RENESAS

V850ES/Jx3-L Stick

32-bit Microcontroller

V850ES/Jx3-L   UPD70F3793
                        UPD70F3792

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The following usage notes are applicable to all MPU/MCU products from Renesas. For detailed usage notes on the products covered by this manual, refer to the relevant sections of the manual. If the descriptions under General Precautions in the Handling of MPU/MCU Products and in the body of the manual differ from each other, the description in the body of the manual takes precedence.

1. Handling of Unused Pins
   Handle unused pins in accord with the directions given under Handling of Unused Pins in the manual.

   The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on
   The state of the product is undefined at the moment when power is supplied.

   The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses
   Access to reserved addresses is prohibited.

   The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals
   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

   When the clock signal is generated with an external resonator (or from an external oscillator) during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Moreover, when switching to a clock signal produced with an external resonator (or by an external oscillator) while program execution is in progress, wait until the target clock signal is stable.

5. Differences between Products
   Before changing from one product to another, i.e. to one with a different part number, confirm that the change will not lead to problems.

   The characteristics of MPU/MCU in the same group but having different part numbers may differ because of the differences in internal memory capacity and layout pattern. When changing to products of different part numbers, implement a system-evaluation test for each of the products.

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- • Product release schedule
- • Availability of related technical literature
- • Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)
- • Network requirements

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Preface

Readers This manual is intended for users who want to understand the functions of the concerned microcontrollers.

Purpose This manual presents the hardware manual for the concerned microcontrollers.

Organisation This system specification describes the following sections:

- Pin function
- CPU function
- Internal peripheral function

Module instances These microcontrollers may contain several instances of a dedicated module. In general the different instances of such modules are identified by the index "n", where "n" counts from 0 to the number of instances minus one.

Legend Symbols and notation are used as follows:

- Weight in data notation: Left is high order column, right is low order column
- Active low notation: xxx (pin or signal name is over-scored) or /xxx (slash before signal name) or _xxx
- Memory map address: High order at high stage and low order at low stage

Note Additional remark or tip

Caution Item deserving extra attention

Numeric notation Binary: xxxx or xxxB

Decimal: xxxx

Hexadecimal xxxxH or 0x xxxx

Numeric prefixes representing powers of 2 (address space, memory capacity):

K (kilo): $2^{10} = 1024$

M (mega): $2^{20} = 1024^2 = 1,048,576$

G (giga): $2^{30} = 1024^3 = 1,073,741,824$

Register contents X, x = don't care

Diagrams Block diagrams do not necessarily show the exact wiring in hardware but the functional structure. Timing diagrams are for functional explanation purposes only, without any relevance to the real hardware implementation.

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How to Use This Manual

(1) Purpose and Target Readers

This manual is designed to provide the user with an understanding of the hardware functions and electrical characteristics of the MCU. It is intended for users designing application systems incorporating the MCU. A basic knowledge of electric circuits, logical circuits, and MCUs is necessary in order to use this manual. The manual comprises an overview of the product; descriptions of the CPU, system control functions, peripheral functions, and electrical characteristics; and usage notes.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the xxx/xx Group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
Data Sheet	Hardware overview and electrical characteristics	xxx/xx Group Datasheet	R01DSxxxxEJxxxx
User's manual for Hardware	Hardware specifications (pin assignments, memory maps, peripheral function specifications, electrical characteristics, timing charts) and operation description. Note: Refer to the application notes for details on using peripheral functions.	xxx/xx User's manual for Hardware	This User's manual
User's manual for Software	Description of CPU instruction set	xxx/xx Series User's manual for Software	R01USxxxxEJxxxx
Application Note	Information on using peripheral functions and application examples. Sample programs. Information on writing programs in assembly language and C.	Available from Renesas Electronics Web site.	
Renesas Technical Update	Product specifications, updates on documents, etc.		

(2)   List of Abbreviations and Acronyms

Abbreviation	Full Form
ACIA	Asynchronous Communication Interface Adapter
bps	bits per second
CRC	Cyclic Redundancy Check
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
GSM	Global System for Mobile Communications
Hi-Z	High Impedance
IEBus	Inter Equipment Bus
I/O	Input/Output
IrDA	Infrared Data Association
LSB	Least Significant Bit
MSB	Most Significant Bit
NC	Non-Connect
PLL	Phase Locked Loop
PWM	Pulse Width Modulation
SFR	Special Function Register
SIM	Subscriber Identity Module
UART	Universal Asynchronous Receiver/Transmitter
VCO	Voltage Controlled Oscillator

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Table of Contents

Chapter 1 Introduction

V850ESJX3-STICK is a demonstration kit for the Renesas J Series V850ES microcontroller family. It supports On-Board debugging and Flash programming. The board is pre-programmed to work with the GUI, provided on the CDROM, to demonstrate the low power capabilities of the Renesas J Series MCU.

1.1 Features of V850ESJX3-STICK

- Easy to use device demonstration capabilities

V850ESJX3-STICK contains elements to easily demonstrate simple I/O-functions, i.e. LED output, I/O lines, UART serial interface.

- Power supply via USB interface

V850ESJX3-STICK is powered via USB interface. No separate power supply is needed although a connector is provided to supply an external power supply if needed.

- On-Board debug function

The *V850ESJX3-STICK* supports an On-Board debug function by using the IAR C-SPY debugger, without the need of additional debug hardware. It allows Flash programming and supports standard debug functions i.e. code execution, single stepping, software breakpoints, memory manipulation etc.

- WriteEZ5, Flash programming software

Windows based Flash programming software allows the user to select and download application programs to the *V850ESJX3-STICK* board for evaluation purposes.

- Various input / output signals available, such as
  - o All I/O ports prepared to be connected to user hardware
  - o Virtual UART interface, via the µPD78F0730 78K0 8-bit microcontroller with on-board USB interface
  - o 1 LED connected to the V850ES/JG3-L port for visualization.

- The IAR Embedded Workbench for V850 and the IAR C-SPY debugger / simulator are included. These packages are restricted in such that maximum program code size is limited to 32 kB.

- Full documentation is included for the Renesas V850ES/JG3-L microcontroller, the IAR Systems Embedded Workbench, IAR Systems C-SPY debugger / simulator and the Renesas WriteEZ5 Flash programming software.

Note ***V850ESJX3-STICK* is not intended for code development. Renesas does not allow and does not support in any way any attempt to use *V850ESJX3-***

STICK in a commercial or technical product.

1.2 System Requirements

Host PC	A PC supporting Windows 2000 or Windows XP is required for the IAR Systems Embedded Workbench demo-version. A Pentium processor with at least 1 GHz CPU performance, with at least 256 Mbytes of RAM, allowing you to fully utilize and take advantage of the product features. 500 Mbytes of free disk space, and an additional 10 Mbytes of free disk space on the Windows system drive. A web browser and Adobe Acrobat Reader to be able to access all the product documentation.
Host Interface	USB interface that enables communications in USB (version 1.1 or later)

1.3 Package Contents

- *V850ESJX3-STICK*

- CD-ROM 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 *V850ESJX3-STICK* starter kit.

1.4 Trademarks

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Chapter 2   V850ESJX3-STICK System Configuration

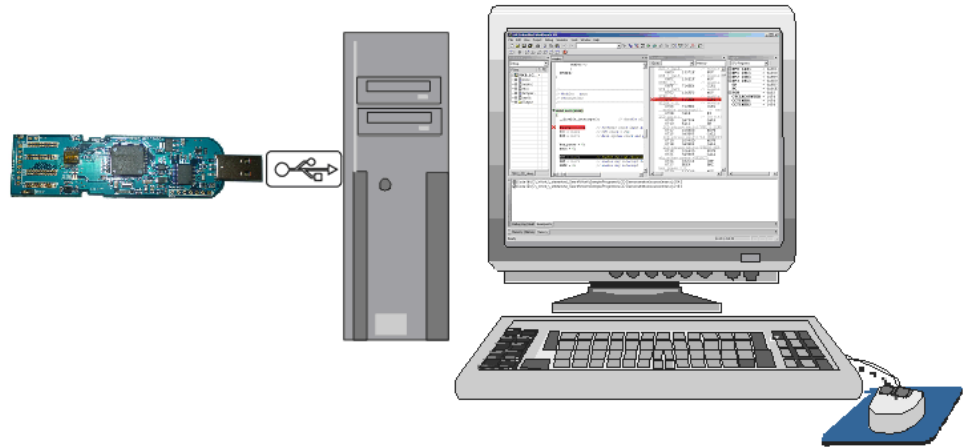The *V850ESJX3-STICK* system configuration is given in the diagram below:

Figure 1   *V850ESJX3-STICK* **system configuration**

2.1   V850ESJX3-STICK

V850ESJX3-STICK is a demonstration kit for the Renesas J Series V850ES family devices. The device used is the V850ES/JG3-L (μPD70F3793) a typical microcontroller from the J Series. The board can be directly connected to the host system via a USB port. The host system may be used for On-Board debugging or Flash programming and to allow execution of the demonstration program on the V850ES/JG3-L device in combination with the supplied demonstration GUI.

The *V850ESJX3-STICK* board is equipped with a 5 MHz oscillator which allows running the V850ES/JG3-L microcontroller at maximum speed of 20 MHz. Sub-clock is provided with 32.768 kHz.

2.2   Host Computer

The USB host interface enables communication to the *V850ESJX3-STICK* board. The μPD78F0730 78K0 8-bit microcontroller with on-chip USB interface and the Renesas virtual UART driver allows application software to access the USB device in the same way as it would access a standard RS232 interface. The Renesas virtual UART driver appears to the windows system as an extra COM Port, in addition to any existing hardware COM Ports.

2.3   Power Supply via USB Interface

V850ESJX3-STICK is powered by USB interface therefore no separate power supply is needed. The USB interface provides the *V850ESJX3-STICK* board with the supply voltage*.*

Chapter 3   V850ESJX3-STICK Board Components

The *V850ESJX3-STICK* board is equipped with USB connector and with several connectors in order to be connected to host computers, Flash programmer, MiniCube2 or any external target hardware.
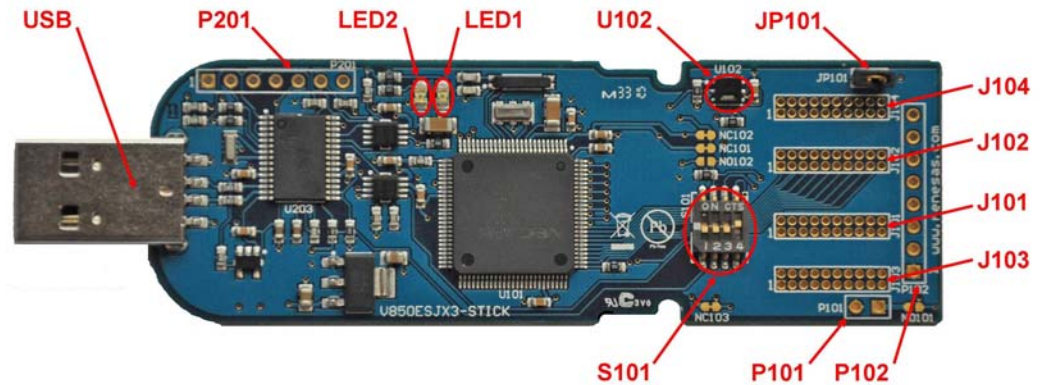

Figure 2   *V850ESJX3-STICK* **board Components**

Some of the *V850ESJX3-STICK* components are free for user application hardware and software. Please read the user manual of the V850ES/JG3-L device carefully to get information about the electrical specification of the available I/O ports before you connect any external signal to the *V850ESJX3-STICK* board.

3.1   Configuration Switch S101

The dip-switch S101 (Bits 1-4) controls the different operating modes of the *V850ESJX3-STICK* board.

3.1.1   GUI Demonstration Mode

Within the GUI demonstration operation mode, the target program that is written to the internal Flash memory of the V850ES/JG3-L device is executed. To release this mode, reset the *V850ESJX3-STICK* board once after switching S101.

S101	Configuration
S101.1	OFF
S101.2	OFF
S101.3	OFF
S101.4	ON

Table 1   S101, GUI demonstration mode

3.1.2 On-board Debug / Flash Programming Mode

The *V850ESJX3-STICK* starter kit supports an On-Board debug mode achieved by a dedicated monitor running on the V850ES/JG3-L device. By using the IAR C-SPY debugger, it supports Flash programming and standard debug functions i.e. code execution, single stepping, software breakpoints, memory manipulation etc.

Additionally the built-in Flash memory of the V850ES/JG3-L device can be re-programmed by using the WriteEZ5 Flash programming GUI.

Configure S101 as following to use the On-Board debug or Flash programming mode:

S101	Configuration
S101.1	OFF
S101.2	ON
S101.3	ON
S101.4	ON

Table 2   S101, On board Debug / Flash Programming Mode

For more details please refer to **Chapter 10 – On-board Debugging** of this document.

3.2 User's Led LED1

LED1 is connected to the port pin "P36" of the V850ES/JG3-L. It can be used by the user for any purpose.

3.3 Power Led LED2

LED2 is the Power LED. LED2 is activated if power is supplied to the *V850ESJX3-STICK* board.

3.4 External Power Supply P101

External power can be supplied by connecting a 5V DC to the connector P101 (not assembled). To power the complete board via external power supply, the soldering bridges NC103 must be opened (default closed) and NO101 must be closed (default opened). Please refer to the schematic and the assembly drawing of the board to locate the above components.

P101	Configuration
P101.1	Plus
P101.2	Minus

Table 3   External Power Supply - Connector P101

Note   Pin number 1 is marked with a square on the assembly drawing

3.5   Current Measurement JP101

JP101 is a closed jumper that connects the 3.3V power supply to the VDD pin of the V850ES/JG3-L. The jumper can be replaced by the two leads of an Amp-meter to measure the current consumed by the device. To use this function please make sure that the Amp-meter is connected before supplying power to the starter kit. The current can be measured for different power modes by using the demonstration GUI supplied to enter all different power modes.

3.6   MiniCube2 Connector P102

P102 (not assembled) is provided to allow debugging and programming of the *V850ESJX3-STICK* using MiniCube2. This function allows the user to make use of the UART0 and therefore write application that can use the Renesas virtual UART. For this function, an 8-way standard pitch connector needs to be mounted as shown below.
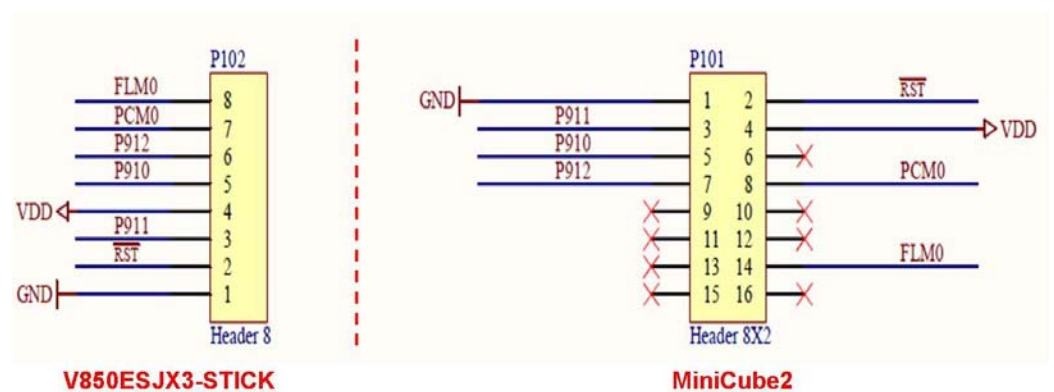
Figure 3   MiniCube2 Connection toV850ESJX3-STICK

3.7   MiniCube2 Connector P201

P201 was provided for programming of the μPD78F0730 78K0 8-bit microcontroller during manufacturing and is advised not to use it to keep the USB interface working correctly.

3.8   Temperature and Humidity U102

U102 is the SHT21 the digital temperature and humidity sensor lately launched by Sensirion. It integrates the sensors and a signal processing to provide calibrated output with I2C interface. The V850ES/JG3-L uses the I2C interface to communicate with the sensor. For detailed communication interface with the SHT21, please visit Sensirion website:

www.sensirion.com/humidity-sensor-sht21-datasheet
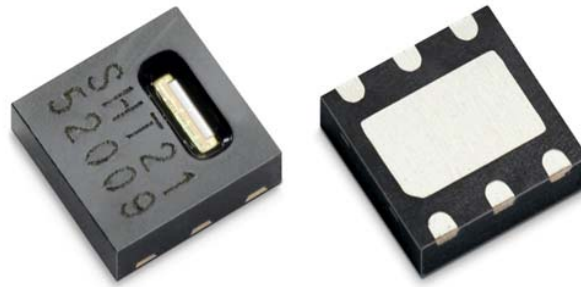
Figure 4   Temperature and Humidity Sensor from Sensirion

3.9 USB Interface Connector USB

The USB connector allows connecting the IAR C-SPY debugger or the WriteEZ5 Flash programming software to the *V850ESJX3-STICK* board in order to debug or program application software to the V850ES/JG3-L device. The board power supply is also provided by this connector.

