Application Note

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Getting Started

RH850/D1x

Renesas Electronics
www.renesas.com

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Chapter 1 Introduction

This document is intended to provide D1x specific information on the device usage. It should be used in conjunction with the appropriate D1x Users Manual and - if available - Operating Precautions Document (OPC).

This document provides relevant information about hardware and software related to work with the RH850/D1x devices:

- Latest device documentation,
- Latest tools for software development,
- Latest information about hardware tools for device development,
- Software examples to get started.

Chapter 2 Reference Documents

This chapter contains information about the device reference documentation.

2.1 Hardware Users Manual

The *Hardware Users Manual* (UM) provides information about the functional behaviour of the device.

To receive a copy of the *Hardware Users Manual*, please contact your local Renesas sales representative.

2.2 Datasheet / Electrical Target Specification

The *Datasheet* (DS) or *Electrical Target Specification* (ETS) provides information about the electrical behaviour of the device.

To receive a copy of the *Datasheet or Electrical Target Specification*, please contact your local Renesas sales representative.

2.3 Operating Precaution

The *Operating Precaution* (OPC) provides information about differences of the information provided within the User Manual or Data Sheet and actual device implementations.

To receive a copy of the *Operating Precaution*, please contact your local Renesas sales representative.

2.4 Software Users Manual

The S*oftware Users Manual* provides information about the V850E3v5 architecture.

To receive a copy of the S*oftware Users Manual*, please contact your local Renesas sales representative.

Chapter 3 Software Tools

Please note that this chapter only contains information about tools directly supported by Renesas Electronics.

Please make sure to unzip any compressed files before copying them to their destination directories.

3.1 Development Environment / Compiler

3.1.1 Green Hills Multi

The required version of the GHS compiler is MULTI v2013.5.5 or v2015.1.7.

In this Application Note, the following installation path is used:

'Compiler-directory': C:/ghs/comp_201355

3.1.2 Documentation

The Operations Precautions Manual for the Green Hills MULTI Integrated Development Environment can be downloaded from the following website:

http://www.renesas.eu/update?oc=Y-GHS-MULTI-V800-FULL

3.1.3 EXEC & ESERV

In order to support the RH850/D1x devices, the supplied EXEC and ESERV versions of the default GHS installation need to be replaced.

The latest versions at the release date of this document are:

Executor Version: V4.00.00.00
850eserv2 Version: V2.044

The files are contained in the folder '01 - Tools/01 - GHS/'.

Copy all files of the ‘01 – Tools/01 - GHS/copy2comp’ directory to the ‘Compilerdirectory’. Copy all files directly to the ‘Compiler-directory’.

The folder '01 - Tools/01 - GHS/manuals' contains the accompanying documentation e.g. the actual version of the V850/850E ICE SERVER Reference Manual.

The document number of this manual which is also distributed with the Green Hills Multi installation is 'sv-v850e2-us-xx' (where xx stands for the actual version of the document.

This document describes how to use Green Hills Multi in combination with the Renesas ICE and debug interface.

Note:
When using this Exec/850eserv package please update the IE850 [QB-V850E2] main unit to the newest firmware version (see Chapter 4.1.1 IE850 [QB-V850E2] main unit).

3.2 Device Files

The device file package contains the following material:

- Device Files (*.dvf) for the devices of the D1x series
- C-Header files (*.h) of device related registers
  there are three folders containing header files (*.dvf.h). For the example project the files in the folder named 'inc_ghs' are used.
- Debugger information files (*.grd)
- Linker files (*.ld)
- Startup files (*.850)

The files can be found within the 'RH850D1x_Getting_Started' package in this folder:

01 – Tools/01 – GHS/Device File

For detailed change/usage and version information refer to the related readme files.

The device file (*.dvf) can be placed in any directory of the user's PC installation. Still, the chosen path must be supplied to the GHS environment upon start of a debug session. See chapter 'Demo Code Examples' for further details.

The header-, linker- and other files usually are placed within the directory structure of a SW project. See the supplied demo project for reference.

Chapter 4 Hardware Tools

Please note that this chapter only contains information about tools directly supported by Renesas Electronics.

