PHYCHIPS

USER'S MANUAL

December 2010

PHYCHIPS

Contents

1   Overview & Block Composition Diagram

1.1 **Overview**

The PRM90U10A is a UHF RFID Reader hybrid module which integrates high performance UHF RFID reader chipset, VC-TCXO, Low Drop Regulator, Balun, Coupler, Saw filter, Power amp, Isolator and low pass filter.
UHF RFID reader chipset uses PR9000 of PHYCHIPS which integrates 900MHz radio, baseband processor, industry standard enhanced 8052 MCU, memory (64k Flash & 16k SRAM) and many other features.
This module fully compliant with ISO18000-6C/EPC Global Gen II reader protocol and provide all functions of PR9000. Also reduce size, cost and power consumption.
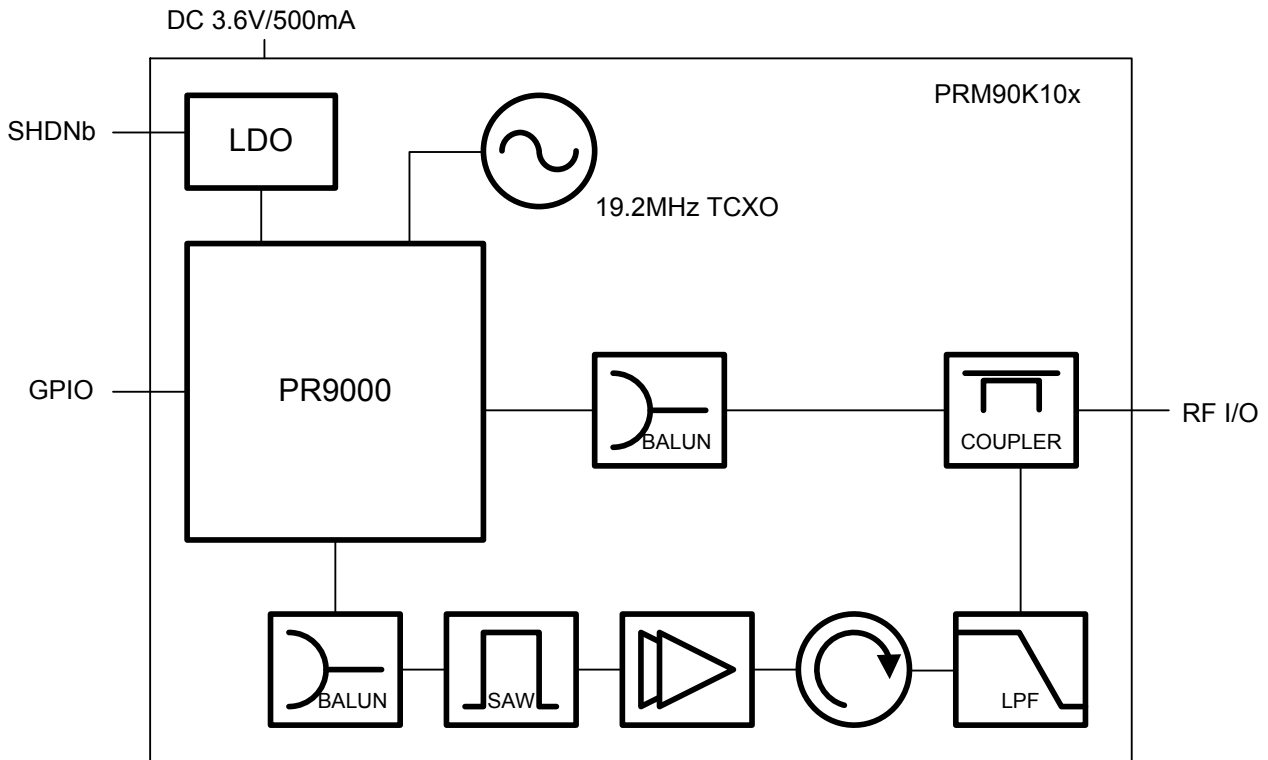
1.2 **Block Domposition Diagram**
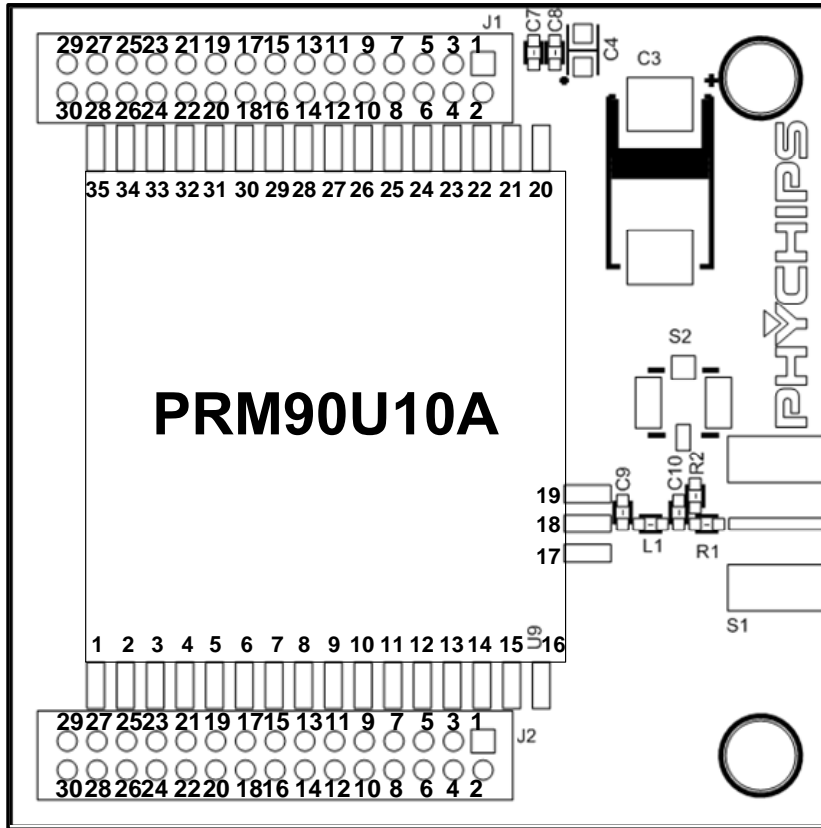