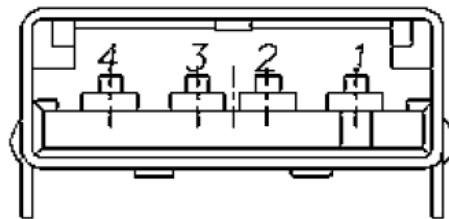Additionally connector USB connects UARTA0 of the V850ES/JG3-L device to the host system.

Figure 5   Connector USB, USB A Type Host Connector Pin Configuration

USB connector USB	Signal name
1	VBUS
2	D-
3	D+
4	GND

Table 4   Pin Configuration of USB Connector USB1

For connection with the host machine, *V850ESJX3-STICK* can be plugged directly into an available USB port.

3.10 External Connectors J101 to J104

J101 to J104 are connectors for external user hardware. A standard ½ pitch, 2 rows by 20 way, straight headers can be mounted to bring all I/Os for usage. Please read the user manual of the V850ES/JG3-L device carefully to get information about the electrical specification of the available I/O ports.

Figure 6   External connectors J101, J102, J103 and J104

J101	Signal Name	V850ES/JG3-L pin name	Comment
1	PDL4	PDL4 / AD4	
2	P35	P35 / TIP11 / TOP11	
3	PDL3	PDL3 / AD3	
4	P38	P38 / TXDA2 / SDA00	
5	PDL2	PDL2 / AD2	
6	P39	P39 / RXDA2 / SCL00	
7	PDL1	PDL1 / AD1	
8	P50	P50 / KR0 / TIQ01 / TOQ01 / RTP00	
9	PDL0	PDL0 / AD0	
10	P51	P51 / KR1 / TIQ02 / TOQ02 / RTP01	
11	PCT6	PCT6 / ASTB	
12	P52	P52 / KR2 / TIQ03 / TOQ03 / DDI / RTP02	
13	PCT4	PCT4 / RD	
14	P53	P53 / KR3 / TIQ00 / TOQ00 / DDO / SBI2 / RTP03	
15	PCT1	PCT1 / WR1	
16	P54	P54 / KR4 / DCK / SOB2 / RTP04	
17	PCT0	PCT0 / WR0	
18	P55	P55 / KR5 / DMS / SCKB2 / RTP05	
19	PCM3	PCM3 / HLDRQ	
20	P90	P90 / KR6 / TXDA1 / A0 / SDA02	

Table 5   Connector J101

J102	Signal Name	V850ES/JG3-L pin name	Comment
1	PDL14	PDL14 / AD14	
2	PDL15	PDL15 / AD15	
3	PDL13	PDL13 / AD13	
4	PDH0	PHD0 / A16	
5	PDL12	PDL12 / AD12	
6	PDH1	PHD1 / A17	
7	PDL11	PDL11 / AD11	
8	P711	P711 / ANI11	
9	PDL10	PDL10 / AD10	
10	P710	P710 / ANI10	
11	PDL9	PDL9 / AD9	
12	P79	P79 / ANI9	
13	PDL8	PDL8 / AD8	
14	P78	P78 / ANI8	
15	PDL7	PDL7 / AD7	
16	P77	P77 / ANI7	
17	PDL6	PDL6 / AD6	
18	P76	P76 / ANI6	

			Connected to 10 kΩ pull-down resistor
19	PDL5	PDL5 / FLMD1 / AD5	Connected to 10 kΩ pull-down resistor
20	P75	P75 / ANI5	

Table 6   Connector J102

J103	Signal Name	V850ES/JG3-L pin name	Comment
1	PCM2	PCM2 / HLDAK	
2	P91	P91 / KR7 / RXDA1 / A1 / SCL02	
3	PCM1	PCM1 / CLKOUT	
4	P92	P92 / TIP41 / TOP41 / A2	
5	PCM0	PCM0 / WAIT	
6	P93	P93 / TIP40 / TOP40 / A3	
7	PDH3	PHD3 / A19	
8	P94	P94 / TIP31 / TOP31 / A4	
9	PDH2	PHD2 / A18	
10	P95	P95 / TIP30 / TOP30 / A5	
11	P915	P915 / INTP6 / A15 / TIP50 / TOP50	
12	P96	P96 / TIP21 / TOP21 / A6	
13	P914	P914 / INTP5 / A14 / TIP51 / TOP51	
14	P97	P97 / SIB1 / TIP20 / TOP20 / A7	
15	P913	P913 / INTP4 / A13	
16	P98	P98 / SOB1 / A8	
17	P912	P912 / A12 / SCKB3	
18	P99	P99 / SCKB1 / A9	
19	P911	P911 / A11 / SOB3	
20	P910	P910 / A10 / SIB3	

Table 7   Connector J103

J104	Signal Name	V850ES/JG3-L pin name	Comment
1	P34	P34 / TIP10 / TOP10	
2	P74	P74 / ANI4	
3	P33	P33 / TIP01 / TOP01	
4	P73	P73 / ANI3	
5	P32	P32 / ASCKA0 / TOP01 / TIP00 / TOP00 / SCKB4	
6	P72	P72 / ANI2	
7	P42	P42 / SCKB0	
8	P71	P71 / ANI1	
9	P06	P06 / INTP3	
10	P70	P70 / ANI0	
11	P05	P05 / INTP2 / DRST	
12	VRef0	AVREF0	Connected to VDD by soldering bridge
13	P04	P04 / INTP1	
14	P10	P10/INTP9	
15	P03	P03 / INTP0 / ADTRG	
16	P11	P11/INTP10	
17	P02	P02 / NMI	
18	VRef1	AVREF1	Connected to VDD by soldering bridge
19	T_RESET	NA	External reset pin
20	PDH4	PHD4 / A20	

Table 8   Connector J104

3.11 Soldering Bridges

Some terminals can be customized by opening or closing the corresponding soldering bridge accordingly. For more details please refer to the board schematics **Chapter 12 – Schematics** of this document.
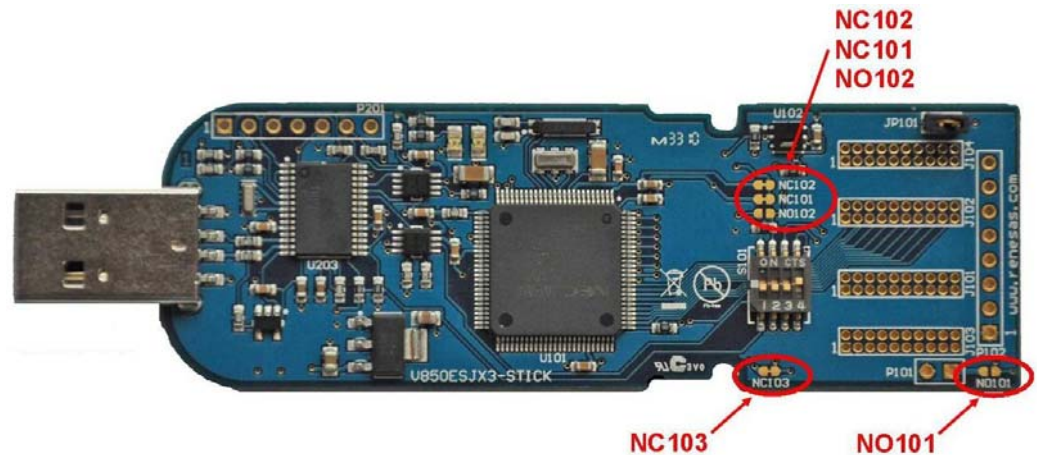
Figure 7   Placement of soldering bridges

Soldering Bridge Name	Factory Setting	Comment
NC101	Closed	Power is supplied from the USB interface
NC102	Closed	Connects AVREF1 pin to VDD
NC103	Closed	Connects AVREF0 pin to VDD
NO101	Open	Power is supplied externally
NO102	Open	By closing the soldering bridge the FLMD0 pin is connected to port pin P37. This allows by using Flash self-programming to enable or disable Flash write operations via port pin P37.

Table 9   Soldering Bridges

3.12 V850ES/JG3-L Memory Map

The V850ES/JG3-L memory layout is shown in the table below.

Address area			
	0x3FFFFFF 0x3FFF000	SFR Area	Free for user application software
	0x3FFEFFF 0x3FF5000	40 KB Internal RAM	
	0x3FFAFFF 0x3FF0000	Access prohibited area	
	0x3FEFFFF 0x1000000	Use prohibited (program fetch prohibited area)	
	0x0FFFFFF 0x0100000	External memory area	
	0x00FFFFF 0x0040000	Access prohibited area	
	0x007FFFF 0x0000000	512 KB Flash memory	Free for user application Software

Table 10   V850ES/JG3-L memory map

Chapter 4 Getting Started

The IAR Systems Embedded Workbench V850 allows to compile, download and debug application software on the *V850ESJX3-STICK* starter kit hardware.

Additionally, the WriteEZ5 Flash programming software can be used for simple Flash programming of the V850ES/JG3-L internal Flash memory.

As communication interface between the host computer and the *V850ESJX3-STICK* board, the USB port interface is used. Before you can download, debug or execute any application programs, hardware and software must be installed properly.

4.1 CDROM Content

The CDROM shows following directory structure:

V850ESJX3-STICK CDROM	Content Details
📁 Acrobat	Acrobat Reader for 32Bit Windows OS
📁 Applilet	Applilet for V850ES/Jx3-L setup
📁 Device File Package	V850ES/Jx3-L Device files Setup for IAR EW for V850
📁 Doc	Documentation
📁 dotnet	
📁 Driver	USB drivers for *V850ESJX3-STICK*
📁 IAR Systems	IAR Embedded Workbench for V850 setup
📁 Sample Program	
📁 IAR EW sample project	Sample program for IAR
📄 V850ESJX3-STICK.hex	Hex File for flash programming
📁 V850ESJX3-STICK_Demo	GUI for *V850ESJX3-STICK*
📁 WriteEZ5	
📁 PRM	PRM parameter file for WriteEZ5
🔷 WriteEZ5 GUI	WriteEZ5 GUI setup

Table 11 V850ESJX3-STICK CDROM directory structure

Chapter 5   Hardware Installation

After unpacking *V850ESJX3-STICK*, connect the stick board to your host computer. When *V850ESJX3-STICK* board is connected, the USB driver needs to be installed on the host machine. Please refer to the following section: **Chapter 6 - Software Installation**.

Chapter 6   Software Installation

The *V850ESJX3-STICK* package comes with several software demonstration packages:

- o IAR Systems Embedded Workbench for V850, including C compiler, assembler, linker, librarian and IAR C-SPY debugger / simulator

- o WriteEZ5 Flash programming GUI software to allow Flash programming of the V850ES/JG3-L internal Flash memory

- o V850ES/Jx3-L Demonstration GUI to be run with the sample program

- o Applilet in order to generate quickly and graphical code for your V850ES/Jx3-L device.

The IAR Systems Embedded Workbench and the WriteEZ5 Flash programming GUI must be installed on your PC. For detailed installation hints, refer to the following chapters and to the corresponding documentation of the IAR Embedded Workbench and of WriteEZ5.

Note Please insert the *V850ESJX3-STICK* CDROM in your PC in order to proceed with CDROM AUTORUN.

6.1   IAR Systems Embedded Workbench for V850 Installation

To install the *IAR Systems Embedded Workbench for V850* including the C-SPY debugger / simulator, select the *EWV850-KS32-EE_V371A* SETUP program in the directory \IAR Systems\ of the CDROM or click on the autorun on "IAR Embedded Workbench for V850". The setup dialogues will guide you through the installation process.

6.2   WriteEZ5 Flash Programming GUI Installation

To install the *WriteEZ5* Flash programming GUI, select the SETUP program in the directory \WriteEZ5\ of the CDROM or click on the autorun on "Flash Programming software WriteEZ5". The setup dialogues will guide you through the installation process.

6.3 V850ESJX3-L Demo GUI Installation

To install the *V850ESJX3-L Demo GUI*, select the *V850ESJx3-L* SETUP program in the directory \V850ESJX3-STICK_Demo\ of the CDROM or click on the autorun on "V850ESJX3-STICK Demo". The setup dialogues will guide you through the installation process.

6.4   Applilet Installation

To install the Applilet GUI code generator for the V850ES/Jx3-L device, select the *Applilet3_for_V850ESJX3-L_EE_V202* SETUP program in the directory \Applilet\ of the CDROM or click on the autorun on "Applilet3 for V850ESJx3-L". The setup dialogues will guide you through the installation process.

6.5   USB Driver Installation

In order to use the *V850ESJX3-STICK* board in combination with IAR C-SPY debugger or the WriteEZ5 Flash programming GUI software, "NEC Electronics Starter Kit Virtual UART" USB driver must be installed on the host machine.

Please check your Windows version, and follow the corresponding instructions:

- Installation on Windows 2000   → Chapter 6.5.1 of this manual
- Installation on Windows XP   → Chapter 6.5.2 of this manual

Note   *Please insert the V850ESJX3-STICK CDROM in your CDROM drive in order to proceed with the USB driver installation.*

After the installation, please go to **Chapter 6.5.3 – Confirmation of USB Driver Installation**.

6.5.1   Installation on Windows 2000

<1>   When the *V850ESJX3-STICK* board is connected with the host machine, the board is recognized by Plug and Play, and the wizard for finding new hardware is started. Click Next > to continue.

Figure 8   Found new Hardware Wizard (Windows 2000)

<2>   Select "Search for a suitable driver for my device (recommended)" and click
Next >.

Figure 9   Search Method (Windows 2000)

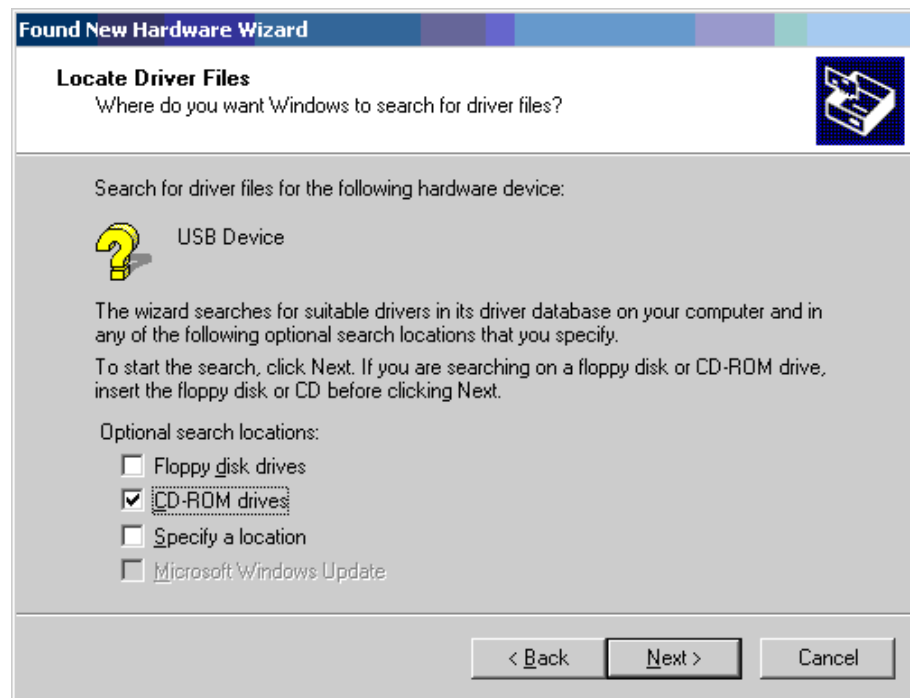<3>   Mark "CD-ROM drives" and click Next > .

