> ?		
Command Name	Parameter	Description
? cls start stop restart display energy rtc setrtc readmem writemem formatmem dump calib peonfig clrenergy binfo bswap binvy xfer hash	dd/mm/yy hh:mm:ss ww type(0:EEP,1:DTFL) addr size [cast] type(0:EEP,1:DTFL) addr size value type(0:EEP,1:DTFL) current c cp imax v i w get:empty; set: pconst_total, pontime	Help Clear screen Start EM Stop EM Restart EM Display current measured data Display measured energy data Display current RTC time Set RTC time Read memory type at addr, size, display value Write memory type at addr, size with value Format memory type (followed format.h) Dunp waveform from EM Core Calibrate (cycle.cycle_phase,imax,U,I,wire) Get, Set pulse config: pulse constant and on time Clear EM energy counter in eeprom and ram Get bank status information Swap bank Invert boot flag and reset Transfer image file using XModem Protocol Hash the secondary bank and compare to the header

Figure 10: Available Commands in Continuous Metrology FOTA

Enter the commands as defined to observe each function. The input parameter format is printed for functions that require additional input parameters.

4.5. Displaying Measurement Values

- Type "display" and press Enter key.
- Voltage (DSAD2), Phase Current (DSAD0), Neutral Current (DSAD1) are displayed, together with calculated Power and Energy.

Parameter	Total	Unit I
Voltage RMS Current RMS Phase Current RMS Phase Current RMS Neutral Line Frequency	220.0181400 4.9983201 5.0002499 50.0000000	Volt Ampere Ampere Hz
Active Power Fundamental Power Reactive Power Apparent Power Power Factor Power Factor Sign	1099.8510000 0.000000 0.0000000 1099.8530000 1.0000000 PF_SIGN_UNITY	Watt Watt UAr VA
Neutral Active Power Neutral Fundamental Power Neutral Reactive Power Neutral Apparent Power Neutral Power Factor Neutral Power Factor Sign	1100.0909000 0.0000000 0.0000000 1100.0930000 1.0000000 PF_SIGN_UNITY	Watt Watt UAr UA
EM Import Active EnergyIEM Import Reactive Energy (C)IEM Import Reactive Energy (L)EM Import Apparent EnergyEM Export Active EnergyEM Export Reactive Energy (C)EM Export Reactive Energy (L)EM Export Reactive Energy (L)EM Export Apparent Energy	0.0362309 0.0000065 0.0004880 0.0477714 0.000000 0.0000000 0.0000000 0.0000000 0.000000	kWh kUArh kUArh kUAh kWh kUArh kUArh kUArh

Figure 11: Output of the Display command

- On the first time running of the RL78/I1C(512KB) Fast Prototyping Board with the FPB Signal Board, the EEPROM module will not be initialized.
- Please format the EEPROM using the "**cirenergy**" command in order to clear the data used for Energy storage.

EM Import EM Import EM Import EM Import EM Export EM Export EM Export EM Export	Active Energy Reactive Energy Apparent Energy Active Energy Reactive Energy Reactive Energy Reactive Energy Apparent Energy	(C) nai (L) nai nai nai (C) nai (L) nai nai	n kWh n kVArh n kVArh n kVAh n kVA n kVArh n kVArh n kVArh n kVA		
	CMD> clrener Clear energy Clear energy	gy counter in counter in	n storage n RAM	(eeprom)	

Figure 12: Clearing the Energy data stored in the EEPROM module

4.6. Displaying the Periodic Energy Table

- Energy will be periodically stored in a round-robin array, together with the timestamp of when the energy was recorded.
- The default interval time is set to 10 seconds.
- Type "energy" and press the Enter key to display the Energy Table.