Figure 1 Block Composition Diagram

2   Pin Description

Figure 2 Pin Description

2.1 **J1 Pin Description**

No.	Pin Name	Description
1	VDD_3.6V	3.6 V DC Power for SOC(Max. 1A)
2	VDD_3.6V	3.6 V DC Power for SOC(Max. 1A)
3	VDD_3.6V	3.6 V DC Power for SOC(Max. 1A)
4	VDD_3.6V	3.6 V DC Power for SOC(Max. 1A)
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	NC	Reserved, Not Ground
10	NC	Reserved, Not Ground
11	NC	Reserved, Not Ground
12	NC	Reserved, Not Ground
13	GND	Ground
14	GND	Ground
15	NC	Reserved, Not Ground
16	NC	Reserved, Not Ground
17	GND	Ground
18	GND	Ground

19	P2.2	Quasi-bidirectional I/O port
20	NC	Reserved, Not Ground
21	MDS_SCL	I/O for ISP. The pull-up resistor is always switched on. This port is quasi-bidirectional
22	MDS_SDA	I/O for ISP. The pull-up resistor is always switched on. This port is quasi-bidirectional
23	GND	Ground
24	RESETb	External Reset for SOC
25	P0.1	Quasi-bidirectional I/O port or Serial Port 0 Output
26	P0.0	Quasi-bidirectional I/O port or Serial Port 0 Input
27	NC	Reserved, Not Ground
28	P0.2	Quasi-bidirectional I/O port or External Interrupt Input 0
29	P0.5	Quasi-bidirectional I/O port or Timer 1 External Input or SPI Master Output Slave Input
30	P0.4	Quasi-bidirectional I/O port or Timer 0 External Input or SPI Master Input Slave Output

