

# RX220 Group

Renesas Starter Kit User's Manual

RENESAS MCU  
RX Family / RX200 Series

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This Renesas Starter Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures;

- ensure attached cables do not lie across the equipment
- reorient the receiving antenna
- increase the distance between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that which the receiver is connected
- power down the equipment when not in use
- consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken;

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Starter Kit does not represent an ideal reference design for an end product and does not fulfil the regulatory standards for an end product.

# How to Use This Manual

## 1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the RSK hardware functionality, and electrical characteristics. It is intended for users designing sample code on the RSK platform, using the many different incorporated peripheral devices.

The manual comprises of an overview of the capabilities of the RSK product, but does not intend to be a guide to embedded programming or hardware design. Further details regarding setting up the RSK and development environment can found in the tutorial manual.

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 RX220 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.
User's Manual	Describes the technical details of the RSK hardware.	RSKRX220 User's Manual	R20UT2230EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX220 Tutorial Manual	R20UT2231EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX220 Quick Start Guide	R20UT2232EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX220 Schematics	R20UT2229EG
Hardware Manual	Provides technical details of the RX220 microcontroller.	RX220 Group Hardware Manual	R01UH0292EJ

## 2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
bps	Bits per second
CAN	Controller Area Network
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DAC	Digital-to-Analog Converter
DIP	Dual In-line Package
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
E1	Renesas On-chip Debugging Emulator
EEPROM	Electrically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GPT	General PWM Timer
I <sup>2</sup> C (IIC)	Philips™ Inter-Integrated Circuit Connection Bus
IRQ	Interrupt Request
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LIN	Local Interconnect Network
MCU	Micro-controller Unit
MTU	Multi-Function Timer Pulse Unit
n/a (NA)	Not applicable
n/c (NC)	Not connected
NMI	Non-maskable Interrupt
OTG	On The Go™
PC	Personal Computer
PDC	Parallel Data Capture Unit
PLL	Phase Locked Loop
POE	Port Output Enable
PWM	Pulse Width Modulation
RAM	Random Access Memory
ROM	Read Only Memory
RSK	Renesas Starter Kit
RTC	Realtime Clock
SAU	Serial Array Unit
SCI	Serial Communications Interface
SFR	Special Function Registers
SPI	Serial Peripheral Interface
SSI	Serial Sound Interface
TAU	Timer Array Unit
TFT	Thin Film Transistor
TPU	Timer Pulse Unit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
WDT	Watchdog timer

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## 1. Overview

### 1.1 Purpose

This RSK is an evaluation tool for Renesas microcontrollers. This manual describes the technical details of the RSK hardware. The Quick Start Guide and Tutorial Manual provide details of the software installation and debugging environment.

### 1.2 Features

This RSK provides an evaluation of the following features:

- Renesas microcontroller programming
- User code debugging
- User circuitry such as switches, LEDs and a potentiometer
- Sample application
- Sample peripheral device initialisation code

The RSK board contains all the circuitry required for microcontroller operation.

## 2. Power Supply

### 2.1 Requirements

This RSK is supplied with an E1 debugger. The debugger is able to power the RSK board with up to 200mA. When the RSK is connected to another system then that system should supply power to the RSK. All RSK and RSK+ boards have an optional centre positive supply connector using a 2.0mm barrel power jack.

Details of the external power supply requirements for the RSK, and connections are shown in **Table 2-1** below.

J15 Setting	J17 Setting	Supply Source	Voltage	Regulator IC output voltage
Open	Pin1-2 shorted	PWR/CON_5V	5V	none
Open	Pin2-3 shorted			3.3V
Shorted	Pin2-3 shorted			1.62V
Don't care	Pin1-2 shorted	CON_3V3/Board_VCC(E1)	5V	none
Don't care	Pin1-2 shorted		3.3V	none

**Table 2-1: Main Power Supply Requirements**

The main power supply connected to PWR1 should supply a minimum of 5W to ensure full functionality.
---

### 2.2 Power-Up Behaviour

When the RSK is purchased, the RSK board has the 'Release' or stand-alone code from the example tutorial software pre-programmed into the Renesas microcontroller. On powering up the board the user LEDs will start to flash. After 200 flashes or after pressing any switch, the LEDs will flash at a rate controlled by the potentiometer.



### 3. Board Layout

#### 3.1 Component Layout

Figure 3-1 below shows the top component layout of the board.

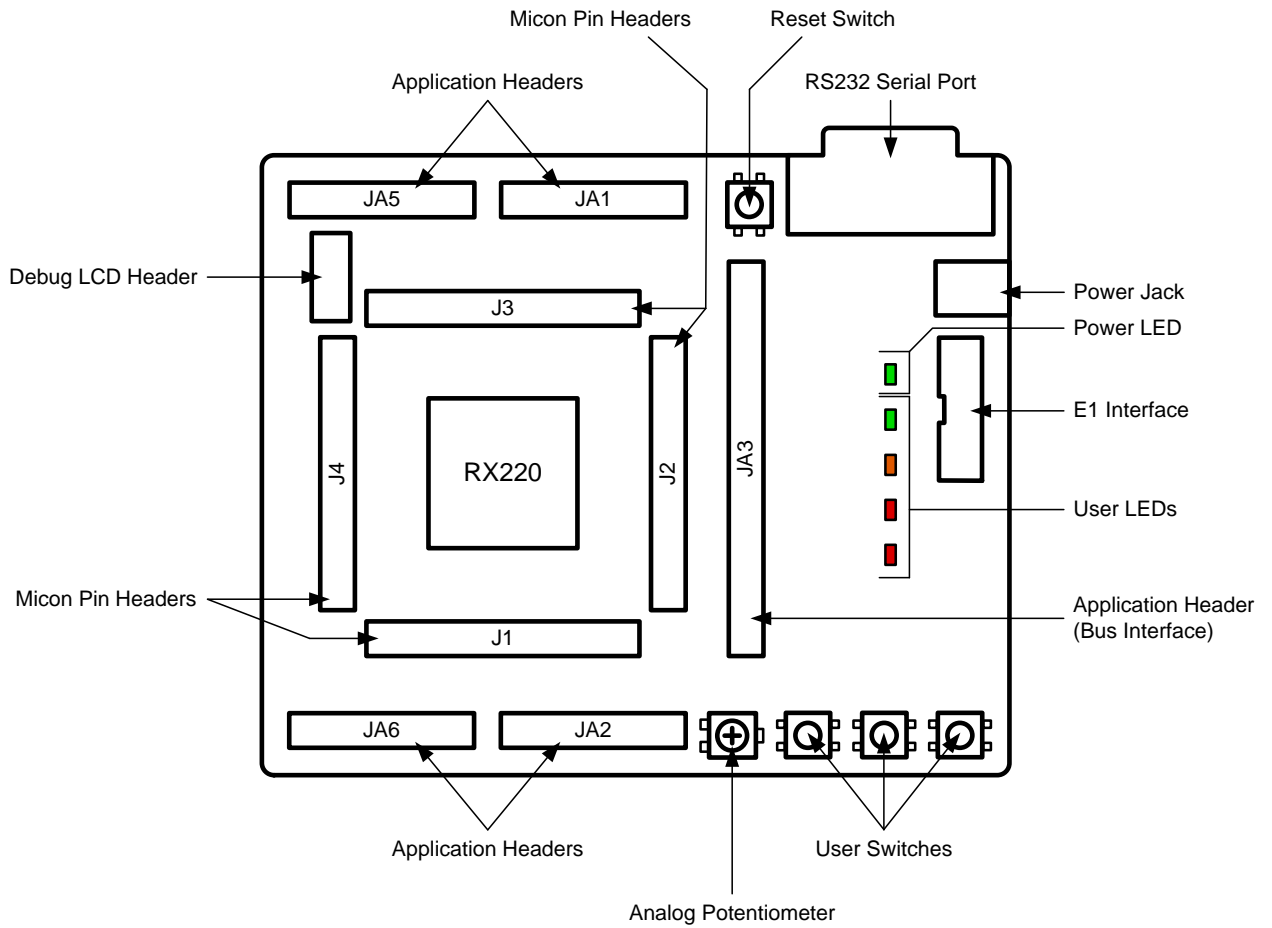


Figure 3-1: Board Layout

### 3.2 Board Dimensions

Figure 3-2 below gives the board dimensions and connector positions. All the through-hole connectors are on a common 0.1 inch grid for easy interfacing.

