# Quick Start Guide Renesas Promotion Board for RL78/G13

This Quick-Start Guide is for the RL78/G13 USB Stick (YRPBRL78G13). The RL78/G13 is a new low-power, high-performance 16-bit microcontroller. The RL78/G13 Stick is preprogrammed with software that demonstrates real time tracking, memory retention, current measurement, and self-test functions through different low power modes, and ADC measurement of external voltage and internal temperature. The following steps highlight how to measure current in different low power modes and show how memory and time in the Real-Time Clock are retained through the different power modes. For more information, please read the user manual in the document directory.

**Note**: When the complete installation is selected, and the Quick start guide document is selected to be opened, this can be open at the same time as the IAR installation. It is recommended that the Quick start guide is left open until the IAR installation and registration has been completed.

## 1) Package Contents

- YRPBRL78G13 Board
- USB Type A / Mini-B cable
- Screwdriver to adjust the potentiometer voltage
- DVD containing all the software, tools and documentation needed to quickly start evaluating the product.

If any part is missing or seems to be damaged, please contact the dealer from whom you received your YRPBRL78G13 starter kit.

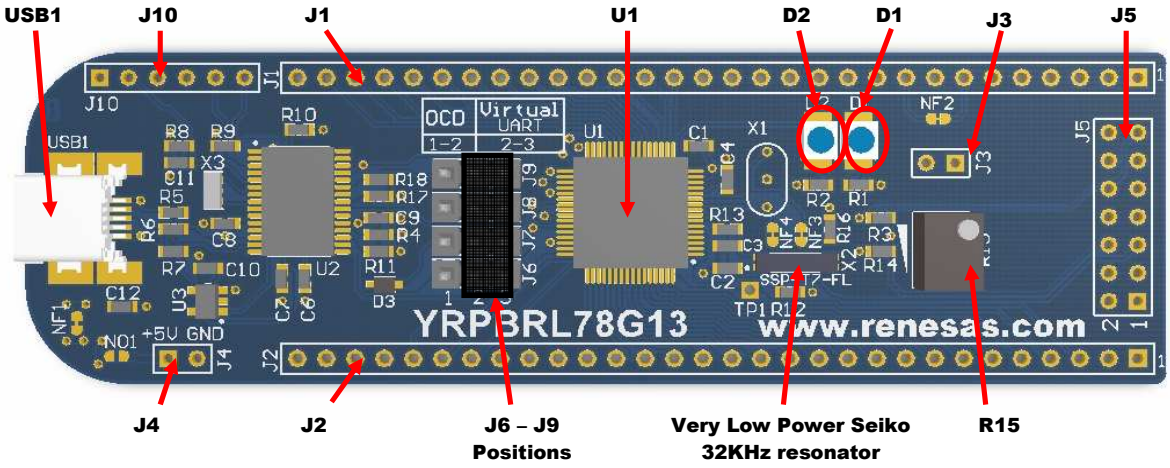
## 1) Installation

The installation of the demonstration files and GUI will be automatically performed by the DVD installer. If the DVD does not autostart, please run the “Setup” executable file on the DVD and follow the directions for the installation. Please note that the user will require administration rights to the host PC in order to install the demonstration and tool software.

## 2) Connection

1. First ensure that the YRPBRL78G13 USB stick jumpers are configured as shown below.

| Jumpers | Configuration |
|---|---|
| J6 | 2-3 |
| J7 | 2-3 |
| J8 | 2-3 |
| J9 | 2-3 |




2. Next connect the YRPBRL78G13 USB stick to the host PC using the USB cable provided and when the USB stick is connected, diode D1 should be on, indicating that power is supplied to the RL78/G13 Stick. If this is the first time the USB stick is connected to the host PC the Virtual UART driver will need to be installed. The driver will have been copied to the host PC by the installation process. When the Host PC detects the new hardware, locate the Renesas Virtual UART driver appropriate to the Windows operating system (i.e. 32/64bit OS) and follow the windows installation directions.

