

RC2200DK Demonstration Kit User Manual

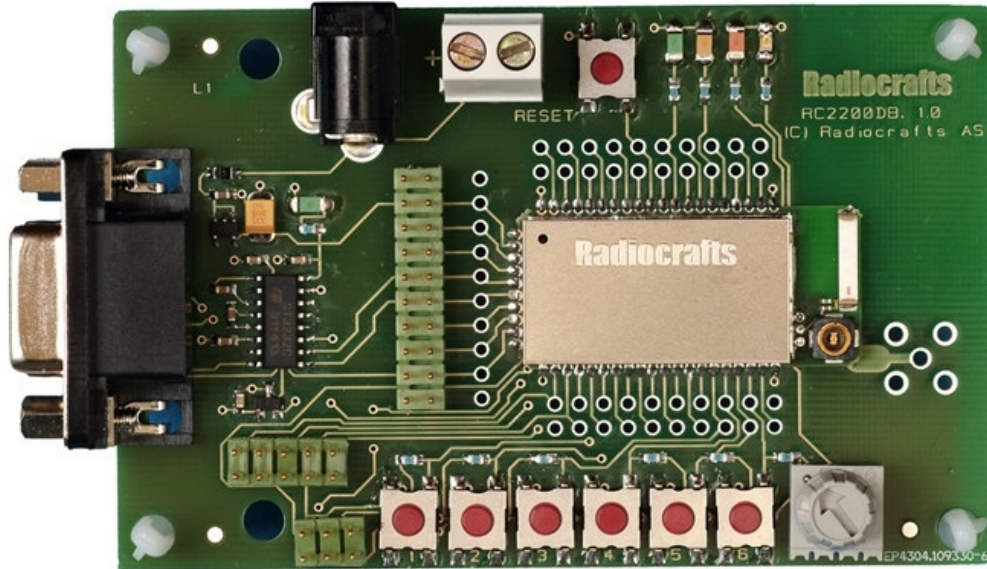


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Quick Introduction

First verify which firmware your DK has been delivered with. Radiocrafts provides several firmware versions which can be found as the last part of the part number:

RC2200DK-SPPIO: Serial Port Profile with I/O mapping. This is a fully working firmware with the Radiocrafts SPPIO™ private profile based on the Airbee-ZNS.

RC2200DK-HCL: Home Control Lighting profile. This is a demonstration firmware showing the Chipcon/Figure8Wireless Z-stack implementation with the home control lighting profile.

For a quick start introduction using the kits, please refer to the *RC2200DK-SPPIO Quick Start* for the Serial Port Profile and I/O mapping demo kit *RC2200DK-HCL Quick Start* for the Home Control Lighting demo kit

These documents are available on Radiocrafts' webpage www.radiocrafts.com.

Introduction

The RC2200 Zigbee-ready modules provide a very compact solution for a wide range of wireless network applications. The kit can be used to evaluate one of embedded applications, or to develop and test proprietary applications.

The kit comes in two versions:

- RC2200DK-SPPIO with the standard off-the-shelf SPPIO™ private profile from Radiocrafts based on the Airbee-ZNS
- RC2200DK-HCL with the Home Control Lighting profile based on Chipcon / Figure 8 Wireless Z-stack and HCL profile example

The SPPIO is a fully working ZigBee-ready application embedded in the module. Each module is delivered with a unique IEEE address, and is field configurable through AT-commands. For more information on the SPPIO, please refer to the RC2200AT-SPPIO Data Sheet.

The HCL profile is for demonstration only. It is based on the HCL example and reference design from Chipcon/F8W and is ported to the RC2200DB platform by redefining push buttons and LEDs. For details on the code porting, please contact Radiocrafts.

The kit can also be used for development of a customer's proprietary protocol, or any Zigbee network implementation ported to the RC2200 hardware platform. In this case the user would re-flash the modules with his own application, and the JTAG could be used for debugging.