2.2 J2 Pin Description

No.	Pin Name	Description
1	NC	Reserved, Not Ground
2	NC	Reserved, Not Ground
3	GND	Ground
4	GND	Ground
5	NC	Reserved, Not Ground
6	NC	Reserved, Not Ground
7	GND	Ground
8	GND	Ground
9	TXD1	Quasi-bidirectional I/O port or Serial Port 1 Output
10	RXD1	Quasi-bidirectional I/O port or Serial Port 1 Input
11	GND	Ground
12	GND	Ground
13	P1.7	Quasi-bidirectional I/O port or External Interrupt 5 (Negative Edge)
14	P1.6	Quasi-bidirectional I/O port or External Interrupt 4 (Positive Edge)
15	P1.5	Quasi-bidirectional I/O port or External Interrupt 3 (Negative Edge)
16	P1.4	Quasi-bidirectional I/O port or External Interrupt 2 (Positive Edge)
17	P1.3	Quasi-bidirectional I/O port or I2C SCL
18	P1.2	Quasi-bidirectional I/O port or I2C SDA
19	P1.1	Quasi-bidirectional I/O port or Timer/ Counter 2 Capture/Reload Trigger
20	P1.0	Quasi-bidirectional I/O port or External Input for Timer/Counter 2
21	P0.7	Quasi-bidirectional I/O port or SPI Slave Select Bar
22	P0.6	Quasi-bidirectional I/O port or SPI SCK
23	NC	Reserved, Not Ground
24	NC	Reserved, Not Ground
25	NC	Reserved, Not Ground
26	NC	Reserved, Not Ground
27	GND	Ground
28	GND	Ground
29	SHDNb	Module Enable/Disable Enable : Open Disable : Ground