umu/ energy +		+	
Parameter / Time	Total / +Increase	l Unit	
EM Import Active Energy RTC Time: 06/07/2021 11:15:30 02	0.0863380 + 2.0177307	k\\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:15:20 02	0.0843203 + 2.0179825	k\\h \\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:15:10 02	0.0823023 + 2.0176163	k\\h \\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:15:00 02	0.0802847 + 2.2199173	k\\h \\h \\h	* Not
EM Import Active Energy RTC Time: 06/07/2021 11:14:50 02	0.0780648 + 2.0180511	k\\h \\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:14:40 02	0.0760467 + 2.0182648	k\\h \\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:14:30 02	0.0740285 + 2.0179901	k\\h \\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:14:20 02	0.0720105 + 2.0181580	k\\h \\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:14:10 02	0.0699923 + 2.0181580	k\\h \\h	
EM Import Active Energy RTC Time: 06/07/2021 11:14:00 02	0.0679742	k\\h k\\h 	

Figure 13: Energy Table

- The Energy Table is used to demonstrate the capability of the Continuous Metrology FOTA process.
- There should be no loss of energy logged during the Image Transfer and Continuous Metrology Bank-Swap operations.

Note :

The "Increase" values of 10-second energy are sometimes fluctuated logically by the frequency deviation on the asynchronous clocks as shown in the timing chart below.

(e.g.)

In the conditions that The Clock (A) has a frequency deviation of minus X [ppm] while the Clock (B) has a frequency deviation of plus Y [ppm]. In addition, whether it happens depends on the phase relationship of the 1-second boundary of both clocks.



Figure 14: Timing chart of Energy Accumulation

5. Calibration of the Metrology

- Calibration of the metrology can be performed using the "calib" command.
- The potentiometer R8 should be in the furthest counter-clockwise position during calibration, which represents **Ib** current.

Note: The arrow on the knob represents the position of the potentiometer indicator for Ib



Figure 15: Potentiometer Setting and Display

- The furthest clockwise position of R8 outputs a signal roughly 5x that of **Ib**, representing **Imax** current.
- The parameters entered for calibration represent:
 - a. Number of cycles to accumulate for coefficient calculation.
 - b. Number of cycles to accumulate for phase angle calculation.
 - c. Maximum expected current value (Imax).
 - d. Voltage.
 - e. Calibration current value (Ib).
 - f. DSAD Current channel (Phase = 1, Neutral = 0).

• The suggested parameters to use for calibration when paired with the FPB Signal Board are:

calib 50 50 30 220 5 0 calib 50 50 30 220 5 1



Figure 16: Calibration of EM Core

• The calibration can be verified using the "**display**" command, with the potentiometer R8 set to minimum and maximum values.

a. Potentiometer set to Minimum value (Ib)

<image/>		
Waiting for signal stable + Parameter	¦ Total	¦ Unit
Voltage RMS Current RMS Phase Current RMS Neutral Line Frequency	220.0181400 4.9983201 5.0002499 50.0000000	Volt Ampere Ampere Hz
Active Power Fundamental Power Reactive Power Apparent Power Power Factor Power Factor Sign	1099.8510000 0.000000 0.000000 1099.8530000 1.0000000 PF_SIGN_UNITY	Watt Watt UAr UA
Neutral Active Power Neutral Fundamental Power Neutral Reactive Power Neutral Apparent Power Neutral Power Factor Neutral Power Factor Sign	1100.0909000 0.0000000 0.0000000 1100.0930000 1.0000000 PF_SIGN_UNITY	Watt Watt UAr UA
EM Import Active Energy EM Import Reactive Energy (C) EM Import Reactive Energy (L) EM Import Apparent Energy EM Export Active Energy EM Export Reactive Energy (C) EM Export Reactive Energy (L)	6 0362309 0 000065 0 0004880 0 0477714 0 0000000 0 0000000 0 0000000	: kWh : kUArh : kUArh : kUAh : kWh : kUArh : kUArh

Figure 17: Potentiometer R8 set to Minimum after Calibration.

