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Quick Start Guide: RL78G14 Motor Control Starter Kit

## Document Contents

1.0   Introduction

This quick start guide is provided to assist the user in connecting and using up the RL78G14 motor control starter kit for the first time. The RL78G14 microcontroller flash memory on the board is supplied pre-programmed with the motor control demonstration project. Please check the contents of the kit using the supplied package contents list and notify your supplier if anything is missing

Note: PLEASE DO NOT CONNECT THE BOARD TO THE HOST PC BEFORE INSTRUCTED

2.0   Board Layout
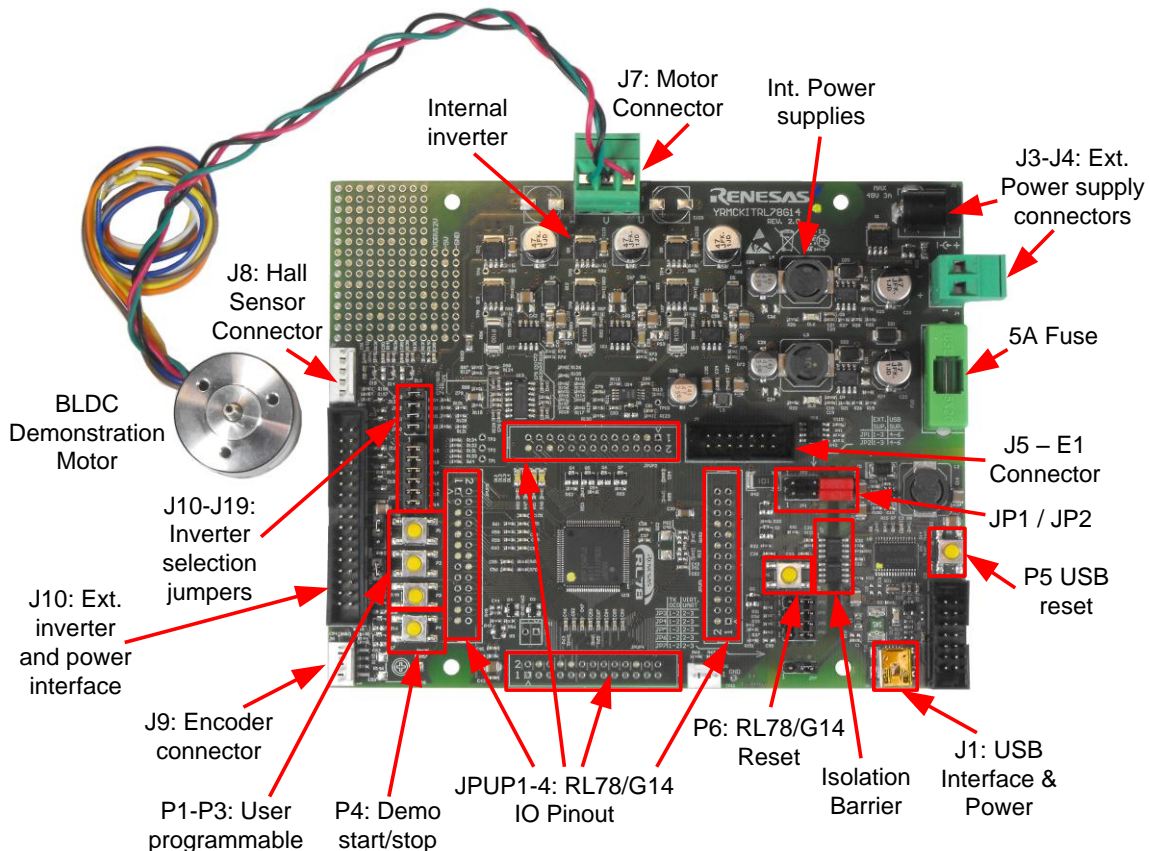
For further details, please refer to chapter 2 of the YRMCKITRL78G14 Motor Control Starter Kit user manual.

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3.0 Stand-alone Demonstration Mode

The RL78G14 motor control starter kit is supplied pre-configured with the embedded motor control program and to operate in a stand-alone demonstration mode that does not require the installation of the GUI. To use this mode, all that is required is to connect the demonstration motor and connect the USB cable to your PC to power the board. Before connecting the USB cable to the PC and the YRMCKITRL78G14 board please follow the setup procedure below

1. To connect the demonstration BLDC motor place the connector in the motor connector on the PCB and connect the three wires to the as follows (the green connector is pre-fitted).

    a. Red Motor wire to "U" connection
    b. Black motor wire to the "V" connection
    c. Green motor wire to the "W" connection

    Note: The Hall sensor wires do not need to be connected

2. Check that the jumpers JP1 and JP2 are both connected between pins 2 and 3:
   Check that the jumpers are connected as shown below.