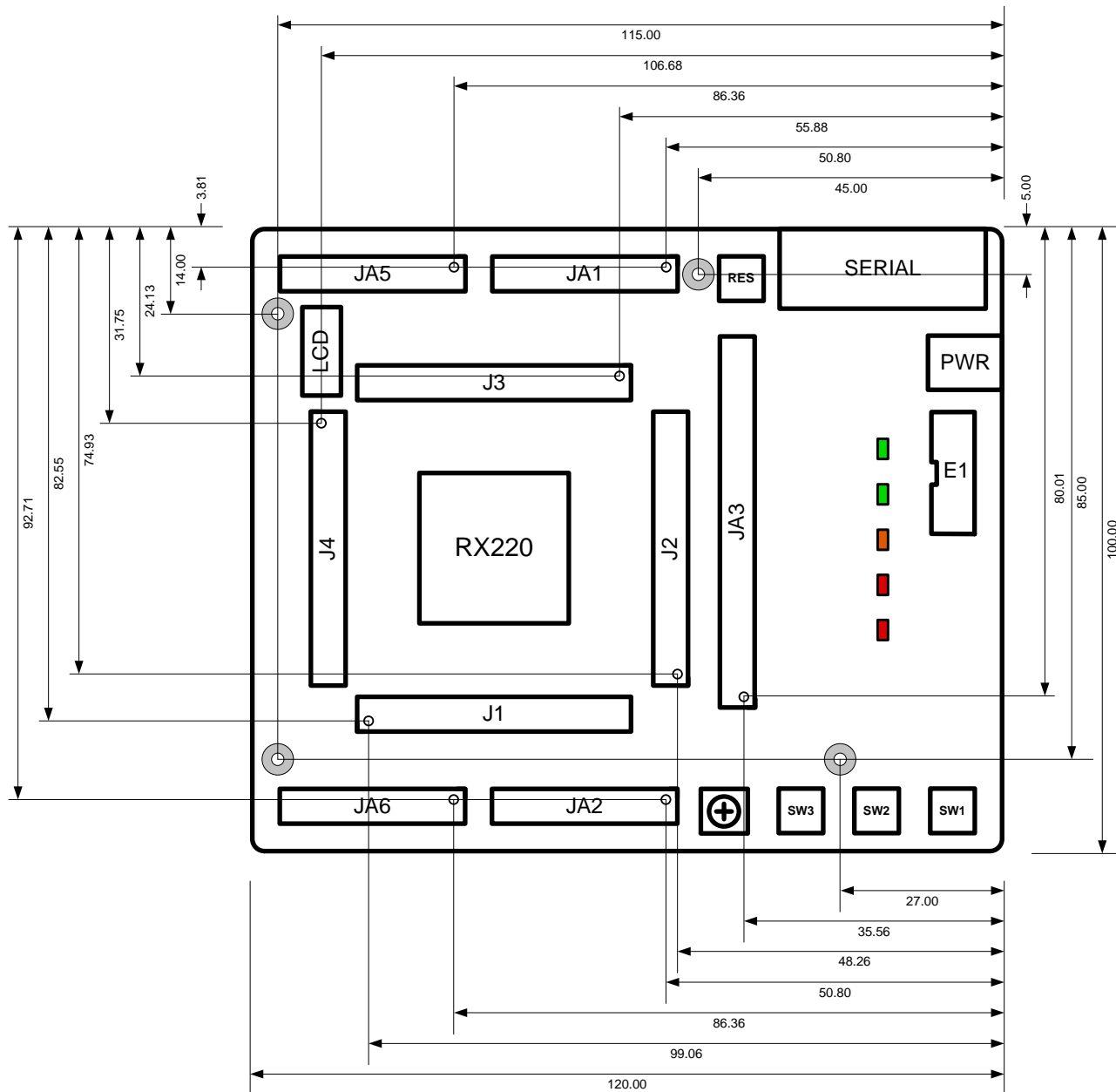


Figure 3-2: Board Dimensions

### 3.3 Component Placement

Figure 3-3 below shows placement of individual components on the top-side PCB. Component types and values can be looked up using the board schematics.

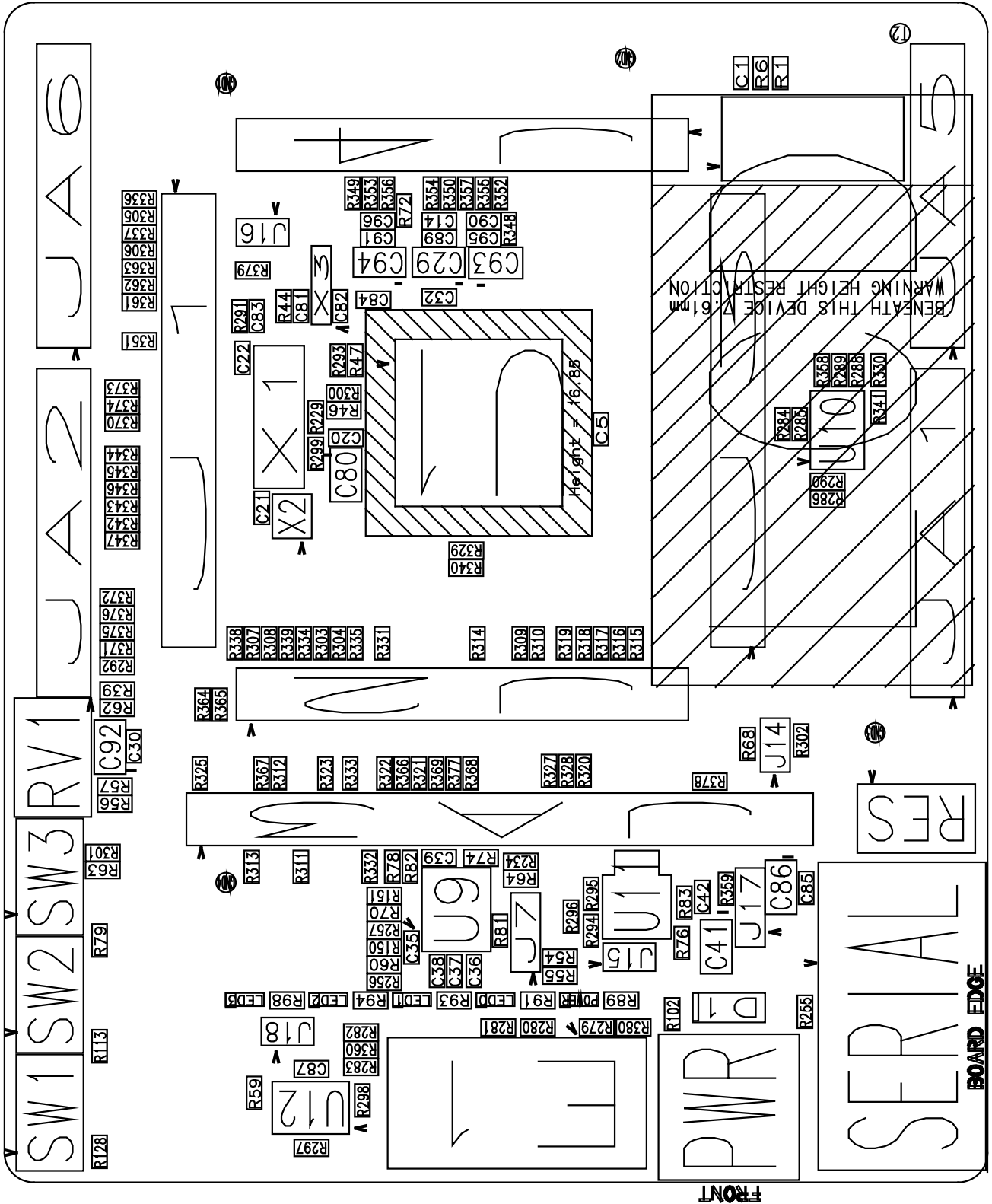


Figure 3-3: Top-Side Component Placement

## 4. Connectivity

### 4.1 Internal RSK Connections

The diagram below shows the RSK board components and their connectivity to the MCU.