Figure 10   Driver File Location (Windows 2000)

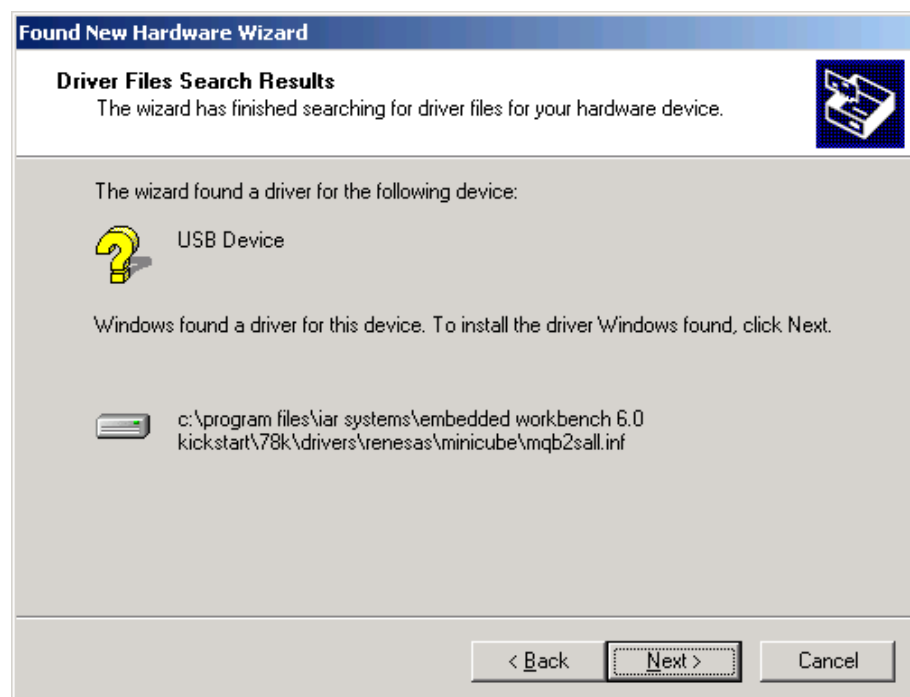<4>   Confirm the found driver "mqb2all.inf" by clicking Next > .

Figure 11   Driver File Search Result (Windows 2000)
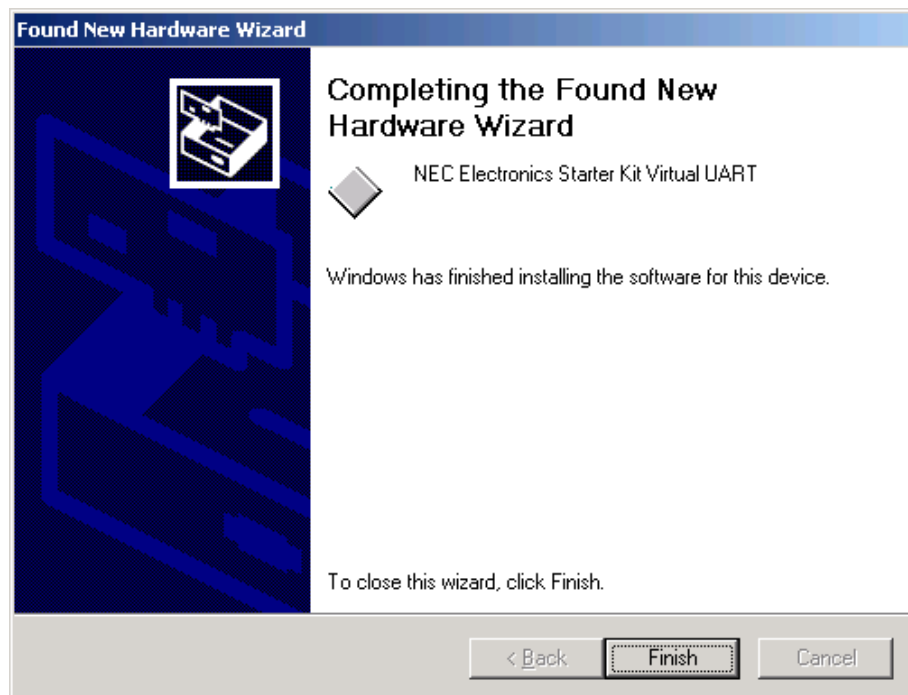
<5> Click Finish .to close the installation wizard

Figure 12   USB Driver Installation Completion (Windows 2000)

6.5.2   Installation on Windows XP

<1> When the *V850ESJX3-STICK* board is connected to the host machine, the board is recognized by "Plug and Play", and the wizard for finding new hardware is started.

Select "Install from a list or a specific location (Advanced)" and click Next > .

Figure 13   Found new Hardware Wizard (Windows XP)

<2> Mark "Search removable media".

Click Next > .

Figure 14   Search Location Specification (Windows XP)

<3> Click Continue Anyway to continue the installation.

Figure 15   Installation Confirmation (Windows XP)

<4>   Click Finish to close the installation wizard.

Figure 16   USB Driver Installation Completion (Windows XP)

6.5.3   Confirmation of USB Driver Installation

After installing the USB driver, check that the driver has been installed correctly, according to the procedure below.

Open "Device Manager" by entering Windows start menu:

[Start] → [Settings] → [Control Panel] → [System] → tab [Hardware]

When the V850ESJX3-STICK board is connected to the host PC, the "NEC Electronics Starter Kit Virtual UART" (without "?" mark) should be present under the section "Ports (COM & LPT)".

The screen below shows that the COM port number is "COM2".

When you change the USB port connection, the COM port number will be changed as well.
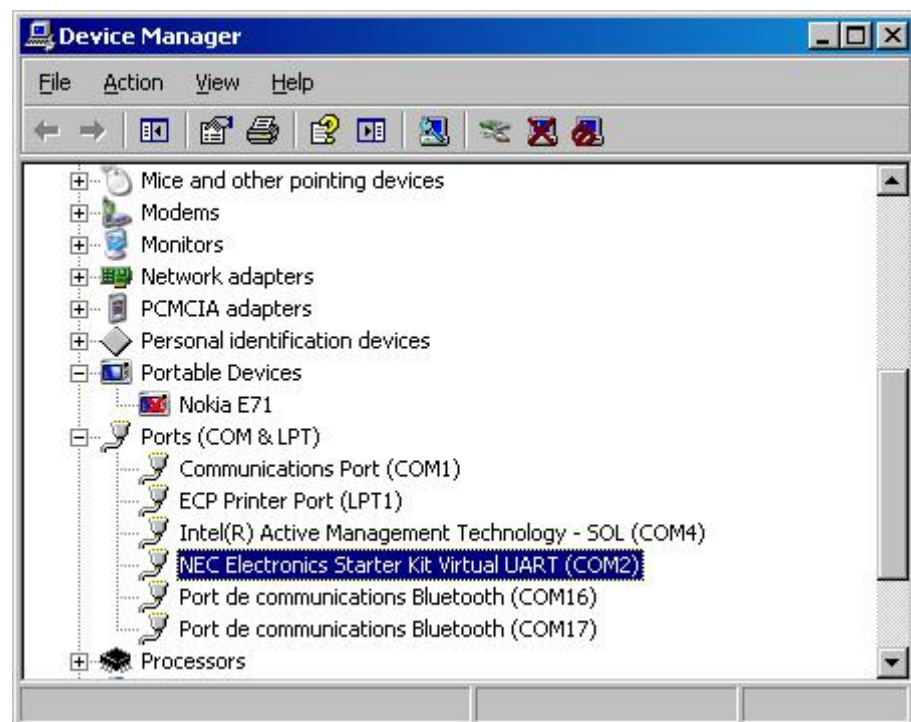
Figure 17   Device Manager

Caution   Do not do "Hardware Modification Scan" when you communicate with the target device.

Chapter 7 How to use WriteEZ5 Flash Programming Software

This chapter explains the basic operations of the WriteEZ5 GUI for programming the *V850ESJX3-STICK* board. This chapter covers how to start the system, execute the EPV command, and program the target V850ES/JG3-L device.

The conditions of the series of operations described in this chapter are as follows:

Hardware Configuration of *V850ESJX3-STICK*

Board	:	V850ESJX3-STICK
CPU	:	V850ES/JG3-L
Target Device	:	µPD70F3793
Clock	:	5 MHz
Voltage level	:	3.3V

Software Configuration of WriteEZ5 GUI

Parameter file	:	70F3793_CSI0.prm
Clock setting	:	5 MHz multiply by 4
Port	:	COMx (38400bps)
Operation mode	:	Chip
Write HEX file	:	V850ESJX3STICK.hex
Option Setting	:	Blank Check Before Erase

Please note that the user manual of the WriteEZ5 Flash programming GUI is available in the directory \Doc\ of the CDROM. By consequence, please refer to it for additional information about the WriteEZ5 GUI.

<1> Installing the WriteEZ5 GUI

Install the WriteEZ5 GUI software on the host machine you are using, by referring to **Chapter 6 – Software Installation** (if the software has not been installed yet).

<2> Installing the driver

Install the USB driver on the host machine you are using, by referring to **Chapter 6 – Software Installation** (if the driver has not been installed yet).

<3> Installing the parameter file

The parameter files for the family V850ES/JG3-L device can be found in the directory \WriteEZ5\PRM of the CDROM.

Newest version of parameter file for the µPD70F3793 device can be downloaded from the Renesas Electronics website. Download the parameter files from the following web site:

http://www.renesas.eu/update

<4> Setting and connecting   Set the *V850ESJX3-STICK* board by configuring S101 as following:

S101	Configuration
S101.1	OFF
S101.2	ON
S101.3	ON
S101.4	ON

Table 12   S101 configuration for Flash Programming Mode

Figure 18   Stick in Flash Programming Configuration

Connect the *V850ESJX3-STICK* board with the host machine.

<5> Starting   Start the WriteEZ5 GUI from Windows start menu:

[Start] → [Programs] → [Renesas Electronics Tools] → [WriteEZ5] → [V1.00_r3]

Or use the shortcut icon on your Desktop.
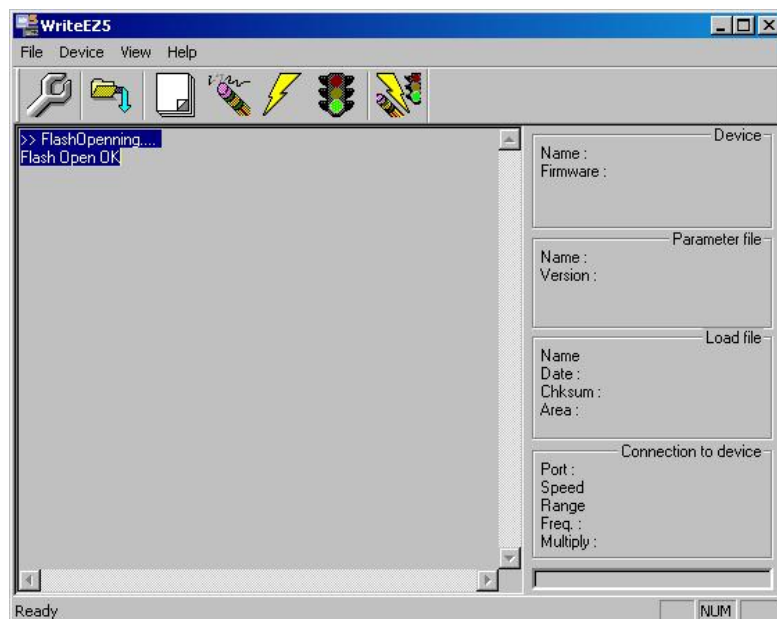
Figure 19   WriteEZ5 Startup screen

<6> Setting the programming environment

(6.1) Select [Device] → [Setup] from the menu bar or click on the [Setup] icon.

The "Standard" tab of the "Device Setup" dialog box is opened:
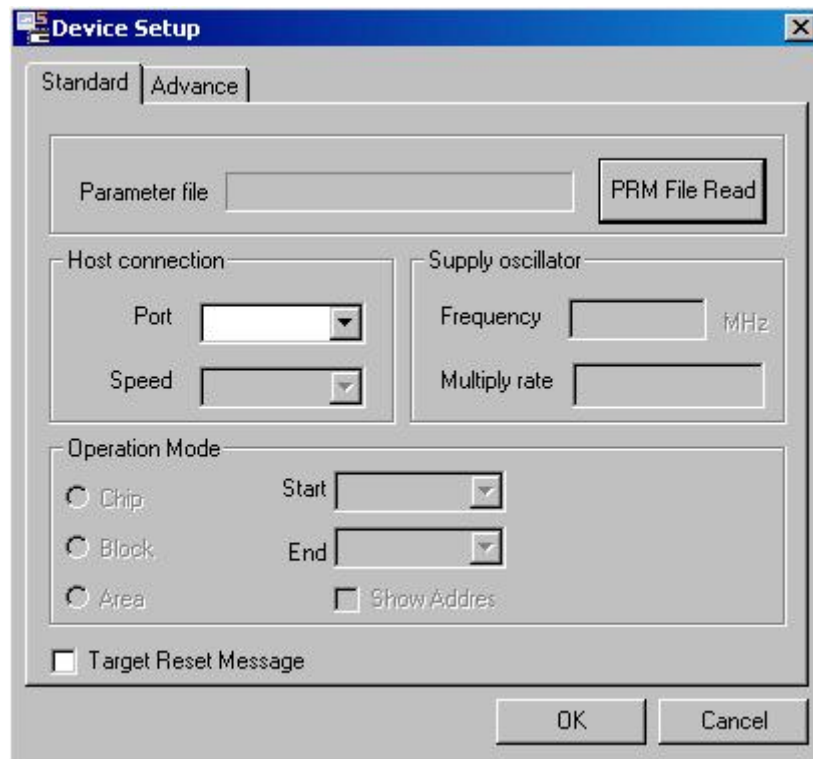
Figure 20 « Standard Device Setup » Dialog Box

(6.2) Click on PRM File Read to open the parameter file selection window.

Select the parameter file "70F3793_CSI0.prm" then click on Open .
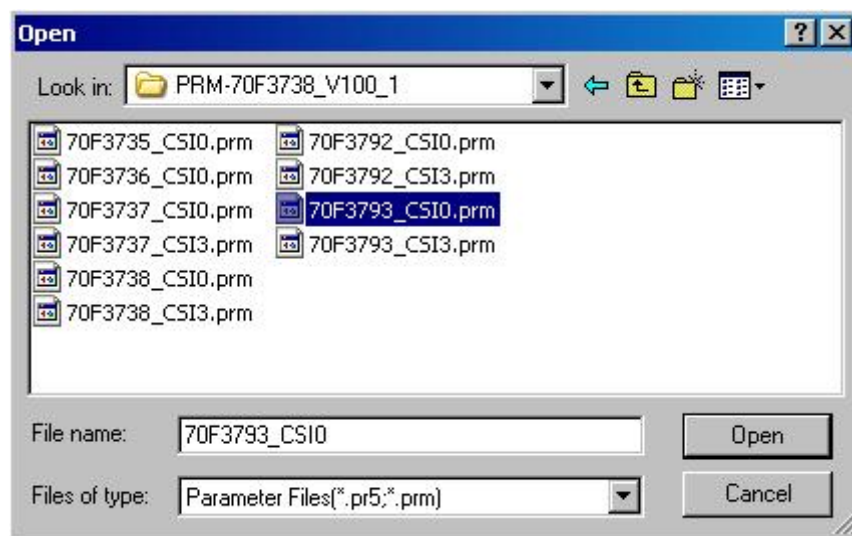
Figure 21 Parameter File Selection

(6.3) From the "Port" list box, select the communication port that matches the host machine being used. Select the communication speed of the host connection.
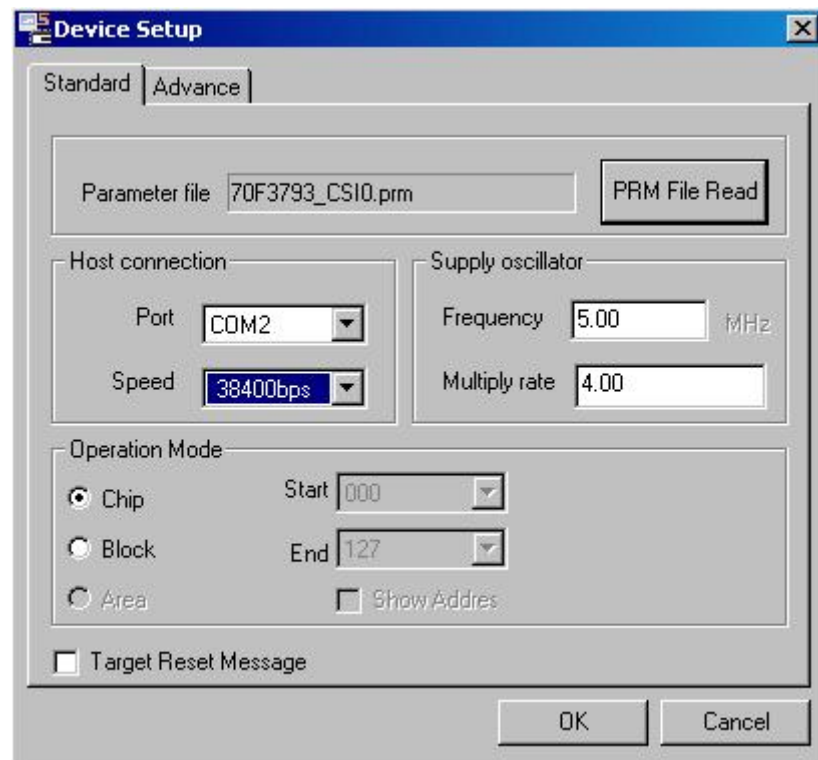
Figure 22 Port Selection

Remark   Selectable ports can be checked using Device Manager. For details, refer to **Chapter 6.5.3 - Confirmation of USB Driver Installation**.