4.1 IE850 [QB-V850E2] In-Circuit-Emulator

4.1.1 IE850 [QB-V850E2] main unit

In case the IE850 [QB-V850E2] is configured to operate with V850E2 devices it needs to be updated in order to operate with RH850 devices.

The description on how to perform this update (and how to configure the emulator back for operation with V850E2 devices) and the related software tools and data files can be found in this folder:

01 – Tools/04 – IE850/IEQBUTL2

Please check the sub folder ‘RH850’ on how to prepare the emulator for operation with RH850 devices and the sub folder ‘V850E2’ for reverting the emulator for operation with V850E2 devices.

4.1.2 IE850 [QB-V850E2] In-Circuit-Emulator Accessories Overview

The below table lists the accessories to be used with the IE850 [QB-V850E2] In-Circuit-Emulator. It contains hyperlinks to the related documentation on the Renesas Website for further information.
(Tools shown in italic letters are not **recommended for new designs**.)

MCU	Package	IE850	Pod	Exchange Adapter	Emulator Connector	Target Connector	Mount Adapter	Trace Option
RH850/D1M2H	484-pin BGA (27x27)	Y-QB-V850E2-EE	RTE7701460EPA00000R *RTE7701412EPA00000R*	RTE7701412CBF484T000R	-	BSSOCKET484Z2627RE21N	LSPACK484Z2627RE01	QB-V850E2-SP
RH850/D1M1A	272-pin BGA (27x27)		RTE7701460EPA00000R	RTE7701461CBF272T000R	-	BSSOCKET272Z2021RE21N	LSPACK272Z2021RE11 LSPACK272Z2021RE12	
RH850/D1M1H	272-pin BGA (27x27)		RTE7701460EPA00000R *RTE7701427EPA00000R*	RTE7701463CBF272T000R *RTE7701407CBF272T000R*	-	BSSOCKET272Z2021RE21N	LSPACK272Z2021RE11	
RH850/D1M1	176-pin QFP (24x24)			RTE7701463CBF272T000R *RTE7701405CFK176T000R*	QB-176GM-YQ-01T	QB-176GM-NQ-01T	QB-176GM-HQ-01T	
RH850/D1L2H								
RH850/D1L2	144-pin QFP (20x20)			RTE7701422CFK144T000R *RTE7701401CFK144T000R*	QB-144GJ-YQ-01T	QB-144GJ-NQ-01T	QB-144GJ-HQ-01T	
RH850/D1L1	144-pin QFP (20x20)			RTE7701421CFK144T000R *RTE7701401CFK144T000R*	QB-144GJ-YQ-01T	QB-144GJ-NQ-01T	QB-144GJ-HQ-01T	

4.2 Flash Programmer PG-FP5

In order to support the RH850/D1x devices the PG-FP5 GUI, PG-FP5 firmware and FPGA data should have the below mentioned versions:

GUI Version:	V2.15
Firmware Version:	V2.15
FPGA Version:	V4

The required flash programmer GUI and firmware updates can be downloaded from the following website:

http://www.renesas.eu/update?oc=PG-FP5-EE

Or go to the Renesas Microcontroller Development Tools Download site and select the PG-FP5:

http://www2.renesas.eu/products/micro/download/

For programming via PG-FP5 please use the latest version of the parameter files for the corresponding RH850/D1x devices:

Parameter files:

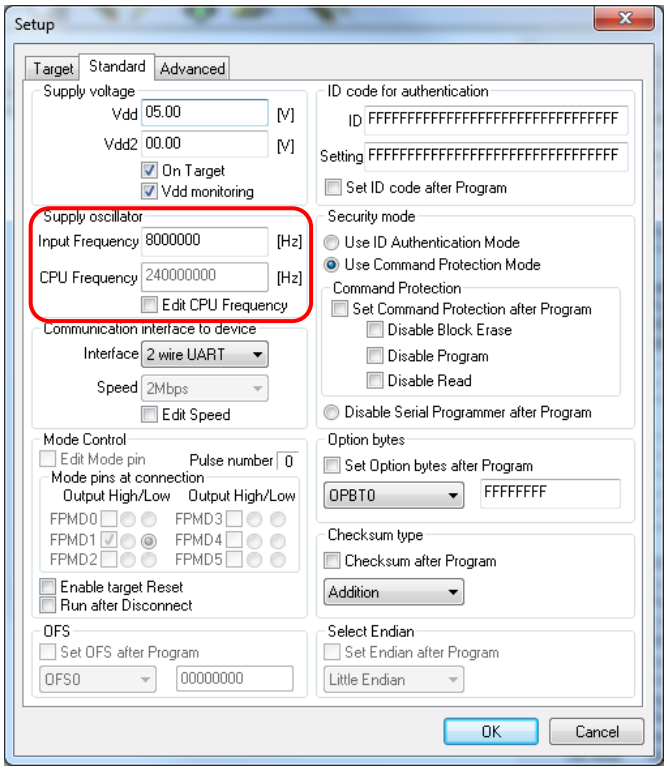
	Device	Device Version	PR5-File	Version
144-pin	R7F701401		R7F701401.pr5	V1.00
144-pin	R7F701402		R7F701402.pr5	V1.00
176-pin	R7F701403		R7F701403.pr5	V1.00
176-pin	R7F701404		R7F701404.pr5	V1.00
176-pin	R7F701405		R7F701405.pr5	E1.00a
272-pin	R7F701406		R7F701406.pr5	V1.00
272-pin	R7F701407		R7F701407.pr5	V1.00
376-pin	R7F701408		R7F701408.pr5	E1.00b
376-pin	R7F701410		R7F701410.pr5	V1.00
484-pin	R7F701411		R7F701411.pr5	V1.00
484-pin	R7F701412		R7F701412.pr5	E1.00b
144-pin	R7F701421		R7F701421.pr5	V1.00
144-pin	R7F701422		R7F701422.pr5	V1.00
176-pin	R7F701423		R7F701423.pr5	V1.00
376-pin	R7F701428		R7F701428.pr5	V1.00
376-pin	R7F701430		R7F701430.pr5	V1.00
484-pin	R7F701431		R7F701431.pr5	V1.00
484-pin	R7F701432		R7F701432.pr5	V1.00
272-pin	R7F701461		R7F701461.pr5	E1.00b

The parameter files for the flash programmer can be found within the ‘RH850D1x_Getting_Started’ package in this folder:

01 – Tools/02 - PG-FP5

Usage note:

For a successful connection to the device, please use the supply oscillator settings shown in the screenshot below:



4.3 Flash Programmer RFP

The standard version of the RFP can be used to program D1x devices.

The RFP can be downloaded from the Renesas Microcontroller Development Tools Download / Updates site:

http://www.renesas.eu/update?oc=RFP-EE

Or go to the Renesas Microcontroller Development Tools Download site and select the RFP-EE:

http://www2.renesas.eu/products/micro/download/

In RFP select the settings for RH850/Generic Boot Device.

Operating Precautions for the RFP (if available) can be found using the above mentioned links. Actual updates can be found in this package in the folder

01 – Tools/03 - RFP

4.4 eFLASHLOAD utility

The eFLASHLOAD utiliy can be used to program external flash memories using the standard Renesas debugging hardware (e.g Debugger E1).

Use Version 3.00 or higher for RH850/D1x devices.

The eFLASHLOAD utility and the accompanying documentation can be downloaded from the Renesas Microcontroller Development Tools Download / Updates site:

http://www.renesas.eu/update?oc=eFLASHLOAD

Or go to the Renesas Microcontroller Development Tools Download site and select the eFLASHLOAD utility:

http://www2.renesas.eu/products/micro/download/

4.5 Debugger E1

No dedicated actions or updates are required to use the E1 emulator with the RH850/D1x devices.

The manual “Additional Document for User’s Manual (Notes on Connection of RH850/D1L and RH850/D1M)” can be found on the Renesas Web Site:

https://www.renesas.com/en-eu/search/keyword-search.html#q=R20UT3120EJ

4.6 Application Boards

This chapter lists the various application boards available for RH-850-D1x devices.