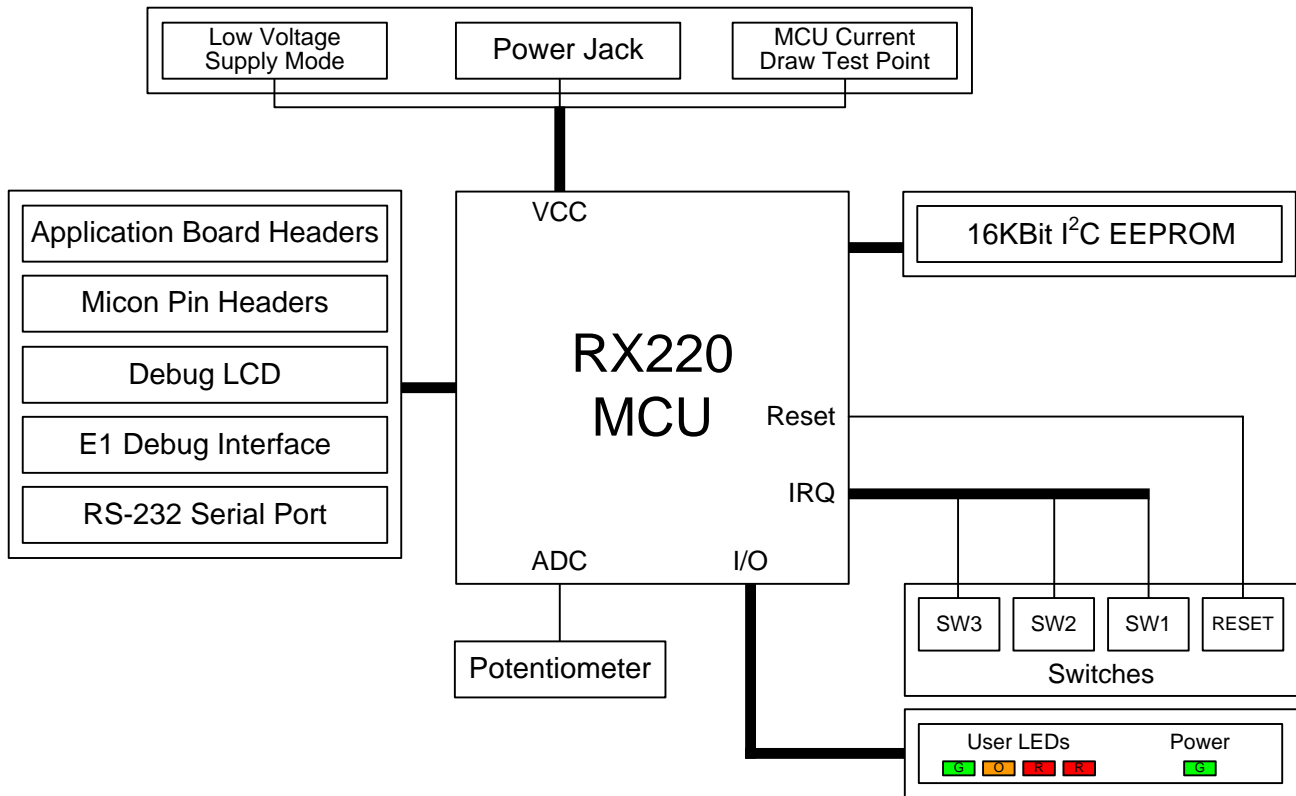
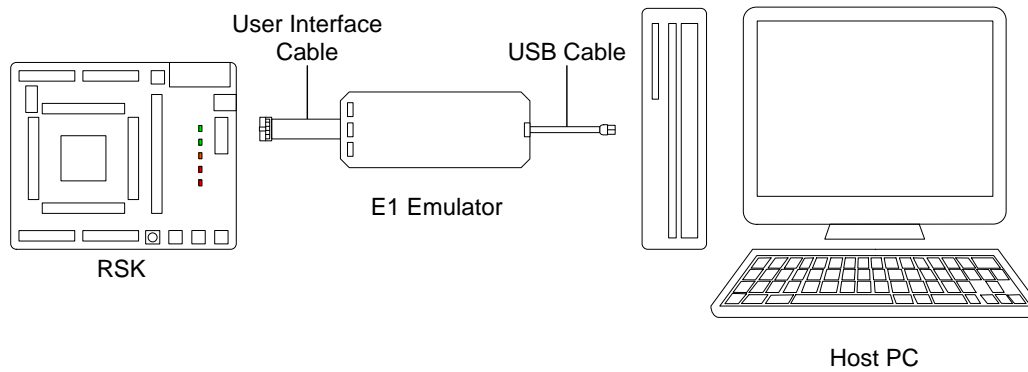


Figure 4-1: Internal RSK Block Diagram

## 4.2 Debugger Connections

The diagram below shows the connections between the RSK, E1 debugger and the host PC.



**Figure 4-2: Debugger Connection Diagram**

## 5. User Circuitry

### 5.1 Reset Circuit

A reset control circuit is not fitted to the RSK, as the MCU is capable of voltage and power-on detection. Resets are handled internally, and reset switch is connected directly to nRES on the MCU (pin 10).

### 5.2 Clock Circuit

A clock circuit is fitted to the RSK to generate the required clock signal to drive the MCU, and associated peripherals. Refer to the RX220 Group Hardware Manual for details regarding the clock signal requirements, and the RSKRX220 board schematics for information regarding the clock circuitry in use on the RSK. Details of the oscillators fitted to the RSK are listed in **Table 5-1** below.

Crystal	Function	Default Placement	Frequency	Device Package
X1	Main MCU crystal.	Fitted	20MHz	Encapsulated, SMT
X2	External clock oscillator	Not fitted	20MHz	Encapsulated, SMT
X3	Real time Clock	Fitted	32.768kHz	Encapsulated, SMT

**Table 5-1: Oscillators**

### 5.3 Switches

There are four switches located on the RSK board. The function of each switch and its connection is shown in **Table 5-2**. For further information regarding switch connectivity, refer to the RSKRX220 board schematics.

Switch	Function	MCU Connection	
		Port	Pin
RES	When pressed, the microcontroller is reset.	nRES	10
SW1	Connects to an IRQ input for user controls.	IRQ1 (P31)	19
SW2	Connects to an IRQ input for user controls.	IRQ3 (P33)	17
SW3	Connects to an IRQ input for user controls. The switch is also connected to an ADTRG input via R301, and is used to trigger AD conversions.	IRQ4 (P34)	16
		nADTRG0 (P07)	98

**Table 5-2: Switch Connections**

## 5.4 LEDs

There are five LEDs on the RSK board. The function of each LED, its colour, and its connections are shown in **Table 5-3**.

LED	Colour	Function	MCU Connection	
			Port	Pin
POWER	Green	Indicates the power status	No connection	-
LED0	Green	User operated LED.	P14	32
LED1	Orange	User operated LED.	P15	31
LED2	Red	User operated LED.	P16	30
LED3	Red	User operated LED.	P17	29

**Table 5-3: LED Connections**

## 5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input AN000, pin 95. The potentiometer can be used to create a voltage between AVCC and ground (by default, AVCC is connected to the board power supply Board\_VCC).

Please see the manufacture site for potentiometer details. (Manufacturer Name: PIHER INTERNATIONAL CORPORATION, Part Number: N6R)

The potentiometer is fitted to offer an easy method of supplying a variable analog input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the RX220 Group Hardware Manual for further details.

## 5.6 Debug LCD Module

A debug LCD module is supplied with the RSK, and should be connected to the LCD header.

Care should be taken when installing the LCD module to ensure pins are not bent or damaged. The LCD module is vulnerable to electrostatic discharge (ESD); therefore appropriate ESD protection should be used.

The debug LCD module uses a 4-bit interface to reduce pin allocation. No contrast control is provided, as this is set by a resistor supplied on the display module. Connection information for the debug LCD module is provided in **Table 5-4** below.

Debug LCD Header							
Pin	Circuit Net Name	MCU Pin		Pin	Circuit Net Name	MCU Pin	
		Port	Pin			Port	Pin
1	Ground	-	-	2	5V	-	-
3	No Connection	-	-	4	DLCDRS	PJ1	6
5	R/W (pulled to ground)	-	-	6	DLCDE	PJ3	4
7	No Connection	-	-	8	No Connection	-	-
9	No Connection	-	-	10	No Connection	-	-
11	DLCD4	PH0	38	12	DLCD5	PH1	37
13	DLCD6	PH2	36	14	DLCD7	PH3	35

**Table 5-4: LCD Header Connections**

## 5.7 RS232 Serial Port

Serial port SCI1 is connected to the standard RS232 header fitted to the RSK. Alternatively, serial port SCI9 can be connected to the RS232 transceiver by making changes to the configurations to the jumpers and option links (refer to §6). Connections between the RS232 header and the microcontroller are listed in **Table 5-5** below.

SCI Signal	Function	MCU Connection		RS232 Connection
		Port	Pin	
TXD0	GPIO pin**	P20	28	Pin 2*
RXD0	GPIO pin**	P21	27	Pin 3*
TXD1	SCI1 Transmit Signal.	P26	22	Pin 2
RXD1	SCI1 Receive Signal.	P30	20	Pin 3
TXD9	SCI9 Transmit Signal.	PB7	53	Pin 8*
RXD9	SCI9 Receive Signal.	PB6	54	Pin 7*
RS232TX	External SCI Transmit Signal.	n/a	n/a	Pin 2*
RS232RX	External SCI Receive Signal.	n/a	n/a	Pin 3*

**Table 5-5: Serial Port Connections**

\* This connection is not available in the default RSK configuration - refer to §6 for the required modifications.

\*\* TXD0 & RXD0 do not connect to an SCI peripheral on the RX220, so these signals may only be used as GPIO/timer pins. For more information refer to the RX220 Group Hardware Manual.