The RC2200DK Demonstration Kit is designed to make it easy for the user to evaluate the module and/or develop an application very quickly. With the RC2200DK Demonstration Kit you can:

- evaluate the RF performance of the modules
- evaluate the functionality of the SPPIO or HCL application profiles
- develop your own application interfacing the modules
- build a prototype of your application

This User Manual describes how to interface the Demonstration Kit and provide detailed documentation for the Demonstration Board and its onboard resources.

Your RC2200DK Demonstration Kit should contain the following items:

| Kit contents | |
|--------------------------------|--------------------|
| Item | Number of articles |
| Demonstration Board (RC2200DB) | 2 |
| RS232 serial cable (1:1) | 2 |
| AC/DC battery eliminator 6VDC | 2 |

Demonstration Board

The Demonstration Kit includes two Demonstration Boards. The Demonstration Boards contain the RC2200AT module and associated support circuits. The board provides an a serial port driver circuit for RS232 and the 9-pin D-Sub connector, ISP and JTAG interfaces for programming and debugging, access to all digital and analogue I/O, push-buttons, LEDs, a potentiometer and a temperature sensor as well as a voltage regulator.

Configuration jumpers and connectors make it easy to interface the RC2200 with various test equipment or the host used in an application. Not all components are needed in an actual application. Please see the datasheet for a typical application circuit.

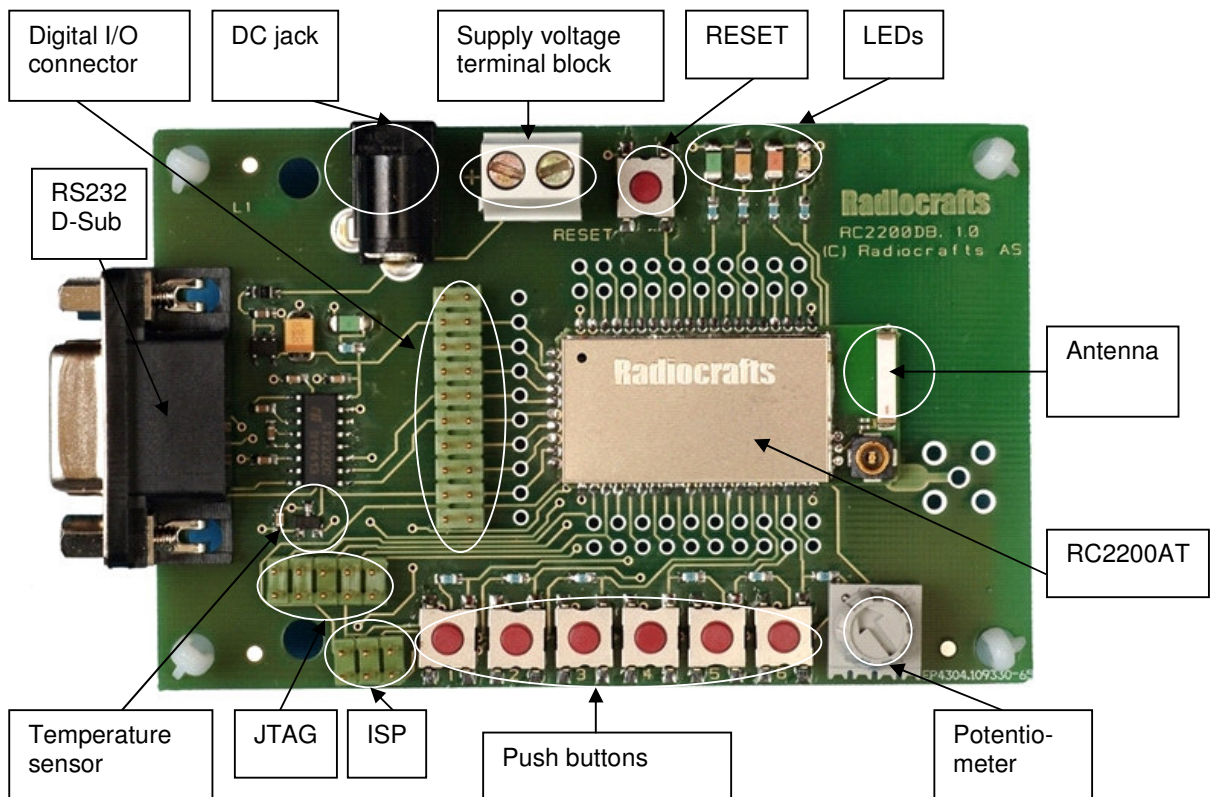


Figure 1: RC2200DB Demonstration Board

The MMCX connector shown on the picture is normally not mounted on the module. Also the SMA connector layout pattern is not used on this board (and is not connected to the module antenna output).