(6.4) Set "Supply Oscillator" according to the specifications of the *V850ESJX3-STICK* board:

- o   "Frequency = 5 MHz"
- o   "Multiply rate = 4.00"

In "Operation mode", please specify the "Chip" mode.

The following figure shows the recommended settings:
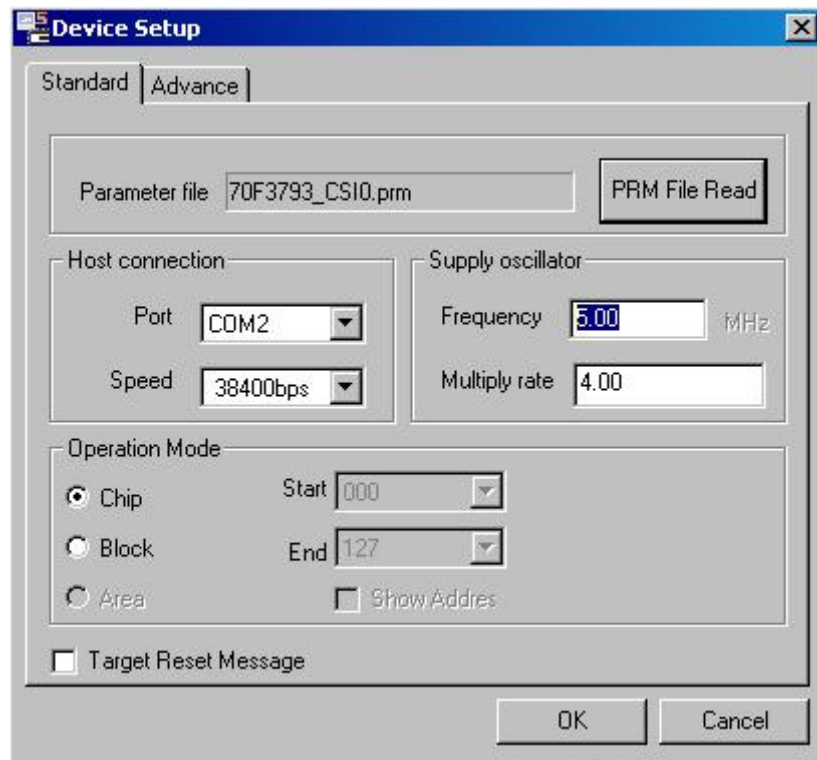
Figure 23   Oscillator Selection

(6.5) Switch to the "Advance" dialog box:

In "Command Options", check "Blank check before Erase".

In "Security flag settings", all the different options should remain unchecked.
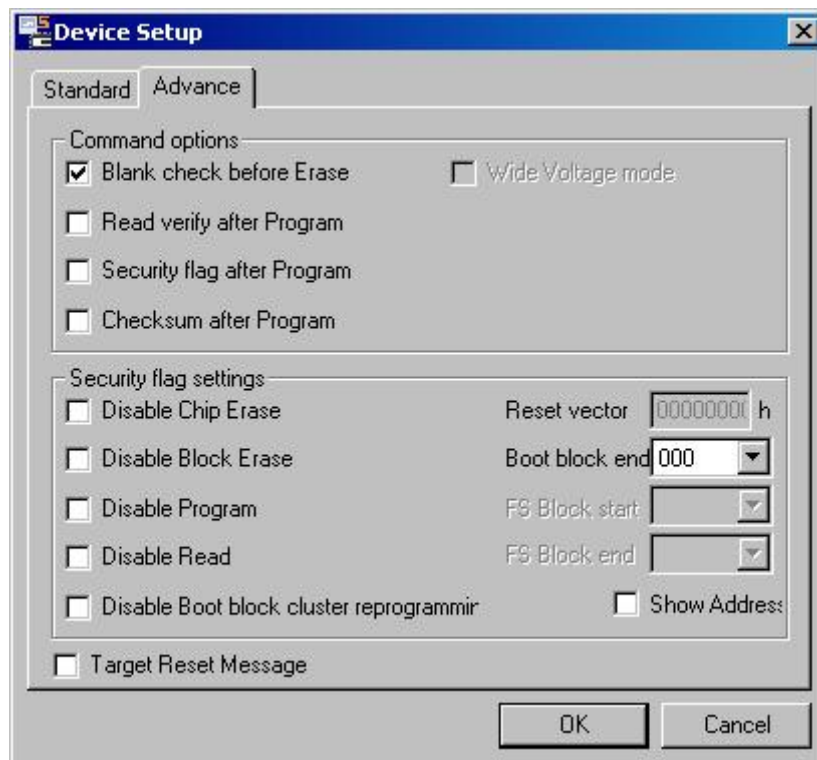
Figure 24   « Advance Device Setup » Dialog Box

(6.6) Click on the button OK . The GUI software sets the parameters.

When the settings have bee completed, the following screen is displayed:
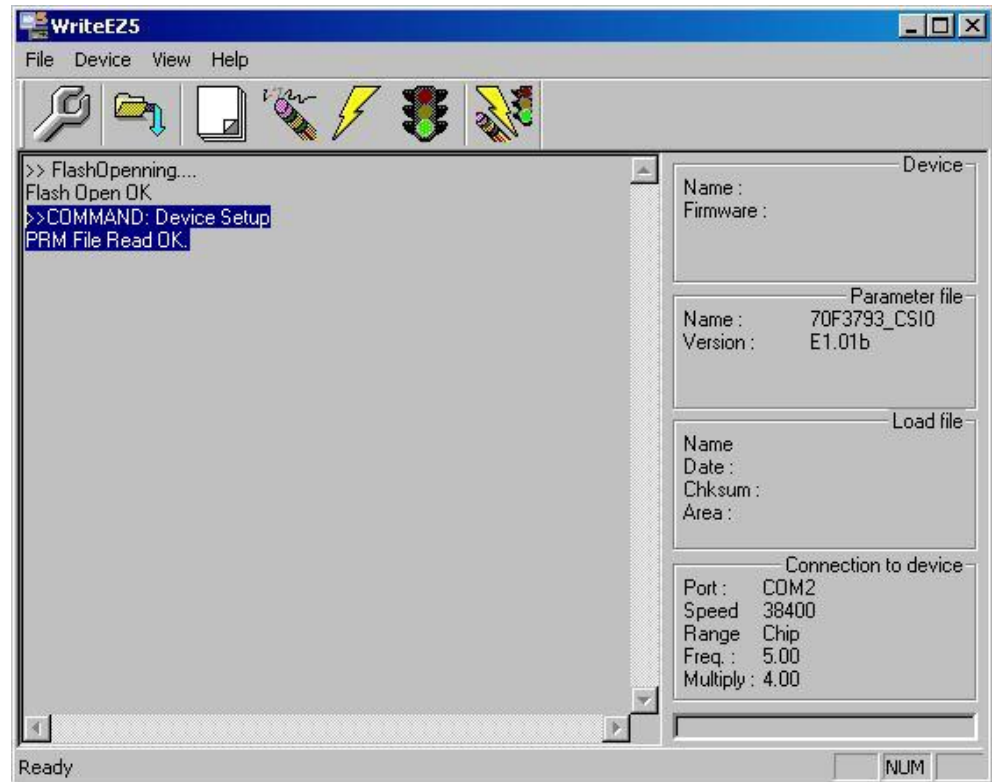
Figure 25   Completion of Parameter Settings

<7> Selecting a user program

(7.1) Select [File] → [Load] from the menu bar or click on the [Load] icon.

(7.2) Select a program file to be written to the target device, then click on the button Open .
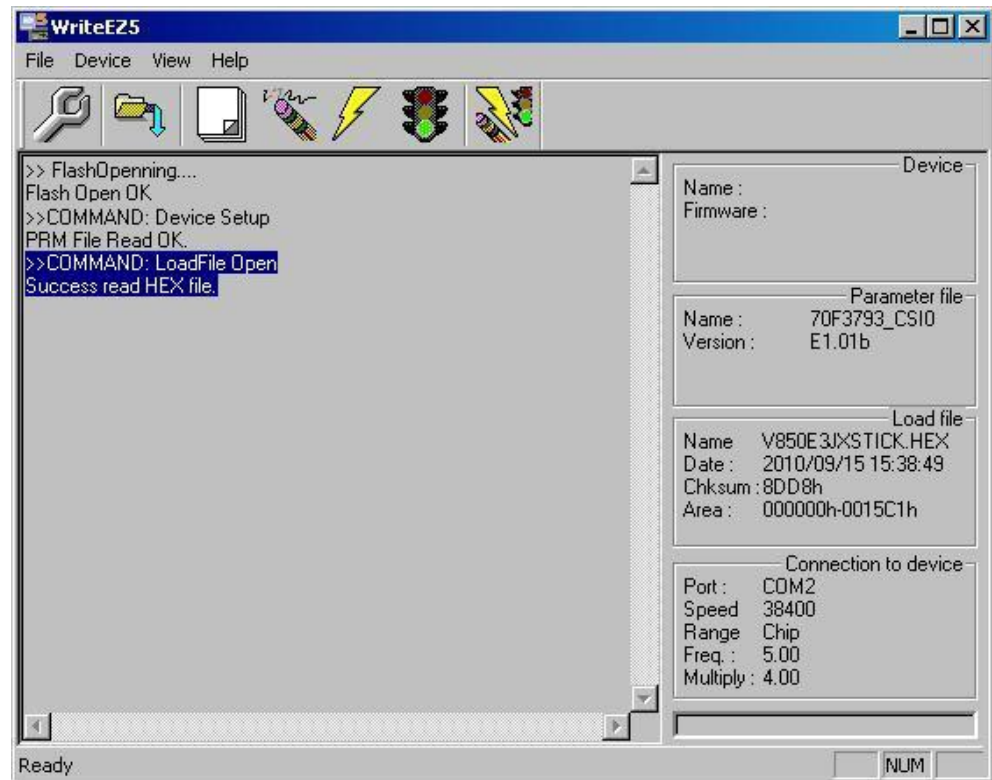
Figure 26   **Completion of HEX file Download**

<8> Autoprocedure (EPV) command execution   Select [Device] → [Autoprocedure(EPV)] form the menu bar or click on the [Autoprocedure] icon.

When the [Autoprocedure(EPV)] command is executed, Blank Check → Erase → Program and Flash Internal Verify are executed sequentially for the µPD70F3793 device.
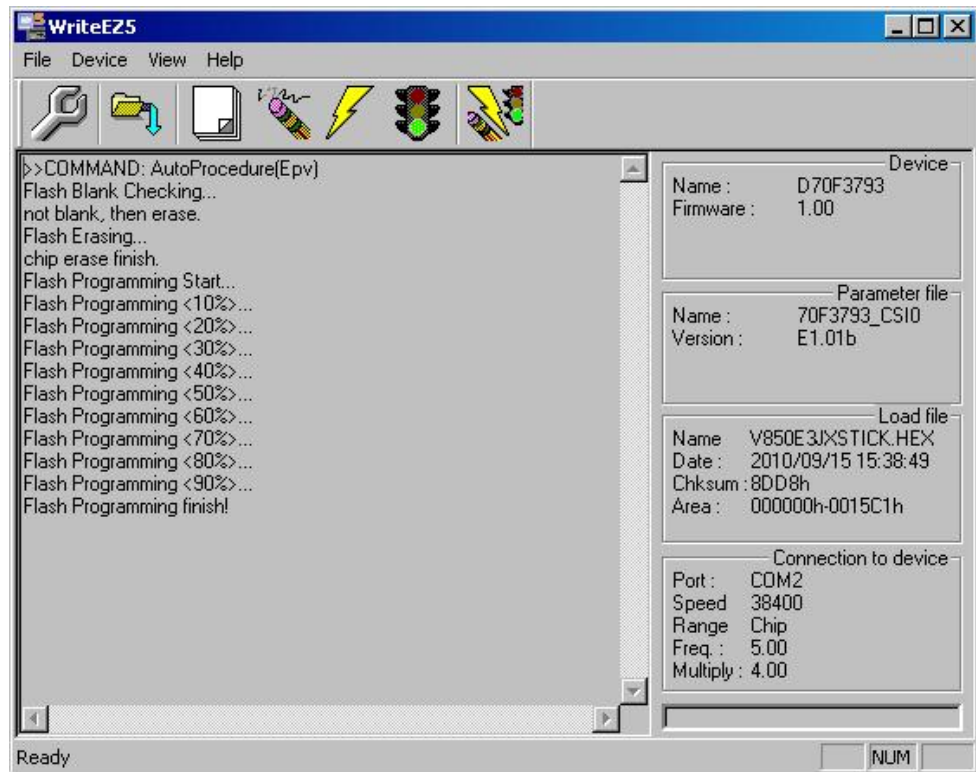
Figure 27   Completion of EPV command

<9> Terminating the GUI Select [File] → [Quit] to terminate the GUI software. All settings executed so are saved, so that those settings can be reused when the WriteEZ5 GUI is restarted.

<10> Execute application Set the *V850ESJX3-STICK* board to the normal operation mode by applying the following settings.

S101	Configuration
S101.1	OFF
S101.2	OFF
S101.3	OFF
S101.4	ON

Table 13   S101 configuration for Normal Operation Mode

Figure 28   Stick in Normal Operation Configuration

In case you have downloaded the original file of the starter kit, "Led 1" starts blinking.

<11> Restarting the GUI When the WriteEZ5 GUI is restarted, the latest settings should be applied.

Chapter 8 Troubleshooting

- **In driver installation, recognition based on Plug and Play is disabled.**

Cause:

The USB connector may not be inserted normally into the USB port of the personal computer.

Action:

Check that the USB connector is inserted fully into the USB port of the personal computer.

Alternatively, disconnect the USB connector, then insert the USB connector again after a while.

- **The driver file cannot be found at a specific location**

Cause:

The WriteEZ5 programming software may not be installed correctly.

Action:

Install the WriteEZ5 software again by referring to **Chapter 6 - Software Installation**.

- **In checking by Device Manager, "USB Serial Port" or "USB High Speed Serial Converter" is not displayed. Alternatively, the "!" or "×" is prefixed**

Cause:

The USB connector may not be inserted normally into the USB port of the personal computer.

Action:

Check that the USB connector is inserted fully into the USB port of the personal computer.

Alternatively, disconnect the USB connector from the USB port, then insert the USB connector again after a while.

Cause:

The driver may not be installed correctly.

Action:

<1>   When this product is connected to the personal computer, right-click the driver marked with "!" or "×".

Click Erase when displayed.

<2>   On Device Manager, execute [Hardware Modification Scan].

<3>   Install the driver again with Plug and Play.

Cause:

The device may not be recognized (in the case of connection with the USB hub).

Action:

Try the following:

o • Disconnect the USB connector, then insert the USB connector again.

o • Connect the USB connector to another port of the USB hub.

If the same symptom occurs, do not use the USB hub, but directly connect the connector to the USB port of the personal computer.

• **When this product is connected with a personal computer, the "Add New Hardware Wizard" screen is displayed**

Cause:

If the USB connector of this product is not inserted into the USB port used at the installation time but into another USB port, this product may be recognized as a new hardware item.

Action:

Install the driver by referring to **Chapter 6 - Software Installation**

• **Communication with the *V850ESJX3-STICK* is disabled**

Cause:

The driver may not be installed correctly.

Action:

Check if the USB driver is installed correctly by referring to **Chapter 6 – Software Installation**.

Cause:

The COM port selected via the "Port list box" within device setup menu of WriteEZ5 may not be set correctly.

Action:

Set the port checked using Device Manager.

Cause:

The *V850ESJX3-STICK* board is operating in normal mode.

Action:

Set the board to the Debugging / Flash programming mode.

Cause:

The PRM file selected in [Device Setup] may be incorrect.

Action:

Use the corresponding PRM file that matches the target device. For information about the PRM file, refer to **Chapter 7 – How to use WriteEZ5 flash programming software** or to the user manual of WriteEZ5 Flash programming GUI.

Cause:

The setting of "Supply oscillator" in [Device Setup] may be incorrect.

Action:

Make a correct setting according to the specifications of the target device

Chapter 9 On-Board Debugging

Before using the On-Board debug function of the *V850ESJX3-STICK* board together with the IAR C-SPY debugger it is necessary to install the USB driver first. The *V850ESJX3-STICK* starter kit uses a monitor program for debugging purpose. The communication between the starter kit and the IAR C-SPY debugger - that is running on the personal computer - is done via the standard UART / USB connection. The monitor program is automatically downloaded to the starter kit.

For communication interface, the build-in UARTA0 of the V850ES/JG3-L device is used by the monitor. Consequently, it can not be used by the user application.