## 5.8 I<sup>2</sup>C Bus (Inter-IC Bus)

The RX220 features one I<sup>2</sup>C (Inter-IC Bus) interface module, which is connected to a 16Kbit EEPROM (Electrically-Erasable Programmable Read Only Memory). Specific details of the EEPROM device and the connections can be found in the board schematics.

This EEPROM only supports one concurrent device on a single I2C bus, as it responds to all possible addresses.



## 6. Configuration

### 6.1 Modifying the RSK

This section lists the option links that are used to modify the way RSK operates in order to access different configurations. Configurations are made by modifying link resistors or headers with movable jumpers or by configuration DIP switches

A link resistor is a  $0\Omega$  surface mount resistor, which is used to short or isolate parts of a circuit. Option links are listed in the following sections, detailing their function when fitted or removed. **Bold, blue text** indicates the default configuration that the RSK is supplied with. Refer to the component placement diagram (§3) to locate the option links, jumpers and DIP switches.

When removing soldered components, always ensure that the RSK is not exposed to a soldering iron for intervals greater than 5 seconds. This is to avoid damage to nearby components mounted on the RSK.

When modifying a link resistor, always check the related option links to ensure there is no possible signal contention or short circuits. Because some of the MCU's pins are multiplexed, some of the peripherals must be used exclusively. Refer to the RX220 Group Hardware Manual and RSKRX220 board schematics for further information.

### 6.2 MCU Operating Modes

**Table 6-1** below details the function of the jumpers associated with the MCU operating modes.

Reference	Position One	Position Two	Position Three	Related Ref.
J16	<b>All pins open: MCU starts in Single Chip mode.</b>	All pins closed: MCU starts in Boot Mode (SCI) or User boot mode.	n/a	J18
J18	<b>All pins open: Puts the MCU into Boot Mode (SCI) by J16 closed.</b>	All pins closed: Puts the MCU into User Boot Mode by J16 closed.	n/a	J16, R283

**Table 6-1: MCU Operating Mode Jumper Settings**

### 6.3 ADC Configuration

**Table 6-2** below details the function of the option links associated with the Analog-to-Digital circuit.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R72	No function. Do not fit.	<b>No function</b>	R356
R356	No function. Do not fit.	<b>No function.</b>	R72
R349	No function. Do not fit.	<b>No function.</b>	R353
R353	No function. Do not fit.	<b>No function.</b>	R349
R39	Connects AVSS0 (MCU, pin 99) to CON_AVSS (JA1.pin 6).	<b>Disconnects AVSS0 (MCU, pin 99) from CON_AVSS (JA1.pin 6).</b>	R62
R56	<b>Connects the potentiometer (RV1, pin 3) to Board_VCC.</b>	Disconnects the potentiometer (RV1, pin 3) from Board_VCC.	R57
R57	Connects the potentiometer (RV1, pin 3) to CON_AVCC (JA1.pin 5).	<b>Disconnects the potentiometer (RV1, pin 3) from CON_AVCC (JA1.pin 5).</b>	R56
R62	<b>Connects AVSS0 (MCU, pin 99) to GROUND.</b>	Disconnects AVSS0 (MCU, pin 99) from GROUND.	R39
R348	<b>Connects VREFL0 (MCU, pin 94) to GROUND.</b>	Disconnects VREFL0 (MCU, pin 94) from GROUND.	R352
R350	<b>Connects AVCC0 (MCU, pin 97) to UC_VCC.</b>	Disconnects AVCC0 (MCU, pin 97) from UC_VCC.	R354
R352	Connects VREFL0 (MCU, pin 94) to CON_VREFL0.	<b>Disconnects VREFL0 (MCU, pin 94) from CON_VREFL0.</b>	R348
R354	Connects AVCC0 (MCU, pin 97) to CON_AVCC (JA1.pin 5).	<b>Disconnects AVCC0 (MCU, pin 97) from CON_AVCC (JA1.pin 5).</b>	R350
R355	Connects VREFH0 (MCU, pin 96) to CON_VREFH0 (JA1.pin 7).	<b>Disconnects VREFH0 (MCU, pin 96) from CON_VREFH0 (JA1.pin 7).</b>	R357
R357	<b>Connects VREFH0 (MCU, pin 96) to UC_VCC.</b>	Disconnects VREFH0 (MCU, Pin 96) from UC_VCC.	R355

**Table 6-2: ADC Option Links**

Note that option links listed as “No function” connect to unused (no connection) MCU pins, and are retained for compatibility with other Renesas products.

## 6.4 E1 Debugger Interface

**Table 6-3** below details the function of the option links associated with serial port configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R279	Connects SCK1 (MCU, pin 21) to the E1 connector (pin 1).	Disconnects SCK1 (MCU, pin 21) from the E1 connector (pin 1).	R363, R380
R280	Connects TXD1 (MCU, pin 22) to the E1 connector (pin 5).	Disconnects TXD1 (MCU, pin 22) from the E1 connector (pin 5).	R60, R150, R256, R344, R362, R378
R281	Connects MODE (MCU, pin 7, MD/FINED) to the E1 connector (pin 7).	Disconnects MODE (MCU, pin 7, MD/FINED) from the E1 connector (pin 7).	J16
R282	Connects RXD1 (MCU, pin 20) to the E1 connector (pin 11).	Disconnects RXD1 (MCU, pin 20) from the E1 connector (pin 11).	R70, R151, R257, R361
R283	Connects UB (MCU, pin 45) to the E1 connector (pin 10).	Disconnects UB (MCU, pin 45) from the E1 connector (pin 10).	J18

**Table 6-3: E1 Debugger Interface Option Links**

## 6.5 RS232 Serial Port Configuration

Table 6-4 below details the function of the option links associated with serial port configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R54	Connects R2IN (U9, pin 9) to the serial port (pin 7).	<b>Disconnects R2IN (U9, pin 9) from the serial port (pin 7).</b>	R55, J7
R55	Connects T2OUT (U9, pin 8) to the serial port (pin 8).	<b>Disconnects T2OUT (U9, pin 8) from the serial port (pin 8).</b>	R54, J7
R60*	<b>Connects TXD1 (MCU, pin 22) to T1IN (U9, pin 13).</b>	Disconnects TXD1 (MCU, pin 22) from T1IN (U9, pin 13).	R70, R150, R256, R280, R344, R345, R362, R378
R64	Connects TXD9 (MCU, pin 53) to T2IN (U9, pin 12).	<b>Disconnects TXD9 (MCU, pin 53) to T2IN (U9, pin 12).</b>	R81, R331
R70*	<b>Connects RXD1 (MCU, pin 20) to R1OUT (U9, pin 15).</b>	Disconnects RXD1 (MCU, pin 20) from R1OUT (U9, pin 15).	R60, R151, R257, R282, R361
R78	Enable Shutdown function. Do not fit both R78 and R82.	<b>Disable Shutdown function</b>	R82
R81	Connects RXD9 (MCU, pin 54) to R2OUT (U9, pin 10).	<b>Disconnects RXD9 (MCU, pin 54) to R2OUT (U9, pin 10).</b>	R64, R332
R82	<b>Disable Shutdown function</b> <b>Do not fit both R78 and R82.</b>	Enable Shutdown function.	R78
R150	Connects TXD0** (MCU, pin 28) to T1IN (U9, pin 13).	<b>Disconnects TXD0** (MCU, pin 28) from T1IN (U9, pin 13).</b>	R60, R151, R256
R151	Connects RXD0** (MCU, pin 27) to R1OUT (U9, pin 15).	<b>Disconnects RXD0** (MCU, pin 27) from R1OUT (U9, pin 15).</b>	R70, R150, R257, R365
R255	Connects the serial port connector shield to ground.	<b>Disconnects the serial port connector shield from ground.</b>	-
R256	Connects RS232TX (JA6, pin 5) to T1IN (U9, pin 13).	<b>Disconnects RS232TX (JA6, pin 5) from T1IN (U9, pin 13).</b>	R60, R150, R257
R257	Connects RS232RX (JA6, pin 6) to R1OUT (U9, pin 15).	<b>Disconnects RS232RX (JA6, pin 6) from R1OUT (U9, pin 15).</b>	R70, R151, R256

**Table 6-4: RS232 Serial Port Option Links**

\* If the flash programming features of the E1 interface are to be used R60 and R70 should be removed.

\*\* TXD0 & RXD0 do not connect to an SCI peripheral on the RX220, so these signals may only be used as GPIO/timer pins. For more information refer to the RX220 Group Hardware Manual.