JP3 pins 2 – 3	JP10 fitted
JP4 pins 2 – 3	JP11 fitted
JP5 pins 2 – 3	JP12 fitted
JP6 pins 2 - 3	JP13 fitted
JP7 pins 2 – 3	JP14 fitted
JP15 fitted	JP16 fitted
JP17 fitted	JP18 fitted
JP19 fitted	Jumpers JP8 and JP9 can be either connected or open

3. Connect the USB cable to your PC and connect the to the USB connector on the board.
   The following LEDs should be lit:-
   * The orange LED DL1 should blink at approximately ½ second intervals
   * The orange LED DL4 should be on
   * The green power supply LEDs (DL5 and DL6) and DL7 (USB connection) should be on

4. If all is correct then press the push button switch P4 and the motor demonstration should start.
   The demonstration should follow the following sequence:-
   * The motor will accelerate up to a set speed
   * The motor should then run in a steady state for approx 10 seconds
   * The Motor direction will be reversed
     (This will stop the motor and accelerate to the same speed but in the opposite direction)
   * The motor should then run in a steady state for approx. 10 seconds and then stop.

5. Once completed, the demonstration can be restarted by pressing the button (P4) again

6. When the demo is completed, the USB lead can be removed and proceed to install the GUI, software and documentation (See section 4).

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4.0   Installation

Insert the Software CD into your computer's CD-ROM drive. The CD should start the installation automatically. If the installer does not start, browse to the CD root folder and double click on the "setup.exe" file.

Windows™ Vista and 7 users may see "User Account Control" dialog box. If applicable, enter the administrator password and click <OK>. It is recommended that the user has sufficient administration rights to install the software on the CD. The following shall be installed:

    a.   The Motor Control GUI
    b.   The IAR Embedded Workbench (Kick Start Evaluation version)
    c.   Renesas Flash Programmer
    d.   The motor control IAR project
    e.   The RL78 IEC self test code and test harness project
    f.   All necessary documentation
    g.   Virtual UART USB drivers
    h.   Manual Navigator

Please note that the IAR Embedded Workbench will require license registration. Please follow the instructions during installation and ensure no other instance of the IAR Embedded Workbench is open.

The documentation will be copied and is designed to be viewed with the Manual Navigator, which is installed with this kit. It is recommended that a USB port or hub is used that does not have any other peripheral devices connected.

The virtual UART drivers are included separately with the CD_ROM and are also included in the IAR installation The correct driver needs to be installed before using the GUI RFP or IAR Workbench.

To install the virtual UART drives:-

1. Connect the USB cable to the board and the PC
2. 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.
3. **For 32-bit Windows OS**
    a.   If using the **YRMCKITRL78G14** installation:-
        32-bit USB drivers should be used (i.e. Windows XP, Vista and W7) and are located here
        C:\Program Files\Renesas\YRMCKITRL78G14\Virtual UART\32bit
    b.   If using the **IAR** installation:-
        C:\Program Files\IAR Systems\Embedded Workbench 6.0\rl78\drivers\renesas\VirtualCOM\32bit
4. **For 64-bit Windows OS**
    a.   If using the **YRMCKITRL78G14** installation:-
        64-bit USB drivers (i.e. Windows Vista and W7) and are located here:
        C:\Program Files\Renesas\YRMCKITRL78G14\Virtual UART\64bit
    b.   If the IAR installation:-
        C:\Program Files\IAR Systems\Embedded Workbench 6.0\rl78\drivers\renesas\VirtualCOM\64bit

On completion the driver installation should be set to "Renesas Starter Kit Virtual UART". This can be verified in the Device Manager and note the "com" port assigned.

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5.0   Using the Graphical User Interface (GUI)

5.1   Demonstration using the GUI

The GUI is installed during the installation process. To start the GUI click on the Motor Control Demonstration ICON in the start menu.

Motor Control Demo
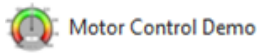
Please note that for Windows Vista and Windows 7 users, it is necessary to run the GUI as "Run as administrator".

It is suggested that the USB cable should be connected to the PC and the board before opening the GUI as this makes the connection process easier. The GUI can be opened without the board being connected.
It is also recommended that that there are no other peripheral devices connected to the port or hub being used for the motor control kit.

Once the GUI is open use the following procedure to connect the GUI to the YRMCKITRL78G14 board.