To set the *V850ESJX3-STICK* starter kit to the On-Board debug mode configure S101 as following:

S101	Configuration
S101.1	OFF
S101.2	ON
S101.3	ON
S101.4	ON

Table 14   S101 configuration for On-board debugging / Flash Programming Mode

Figure 29   Stick in On board debugging Configuration

9.1 Monitor Resources

The debugging feature of the *V850ESJX3-STICK* starter kit has been realized by a monitor program that is running on the V850ES/JG3-L device. Therefore, the following resources are reserved by the monitor and can not be used by the user program.

9.1.1 UARTA0

The UARTA0 of the V850ES/JG3-L device is reserved for the monitor program and can not be used by a user program.

Device	UART for debugging	Interrupt Control Flag	Terminal user
V850ES/JG3-L (µPD70F3793)	UARTA0	UA0RMK	P30/TXDA0 P31/RXDA0

Additionally, please note the following points:

- Do not change the control registers of UARTA0.

- Do not change or disable the interrupt control / mask flags of UARTA0.

- Do not change the port mode or port mode control registers for port bits P30 and P31.

- Debugging functions like forcible break (debugger stop command) do not operate normally in the following states where the clock supply to UARTA0 is disabled:

  o IDLE mode

  o STOP mode

  o Main oscillation (fx) is stopped.

9.1.2 Interrupt Vectors

The following interrupt vectors are used by the monitor program and can not be used by a user program.

Device	Interrupt vector address	Function
V850ES/JG3-L (µPD70F3793)	0x0060	DBTRAP debug interrupt vector
	0x0310	UARTA0 receive interrupt vector

9.1.3 Reset Vector

When a user program is downloaded by using the IAR C-SPY debugger, the reset vector (address 0x0000) of the user program is replaced by the one of the monitor program. The debugger moves the reset vector of the user program automatically to address 0x0004. The correction of the relative jump address is also done automatically by the debugger.

0x0000	MOV _start, R31
0x0006	JMP R31
0x0008	

0x0000	JR monitor
0x0004	MOV _start, R31
0x000A	JMP R31
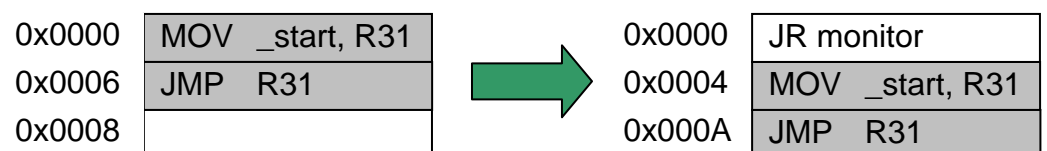
Figure 30 Example of reset vector

9.1.4 Memory Area

The monitor program is located in the highest Flash block of the V850ES/JG3-L device. Only 2 kB of memory are allocated by the monitor program. Moreover, the monitor reserves 10-16 bytes of the global stack area by halting the user program, caused by a forcible break (debugger stop command) or a software breakpoint.

9.1.5 Clock Operation

After releasing a reset, the monitor program sets the operation clock of the CPU to the maximum speed of 20 MHz. The monitor program switches also to the maximum CPU speed of 20 MHz when releasing a forcible break (debugger stop command) or when the user program execution is stopped caused by a software breakpoint. After the user program execution is restarted (debugger go command) the monitor restores the previous CPU operation clock setting.

Note Do not change the frequency of the external oscillator connected to the X1 and X2 pins. The baud rate calculation for UARTA0 is based on a 5 MHz input frequency; otherwise no communication to the *V850ESJX3-STICK* starter kit can be established.

9.1.6 Other Limitations

The watchdog timer 1 and 2 can not be used. Please be sure to set the option bytes of the V850ES/JG3-L device accordingly to allow the watchdog timer disable.

The forcible break (debugger stop command) can not be used when the global interrupts were disabled by the user program (DI instruction).

9.2 IAR Sample Session

When everything is set up correctly the IAR Embedded Workbench can be started. To do so, start the Embedded Workbench from Windows start menu:

[Start] → [Programs] → [IAR Systems] → [IAR Embedded Workbench Kickstart for V850]

The following screen appears:
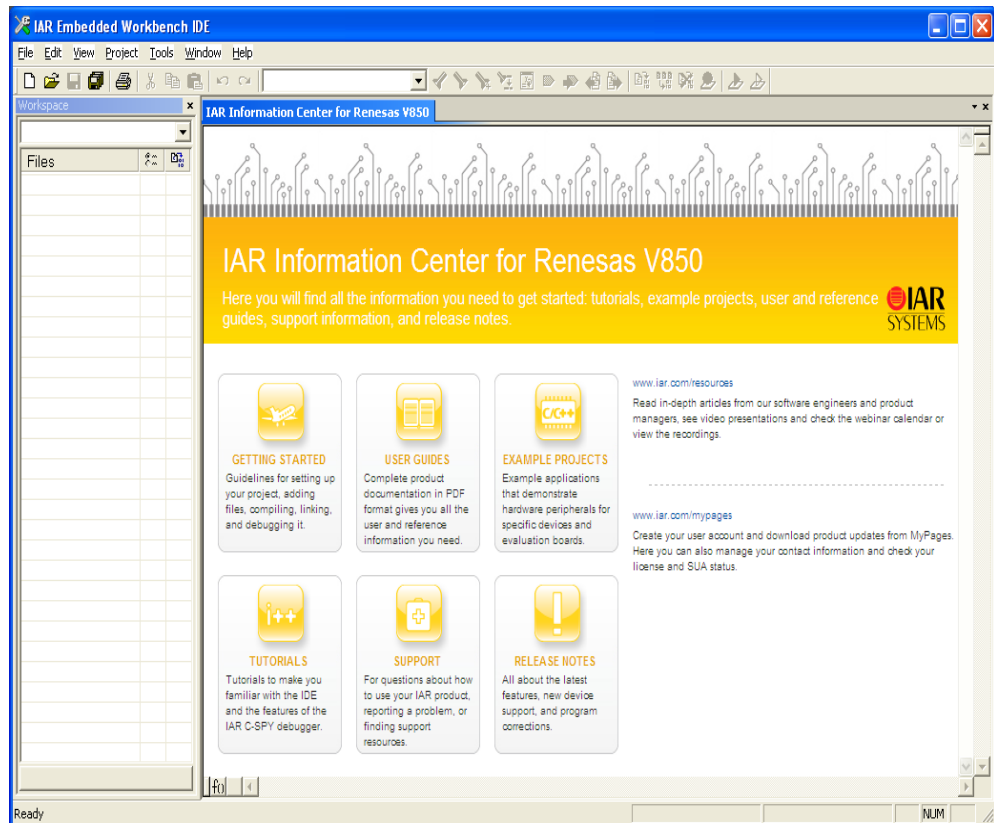
Figure 31 IAR Embedded Workbench

Now from the "File" menu select "Open" and select the option "workspace". Open the file "V850LPC_startup_sample_V100.eww". This is the workspace file that contains general information about the sample project and settings.
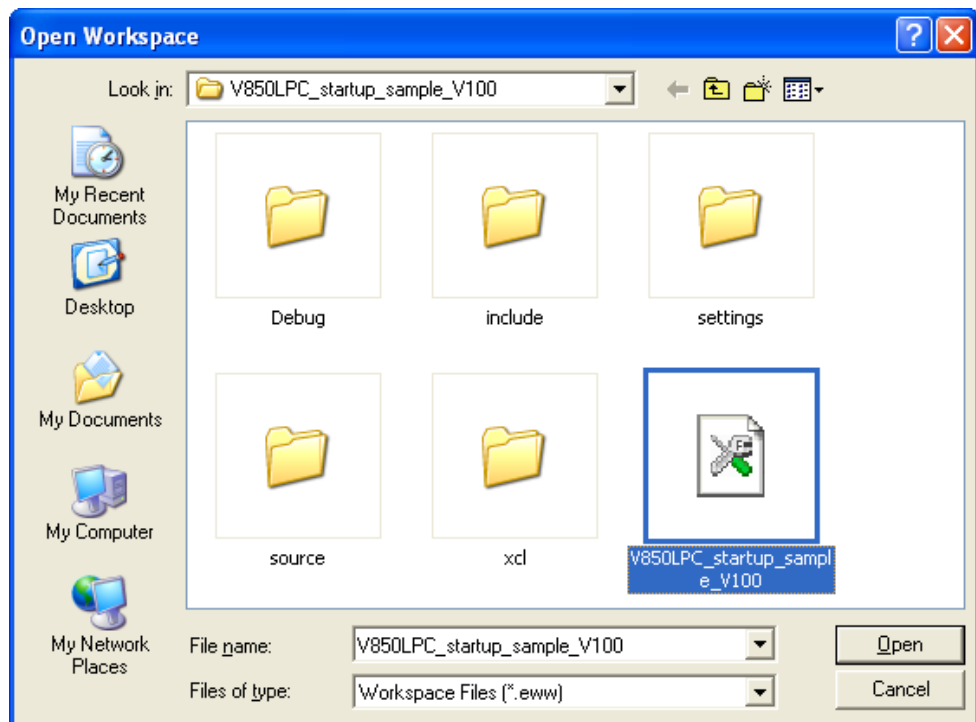
Figure 32 IAR Sample project location

After the demonstration workspace has been opened the project contained in the workspace is displayed. Now click on the little "+" sign next to the "**V850LPC_startup_sample_V100**" project to show files that are part of the project. The screen should now look similar to this:
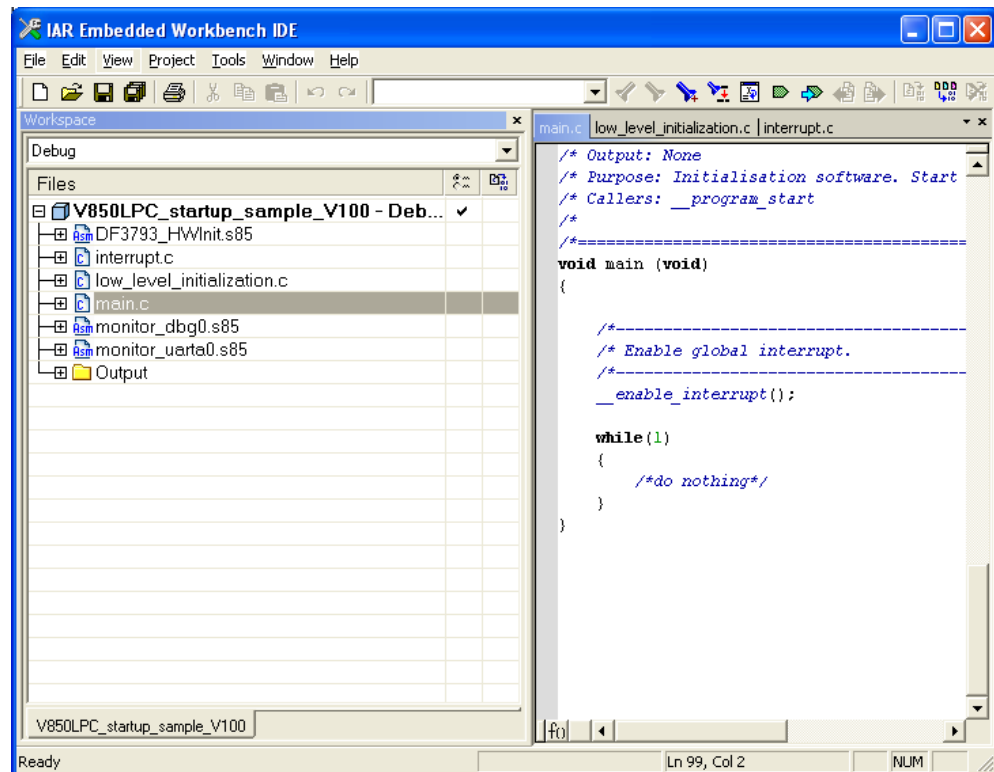
Figure 33   IAR project workspace

The next step is to check some settings of the IAR Embedded Workbench that have to be made for correct operation and usage of the On-Board debug function of the *V850ESJX3-STICK* board. First highlight the upper folder called "V850LPC_startup_sample_V100" in the workspace window. Then select "Project" > "Options" from the pull-down menus. Next select the category "Debugger". Make sure that the driver is set to "MINICUBE2" in order to use the On-Board debug function of the *V850ESJX3-STICK* board.
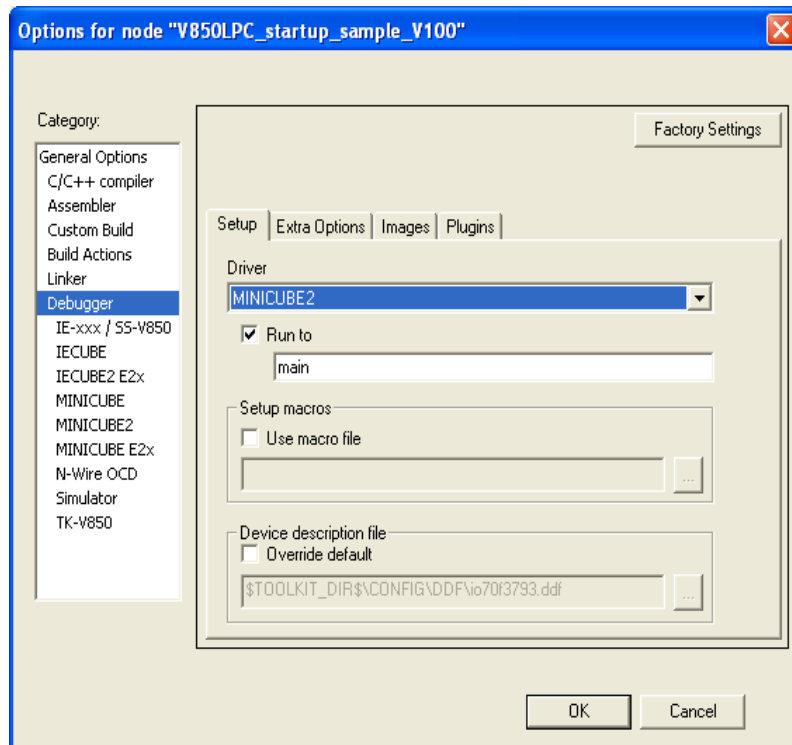
Figure 34 IAR Debugger options

Next the correct linker settings of the demo project will be checked. This can be done in the "Linker" category as shown below. Select the "Config" tab and check that the linker command file "lnk70f3793.xcl" is selected. This file is used by the linker and contains information on where to place the different sections of code and data that may be used within the demo project:
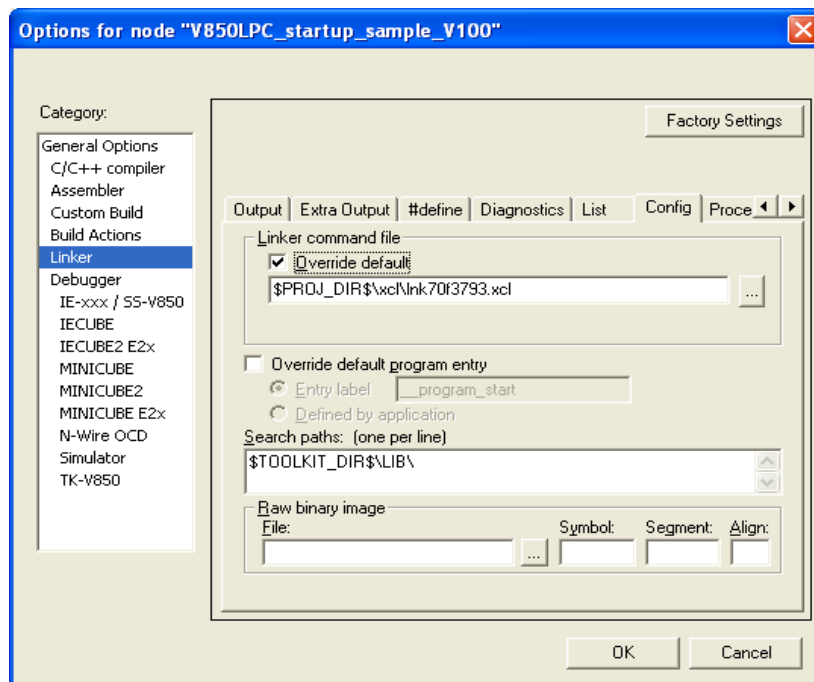
Figure 35 IAR Linker options

Now after everything has been setup correctly it is time to compile and link the demonstration project. Close the "Options" menu and select "Rebuild All" from the "Project" menu. If the project is compiled and linked without errors or warnings it can now be downloaded to the *V850ESJX3-STICK* board and debugged.