## 6.6 IRQ & General I/O Pin Configuration

Table 6-5 below details the function of the option links associated with IRQ and general I/O pin configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R303	Connects LED1_MTCLKB (MCU, pin 31) to the application header (JA2, pin 26).	Disconnects LED1_MTCLKB (MCU, pin 31) from the application header (JA2, pin 26).	R334
R304	Connects LED0_MTCLKA (MCU, pin 32) to the application header (JA2, pin 25).	Disconnects LED0_MTCLKA (MCU, pin 32) from the application header (JA2, pin 25).	R335
R305	Connects DLCDE_MTIIOC3C (MCU, pin 4) to the application header (JA2, pin 11).	Disconnects DLCDE_MTIIOC3C (MCU, pin 4) from the application header (JA2, pin 11).	R336
R306	Connects DLCDRS_MTIIOC3A (MCU, pin 6) to the application header (JA6, pin 13).	Disconnects DLCDRS_MTIIOC3A (MCU, pin 6) from the application header (JA6, pin 13).	R337
R307	Connects LED3_MTIIOC3B (MCU, pin 29) to the application header (JA2, pin 13).	Disconnects LED3_MTIIOC3B (MCU, pin 29) from the application header (JA2, pin 13).	R338
R308	Connects LED2_MTIIOC3D (MCU, pin 30) to the application header (JA2, pin 14).	Disconnects LED2_MTIIOC3D (MCU, pin 30) from the application header (JA2, pin 14).	R339
R309	Connects A19_MTIIOC4D (MCU, pin 49) to the application header (JA2, pin 18).	Disconnects A19_MTIIOC4D (MCU, pin 49) from the application header (JA2, pin 18).	-
R310	Connects A18_MTIIOC4B (MCU, pin 50) to the application header (JA2, pin 17).	Disconnects A18_MTIIOC4B (MCU, pin 50) from the application header (JA2, pin 17).	-
R311	Connects A8_MTIIC5W (MCU, pin 61) to the application header (JA6, pin 16).	Disconnects A8_MTIIC5W (MCU, pin 61) from the application header (JA6, pin 16).	-
R312	Connects A9_MTIIOC0C (MCU, pin 59) to the application header (JA2, pin 23) via R370.	Disconnects A9_MTIIOC0C (MCU, pin 59) from the application header (JA2, pin 23).	R370
R313	Connects A4_MTIIC5U (MCU, pin 66) to the application header (JA6, pin 14).	Disconnects A4_MTIIC5U (MCU, pin 66) from the application header (JA6, pin 14).	-
R314	Connects D7_POE0 (MCU, pin 79) to the application header (JA2, pin 24).	Disconnects D7_POE0 (MCU, pin 79) from the application header (JA2, pin 24).	-
R315	Connects D15_IO7 (MCU, pin 71) to the application header (JA1, pin 22).	Disconnects D15_IO7 (MCU, pin 71) from the application header (JA1, pin 22).	-
R316	Connects D14_IO6 (MCU, pin 72) to the application header (JA1, pin 21).	Disconnects D14_IO6 (MCU, pin 72) from the application header (JA1, pin 21).	-
R317	Connects D13_IO5 (MCU, pin 73) to the application header (JA1, pin 20).	Disconnects D13_IO5 (MCU, pin 73) from the application header (JA1, pin 20).	-
R318	Connects D12_IO4 (MCU, pin 74) to the application header (JA1, pin 19).	Disconnects D12_IO4 (MCU, pin 74) from the application header (JA1, pin 19).	-

Table 6-5: IRQ & General I/O Option Links (continued overleaf)

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R319	Connects D11_IO3 (MCU, pin 75) to the application header (JA1, pin 18).	Disconnects D11_IO3 (MCU, pin 75) from the application header (JA1, pin 18).	-
R320	Connects D10_IO2 (MCU, pin 76) to the application header (JA1, pin 17).	Disconnects D10_IO2 (MCU, pin 76) from the application header (JA1, pin 17).	-
R321	Connects D2_IRQ2 (MCU, pin 84) to the application header (JA2, pin 23).	Disconnects D2_IRQ2 (MCU, pin 84) from the application header (JA2, pin 23).	R370, R373, R374
R322	Connects D0_IRQ0 (MCU, pin 86) to the application header (JA2, pin 7).	Disconnects D0_IRQ0 (MCU, pin 86) from the application header (JA2, pin 7).	R371, R375
R323	Connects A11_MTI0C0A (MCU, pin 57) to the application header (JA2, pin 7) via R371.	Disconnects A11_MTI0C0A (MCU, pin 57) from the application header (JA2, pin 7).	R371
R325	Connects A1_MTI0C0B (MCU, pin 69) to the application header (JA2, pin 9) via R372.	Disconnects A1_MTI0C0B (MCU, pin 69) from the application header (JA2, pin 9).	R372
R327	Connects D9_IO1 (MCU, pin 77) to the application header (JA1, pin 16).	Disconnects D9_IO1 (MCU, pin 77) from the application header (JA1, pin 16).	-
R328	Connects D8_IO0 (MCU, pin 78) to the application header (JA1, pin 15).	Disconnects D8_IO0 (MCU, pin 78) from the application header (JA1, pin 15).	-
R329	Connects DLCD5_TMO0 (MCU, pin 37) to TMO0 (JA2.pin 19).	Disconnects DLCD5_TMO0 (MCU, pin 37) from TMO0 (JA2.pin 19).	R340
R330	Connects SDA_TMO3 (MCU, pin 33) to TMO3 (JA2.pin 20).	Disconnects SDA_TMO3 (MCU, pin 33) from TMO3 (JA2.pin 20).	R341
R331	Connects A15_TXD9 (MCU, pin 53) to T2IN (U9, pin 12) via R64.	Disconnects A15_TXD9 (MCU, pin 53) from T2IN (U9, pin 12) via R64.	R64
R332	Connects A14_RXD9 (MCU, pin 54) to R2OUT (U9, pin 10) via R81.	Disconnects A14_RXD9 (MCU, pin 54) from R2OUT (U9, pin 10) via R81.	R81
R333	Connects A13_SCK9 (MCU, pin 55) to the application header (JA6, pin 11).	Disconnects A13_SCK9 (MCU, pin 55) from the application header (JA6, pin 11).	-
R334	Connects LED1_MTCLKB (MCU, pin 31) to LED1.	Disconnects LED1_MTCLKB (MCU, pin 31) from LED1.	R303
R335	Connects LED0_MTCLKA (MCU, pin 32) to LED0.	Disconnects LED0_MTCLKA (MCU, pin 32) from LED0.	R304
R336	Connects DLCDE_MTI0C3C (MCU, pin 4) to DLCDE (LCD, pin 6).	Disconnects DLCDE_MTI0C3C (MCU, pin 4) from DLCDE (LCD, pin 6).	R305
R337	Connects DLCDRS_MTI0C3A (MCU, pin 6) to DLCDRS (LCD, pin 4).	Disconnects DLCDRS_MTI0C3A (MCU, pin 6) from DLCDRS (LCD, pin 4).	R306
R338	Connects LED3_MTI0C3B (MCU, pin 29) to LED3.	Disconnects LED3_MTI0C3B (MCU, pin 29) from LED3.	R307
R339	Connects LED2_MTI0C3D (MCU, pin 30) to LED2.	Disconnects LED2_MTI0C3D (MCU, pin 30) from LED2.	R308
R340	Connects DLCD5_TMO0 (MCU, Pin37) to DLCD (LCD, pin 12).	Disconnects DLCD5_TMO0 (MCU, Pin37) from DLCD (LCD, pin 12).	R329

Table 6-5: IRQ &amp; General I/O Option Links (continued overleaf)