b. Potentiometer set to Maximum value (Imax)

waiting for signal stable +	; Total	 ¦ Unit	-+ !
Voltage RMS	219-9564		
Current RMS Phase Current RMS Neutral Line Frequency	25.2800 25.2887 50.0000	100 ¦ Volt 410 ¦ Ampere 000 ¦ Ampere 000 ¦ Hz	-+
Current RMS Phase Current RMS Neutral Line Frequency Active Power Fundamental Power Reactive Power Apparent Power Power Factor Power Factor Sign	25.2800 25.2887 50.0000 5561.2788 0.0000 3.0200 5561.2808 1.0000 PF_SIGN_UN	100 ; Uolt 410 ; Ampere 000 ; Ampere 000 ; Hz 000 ; Watt 000 ; Watt 000 ; UAr 000 ; UA 000 ; UA	-*
Current RMS Phase Current RMS Neutral Line Frequency Active Power Fundamental Power Reactive Power Apparent Power Power Factor Power Factor Neutral Active Power Neutral Reactive Power Neutral Reactive Power Neutral Apparent Power Neutral Power Factor Neutral Power Factor Neutral Power Factor Neutral Power Factor	25.2800 25.2887 50.0000 5561.2788 0.0000 3.0200 5561.2808 1.0000 PF_SIGN_UN 5562.6948 0.0000 3.0230 5562.6948 0.0000 3.0230 1.0000 9F_SIGN_UN	100 : Uolt 410 : Ampere 000 : Ampere 000 : Hz 000 : Watt 000 : Watt 000 : UAr 000 : UA 000 : Watt 000 : Watt 000 : Watt 000 : UAr 000 : UAr	_*

Figure 18: Potentiometer R8 set to Maximum after Calibration.

6. Image Transfer

This section covers the Image Transfer process of the Continuous Metrology FOTA demonstration.

6.1. Required Software

- The Image Transfer is performed using the XMODEM checksum protocol. Variations such as XMODEM CRC are not supported.
- The Image Transfer function was tested and developed using Tera Term v4.105.

6.2. Starting the Image Transfer

1. Type "xfer" and press the Enter key to initiate the XMODEM Image Transfer function.

CMD> xfer Please start file transfer using XModem protocol. Transfer will initiate within 10 seconds.

2. Send the **rI78i1c0.mot** file using the Tera Term (or equivalent) XMODEM send function.

File	Edit Setup Control	Window	Help		
	New connection	Alt+N			
	Duplicate session	Alt+D			
	Cygwin connection	Alt+G			
	Log				
	Pause Logging				
	Comment to Log				
	View Log				
	Show Log dialog				
	Stop Logging (Q)				
	Send file				
	Transfer	>	Kermit	>	
	SSH SCP		XMODEM	>	Receive
	Change directory		YMODEM	>	Send
	Replay Log		ZMODEM	>	~
	TTY Record		B-Plus	>	
	TTY Replay		Quick-VAN	>	
	Print	Alt+P			
	Disconnect	Alt+I			
	Exit	Alt+Q			
	Evit All				

3. Tera Term will wait for the Acknowledgement (ACK) packet, which is sent out by the User Application every 10 seconds while waiting for the data transfer to start.

Tera Term: XM0	DDEM Send	\times
Filename:	r178i1c0 v01	D2.mot
Protocol:	XMODEM (checksum)
Packet#:		242
Bytes transf	ferred:	30976
Elapsed tim	e: U:44 (7	01Bytes/sj
		25.5%
	Cancel	

- 4. On receiving the ACK, Tera Term will initiate the data transfer. **LED1** on the RL78/I1C(512KB) Fast Prototyping Board will flash during writing of received packets to the secondary memory bank.
- 5. After the data transfer completes successfully, the Image Transfer Time and Software Version stored within the Image Header will be updated.



6. The "**hash**" command can then be used to verify that the hash value of the transferred User Application image matches its pre-calculated hash value stored within the Image Header.

CMD> hash	
Hash value OK	
Calculated program hash:	0x6c30
Embedded program hash:	0x6c30

7. The Software Version and Transfer Time of the Secondary Bank displayed by the "**binfo**" command will be updated on completing the image transfer.



8. The transferred User Application image can be activated using the Boot-Swap commands described in section **7**.

7. Bank-Swap Functions

7.1. Continuous Metrology FOTA Bank-Swap Command

Type "**bswap**" and press the **Enter** key to initiate the Continuous Metrology FOTA Bank-Swap command.