Typical range measured between two boards in line-of-sight is 110 meters when the chip antennas are oriented vertically (or parallel). Indoors a range of 10-30 can be expected, depending on the materials in walls and floors.

Power supply section

The board contains a voltage regulator. You can choose between applying a 4-10V unregulated supply voltage at the DC jack (like the battery eliminator included in the kit), or the screw terminal where a battery pack or some other supply can be connected. The on-board regulator drops the voltage to 3.0V. A green LED will light up the board is connected to a power source.

Input supply voltage range is 4 – 10 V. A series diode protects the circuit against wrong polarity.

The current supply to the module is through the jumper at P13, pin 3 and 4. An ampere meter can be connected here in order to measure the DC current drawn by the module. Remove the jumper and replace by an ampere meter in order to measure the current. The location of P13, pin 3 and 4, are shown in the figure below.

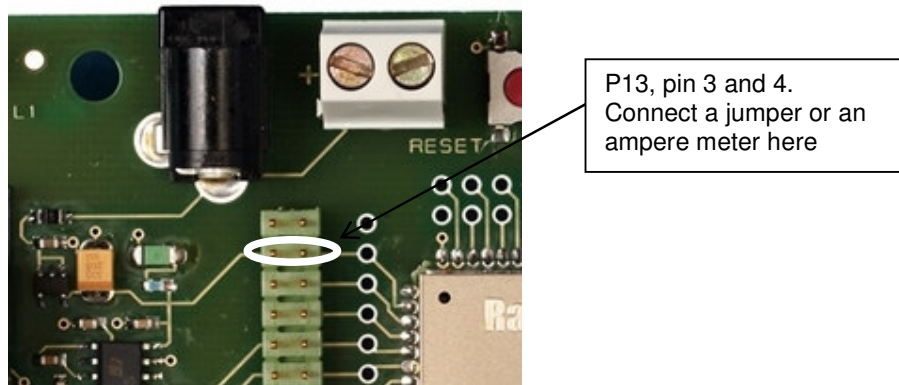


Figure 2. Module current consumption measurement

Note: To ensure proper Power-On Reset (POR) the wall socket end of the AC/DC battery eliminator should be inserted first, and then the DC-jack into the board. If the VCC power-on rise-time specification is not met, the board may need the RESET to be activated to ensure correct start-up.

RS-232 interface

The Demonstration Board provides an RS232 driver circuit. The serial port is configured as a data modem and a 1:1 cable should be used to connect the board to the PC. The RTS/CTS handshaking pair is also provided, so that hardware handshaking may be used on this port. The serial port (RXD and TXD) and handshaking signals can be HW enabled by doing the following hardware changes:

- Insert jumpers at P13 to connect RXD and TXD to the RS232 driver
- Insert jumpers at P13 to connect CTS and RTS to the RS232 driver if hardware handshake is to be used

Note: In order to use HW handshake with the SPPIO profile the UART_FLOW_CONTROL configuration register must be set accordingly.