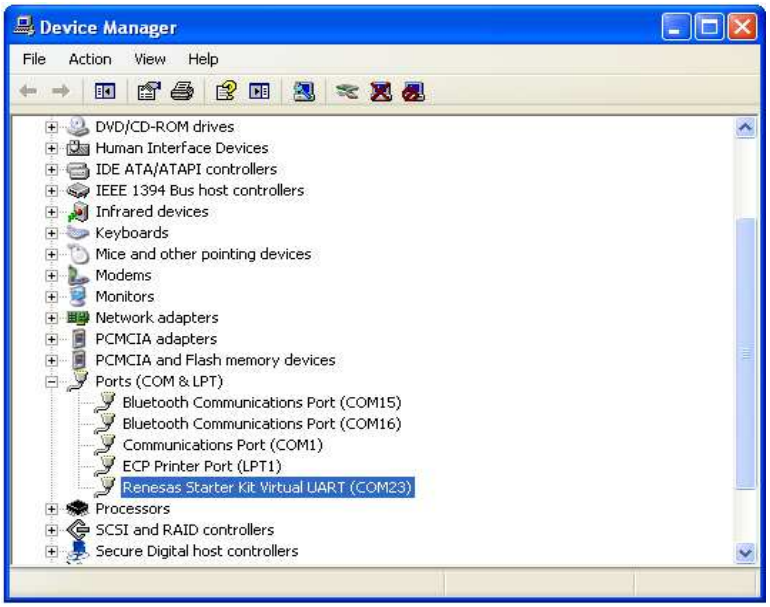
**For 32bit Windows OS, the USB drivers will be located here**

C:\Program Files\Renesas\RPB\RL78G13\USB Drivers\Win2k\

**For 64bit Windows OS, the USB drivers will be located here**

C:\Program Files (x86)\Renesas\RPB\RL78G13\USB Drivers\wlh_amd64\

On completion the driver should be “Renesas Starter Kit Virtual UART”.
This can be verified by in the Device Manager and note the “com” port assigned to the USB stick.



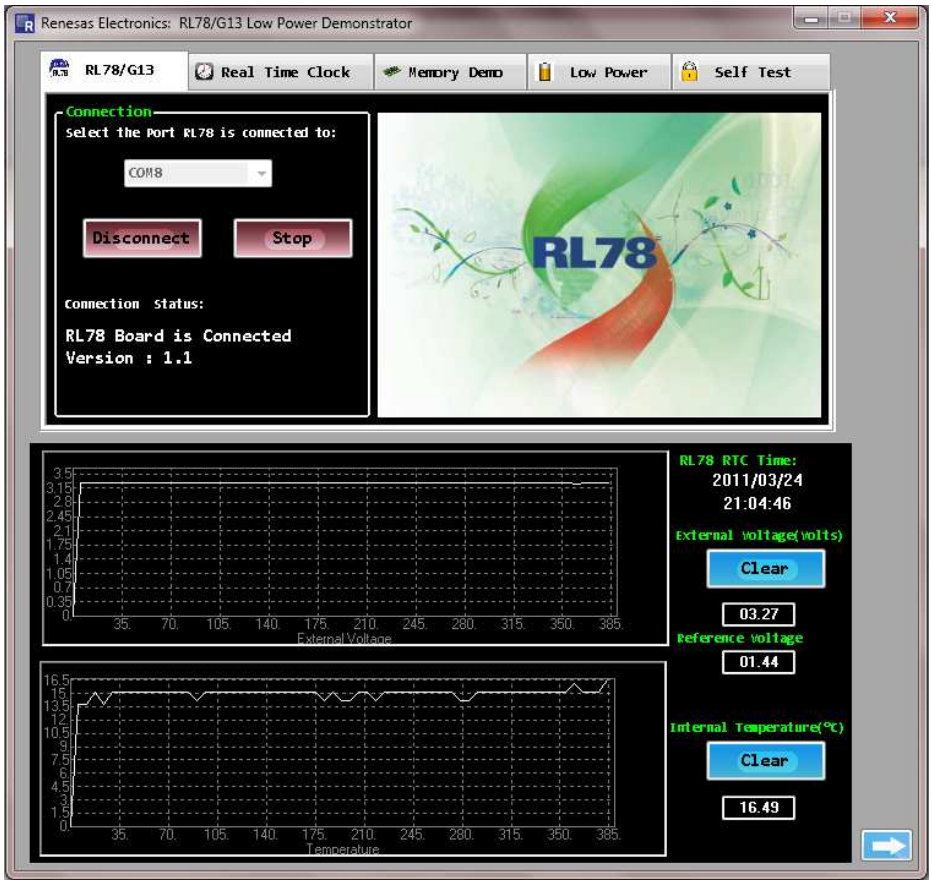
### 3) Starting the Demonstration

To start the demonstrations ensure that the USB stick is connected and the virtual UART driver has been successfully installed. The Demonstrations are controlled by the YRPBRL78G13 GUI which can be started from the “Start -> All Programs” menu or from the icon on the desktop.