30	SHDNb	Module Enable/Disable Enable : Open Disable : Ground

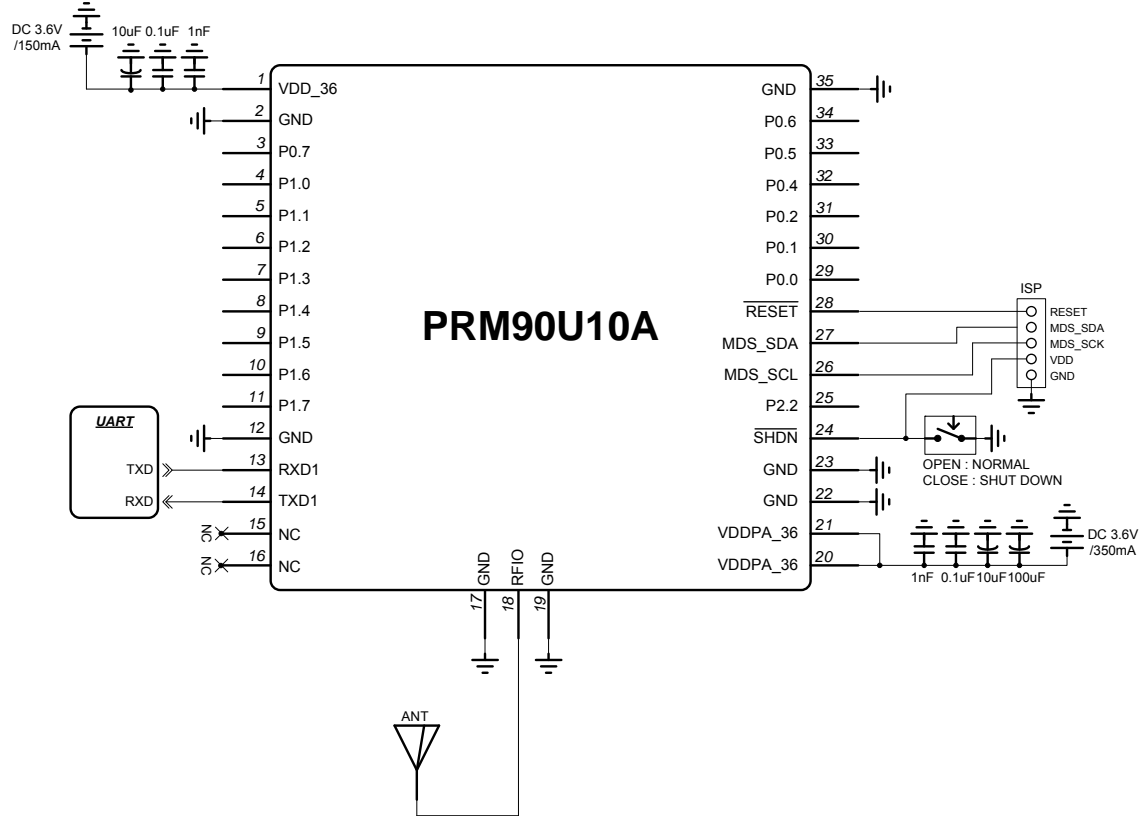## 2.3 **S1 Pin Description(RF I/O)**

3 **Operation method**

Figure 3 Application Circuit

3.1 **Power Supply**

PRM90U10A should be supplied by 2 kinds of 3.6 volts DC power; VDD_36(Pin 1) and VDDPA_36(Pin 20, 21). VDD_36 is for operating of PR9000 RFID reader chipset which current consumption is about 150mA. VDDPA_36 is for operating of power amp which current consumption is 350mA typically.

Additionally, decoupling capacitors should be placed as close as possible these pins. The decoupling capacitors should be placed in the same layer as the module, to avoid any additional parasitic inductance caused by vias.

3.2 **Hardware Mode Control**

PRM90U10A provides normal mode and shut down mode. The mode can control by SHDNb(Pin 24).
Normal mode should be controlled by SHDN pin to open which can activate the module. Otherwise, If SHDNb pin contact to ground, supplied power of the module is shut down internally. In shut down mode, all GPIO ports and UART ports should not input any signal and positive voltage.

3.3 **UART**

The serial interface assigned to two pins. RXD1(Pin 13) is for receiving command from host and TXD1(Pin 14) is for transmitting response to host. Pin connection is shown as below figure.
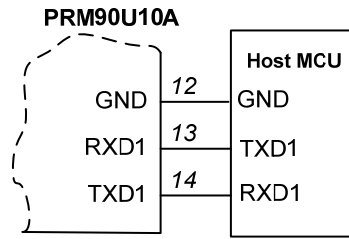
Figure 4 Connecting to host MCU

RS232C transceiver is required for interfacing to PC and diagram connection is shown as below figure.
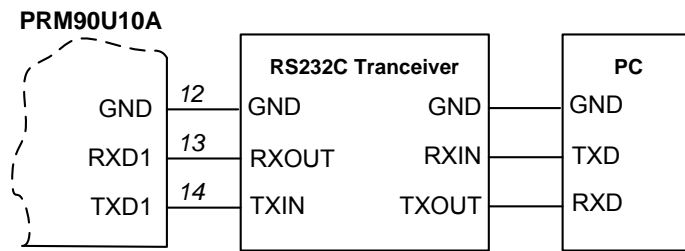

Figure 5 Connecting to RS232 transceiver

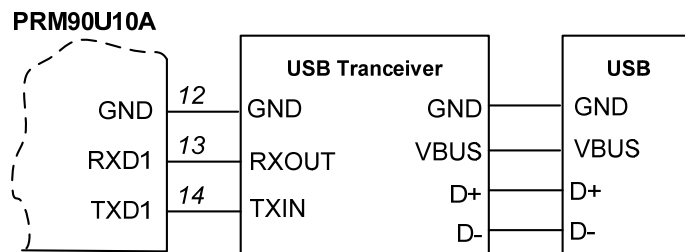Following configuration is used for interfacing to USB transceiver.

Figure 6 Connecting to USB transceiver

3.4 ISP

For firmware downloading in PRM90U10A should be used GenICE3000 by CORERIVER(manufacturer), which downloading speed is faster than UART. Code memory(62kB) and EEPROM(2kB) can be programmed using EJTAG in target.

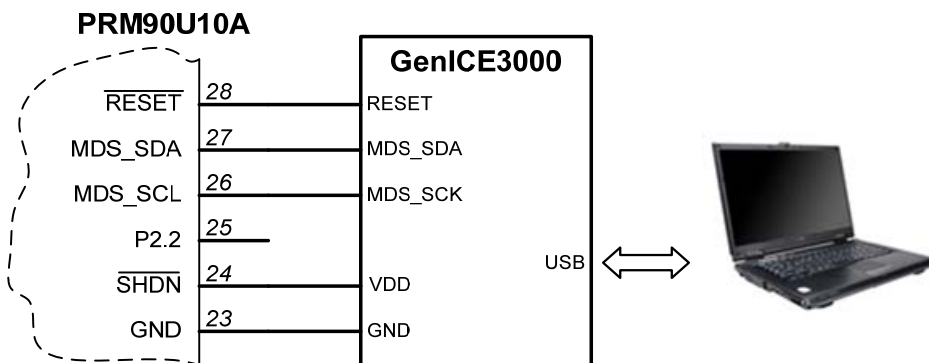Following configuration is used for downloading to GenICE3000.