P13 is used to set jumpers to connect the module UART interface to the RS232 PHY driver. Normally the jumpers connecting RXD and TXD are installed, and provide UART communication with a PC without handshaking. With the jumpers removed the modules RXD and TXD can easily be connected to a host using logic levels, for instance a microcontroller or external development board. The table below shows the pinout and signals at P13.

| Pin no. | Signal | Note |
|---------|--------|----------------------|
| 1 | 2 | GND |
| 3 | 4 | VCC |
| 5 | 6 | Spare digital signal |
| 7 | 8 | GND |
| 9 | 10 | CTS |
| 11 | 12 | RTS |
| 13 | 14 | Spare digital signal |
| 15 | 16 | TXD |
| 17 | 18 | RXD |
| 19 | 20 | GND |

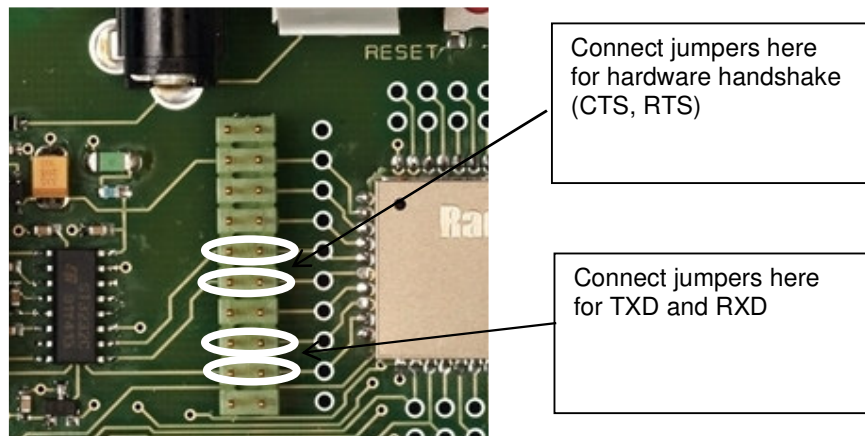


Figure 3. RS232 driver interface

Connectors

The Demonstration Board is furnished with many connectors for easy access to all module signals.

P5 (and P13) bring out supply voltage, the UART1 interface and two spare digital data I/O signals.

P6 brings out digital and analogue I/O (Port 1 and 2). A 2.54 mm pitch pin-row can be mounted at P6 if convenient.

P7 brings out digital I/O and control signal. A 2.54 mm pitch pin-row can be mounted at P7 if convenient.

P8 is the JTAG interface (pin compatible with the Atmel JTAGICE Mk 2 plug). P9 is the ISP interface.

For detailed signal description, please refer to the pinout shown in the data sheet.

Push buttons

The Demonstration Board is furnished with 7 push buttons connected to the following I/O signals:

| Demo Board marking | RC2200 module pin |
|--------------------|--|
| S1 | PE0 |
| S2 | PE1 |
| S3 | PE4. This input can also be used as an interrupt input (INT4) |
| S4 | PE5. This input can also be used as an interrupt input (INT5) |
| S5 | PE6. This input can also be used as an interrupt input (INT6) |
| S6 | PE7. This input can also be used as an interrupt input (INT7) |
| S7 | RESET. Pressing this button will activate the main RESET of the module |

LEDs

The Demonstration Board is furnished with one green power indicator LED, and 4 LEDs connected to the following I/O signals:

| Demo Board marking | LED color and RC2200 module pin |
|--------------------|---------------------------------|
| D3 | Green: PB7 |
| D4 | Orange: PB4 |
| D5 | Yellow: PE2 |
| D6 | Red: PE3 |