To start the IAR C-SPY debugger, select the option "Debug" from the "Project" menu or press the ( ) "Debugger" button. In the next step the MINICUBE2 hardware setup has to be configured before downloading a new application. Press the "Yes" button to enter the hardware setup menu.
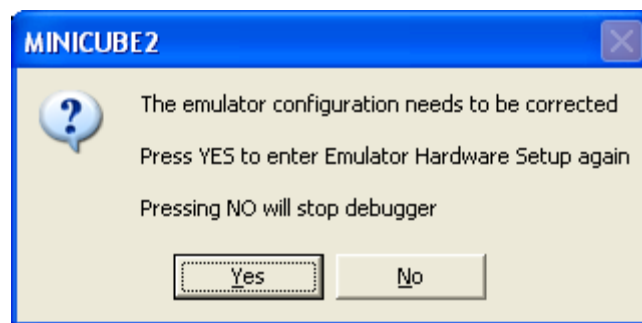
Figure 36   MINICUBE2 hardware setup menu 1/2

Set the configuration as show in the figure below and start the download by pressing the OK button:
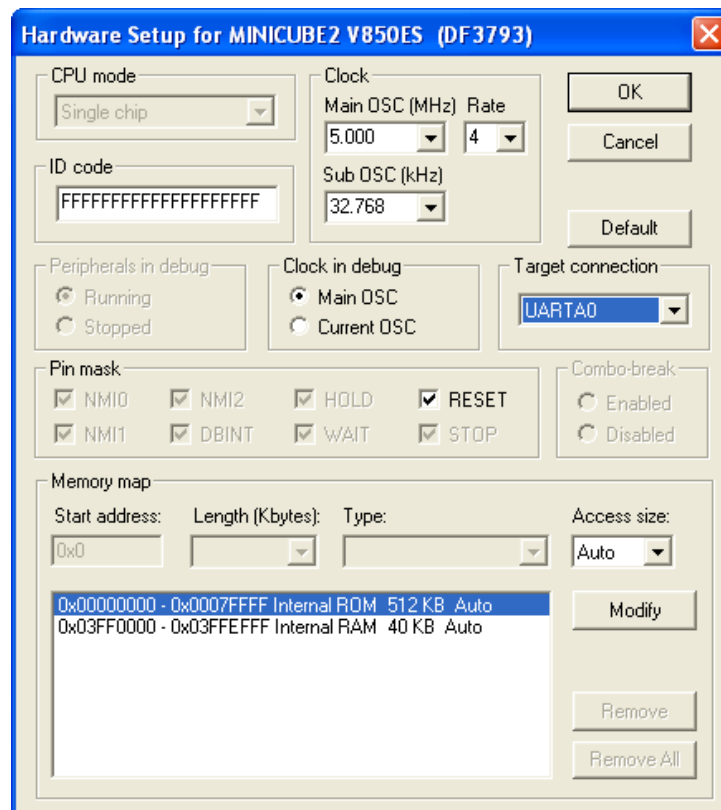
Figure 37   MINICUBE2 hardware setup menu 2/2

Now the debugger is started and the demo project is downloaded to the *V850ESJX3-STICK* board. In other words, the Flash memory of the V850ES/JG3-L device is reprogrammed with the user application. The progress of downloading is indicated by blue dots in the MINICUBE2 Emulator window.

After the download is completed all debug features of IAR C-SPY debugger are available, i.e. Single Stepping (Step Over/-In/-Out), Go, Stop, Breakpoints, Register / Memory view etc.

To get more details on the debugger configuration and capabilities, please refer to the "V850 IAR Embedded Workbench IDE User Guide" of the IAR installation.
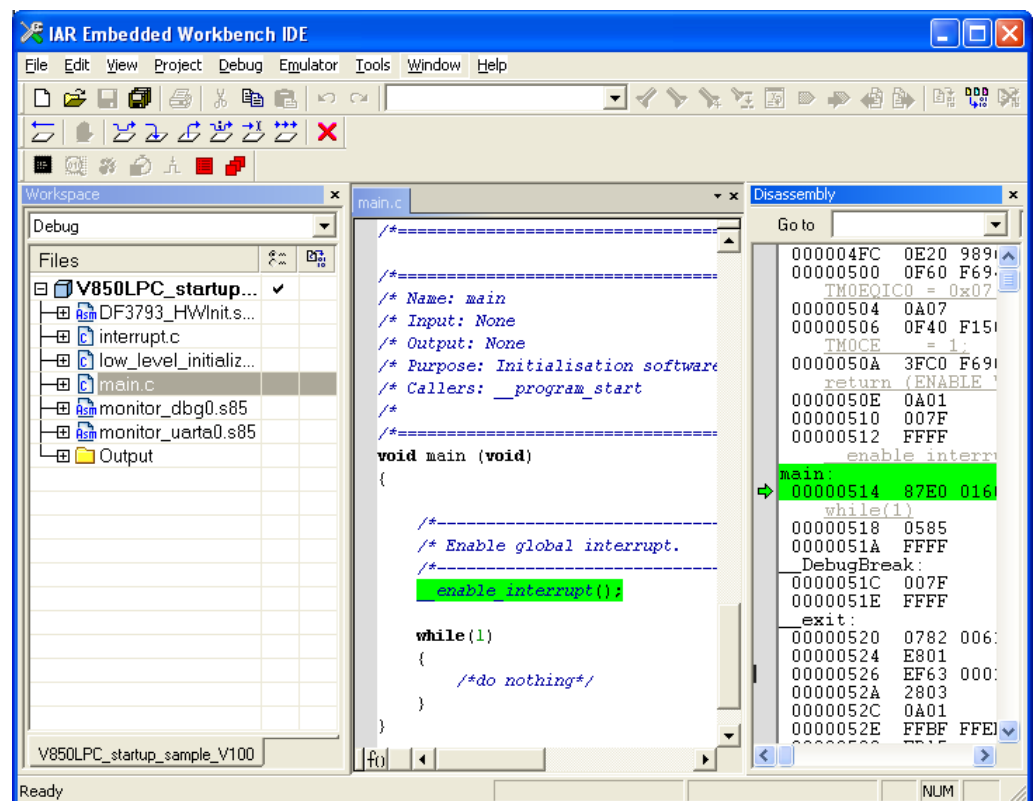
Figure 38   IAR C-SPY debugger

9.3 Debugging Using MiniCube2

If the UART0 is required in the user application, the user can use the CSI3 interface of the V850ES/JG3-L available using P102. Please consult the schematic and the MINICUBE2 user manual for proper connections. To use this interface for debugging proceed as explained above and only change the MINICUBE2 hardware setup as shown below.
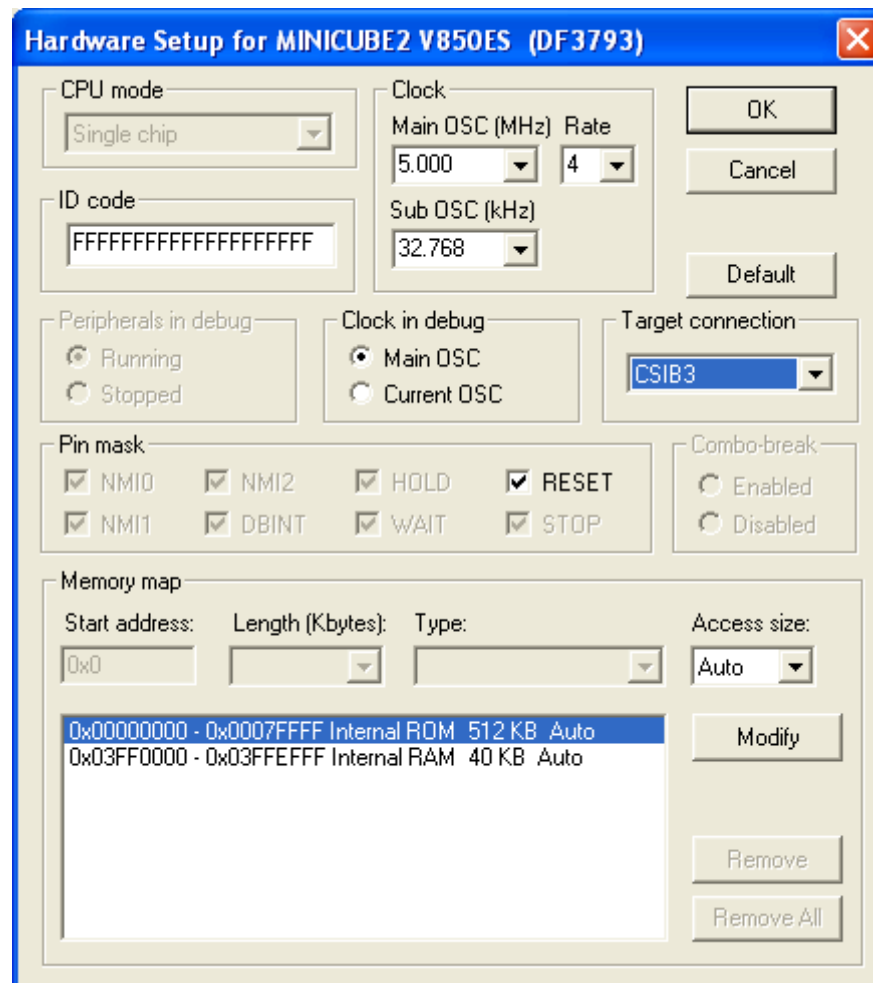
Figure 39   MiniCube2 Hardware setup for the CSI3 I/F

Please note that the MINICUBE2 is a separate tool from Renesas Electronics and is not included with this starter kit. The MINICUBE2 can be purchased separately

Chapter 10 Sample Program

10.1 General Introduction

The sample program is located in a single directory, which will be called main-directory of the sample. You can find this folder called "IAR Embedded Workbench sample project" in the directory \Sample Program\ of the CDROM.

This main directory contains the complete project including all output files of the development tool. The workspace file "**V850LPC_startup_sample_V100**" is located on top of the sample program directories.

📁 **V850LPC_startup_sample_V100**	**V850ES/JG3-L project and output files**
📁 Debug	debug output files for IAR C-SPY debugger
📁 inc	C header files
📁 Release	release output files, i.e. Intel HEX file
📁 settings	configuration files, IAR Embedded Workbench
📁 source	C source files
📁 xcl	Linker control file
📄 V850LPC_startup_sample_V100.dep	dependency information file, IAR Embedded Workbench
📄 V850LPC_startup_sample_V100.ewd	project setting file, IAR C-SPY debugger
📄 V850LPC_startup_sample_V100.ewp	project file, IAR Embedded Workbench
📄 V850LPC_startup_sample_V100.eww	workspace file, IAR Embedded Workbench V850

Table 15   Example directory structure

The main directory contains only the project files for the IAR Systems Embedded Workbench. All source files are located in the directory \source. The directory \include contains the header files. The directory \xcl contains the linker control file of the V850ES/JG3-L device. The sample project uses two targets. One target is the "Debug" (directory \Debug) that holds all information for debugging purpose and the other one is the "Release" target (directory \Release) contains the programmable file, i.e. the Intel HEX file, for programming the V850ES/JG3-L internal Flash memory by using the WriteEZ5 software.

All output files of the development tools for the corresponding target are generated in the directories \Debug and \Release.

For details of using the IAR Embedded Workbench and the IAR C-SPY debugger please refer to the "V850 IAR Embedded Workbench IDE User Guide".

10.2 Functionality

The sample project shows a simple demonstration of timer usage and interrupts handling. Timer M is be setup to generate a compare match interrupt every second which toggles the LED on P36.

10.3 Required Resources

The sample program requires the following peripheral resources of the µPD70F3793:

- Timer M

- P36

- UARTA0 (for debugging)

10.4 Project Structure

The project consists of following software modules:

10.4.1 System Initialization:

All the system initialization including Clock, Timer, Port, Security-ID and On-board OCD resources are within this module.

The files generated for this module are:

- low_level_initialization.c

- DF3783_HWInit.s85

- monitor_uart.s85

- monitor_dbg0.s85

10.4.2 Main Loop

This module includes the main loop and additional system initialization

The files generated for this module are:

- main.c

10.4.3 Interrupt Handling

This module includes the interrupt handling of compare match interrupt of Timer M

The files generated for this module are:

- interrupt.c

Chapter 11 GUI Description

The V850ESJX3-L demonstration GUI is Windows software that can be used to check the operation of the 32-bit microcontroller V850ES/JG3-L mounted on the *V850ESJX3-STICK* board. The demo allows the user to check the power consumption, the on-board RTC, the RAM content, to interface to the temperature and humidity sensor mounted on the *V850ESJX3-STICK* board and to easily switch between the available power modes. The user can measure the current in each power mode using an Amp-meter connected to the P101 provided on the board as shown.

Figure 40 **Current measurement connector**

Please note that the V850ESJX3-*STICK* needs to be running the program supplied "*V850ESJX3-STICK.hex*" within the \SampleProgram\ directory in the CDROM. Before connecting the *V850ESJX3-STICK* for demonstration purpose, the switch S101 needs to be configured correctly as stated **in Chapter 3.1.1 – GUI Demonstration Mode**. After plugging the board to a free USB port make a note of the COM port assigned to the device from the device manager.

11.1 Running the V850ESJX3-L Demo

From Windows start menu, select "V850ESJX3-L Demo"

[Start] → [Programs] → [Renesas Electronics Tools] → [V850ESJX3-L Demo]

to run the V850ESJx3-L demo as shown below. It is also possible to run the demo by double clicking on the GUI demo shortcut icon on the desktop.
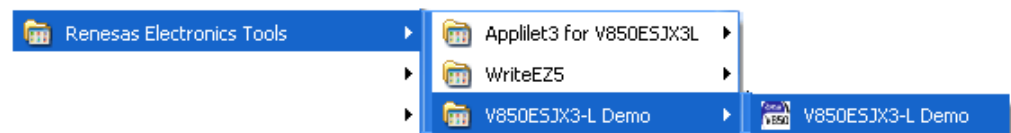

Figure 41 **Running the GUI Demo**

When the Demo GUI is started, the COM Setup dialog box might be displayed. If this dialog box is displayed, enter the number of the COM port to which the *V850ESJX3-STICK board* is connected.
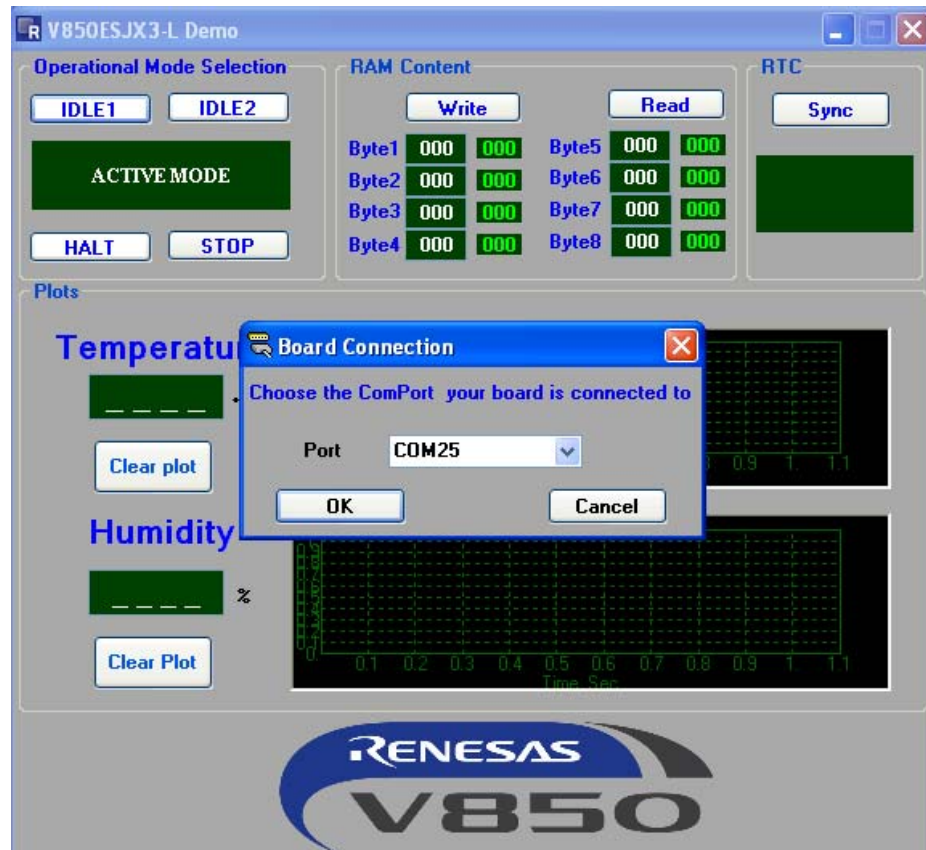
Figure 42   Board Connection Set up

Remark 1   The Board Connection dialog box will be displayed the first time the GUI demo is run or if the COM port is changed.