The default configuration settings of the below mentioned application boards is described in this manual:

"RH850/D1x - Application Board Default Settings",
document number: R01AN2124EDxxxx

The manuals can be found within the ‘RH850D1x Getting Started’ package in this folder:

‘03 - Documentation’

4.6.1 Y-RH850-D1X-MB-T1-V1

RH850/D1x main board Y-RH850-D1X-MB-T1-V1,
board imprint "SBEV-RH850-MAIN".

The latest version of the Main Board Users Manual is
AIB3-H-14-0052 Rev. 1.00 (Preliminary)

4.6.2 Y-RH850-D1L2-PB-TET-V1

RH850/D1L2 adapter board with 144 pin TET socket.

For use with device and emulator.
Board imprint "SBEV-RH850-D1L2".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0481 Rev. 1.01 (Preliminary)

4.6.3 Y-RH850-D1L2H-PB-TET-V1

RH850/D1L2H and RH850/D1M1 adapter board with 176 pin TET socket.

For use with device and emulator.
Board imprint "SBEV-RH850-D1L2H/D1M1".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0368 Rev. 1.01 (Preliminary)

4.6.4 Y-RH850-D1M1H-PB-DEV-V1

RH850/D1M1H adapter board with direct device assembly.
Board imprint "SBEV-RH850-D1M1H".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0480 Rev. 1.01 (Preliminary)

4.6.5 Y-RH850-D1M1H-PB-TET-V1

RH850/D1M1H adapter board with TET BS socket.

For use with device and emulator.
Board imprint "SBEV-RH850-D1M1H".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0480 Rev. 1.01 (Preliminary)

4.6.6 Y-RH850-D1M1A-PB-DEV-OM-V1

RH850/D1M1A adapter board with with R7F701461 MCU assembly and MCP Memory (OctaFlash+OctaRAM).

For use with device and emulator.
Board imprint "SBEV-RH850-D1M1A".

The latest version of the Adapter Board Users Manual is
AISM-AB-17-0020 Rev. 0.02 (Preliminary)

4.6.7 Y-RH850-D1M1V2-PB-TET-OM-V1

RH850/D1M1-V2 adapter board with TET BS socket and equipped with Octa Flash/RAM.

For use with device and emulator.
Board imprint "SBEV-RH850-D1M1-V2".

The latest version of the Adapter Board Users Manual is
AISM-AB-17-0103 Rev. 0.01 (Preliminary)

4.6.8 Y-RH850-D1M1V2-PB-TET-HM-V1

RH850/D1M1-V2 adapter board with TET BS socket and equipped with Hyper RAM.

For use with device and emulator.
Board imprint "SBEV-RH850-D1M1-V2".

The latest version of the Adapter Board Users Manual is
AISM-AB-17-0103 Rev. 0.01 (Preliminary)

4.6.9 Y-RH850-D1M2H-PB-DEV-V1

RH850/D1M2H adapter board with direct device assembly.
Board imprint "SBEV-RH850-D1M2H".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0053 Rev. 1.01 (Preliminary)

4.6.10 Y-RH850-D1M2H-PB-TET-V1

RH850/D1M2H adapter board with TET BS socket and mount adapter.
For use with device and emulator.
Board imprint "SBEV-RH850-D1M2H".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0053 Rev. 1.01 (Preliminary)

4.6.11 Y-RH850-D1M2H-PB-TET-V2

RH850/D1M2H adapter board with TET BS socket, no mount adapter.
For use with emulator.
Board imprint "SBEV-RH850-D1M2H".

The latest version of the Adapter Board Users Manual is
AIB3-H-14-0053 Rev. 1.01 (Preliminary)

Chapter 5 Demo Code Examples

5.1 Basic Demo Code

In case of using (GHS Multi) Demo Projects provided by RENESAS, please note the following:

The software is intended as generic example which shows basic initialization and setup.
The software is provided for reference only.

The files can be found within the ‘RH850D1x_Getting_Started’ package in this folder:

'02 - Example SW'

The GHS software project ‘D1x_GHS_StartUp’ is a minimum application to get started on the RH850/D1x device.