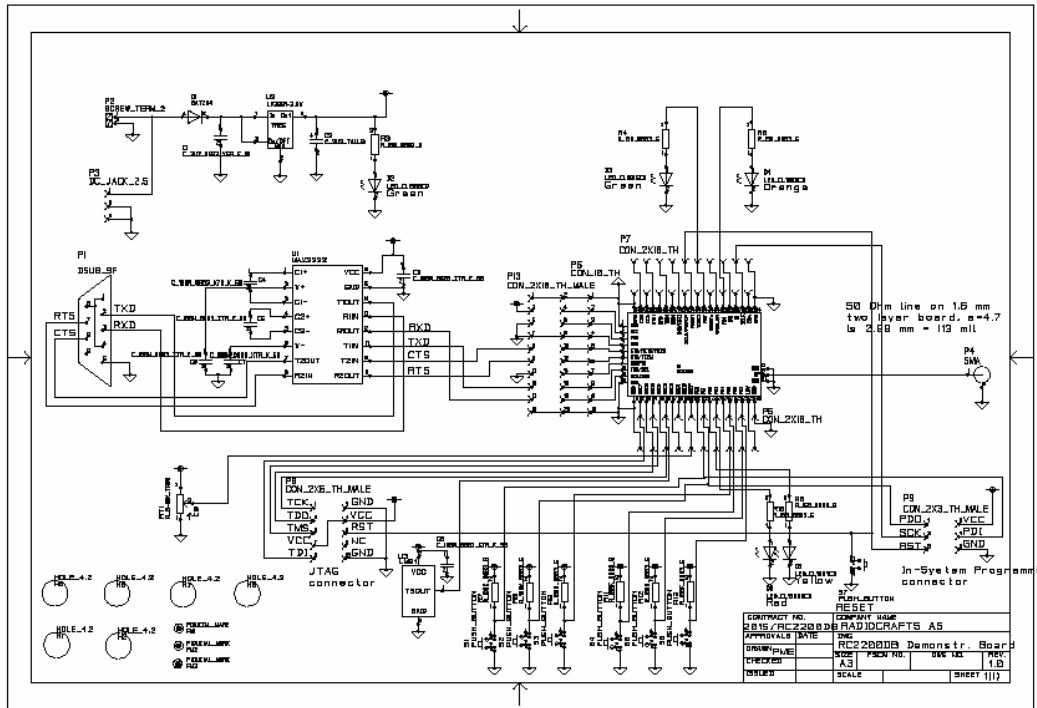
Using the Demonstration Kit

The Demonstration Kit is useful for providing hands-on experience with the RC2200 for both software and hardware developers. Follow the Quick Start Guide for the relevant firmware version for instructions to hook up the kit. The Data Sheet for the module provides detailed information on the internal resources and available I/Os of the modules.

Important: *The use of radio transceivers is regulated by international and national rules. Radiocrafts' modules meet the regulations in EU and US/Canada for different frequency variants. Make sure the local regulative are according to these rules. Your local telecommunication authorities can provide more information on use of un-licensed radio transmitter in your country.*

Circuit Diagram

The circuit diagram is shown below. A full resolution schematic is found in RC2200DB_1_0.zip (available from Radiocrafts' website).



Bill of materials

| <i>Reference</i> | <i>Quantity</i> | <i>Part number</i> | <i>Description</i> |
|------------------|-----------------|----------------------|-------------------------------|
| C1 | 1 | C_2U2_0603_X5R_K_10 | Capacitor, 0603 |
| C2 | 1 | C_3U3_TAN_B | Capacitor, tantal |
| C3-8 | 6 | C_100N_0603_X7R_K_50 | Capacitor, 0603 |
| D1 | 1 | BAT254 | Diode, Si |
| D2-3 | 2 | LED_CL150GCD | Green LED |
| D4 | 1 | LED_CL150DCD | LED, orange, SMD |
| D5 | 1 | LED_CL150YCD | LED, yellow, SMD |
| D6 | 1 | LED_CL150URCD | LED, red, SMD |
| M1 | 1 | RC2200AT | RF Module |
| P1 | 1 | DSUB_9F | D-Sub, 9 pin, female |
| P2 | 1 | SCREW_TERM_2 | 2 pin terminal, screw |
| P3 | 1 | DC_JACK_2.5 | DC jack, 2.5mm center pin |
| P4 | 1 | SMA | SMA connector, straight |
| P8 | 1 | CON_2X5_TH_MALE | Connector 10 pins, pin header |
| P9 | 1 | CON_2X3_TH_MALE | Connector 6 pins, pin header |
| P13 | 1 | CON_2X10_TH_MALE | Connector 20 pins, pin header |
| R7-9;R11-13 | 6 | R_100K_0603_G | Resistor, 0603 |
| R3-6,R10 | 5 | R_150_0603_G | Resistor, 0603 |
| RT1 | 1 | 72PTR10K | Trimming pot, 10K, knob |
| S1-7 | 7 | PUSH_BUTTON | Push button, SMD |
| U1 | 1 | MAX3232 | RS-232 Transceiver, SO-16 |
| U2 | 1 | LP2980-3.0V | 3.0V low drop-out regulator |
| U3 | 1 | LM60C | Temperature sensor, SOT23 |

PCB layout

The PCB is a simple 2-layer board where the bottom layer is used as ground plane. The laminate used is standard FR-4 board material. The PCB is 1.6mm thick. Full resolution layout and assembly drawing are found in RC2200DB_1_0.zip.