Figure 7 Connecting to GenICE3000 for firmware downloading

3.5 GPIO

PRM90U10A provides 16 bi-directional I/O ports. All ports can be configured in two different modes: open-drain (by default) and push-pull which has 3.3V input and 3.3V output.

3.6 RF In/Out

RF I/O(Pin 20) is optimized at 50 ohms impedance.

3.7 Using GUI

The GUI is for the user to be able to quickly get started working with PRM90U10A RFID reader. To run the GUI, click the Windows start button, Program menu, Phychips, PR9000 SDK. After start-up, a window will be opened as shown below.
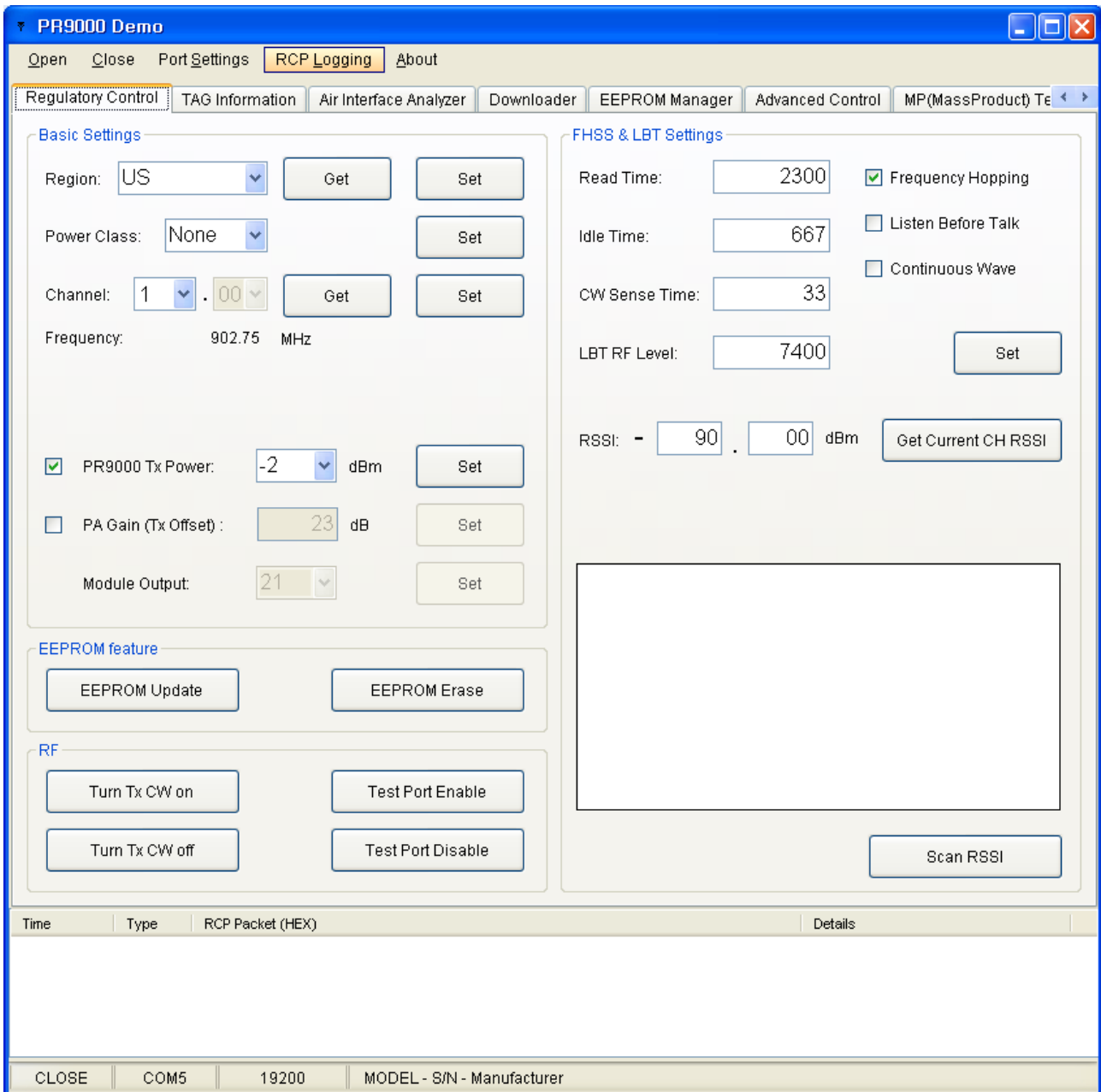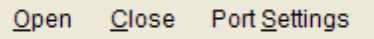