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R341	<b>Connects SDA_TMO3 (MCU, pin 33) to the application header (JA1, pin 25).</b>	Disconnects SDA_TMO3 (MCU, pin 33) from the application header (JA1, pin 25).	R330
R342	<b>Connects MTIOC4A_CS0n (MCU, pin 24) to the application header (JA2, pin 15).</b>	Disconnects MTIOC4A_CS0n (MCU, pin 24) from the application header (JA2, pin 15).	R347
R343	<b>Connects MTIOC4C_CS1n (MCU, pin 23) to the application header (JA2, pin 16).</b>	Disconnects MTIOC4C_CS1n (MCU, pin 23) from the application header (JA2, pin 16).	R346
R344	<b>Connects TXD1_CS2n (MCU, pin 22) to T1IN (U9, pin 13) via R60.</b>	Disconnects TXD1_CS2n (MCU, pin 22) from T1IN (U9, pin 13).	R60, R150, R256, R345, R378
R345	Connects TXD1_CS2n (MCU, pin 22) to Board_VCC.	<b>Disconnects TXD1_CS2n (MCU, pin 22) from Board_VCC.</b>	R344, R362, R378
R346	Connects MTIOC4C_CS1n (MCU, pin 23) to Board_VCC.	<b>Disconnects MTIOC4C_CS1n (MCU, pin 23) from Board_VCC.</b>	R343
R347	Connects MTIOC4A_CS0n (MCU, pin 24) to Board_VCC.	<b>Disconnects MTIOC4A_CS0n (MCU, pin 24) from Board_VCC.</b>	R342
R351	Connects NMIIn (MCU, pin 15) to GROUND.	<b>Disconnects NMIIn (MCU, pin 15) from GROUND.</b>	-
R361	<b>Connects RXD1 (MCU, pin 20) to the application header (JA6, pin 7).</b>	Disconnects RXD1 (MCU, pin 20) from the application header (JA6, pin 7).	R70, R151, R257, R282
R362	<b>Connects TXD1 (MCU, pin 22) to the application header (JA6, pin 8).</b>	Disconnects TXD1 (MCU, pin 22) from the application header (JA6, pin 8).	R60, R150, R256, R280, R344, R345, R378
R363	<b>Connects SCK1 (MCU, pin 21) to the application header (JA6, pin 10).</b>	Disconnects SCK1 (MCU, pin 21) from the application header (JA6, pin 10).	R279, R378, R380
R364	Connects RXD0_MTI0C1B (MCU, pin 27) to the application header (JA2, pin 23).	<b>Disconnects RXD0_MTI0C1B (MCU, pin 27) from the application header (JA2, pin 23).</b>	R373, R365
R365	<b>Connects RXD0_MTI0C1B (MCU, pin 27) to R10OUT (U9, pin 15) via R151.</b>	Disconnects RXD0_MTI0C1B (MCU, pin 27) from R10OUT (U9, pin 15) via R151.	R151, R364
R366	<b>Connects D1_IRQ1 (MCU, pin 85) to the application header (JA2, pin 9).</b>	Disconnects D1_IRQ1 (MCU, pin 85) from the application header (JA2, pin 9).	R372, R376
R367	<b>Connects A6_MTI0C5V (MCU, pin 64) to the application header (JA6, pin 15).</b>	Disconnects A6_MTI0C5V (MCU, pin 64) from the application header (JA6, pin 15).	
R368	<b>Connects D5_IRQ5 (MCU, pin 81) to the application header (JA5, pin 10).</b>	Disconnects D5_IRQ5 (MCU, pin 81) from the application header (JA5, pin 10).	-
R369	<b>Connects D3_IRQ3 (MCU, pin 83) to the application header (JA1, pin 23).</b>	Disconnects D3_IRQ3 (MCU, pin 83) from the application header (JA1, pin 23).	-
R370	Connects MTIOC0C (MCU, pin 59) to the application header (JA2, pin 23).	<b>Disconnects MTIOC0C (MCU, pin 59) from the application header (JA2, pin 23).</b>	R312, R373, R374
R371	Connects MTIOC0A (MCU, pin 57) to the application header (JA2, pin 7).	<b>Disconnects MTIOC0A (MCU, pin 57) from the application header (JA2, pin 7).</b>	R323, R375

Table 6-5: IRQ &amp; General I/O Option Links (continued overleaf)

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R372	Connects MTIOC0B (MCU, pin 69) to the application header (JA2, pin 9).	<b>Disconnects MTIOC0B (MCU, pin 69) from the application header (JA2, pin 9).</b>	R325, R376
R373	Connects MTIOC1B (MCU, pin 27) to the application header (JA2, pin 23).	<b>Disconnects MTIOC1B (MCU, pin 27) from the application header (JA2, pin 23).</b>	R364, R370, R374
R374	<b>Connects D2_IRQ2 (MCU, pin 84) to the application header (JA2, pin 23).</b>	Disconnects D2_IRQ2 (MCU, pin 84) from the application header (JA2, pin 23).	R321, R370, R373
R375	<b>Connects D0_IRQ0 (MCU, pin 86) to the application header (JA2, pin 7).</b>	Disconnects D0_IRQ0 (MCU, pin 86) from the application header (JA2, pin 7).	R322, R371
R376	<b>Connects D1_IRQ1 (MCU, pin 85) to the application header (JA2, pin 9).</b>	Disconnects D1_IRQ1 (MCU, pin 85) from the application header (JA2, pin 9).	R366, R372
R377	<b>Connects D4_IRQ4 (MCU, pin 82) to the application header (JA5, pin 9).</b>	Disconnects D4_IRQ4 (MCU, pin 82) from the application header (JA5, pin 9).	-
R378	<b>Connects TXD1_CS2n (MCU, pin 22) to the application header (JA3, pin 45).</b>	Disconnects TXD1_CS2n (MCU, pin 22) from the application header (JA3, pin 45).	R60, R280, R344, R345, R362
R380	Connects SCK1 (MCU, pin 21) to Board_VCC.	<b>Disconnects SCK1 (MCU, pin 21) from Board_VCC.</b>	R279, R363

**Table 6-5: IRQ & General I/O Option Links (continuation)**



## 6.7 User Switch Configuration

Table 6-6 below details the function of the option links associated with user switches.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R59	Connects RESET_N (MCU, pin 10) directly to the RES switch.	Disconnects RESET_N (MCU, pin 10) from the RES switch.	-
R63	Connects the switch SW3 to SW3_IRQ4 (MCU, pin 16).	Disconnects the switch SW3 from SW3_IRQ4 (MCU, pin 16).	R301
R301	Connects the switch SW3 to ADTRG0n (MCU, pin 98).	Disconnects the switch SW3 from ADTRG0n (MCU, pin 98).	R63

Table 6-6: User Switch Option Links

## 6.8 Power Supply Configuration

Table 6-7 below details the function of the option links associated with power supply configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R68	Connects UC_VCC to power line.	Allows the current consumption of the MCU to be measured across J14.	J14
R76	Connects CON_5V to power line.	Disconnects CON_5V from power line.	J17, R83, R102
R83	Connects 5V to power line.	Disconnects 5V from power line.	J17, R76, R102
R102	Connects the power socket (PWR pin) to power line.	Disconnects the Power socket (PWR pin) from power line.	J17, R76, R83
R302	Connects CON_3V3 to power line.	Disconnects CON_3V3 from power line.	J17, R359
R359	Connects the voltage regulator output (U11, pin 2) to power line.	Disconnects the voltage regulator output (U11, pin 2) from power line.	J17, R302

Table 6-7: Power Supply Option Links

Table 6-8 below details the function of the jumpers associated with power supply configuration.

Reference	Position One	Position Two	Position Three	Related Ref.
J15*	Pins 1 and 2 open: The voltage regulator U11 is set to supply Board_VCC with 3.3V.	Pins 1 and 2 connected: The voltage regulator U11 is set to supply Board_VCC with 1.62V	n/a	-
J17**	All pins open: Disconnects CON_3V3/Board_VCC/UC_VCC from PWR/ /5V/CON_5V/voltage regulator U11.	Pins 1 and 2 connected: Connects CON_3V3/Board_VCC/UC_VCC to PWR/5V/CON_5V	Pins 2 and 3 connected: Connects CON_3V3/Board_VCC/UC_VCC to voltage regulator U11.	R359

Table 6-8: Power Supply Jumpers

\* By default, this jumper is not fitted to the RSK. The default position is therefore all pins open.

\*\* When 5V power rail is less than 5V or Board\_VCC is 1.62V, Debug LCD cannot be used. Refer to the power supply section, §2, for further information.

## 6.9 Clock Configuration

Table 6-9 below details the function of the option links associated with clock configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R44	Connects CON_XCOUT (J1, pin 9) to XCOUT (MCU, pin 9).	<b>Disconnects CON_XCOUT (J1, pin 9) to XCOUT (MCU, pin 9).</b>	R47, R293
R46	<b>Connects the crystal X1 to XTAL (MCU, pin 11).</b>	Disconnects the crystal X1 from XTAL (MCU, pin 11).	R229*, R299, R300
R47	Connects CON_XCIN (J1, pin 8) to XCIN (MCU, pin 8).	<b>Disconnects CON_XCIN (J1, pin 8) from XCIN (MCU, pin 8).</b>	R44, R293
R293	<b>Connects the crystal X3 to XCOUT (MCU, pin 9).</b>	Disconnects the crystal X3 from XCOUT (MCU, pin 9).	R44, R47
R299	Connects CON_EXTAL (J1, pin 13, JA2, pin 2) to EXTAL (MCU, pin 13).	<b>Disconnects CON_EXTAL (J1, pin 13, JA2, pin 2) from EXTAL (MCU, pin 13).</b>	R46, R300
R300	Connects CON_XTAL (J1, pin 11) to XTAL (MCU, pin 11).	<b>Disconnects CON_XTAL (J1, pin 11) from XTAL (MCU, pin 11).</b>	R46, R299

**Table 6-9: Clock Option Links**

\* R229 enables fitting of a feedback resistor, as described the RX220 Group Hardware Manual. This is not normally required for usual RSK operation.