Remark 2   The default installation will create a text file called "COMMS.tx" that holds the COM port the board was connected to. The file is saved in the following folder: **C:/Program Files/Renesas Electronics Tools/ V850ESJX3-L Demo**

11.2 GUI Demo Sections

The following screen shot shows the GUI demo followed by the names of different sections
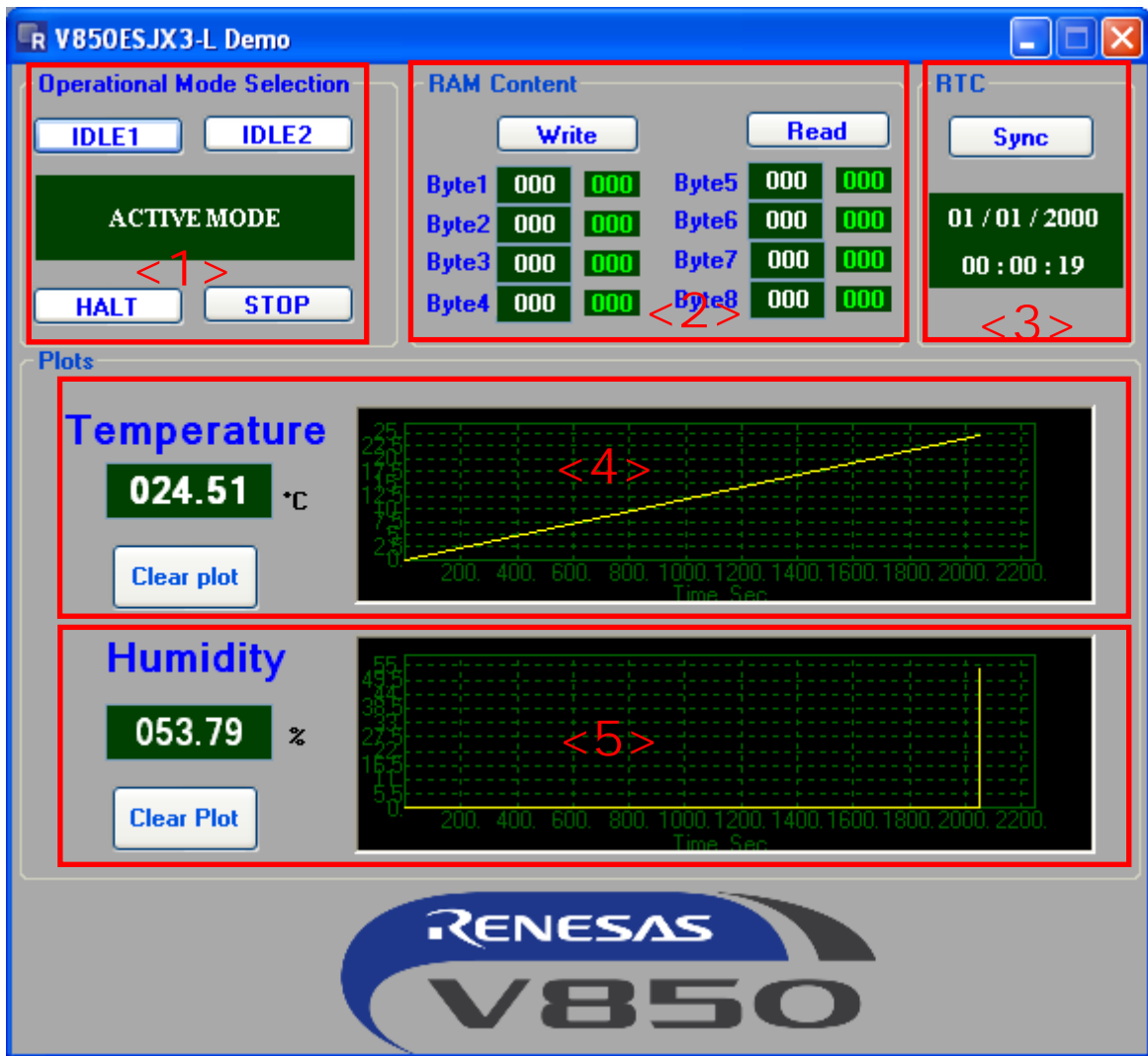
Figure 43   Demo GUI Screenshot

- Section <1> Operational mode selection:

These buttons are used to switch to the operational mode of the V850ES/JG3-L to the mode selected. The button clicked will change caption to "Release" and this need to be clicked again to release the V850ES/JG3-L to the active mode.

- Section <2> RAM content

This section displays the RAM content read from the V850ES/JG3-L RAM and can also be used to write 8 different values to the RAM. RAM content is not lost even when the V850ES/JG3-L enters the lowest power mode. The text field in white colour can be modified to enter random values to be written to the internal RAM. The labels in green display the actual contents reported by the V850ES/JG3-L.

- Section <3> RTC setup

This section displays the date and time reported by the on board RTC. The V850ES/JG3-L RTC registers can be synchronized with the PC system date and time by clicking "Sync" button.

- Section <4> Temperature Graph

This section displays the temperature reported by the SHT21 sensor. The graph can be reinitialized by clicking the "Clear Plot" button. Note that the graph is scaled automatically so for a close look at the reported temperature you need to clear the plot.

- <5> Humidity Graph

This section displays the humidity reported by the SHT21 sensor. The graph can be reinitialized by clicking the "Clear Plot" button. Note that the graph is scaled automatically so for a close look at the reported humidity you need to clear the plot.

11.2.1 Operational Mode Selection

It is recommended to remove the Jumper link from the connector "**JP101**" provided an replace with the two leads of an Amp-Meter to be able to measure the current consumption of the V850ES/JG3-L. The following figure gives an illustration on how to connect
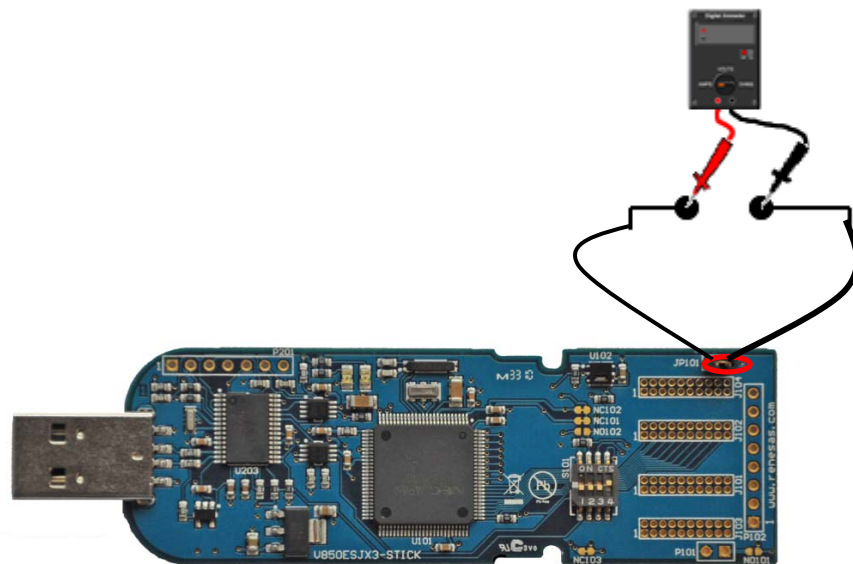

Figure 44   Amp-Meter connection for current measurement

Amongst all the possible modes that the V850ES/JG3-L supports, there are 4 modes that the demonstration GUI utilizes. For more details on the power saving modes of the V850ES/JG3-L please consult the device user manual.

When using the GUI demo the user clicks the appropriate button then the V850ES/JG3-L will enter that power mode and will stay in that state until released by the GUI again. The different power modes supported by this demonstration are given below:

- IDLE1 Mode

In this mode all the operations of the internal circuits except the oscillator, PLL, and flash memory are stopped. This mode can reduce the power consumption to a level lower than the HALT mode because it stops the operation of the on-chip peripheral functions.
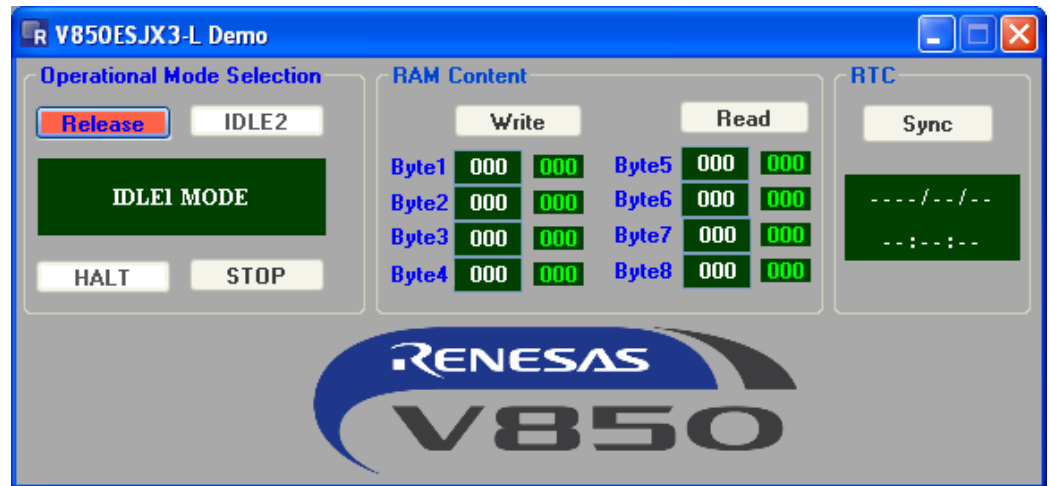
Figure 45   IDLE1 Mode

- IDLE2 Mode

In this mode all the operations of the internal circuits except the oscillator are stopped.

This mode can reduce the power consumption to a level lower than the IDLE1 mode because it stops the operations of the on-chip peripheral functions, PLL, and flash memory.
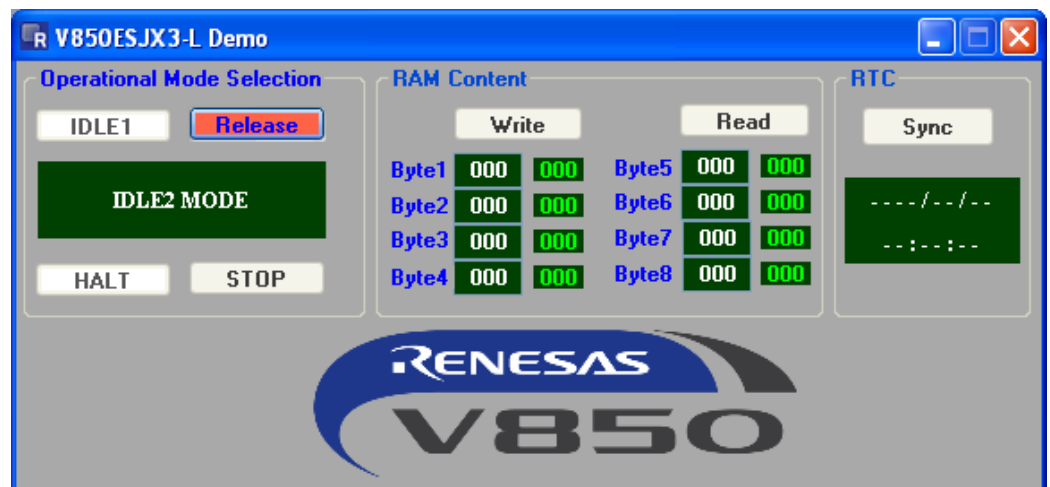

Figure 46   IDLE2 Mode

- HALT Mode

In this mode only the operating clock of the CPU is stopped. The total current consumption of the system can be reduced by using this mode in combination with the normal operation mode for intermittent operation.
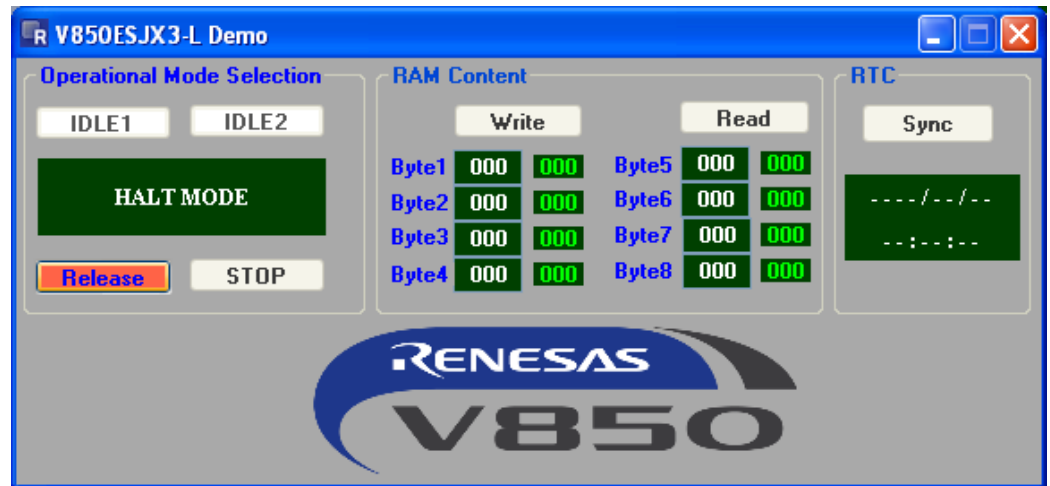
Figure 47   HALT Mode

- STOP Mode

In this mode all the operations of the internal circuits except the sub-clock oscillator are stopped.

This mode can reduce the power consumption to a level lower than all other modes. The V850ES/JG3-L enters the low-voltage STOP mode where the power consumption decreases further because the voltage of the regulator is lowered.
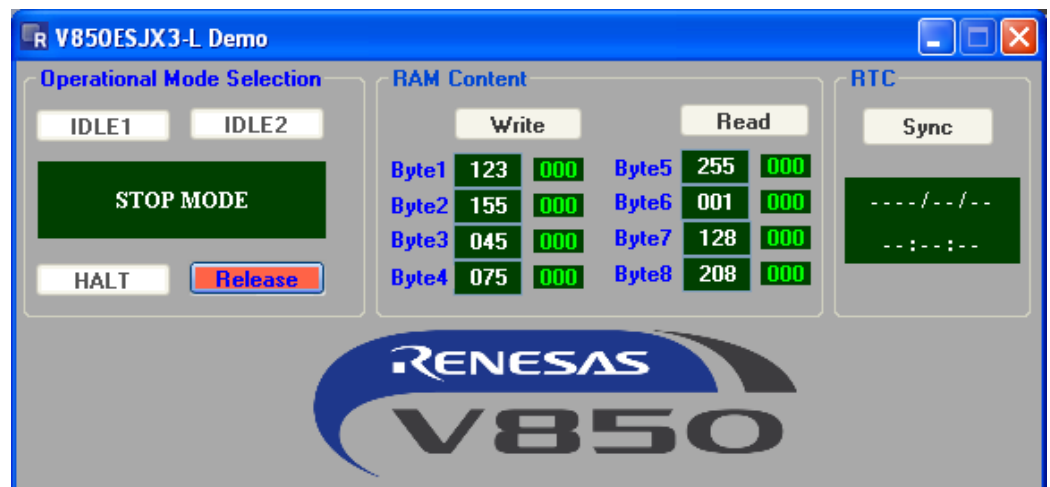

Figure 48   STOP Mode

11.2.2 RAM Content

This section of the GUI demo demonstrates the RAM data retention even in the lowest power mode. User data can be written to the internal RAM of the V850ES/JG3-L device by clicking "Write" button. The data is then written to a specific location within the internal Ram of the V850ES/JG3-L. To read the data back click the "Read" button and the same internal RAM location is read by the V850ES/JG3-L and sent back to the GUI.
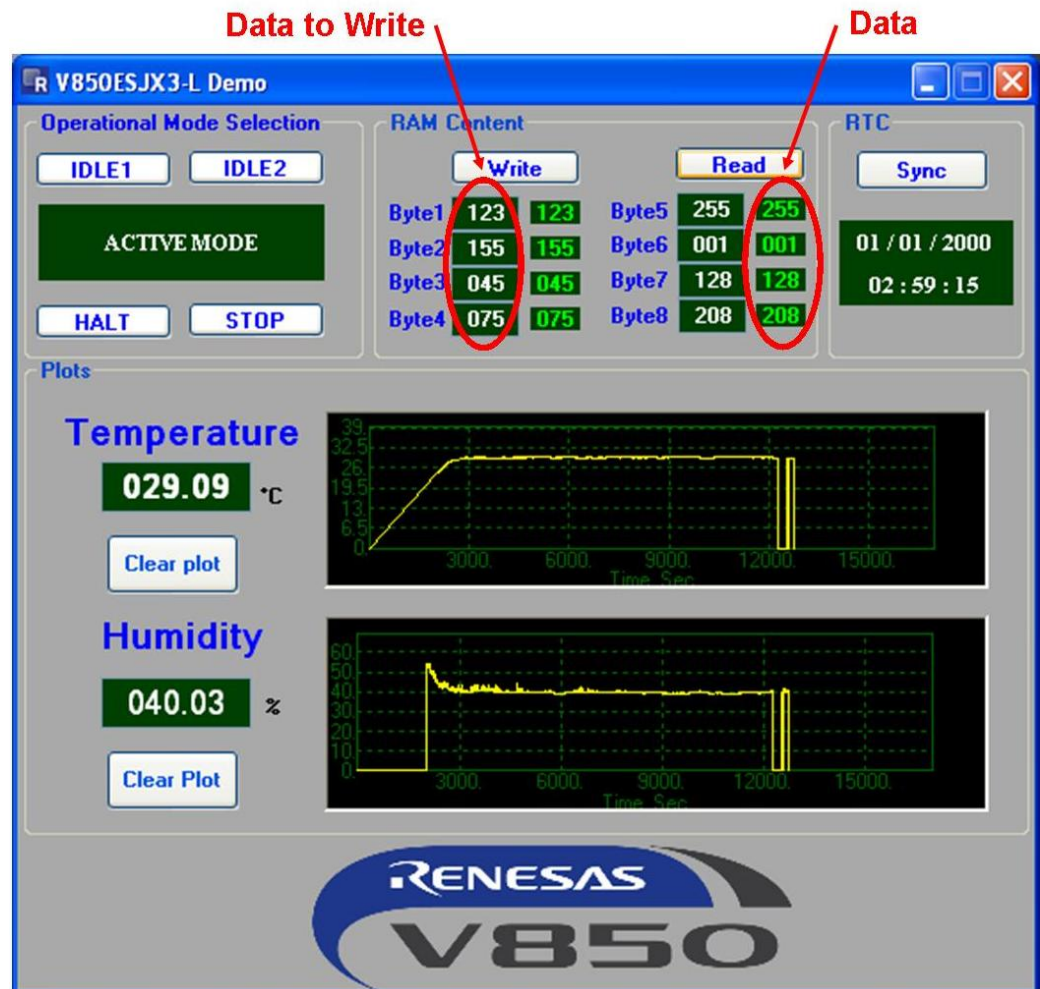
Figure 49   RAM Content

11.2.3 RTC Setup

This section of the GUI demo demonstrates the capability of the V850ES/JG3-L to implement full calendar using the internal separate registers for second, minutes, hours, days, month and years. For full explanation of the onboard RTC please consult the user manual of the device.