The example project is available for the following devices:

- RH850/D1L2H
- RH850/D1M1H
- RH850/D1M2H

The SW provides

- initialization/start-up of the external oscillator,
- initialization/start-up of the PLL,
- switch of the CPU clock to the PLL,
- initialize peripherals used (ports, timer),
- set up timer interrupt function,
- toggle output ports.

When the debug session within the GHS Multi debugger is started an RC file is automatically executed. The RC file is used to establish the connection to the target hardware.

Some settings in the RC file might need to be adjusted. The RC file is located at the following location (example):

/D1M2H_GHS_StartUp_PLL_Timer/output/example.rc

To choose between different available connection methods the RC file should be used. The following options are available:

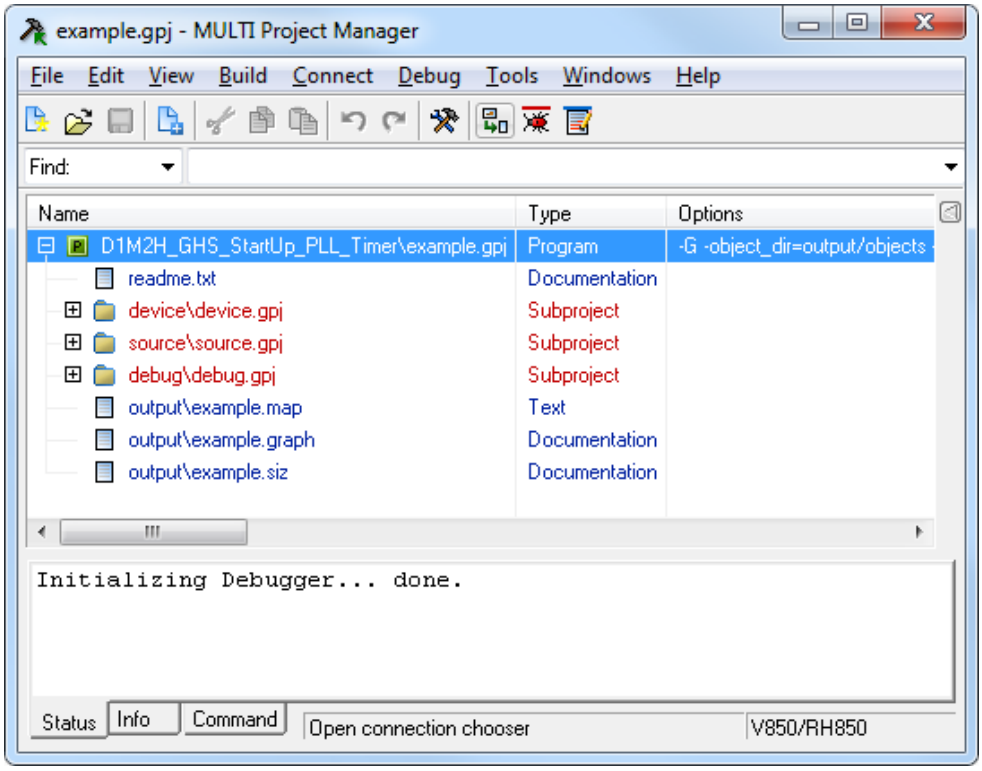
- E1 Debugger (default setting),
- IE850 [QB-V850E2] with target hardware connected,
- IE850 [QB-V850E2] with target hardware not connected.

To choose between the different connection methods, please comment out the unused options.

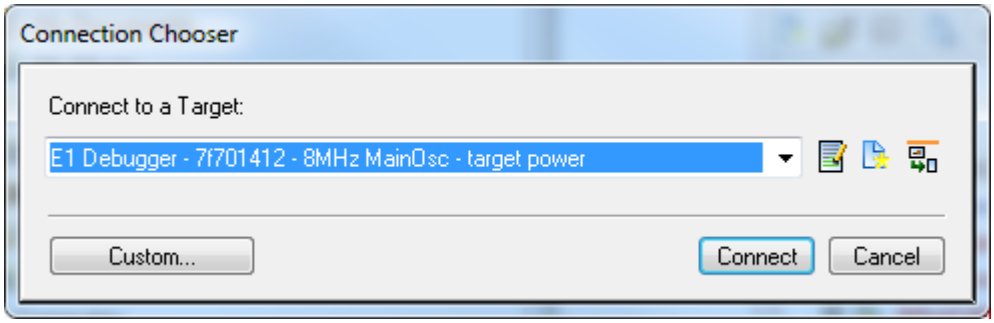
The path to the Device File might need to be adjusted according to the related installation directory. Change the path specified at the ‘-ip=’ option to your installation requirements.