## 6.10 Debug LCD Configuration

Table 6-10 below details the function of the option links associated with debug LCD configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R305	Connects DLCDE_MTI0C3C (MCU, pin 4) to the application header (JA2, pin 11).	<b>Disconnects DLCDE_MTI0C3C (MCU, pin 4) from the application header (JA2, pin 11).</b>	R336
R306	Connects DLCDRS_MTI0C3A (MCU, pin 6) to the application header (JA6, pin 13).	<b>Disconnects DLCDRS_MTI0C3A (MCU, pin 6) from the application header (JA6, pin 13).</b>	R337
R329	Connects DLCD5_TMO0 (MCU, pin 37) to the TMO0 (JA2, pin 19).	<b>Disconnects DLCD5_TMO0 (MCU, pin 37) from the TMO0 (JA2, pin 19)</b>	R340
R336	<b>Connects DLCDE_MTI0C3C (MCU, pin 4) to DLCDE (LCD, pin 6).</b>	Disconnects DLCDE_MTI0C3C (MCU, pin 4) from DLCDE (LCD, pin 6).	R305
R337	<b>Connects DLCDRS_MTI0C3A (MCU, pin 6) to DLCDRS (LCD, pin 4).</b>	Disconnects DLCDRS_MTI0C3A (MCU, pin 6) from DLCDRS (LCD, pin 4).	R306
R340	<b>Connects DLCD5_TMO0 (MCU, pin 37) to the DLCD5 (LCD, pin 12).</b>	Disconnects DLCD5_TMO0 (MCU, pin 37) from the DLCD5 (LCD, pin 12)	R329

**Table 6-10: Debug LCD Option Links**

## 6.11 IIC EEPROM Configuration

**Table 6-11** below details the function of the option links associated with debug LCD configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R285	Connects the EEPROM IC (U10, pin 7) to Board_VCC (enable write-protection)	Disconnects the EEPROM IC (U10, pin 7) from Board_VCC.	-
R286	Connects the EEPROM IC (U10, pin 1) to GROUND.	Disconnects the EEPROM IC (U10, pin 1) from GROUND.	R290*
R290	Connects the EEPROM IC (U10, pin 1) to Board_VCC	Disconnects the EEPROM IC (U10, pin 1) from Board_VCC	R286*
R358	Connects SCL (MCU, pin 34) to the EEPROM IC (U10, pin 6).	Disconnects SCL (MCU, pin 34) from the EEPROM IC (U10, pin 6).	-

**Table 6-11: Debug LCD Option Links**

\* Caution: Do not fit both R286 and R290.

## 7. Headers

### 7.1 Microcontroller Pin Headers

This RSK is fitted with MCU pin headers, which are used to access all the MCU's pins.

**Table 7-1** below lists the connections of the Microcontroller Pin Header, J1.

Microcontroller Pin Header J1					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	CON_VREFH	NC	2	DA0	2
3	CON_VREFL	NC	4	DLCDE_MTIOC3C	4
5	NC	NC	6	DLCDRS_MTIOC3A	6
7	MODE	7	8	CON_XCIN	8*
9	CON_XCOUT	9*	10	RESET_N	10
11	CON_XTAL	11*	12	GROUND	-
13	CON_EXTAL	13*	14	UC_VCC	-
15	NMIIn	15	16	SW3_IRQ4	16
17	SW2_IRQ3	17	18	P32	18
19	SW1_IRQ1	19	20	RXD1	20
21	SCK1	21	22	TXD1_CS2n	22
23	MTIOC4C_CS1n	23	24	MTIOC4A_CS0n	24
25	CTS0RTS0	25	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

**Table 7-1: Microcontroller Pin Header J1 Connections**

\* Connection made through option link

**Table 7-2** below lists the connections of the Microcontroller Pin Header, J2.

Microcontroller Pin Header J2					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	SCK0	26	2	RXD0_MTIOC1B	27
3	TXD0	28	4	LED3_MTIOC3B	29
5	LED2_MTIOC3D	30	6	LED1_MTCLKB	31
7	LED0_MTCLKA	32	8	SDA_TMO3	33
9	SCL	34	10	DLCD7	35
11	DLCD6	36	12	DLCD5_TMO0	37
13	DLCD4	38	14	nWAIT	39
15	ALE	40	16	BCLK_P53	41
17	nRD	42	18	nWR1	43
19	nWR	44	20	UB	45
21	A22	46	22	A21	47
23	A20	48	24	A19_MTIOC4D	49
25	A18_MTIOC4B	50	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

**Table 7-2: Microcontroller Pin Header J2 Connections**

**Table 7-3** below lists the connections of the Microcontroller Pin Header, J3.

Microcontroller Pin Header J3					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	A17	51	2	A16	52
3	A15_TXD9	53	4	A14_RXD9	54
5	A13_SCK9	55	6	A12	56
7	A11_MTI0C0A	57	8	A10	58
9	A9_MTI0C0C	59	10	UC_VCC	-
11	A8_MTI0C5W	61	12	GROUND	-
13	A7	63	14	A6_MTI0C5V	64
15	A5	65	16	A4_MTI0C5U	66
17	A3	67	18	A2	68
19	A1_MTI0C0B	69	20	A0	70
21	D15_IO7	71	22	D14_IO6	72
23	D13_IO5	73	24	D12_IO4	74
25	D11_IO3	75	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

**Table 7-3: Microcontroller Pin Header J3 Connections**

**Table 7-4** below lists the connections of the Microcontroller Pin Header, J4.

Microcontroller Pin Header J4					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	D10_IO2	76	2	D9_IO1	77
3	D8_IO0	78	4	D7_POE0	79
5	D6	80	6	D5_IRQ5	81
7	D4_IRQ4	82	8	D3_IRQ3	83
9	D2_IRQ2	84	10	D1_IRQ1	85
11	D0_IRQ0	86	12	AN007	87
13	AN006	88	14	AN005	89
15	AN004	90	16	AN003	91
17	AN002	92	18	AN001	93
19	CON_VREFL0	94*	20	AD_POT	95
21	CON_VREFH0	96*	22	AVCC	97
23	ADTRG0n	98	24	GROUND	-
25	DA1	100	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

**Table 7-4: Microcontroller Pin Header J4 Connections**

\* Connection made through option link

## 7.2 Application Headers

This RSK is fitted with application headers, which can be used to connect compatible Renesas application devices or as easy access to MCU pins.

**Table 7-5** below lists the connections of the application header, JA1.

Application Header JA1					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	5V	-	2	0V(5V)	-
	CON_5V			GROUND	
3	3V3	-	4	0V(3V3)	-
	CON_3V3			GROUND	
5	AVcc	97	6	AVss	99
	CON_AVCC			CON_AVSS	
7	AVref	96*	8	ADTRG	98
	CON_VREFH0			ADTRG0n	
9	AD0	95	10	AD1	93
	AD_POT			AN001	
11	AD2	92	12	AD3	91
	AN002			AN003	
13	DAC0	2	14	DAC1	100
	DA0			DA1	
15	IO_0	78	16	IO_1	77
	IO0			IO1	
17	IO_2	76	18	IO_3	75
	IO2			IO3	
19	IO_4	74	20	IO_5	73
	IO4			IO5	
21	IO_6	72	22	IO_7	71
	IO6			IO7	
23	IRQ3	83	24	IIC_EX	NC
	IRQ3			NC	
25	IIC_SDA	33	26	IIC_SCL	34
	SDA			SCL	

**Table 7-5: Application Header JA1 Connections**

\* Connection made through option link



**Table 7-6** below lists the connections of the application header, JA2.

Application Header JA2					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	RESn	10	2	EXTAL	13*
	RESET_N			CON_EXTAL	
3	NMIIn	15	4	Vss1	-
	NMIIn			GROUND	
5	WDT_OVF	NC	6	SClATX	28
	NC			TXD0	
7	IRQ0	86/NC/57*	8	SClARX	27
	IRQ0/NC/MTIOC0A			RXD0	
9	IRQ1	85/69*	10	SClACK	26
	IRQ1/MTIOC0B			SCK0	
11	M1_UD	4	12	CTSRTS	25
	MTIOC3C			CTS0RTS0	
13	M1_UP	29	14	M1_UN	30
	MTIOC3B			MTIOC3D	
15	M1_VP	24	16	M1_VN	23
	MTIOC4A			MTIOC4C	
17	M1_WP	50	18	M1_WN	49
	MTIOC4B			MTIOC4D	
19	TMR0	37*	20	TMR1	33*
	TMO0			TMO3	
21	TRIGa	98	22	TRIGb	NC
	ADTRG0n			NC	
23	IRQ2	84/59/27*	24	M1_POE	79
	IRQ2/MTIOC0C/MTIOC1B			POE0	
25	M1_TRCCLK	32	26	M1_TRDCLK	31
	MTCLKA			MTCLKB	