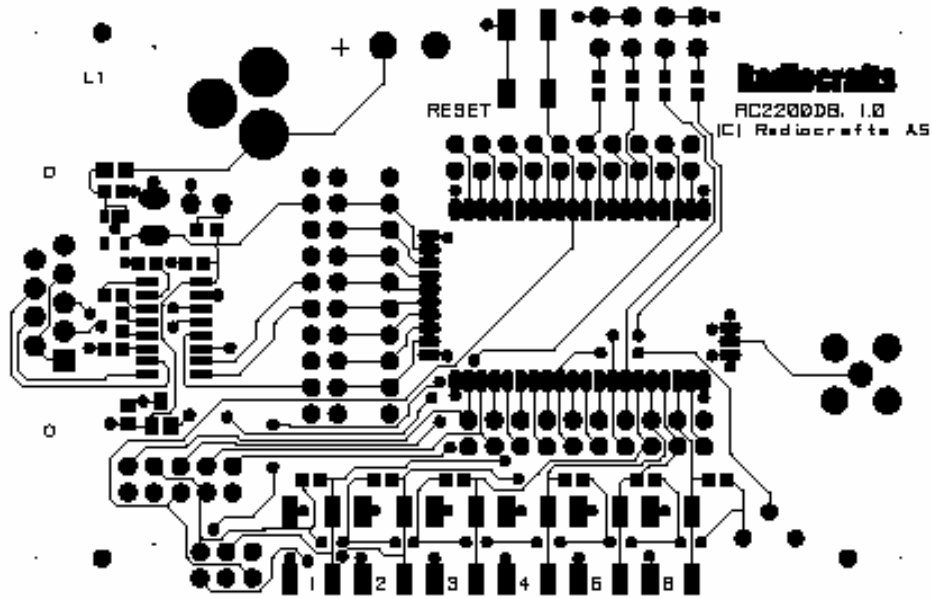


Figure 4: RC2200DB PCB layout, top layer (1)

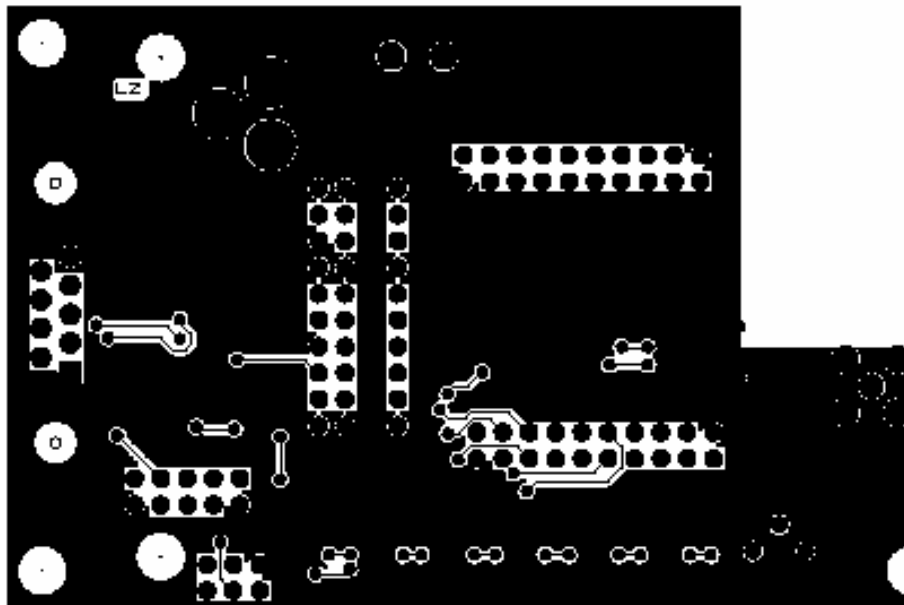


Figure 5: RC2200DB PCB layout, bottom layer (2)