Figure 8 Demo GUI

3.7.1   Serial Port Control

Serial port is controlled by below menu.

To open serial port, click Open menu.

To close serial port, click Close menu.

3.7.1.1 Serial Port Configurations
Port number is selectable from COM1 upto COM9. (Depending on your Windows system settings) Baud Rate should be set 19200 bps.
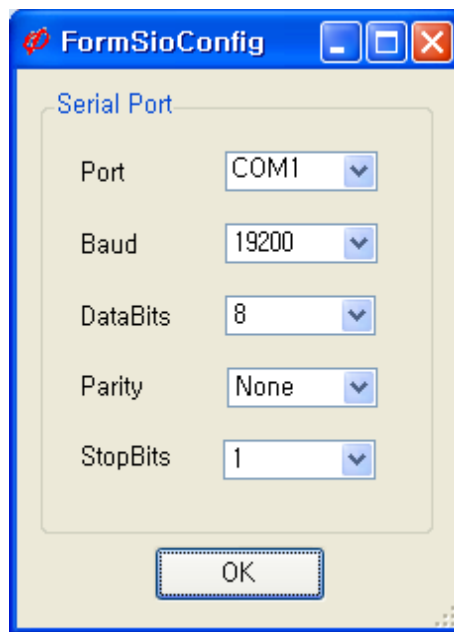

Figure 9 Serial Port Settings

3.7.1.2 Reader Connection Status
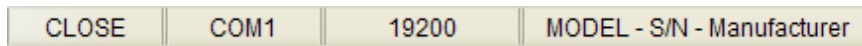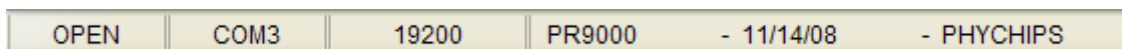Below status bar shows the reader connection status.

Figure 10 Reader Connection Statuses

If PC is successively connected to reader after clicking open button, status bar would be updated as shown below.

3.7.2 Hardware Control

To control hardware, click 'H/W Control Tab.'

3.7.2.1 Band setting
To select operating band, band setting should be required. Select band in combo box and click Set button to set operating band in group box 'Basic settings.'
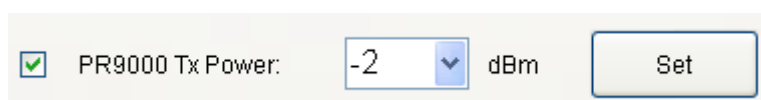
3.7.2.2 Power Class setting
Some countries classified channel numbers according to the power class. Select the power class and click Set button.
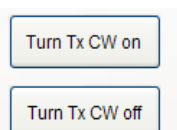.

3.7.2.3 Output Power setting
To set PR9000 output power, select the PR9000 Tx Power combo box and click Set button.

3.7.2.4 CW (Continuous Wave) setting
These buttons are used for hardware debugging purpose only. To turn CW on, click Turn Tx CW on button. To turn CW off, click Turn Tx CW off button.

3.7.3 Procedures for Tags Inventory Operation

To read UHF RFID tags with PR9000 SDK software, follow sequence as described below.