- Image Activation time will be updated and stored within the image header.
- The User Application will be restarted from the secondary memory bank without resetting the MCU.
- Metrology processes and data are maintained in RAM during the Bank-Swap.
- Type "**energy**" and press the **Enter** key to display the Energy Table, <u>before</u> and <u>after</u> invoking the "**bswap**" command. There should be no loss of energy accumulation during the Bank-Swap operation.



Figure 19: Initiating the Continuous Metrology FOTA Bank-Swap command



Figure 20: Display Output

- The version of the User Application contained within rl78i1c_production.mot is [UN 0.0.1].
- After updating to the new User Application contained within **rI78i1c0.mot**, the version is updated to [UN 0.0.2]
- The push button switch **SW** can be pressed to cycle through the LCD display data to view the User Application version.

7.2. Fast FOTA Bank-Swap Command

- Type "binvr" and press the Enter key to initiate the Boot Flag and Reset command.
- This will invert the boot flag and reset the MCU, running the User Application from the secondary memory bank.
- RAM is cleared when performing this command, including the Energy Table.

CM Wa St Cl Up Ex	ID> binvr nit for next energy log entry copping EMOK neckup energy data first DONE ear energy counter in RAM odating Image Activation Time: 01/07/2021 11:36:50 03 recuting invert boot flag then reset	
	FPB Continuous FOTA Demo Start-Up	
ł	Application Version v0.0.2	
+- Re CM	IPP Started: normal startup ISF Flag: 128 ID>	

Figure 21: Initiating the Boot Flag Invert and Reset command

Parameter / Time	¦ Tota	l / +Increase ¦ Unit	
EM Import Active Energy RTC Time: 01/07/2021 11:38	3:20 03 +	0.2754178 kWh 15.4715880 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:38	3:10 03 +	0.2599462 kWh 15.4713590 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:38	3:00 03 +	0.2444748 kWh 15.4717250 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:37	7:50 03 +	0.2290031 kWh 17.0191500 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:37	/:40 03 +	0.2119840 kWh 15.4730680 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:37	7:30 03 +	0.1965109 kWh 15.4721370 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:37	7:20 03 +	0.1810388 kWh 15.4732060 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:37	7:10 03 +	0.1655656 kWh 15.4739990 Wh	
EM Import Active Energy RTC Time: 01/07/2021 11:37	7:00 03 +	0.1500916 kWh 12.3712460 Wh	<- binvr
EM Import Active Energy BIC Time: 01/07/2021 11:36	5:50 03	0.1377203 kWh	

Figure 22: Energy Table showing Bank-Swap history

8. Diving Deeper

- To learn more about the RL78/I1C (512KB) Fast Prototyping Board, refer to the RL78/I1C (512KB) User's Manual available in the User Guides & Manuals of the RL78/I1C webpage at <u>renesas.com/br/en/products/microcontrollers-microprocessors/rl78-low-power-8-16-bit-mcus/rl78i1c-</u> ultra-low-power-microcontrollers-high-end-smart-electricity-meter-market
- Renesas provides several example projects that demonstrate different capabilities of the RL78/I1C (512KB) Fast Prototyping Board. These example projects can serve as a good starting point for users to develop custom applications. Example projects (source code and project files) are available in the RL78/I1C (512KB) Fast Prototyping Board Example Project Bundle.

9. Website and Support

Visit the following URLs to learn about the kit and the RA family of microcontrollers, download tools and documentation, and get support.

- RL78/I1C Resource renesas.com/br/en/products/microcontrollers-microprocessors/rl78low-power-8-16-bit-mcus/rl78i1c-ultra-low-power-microcontrollers-high-end-smart-electricity-metermarket
- RL78 Product Information
 Iow-power-8-16-bit-mcus
- RL78 Knowledge Base <u>en-support.renesas.</u>
 - Renesas Support

en-support.renesas.com/knowledgeBase#31025 en-support.renesas.com/dashboard

Revision History

		Description	
Rev.	Date	Page	Summary
1.00	MAY 31, 2021	-	Initial release