Alternatively the target connection method can be specified in the GHS Multi Connection Chooser. For example it can be specified if the project is run using the E1 Debugger or the In-Circuit-Emulator.

To use the Connection Chooser, select 'Connect' in the Multi Project Manager...

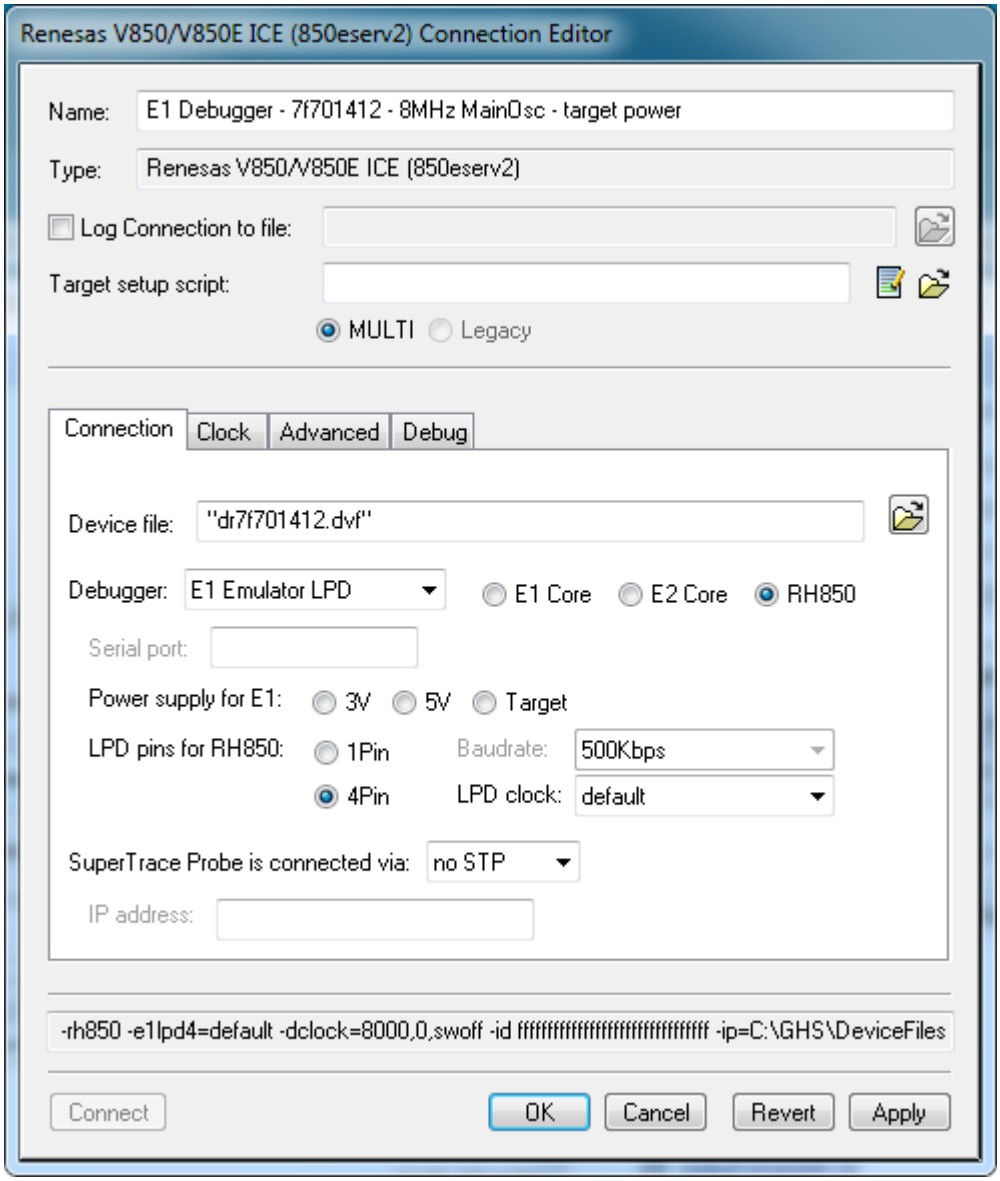


...to open the Connection Chooser...