The GUI will automatically detect the com port for the USB stick and start the GUI. If for any reason this does not happen, please select the appropriate port number from the drop down list, and then press the “Connect” button on the GUI start window.

***Caution***
*The appropriate port number should be detected automatically and proposed as default when opening the GUI Demo. It is important to ensure that the virtual UART is working properly by checking the Windows Device Manager – no question mark should be displayed on the virtual UART.*

The GUI should now be connected and running. Diode D2 should now be blinking and the graphs and data values on the GUI start page should now be updating with the USB stick parameters as shown below.



### 4) Demonstration Summary

The demonstration GUI provides a number of demonstrations of the key RL78/G13 functions.

#### 1) Real Time Clock tab

The RL78/G13 USB stick internal RTC can be synchronized to the host PC clock (click on the "Sync" button). Also the RTC interval interrupt and Alarm clock wake up can be set by the GUI.

#### 2) Memory tab

When enabled (clicking on the "Enable" button) the RL78/G13 writes the ADC measured data from the external potentiometer and internal temperature sensor to the internal data flash memory. The data flash contents are preserved even if power is removed from the board.

The second function in the Memory tab is to be able to read and write data values to and from the internal SRAM memory. This can also be used in conjunction with the low power modes and the write protect self test operation.

#### 3) Low Power tab

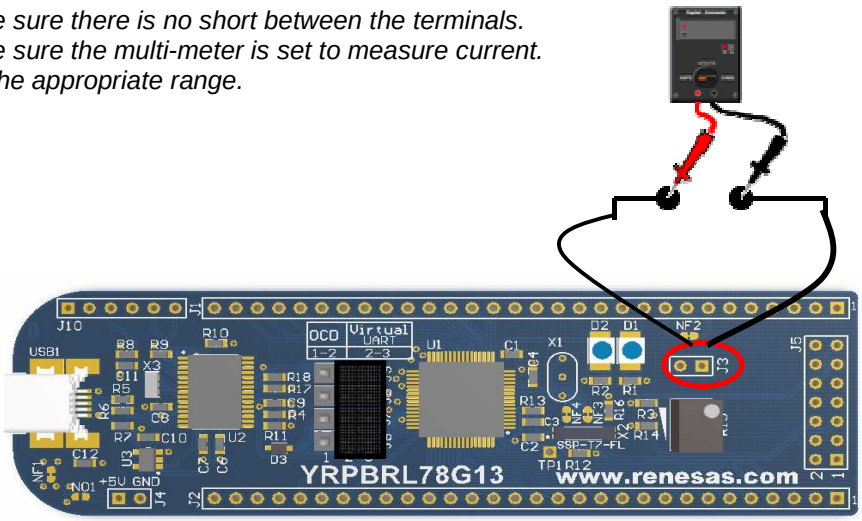
The Low Power modes of the RL78/G13 can be entered by clicking on the HALT, STOP or SNOOZE buttons. Clicking the "Release" button will return the RL78/G13 back to Run mode.

To enter the SNOOZE mode, click on the "SNOOZE" button after selecting the trigger and voltage limit conditions. When you adjust the potentiometer (using the provided screwdriver) to a voltage outside the range you have specified, you can see that the device wakes up (Note this is the only method of waking the RL78 from SNOOZE mode in this demonstration).

The low current consumption can be measured when the low power modes (HALT, STOP and SNOOZE) are selected. Jumper J3 is used for current measurement of the RL78/G13 device. Remove this jumper and connect a multi-meter to these pins, as shown below.