- If more than one "setup" file is in the GUI installation directory (C:\MCDEMO\..) then the user has to select the appropriate "setup" file from the "Select Board Setup" drop down menu bar in the Communication Settings box, located in top left hand corner of the GUI panel. Otherwise the default "setup" file is selected by automatically.
- Select the "setup" file (or alternative setup file name as required)
- Select the "serial Port" drop down box and select the communications port that the YRMCKITRL78G14 board is connected to
- Click on the "connect" button

5.2   The GUI should now be connected to the board

To start the demonstration, press the "DEMO" button in the GUI.
The board should follow the same sequence as described for the stand alone operation. (Section 3)

5.3   Manual Control of the motor

The GUI can also be used to control the motor manually using the Speed Control window.
Click the "Speed Control" button to open this window.
Here the user can start, stop and set direction and speed of the motor.

5.4   Motor parameter Monitoring

The motor operation can be monitored with the Property monitor and the three run time graph displays.
The parameter window can be used to dynamically set many of the operating parameters for the motor control algorithm and aid in the tuning of new or different motors.

5.5   Saving monitor data

It is possible to save the run time data to an excel file. This can be started by clicking the "save data to file" button in the Property Monitor window. The data will start to be saved once the file has been selected. All the data shown in the Property Monitor window is saved at each update of the GUI as a new entry in the excel file.

5.6   System Status

The system state can be monitored using the "System Monitor" window. This shows an overview of the RL78G14 internal configuration, the results of the internal self tests and the indication of the motor alarm function.

5.7   Algorithm Selection

The algorithm selection shows the available options together with the board jumper settings for each selection. The jumper settings for operation of the board can be displayed by clicking on the "Verify Jumper Settings" button when the algorithm window is open. This shows all the jumper settings for the different modes of operation as described in the user manual.

The GUI can be closed by either clicking on the "Exit" button in the bottom left hand corner or the usual windows close button.

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6.0   RL78/G14 Programming

The RL78/G14 can be programmed in two ways

1. **Using the Renesas Flash Programmer and the E1 module (Not included in this kit).**
   It is generally not required to change the jumper settings on the YRMCKITRL78G14 board when using the E1 programmer. Please refer to the user manuals included in the documentation for this kit for the correct operation of the E1 programmer and the RFP.

2. **Using the main USB interface**
   Please note that it is not possible to connect both the GUI and the RFP at the same time via the USB interface. To use the RFP directly with the USB interface please set jumpers to the following the settings:

   JP3, JP4, JP5, JP6 and JP7 to Pins 1 – 2

   The RFP should be configured to use the Serial port connection.
   Please refer to the RFP user manual for the correct operation and settings

   Note: the YRMCKITRL78G14 board can be programmed with an isolated USB interface when using an external power supply and non-isolated when board is powered only by the USB interface.

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7.0   RL78/G14 Debugging

As part of the installation process the IAR Embedded Workbench (Kick Start version) is installed. This allows some additional development and testing of the motor control operation

Code development for the RL78/G14 can be made and debugged in two ways

1. **Using the IAR Embedded Workbench and the E1 unit in On Chip Debug (OCD) mode.**
   As the E1 is not included in this kit it usage details are not included with this guide.
   Please refer to E1 documentation included on the software CD and the YRMCKITRL78G14 Motor Control Starter Kit user manual. It is possible to use the E1 debugger together with the motor control GUI although limitations exist.

2. **Using the IAR Embedded Workbench in direct mode (TK)**
   The IAR debugger can be used directly with the board using the "TK" setting in the Debugger options. This utilises the same serial port and virtual UART configuration as the RFP.
   Note: the IAR debugger cannot be used together with either the motor control GUI or RFP.

   To use the IAR debugger set the Jumpers as follows:

   JP3, JP4, JP5, JP6 and JP7 to Pins 1 – 2
   When the IAR CSPY debugger is activated it will connect and download (program) the built program open in the workbench IDE. The same debugging functions are available for this mode as for the E1 OCD module.
   This mode of debugging can be used with or without an external power supply as the operation of the interface can operate as both isolated and non-isolated.

   The full operation of the IAR Embedded Workbench is beyond the scope of this guide. Please refer to the IAR documentation included with the IAR installation and the YRMCKITRL78G14 Motor Control Starter Kit user manual.

8.0   Next Steps

After you have completed this quick start procedure, please review documentation that came with the kit. The sample code project contains all you need to get started developing your own projects. The software tools provided are Evaluation versions and may have limitations that are described in the documentation. To purchase fully functional versions, please contact your usual Renesas supplier.

9.0   Support

Online technical support and information is available at the following locations

Technical Contact Details

America:	techsupport.america@renesas.com
Europe:	www.renesas.com/motor
Japan:	csc@renesas.com

Websites:

America:	www.am.renesas.com/motor
Europe:	www.renesas.eu/motor
Japan:	www.renesas.com

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