- Configure your serial port settings.
- Open serial port. Then, PR9000 SDK software will try connecting to PR9000.
- Select operation band and click 'Set' button.
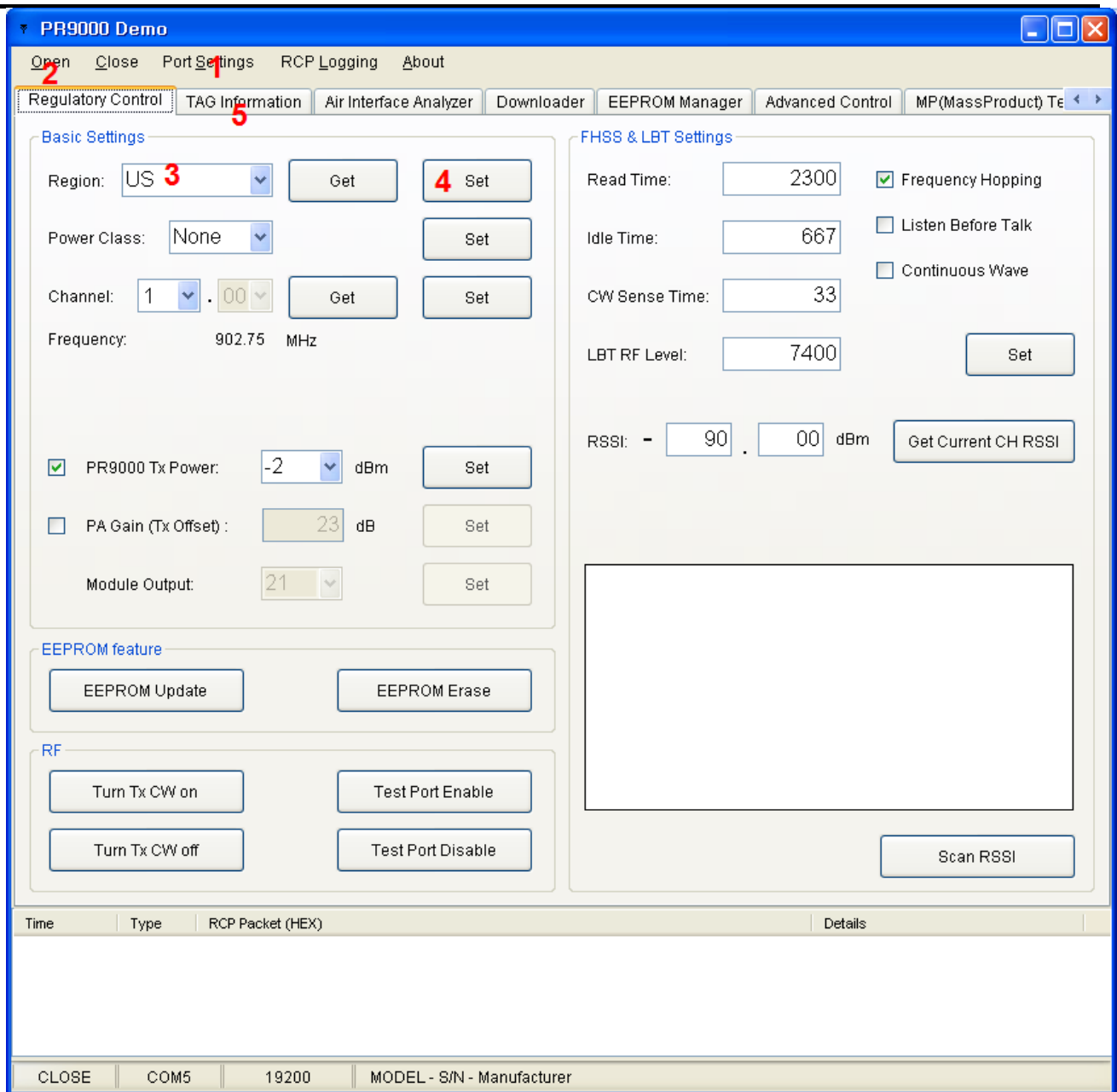- Click 'Tag Information' tab.