***Caution***

*Make sure there is no short between the terminals.*
*Make sure the multi-meter is set to measure current.*
*Set the appropriate range.*




***Caution***

*Current measurements can be from uA to mA. Some multi-meters disconnect when the range.is changed. This will interrupt the voltage supply to the MCU, resulting in a MCU reset It is recommended that the GUI is disconnected from the stick and power is then removed from the stick. The appropriate range can then be selected on the multi-meter before re-connecting the stick re-starting the GUI.*

The typical currents used in the demonstration are shown in the table below.

| Power Mode | Current Consumption* | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | CPU | 32 MHz | 32 KHz | UART | Timer | ADC | RTC | LVD | Flash | RAM |
| RUN | 5.1 mA | On | On | On | On | On | On | On | Off | On | On |
| HALT | 1 mA | Off | On | On | On | On | On | On | Off | On | On |
| STOP | 0.62 µA** | Off | Off | On | Off | Off | Off | On | Off | Off | On |
| SNOOZE | 1 µA (depends on the trigger interval time) | Off | Off | On | Off | Off | On (periodically) | On | Off | Off | On |

** Actual numbers might vary. Please refer to the user manual.*
*** STOP mode without RTC and 32 KHz OSC circuit would be 0.22 µA*

**4) Self Test tab**

The Self Test tab includes the new self test features included on the RL78/G13 device. These include:

Hardware CRC Peripheral
Write Protect (Guard) for internal SRAM and SFR registers
Measurement of the system clock frequency (i.e. for IEC 60730/60335)

**4.1 The CRC Peripheral**

The CRC operates in two modes

1. Background (Automatic) mode
   By clicking on the "Automatic" button, the CRC peripheral will automatically calculate the CRC on the first 32KB area of the code flash memory. The calculation is performed for each click of the button.

2. Peripheral mode
   By clicking on the "Enable" button the RL78/G13 CPU will use the peripheral to calculate a CRC on the current 64 bytes data area displayed in the data flash window (See the Memory tab). The GUI also calculates a reference CRC value on the same data. Both are displayed in the Memory tab window.

**4.2 Guard Protection**

The internal RAM guard is a write protect feature that is set for the first 512 bytes of internal SRAM. When this is enabled the segment of SRAM is write protected, which prohibits the update of the ADC measurements, RTC values and data RAM variables. The guard can be enabled or disabled by clicking on the "Enable" button.

The SFR register protection operates in a similar way to the RAM guard, which prohibits the writing of the SFR that flash LED D2. When the guard is enabled the LED stops flashing as the writing of the relevant SFR registers in prohibited. When the guard is disabled the LED start to flash again (The SFR registers are not write protected).

Please note that only one Guard protection can be set in the GUI at a time.

### 4.3 System Clock Monitor

By clicking on the "Enable" button in the section, the internal 32MHz system clock is measured. In this demonstration, the reference clock is the external Seiko Instruments 32KHz resonator. The GUI displays the measured frequency and the minimum and maximum frequencies measured.

## 5. Further evaluation

For more information about any of the demonstrations described above, please refer to the full YRPBRL78G13 promotion board user manual supplied.

Additional evaluation and development tools are provided as part of this kit. Please note that these are only available with the full installation install option. If the quick" install was previously selected, please insert the DVD again and select the full instillation option.

The additional evaluation tools available are

1. **IAR Debugging**
   The YRPBRL78G13 promotion board allows for the user to evaluate the debugging capability using the IAR tools supplied with this kit.

   Please note that the IAR tools need to be installed and registered in order to use the debugger. Please refer to the full user manual for full detail on how to configure the board for debugging.

   The IAR tools can be found by following the link below
   Start => All Programs menu => IAR Systems => IAR Embedded Workbench for Rl78 1.10 Kickstart => IAR Embedded Workbench

2. **Applilet3 for RL78**
   This is the application code generator used for the IAR debugging project which allows the user to define the setup for both the system configuration and also the peripheral device drivers.

   This program will have been installed when the "full" install is selected. The program can be run by following the link below.

   Start => All Programs menu => Renesas Electronics Tools => YRPBRL78G13 => Applilet3

3. **WriteEZ5 for RL78**
   This program provides a serial programmer interface for the RL78/G13 device This program is required as part of the IAR debugging program

   Start => All Programs menu => Renesas Electronics Tools => YRPBRL78G13 => WriteEZ5