The GUI receives the value of the RTC registers every second and the values are displayed on the available window. When the board is first plugged in and powered up, the RTC will start with a default value. The user can synchronize the onboard RTC with the time and date of the PC system by clicking the "Sync" button. To verify the operation Windows Date and Time applet can be launched to check that the values displayed by the GUI demo are synchronized with the PC system date and time.
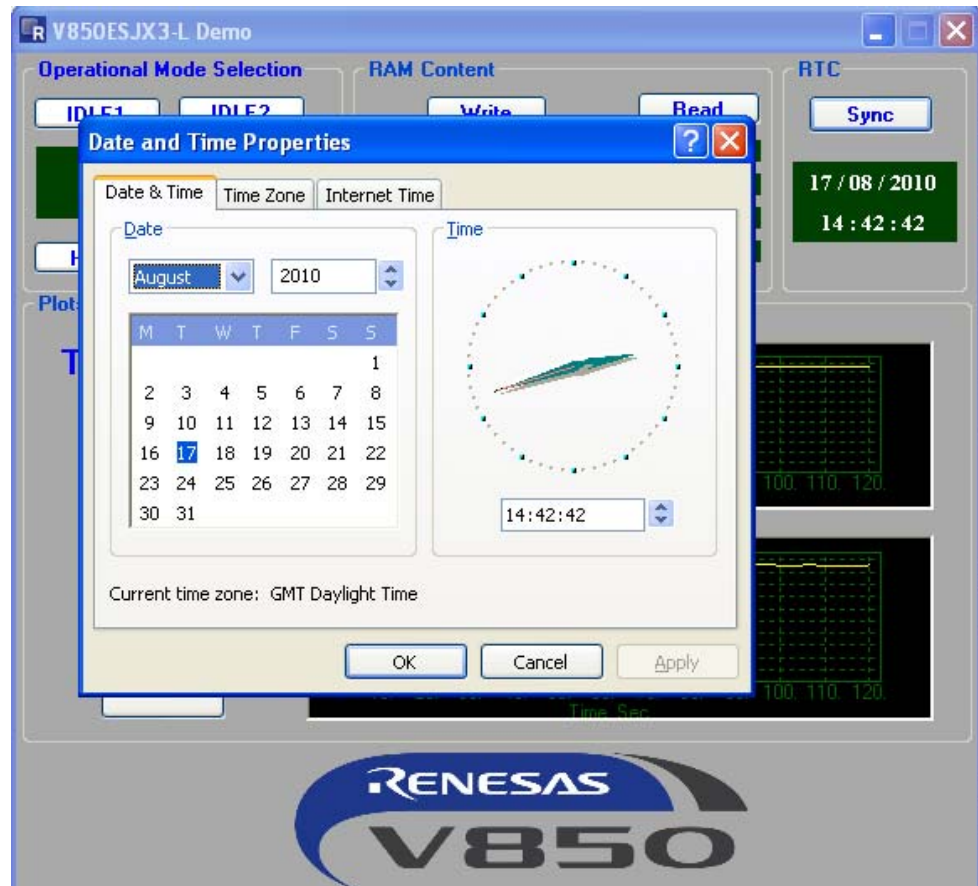
Figure 50   Onboard RTC operation

11.2.4 Temperature and Humidity Graphs

This section of the GUI makes use of the available temperature and humidity sensor SHT21 from Sensirion to measure and display the board temperature and humidity. The temperature and humidity measured are that of the board as the sensor is directly soldered onto the PCB therefore the measured value might not reflect the room temperature. For details on how the digital humidity sensor SHT21 works and how temperature and humidity are measured please consult the device user's manual from the link below.
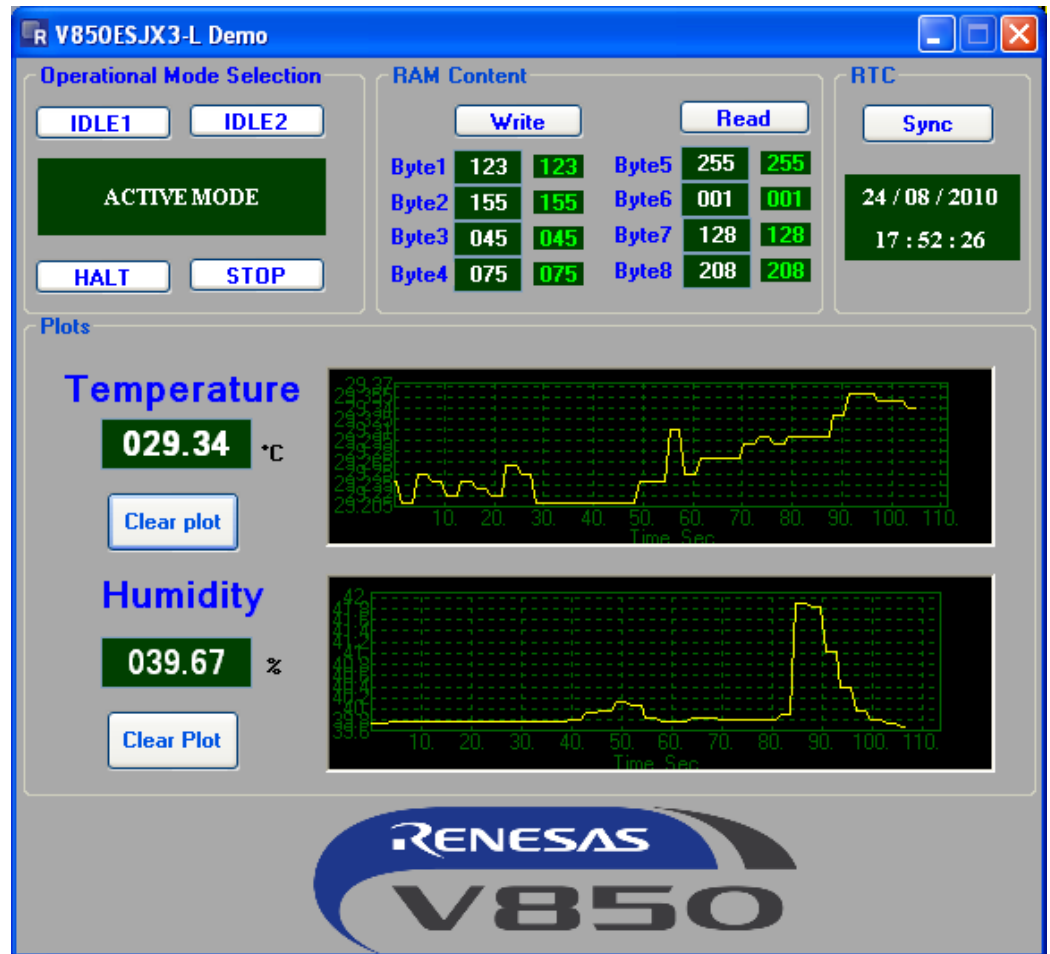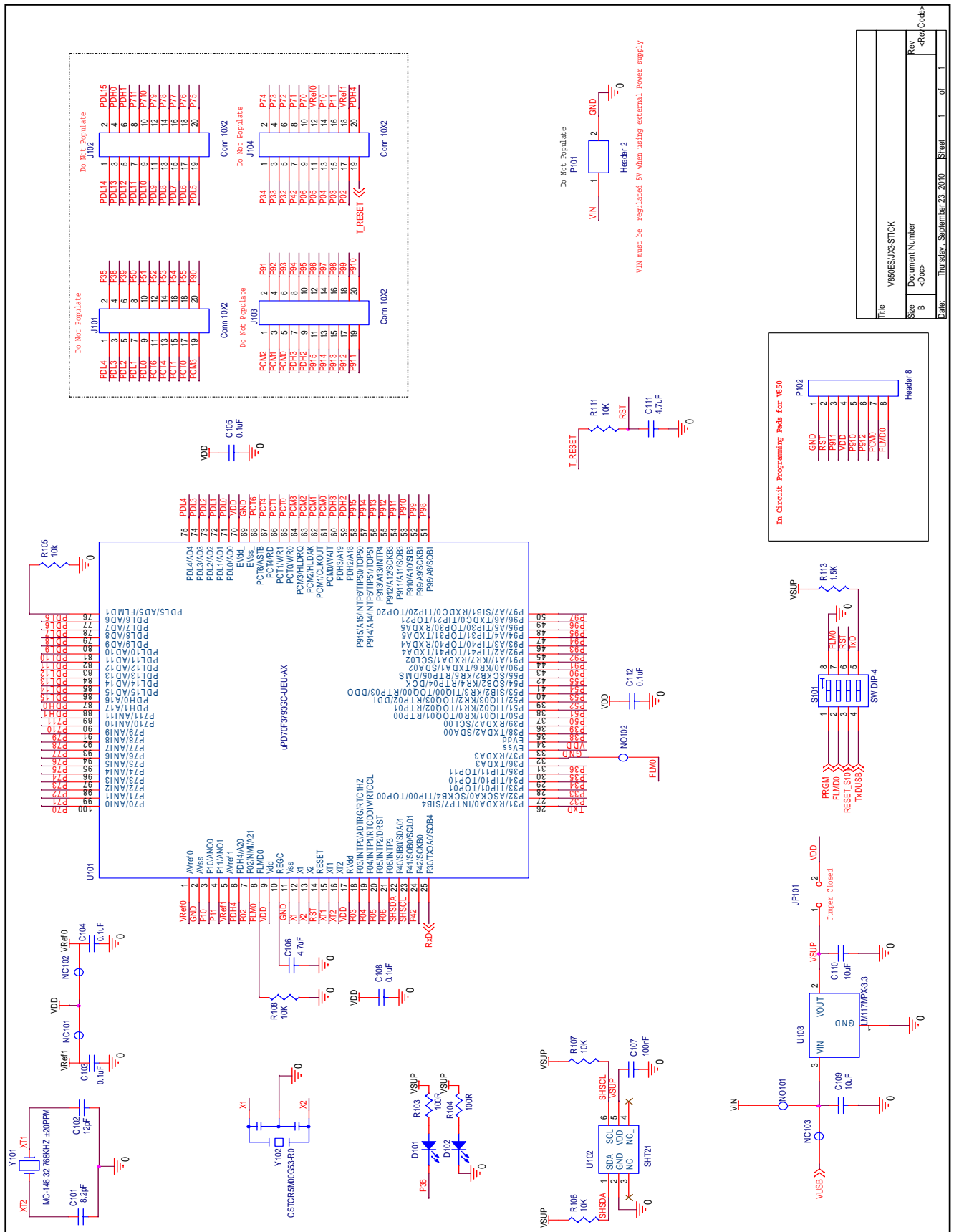
www.sensirion.com/humidity-sensor-sht21

Figure 51   Temperature and Humidity measurement

The graph keeps a history of all the reported values from the V850ES/JG3-L. In order to clear the history and get clear readings please click "Clear Plot" button. The graph then automatically scales the displayed data. To see the temperature and humidity changes simply touch the sensor with a finger or blow some air towards it.
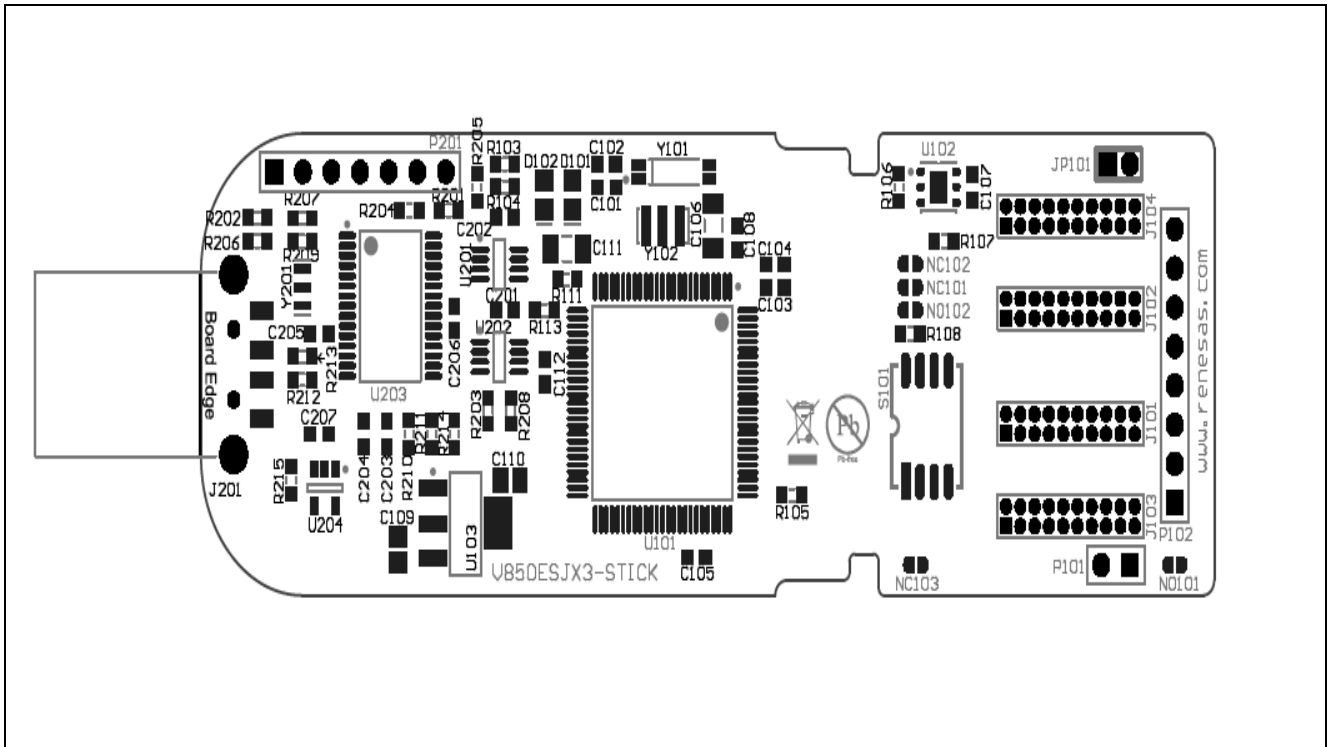
Chapter 12 Schematics

Figure 52 *V850ES/JX3-STICK* **board schematics 1/2**

Figure 53 : **V850ES/JX3-STICK board schematics 2/2**

Figure 54 *V850ES/JX3-STICK* board Assembly drawing

Revision History

Chapter	Page	Description
All	All	First edition

V850ES/Jx3-L Stick

RENESAS

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