**Table 7-6: Application Header JA2 Connections**

\* Connection made through option link

**Table 7-7** below lists the connections of the BUS application header, JA3

Application Header JA3					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	A0	70	2	A1	69
	A0			A1_MTI0C0B	
3	A2	68	4	A3	67
	A2			A3	
5	A4	66	6	A5	65
	A4_MTI0C5U			A5	
7	A6	64	8	A7	63
	A6_MTI0C5V			A7	
9	A8	61	10	A9	59
	A8_MTI0C5W			A9_MTI0C0C	
11	A10	58	12	A11	57
	A10			A11_MTI0C0A	
13	A12	56	14	A13	55
	A12			A13_SCK9	
15	A14	54	16	A15	53
	A14_RXD9			A15_TXD9	
17	D0	86	18	D1	85
	D0_IRQ0			D1_IRQ1	
19	D2	84	20	D3	83
	D2_IRQ2			D3_IRQ3	

**Table 7-7: Bus Application Header JA3 Connections (continued overleaf)**

Application Header JA3					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
21	D4	82	22	D5	81
	D4_IRQ4			D5_IRQ5	
23	D6	80	24	D7	79
	D6			D7_POE0	
25	RDn	42	26	WRn	44/NC
	nRD			nWR	
27	CSan	24	28	CSbn	23
	MTIOC4A_CS0n			MTIOC4C_CS1n	
29	D8	78	30	D9	77
	D8_IO0			D9_IO1	
31	D10	76	32	D11	75
	D10_IO2			D11_IO3	
33	D12	74	34	D13	73
	D12_IO4			D13_IO5	
35	D14	72	36	D15	71
	D14_IO6			D15_IO7	
37	A16	52	38	A17	51
	A16			A17	
39	A18	50	40	A19	49
	A18_MTI0C4B			A19_MTI0C4D	
41	A20	48	42	A21	47
	A20			A21	
43	A22	46	44	-	NC
	A22			NC	
45	CScn	22/NC	46	ALE	40/NC
	TXD1_CS2n			ALE	
47	HWRn	43/NC	48	LWRn	44/NC
	nWR1			nWR	
49	CAS	NC	50	RAS	NC
	NC			NC	

Table 7-7: Bus Application Header JA3 Connections (continuation)

**Table 7-8** below lists the connections of the application header, JA5.

Application Header JA5					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	AD4	90	2	AD5	89
	AN004			AN005	
3	AD6	88	4	AD7	87
	AN006			AN007	
5	CAN1TX	NC	6	CAN1RX	NC
	NC			NC	
7	CAN2TX	NC	8	CAN2RX	NC
	NC			NC	
9	IRQ4	82/NC/NC	10	IRQ5	81/NC
	IRQ4			IRQ5	
11	M2_UD	NC	12	M2_Uin	NC
	NC			NC	
13	M2_Vin	NC	14	M2_Win	NC
	NC			NC	
15	M2_Toggle	NC	16	M2_POE	NC
	NC			NC	
17	M2_TRCCLK	NC	18	M2_TRDCLK	NC
	NC			NC	
19	M2_UP	NC	20	M2_UN	NC
	NC			NC	
21	M2_VP	NC	22	M2_VN	NC
	NC			NC	
23	M2_WP	NC	24	M2_WN	NC
	NC			NC	

**Table 7-8: Application Header JA5 Connections**

**Table 7-9** below lists the connections of the application header, JA6.

Application Header JA6					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	DREQ	NC	2	DACK	NC
	NC			NC	
3	TEND	NC	4	STBYn	NC
	NC			NC	
5	RS232TX	NC	6	RS232RX	NC
	RS232TX			RS232RX	
7	SCIbRX	20	8	SCIbTX	22
	RXD1			TXD1	
9	SClckTX	53	10	SClck	21
	TXD9			SCK1	
11	SClck	55	12	SClckRX	54
	SCK9			RXD9	
13	M1_Toggle	6	14	M1_Uin	66
	MTIOC3A			MTIC5U	
15	M1_Vin	64	16	M1_Win	61
	MTIC5V			MTIC5W	
17	Reserved	NC	18	Reserved	NC
	NC			NC	
19	Reserved	NC	20	Reserved	NC
	NC			NC	
21	Reserved	NC	22	Reserved	NC
	NC			NC	
23	Unregulated_VCC	NC	24	Vss	-
	NC			GROUND	

**Table 7-9: Application Header JA6 Connections**

## 8. Code Development

### 8.1 Overview

For all code debugging using Renesas software tools, the RSK board must be connected to a PC via an E1/E20 debugger. An E1 debugger is supplied with this RSK product.

For further information regarding the debugging capabilities of the E1/E20 debuggers, refer to E1/E20 Emulator Additional Document for User's Manual (R20UT0399EJ).

### 8.2 Compiler Restrictions

The compiler supplied with this RSK is fully functional for a period of 60 days from first use. After the first 60 days of use have expired, the compiler will default to a maximum of 128k code and data. To use the compiler with programs greater than this size you need to purchase the full tools from your distributor.

The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

### 8.3 Mode Support

The MCU supports Single Chip, Boot modes, which are configured on the RSK board. Details of the modifications required can be found in §6. All other MCU operating modes are configured within the MCU's registers, which are listed in the RX220 Group Hardware Manual.

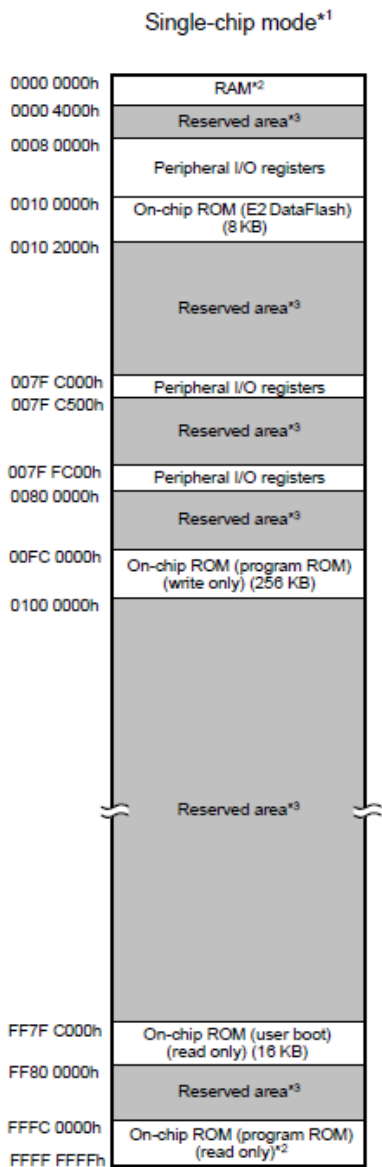
Only ever change the MCU operating mode whilst the RSK is in reset, or turned off; otherwise the MCU may become damaged as a result.

### 8.4 Debugging Support

The E1 emulator (as supplied with this RSK) supports break points, event points (including mid-execution insertion) and basic trace functionality. It is limited to a maximum of 8 on-chip event points, 256 software breaks and 256 branch/cycle trace. For further details, refer RX Family E1/E20 Emulator User's Manual (R20UT0398EJ).

### 8.5 Address Space

Figure 8-1 below details the address space of the MCU. The MCU fitted to the RSK has 256K of ROM. For further details, refer to the RX220 Group Hardware Manual.



- Note 1. The address space in boot mode and user boot mode is the same as the address space in single-chip mode.
- Note 2. The capacity of ROM/RAM differs depending on the products.

ROM (bytes)		RAM (bytes)	
Capacity	Address	Capacity	Address
256 K	FFFC 0000h to FFFF FFFFh	16 K	0000 0000h to 0000 3FFFh
128 K	FFFE 0000h to FFFF FFFFh	8 K	0000 0000h to 0000 1FFFh
64K	FFFF 0000h to FFFF FFFFh		
32 K	FFFF 8000h to FFFF FFFFh	4 K	0000 0000h to 0000 0FFFh

Note: •See Table 1.3, List of Products, for the product type name.

Note 3. Reserved areas should not be accessed.

**Figure 8-1: MCU Address Space Diagram**

## 9. Additional Information

### Technical Support

For details on how to use High-performance Embedded Workshop (HEW), refer to the HEW manual available on the CD or from the web site.

For information about the RX220 Group microcontrollers refer to the RX220 Group Hardware Manual.

For information about the RX assembly language, refer to the RX Family Software Manual.

### Technical Contact Details

*Please refer to the contact details listed in section 7 of the “Quick Start Guide”*

General information on Renesas Microcontrollers can be found on the Renesas website at:

<http://www.renesas.com/>

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