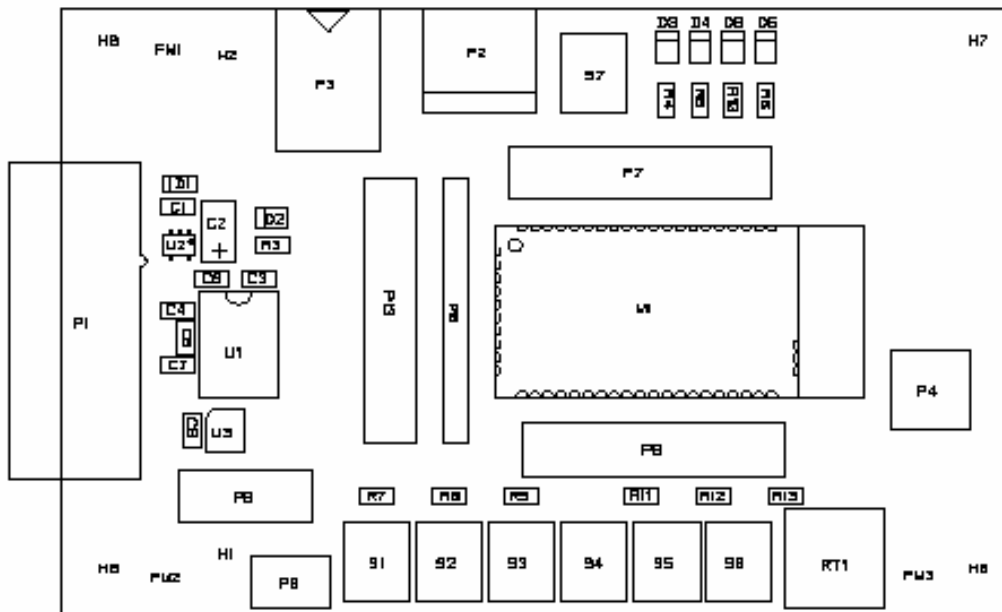


Figure 6: RC2200DB PCB component placement, top side

Troubleshooting

It doesn't work

- First, measure the supply voltage at P13, pin 3. Should be 3.0V.
- Make sure that a jumper is installed or an ampere meter is connected between pin 3 and 4 on P13.
- Is the supply voltage correctly polarized? If not, the protection diode will prevent any current from flowing. + and – are indicated on the PCB, on the DC jack, the tip is + and the ring is –.
- Is the battery eliminator plugged into the wall socket?
- Was the wall socket plugged in first, then the DC-jack to ensure quick rise-time on VCC? If not the module may have to be reset after power on. Press the RESET button.
- Is the wall outlet at the rated voltage printed on the AC/DC battery eliminator (220V or 110V)?
- Is the module programmed with the proper firmware? If not use the Atmel JTAGICE to load the firmware.

I cannot communicate with the RC2200 UART through the serial port

- Make sure that the RXD and TXD jumpers are inserted
- Make sure that you are using a correctly wired 1:1 cable (as the one provided with the kit)
- Make sure the PC (or host) is configured for the correct serial port
- Make sure the PC serial port settings are correct with respect to baud rate, data bits, stop bits, parity bits and handshake (Using the SPPIO the modules factory default configuration is 19200, 8, 1, N, no flow control)

I cannot communicate between two modules using the SPPIO

- Make sure the destination address is the same as the other modules MAC address
- Make sure that pins configured as inputs on one module is configured as output on the other module
- Make sure the MAPPING_SCHEME and PACKET_INTERVAL is set correctly

(For details see the RC2200AT-SPPIO Data Sheet)

Document Revision History

| Document Revision | Changes |
|-------------------|---------------|
| 1.0 | First release |

Disclaimer

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