...select the option "Edit"...

...options can be set in the Connection Editor:



5.2 Further Demo Code Examples

Renesas provides on request a number of demo codes to help faciliate understanding the D1x device operation and application development.

Code examples can be provided for:

- Stepper Motor Driver (ISM+ZPD)
- PCM-PWM Converter (PCMP)
- Sound Generator (SG)
- Temperature-Sensor
- Simple register based CAN-Driver
- etc.

This code is provided as example code from Renesas free of charge / without warranty and can be requested by email form:

device_support.d1x-eu@lm.renesas.com

Or contact your Renesas sales representative.

5.3 Renesas Graphics Library (RGL)

Renesas provides a Graphics Library to give full access to all graphics functions of the microcontroller. The RGL provides:

- API to access all D1x graphics functions, incl. drawing engines, video out/in, warping, JPEG decoding and serial flash access.
- OpenVG 1.1 is available as RGL option (depending on chosen D1x variant).
- Various 3rd-party HMI tool frameworks / code generators are based on RGL (e.g. Altia Design or Luxoft Populus).
- RGL is a production-ready library offered by Renesas as evaluation license and MP license.

See also: http://www.renesas.com/products/mpumcu/rh850/rh850d1x/index.jsp

For further information on D1x Graphics Library contact your Renesas sales representative.

Chapter 6 Revision History

Version / Document Number	Date [YYYY-MM-DD]	Description
R01AN2204ED0100	2014-09-04	Initial release.
R01AN2204ED0101	2014-09-29	Added eFlashload utility, updated references to actual documentation: Software Manual, OPC (Operating Precautions) for GHS Multi.
R01AN2204ED0102	2014-10-17	Added reference to Software Users Manual Added PG-FP5 parameter files for D1L2 devices Updated Exec for Green Hills Multi Added device file package for D1L2 devices Updated documentation for D1x main board Added documentation for D1L2 and D1L2H adapter board Added example software for D1L2 device
R01AN2204ED0103	2015-02-17	Updated application boards and documentation, updated device files, updated PG-FP5 parameter files.
R01AN2204ED0104	2015-04-13	Updated device files (structered GRD files added), updated Preliminary Hardware User's Manual Adapter Board D1M1H, updated PG-FP5 version and parameter files, updated RFP release note.
R01AN2204ED0105	2015-06-10	Updated device files, updated PG-FP5 parameter files, updated RFP, updated documentation for D1x main board, updated EXEC and 850eserv, updated IE850 [QB-V850E2] main unit firmware, added example software for D1M1H device.
R01AN2204ED0106	2015-12-15	Updated device files, updated PG-FP5 parameter files, updated EXEC and 850eserv, added info on demo code examples, added info on RGL (Renesas Graphics Library), updated application board documentation, renamed folders in "01 - Tools/04 - IE850", removed pod documentation, therefore

		added tool emulator accessories overview, replaced E1 connection manual by link to Renesas website.
R01AN2204ED0107	2016-07-26	Updated device files, updated PG-FP5 version, updated PG-FP5 parameter files, updated EXEC and 850eserv.
R01AN2204ED0108	2017-02-07	Updated EXEC and eserv, updated device files, updated tool emulator accessories overview, updated PG-FP5 version, updated PG-FP5 parameter files, updated RFP readme, updated link to E1 Emulator Manual Addendum, updated documentation for Pod for IE850 In-circuit Emulator.
R01AN2204ED0109	2017-07-18	Updated EXEC and eserv, updated device files, updated application board documentation.

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