Figure 11 Procedures for tag inventory operation

- Click 'Read multiple' button to start reading RFID tags.
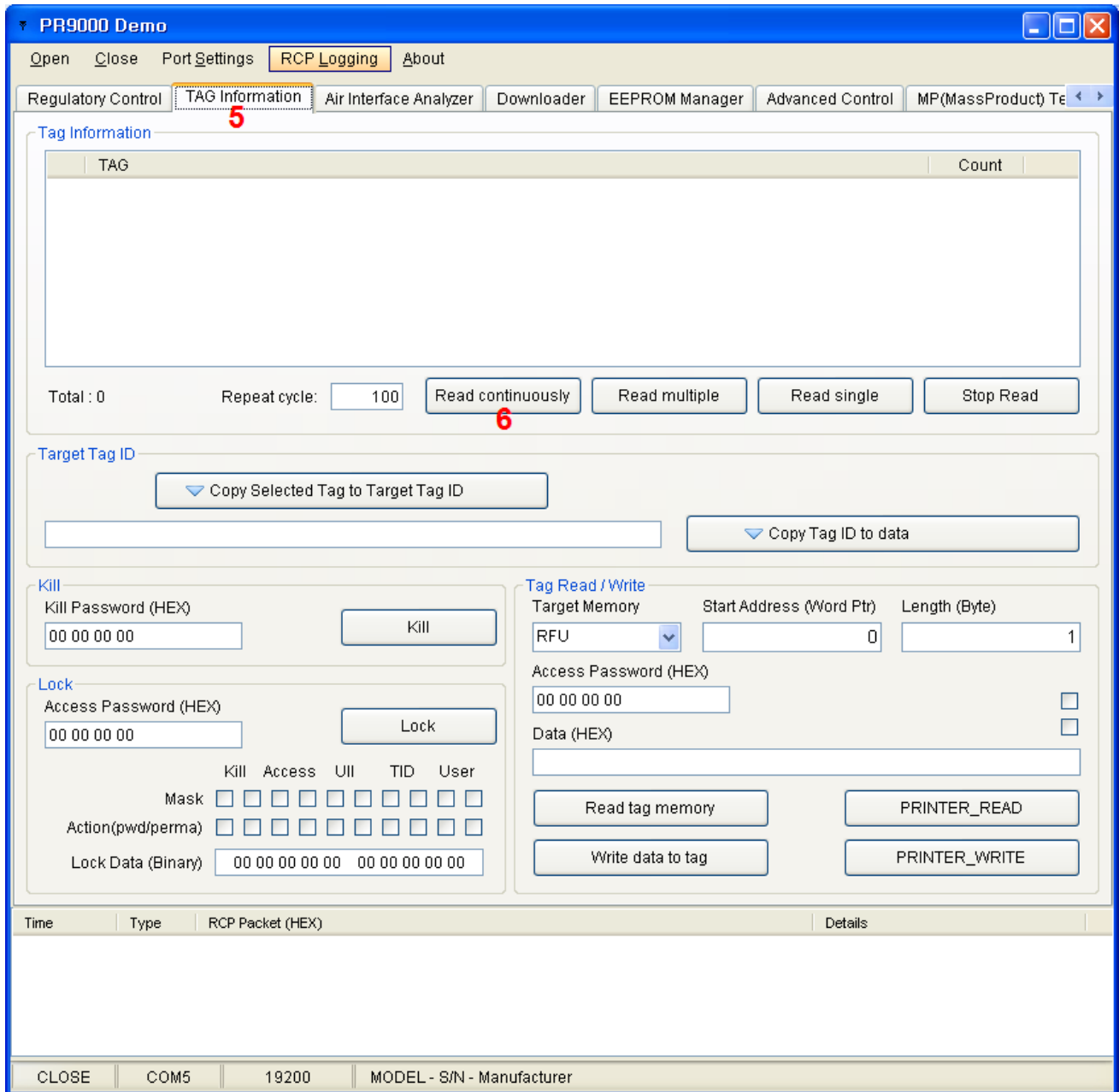
Figure 12 Procedures for tag inventory operation

4 Specification

No.	Item		Unit	Test Condition	Specification			Remark
					min	Typ.	max	
1	Freq. Range		MHz		902.75		927.25	
2	Tx Power		dBm	PR9000 = 4dBm		25.5		
3	Tx ACPR	+/-200kHz	dBc	PR9000 = 4dBm			-20	
		+/-400kHz	dBc	PR9000 = 4dBm			-50	
		+/-600kHz	dBc	PR9000 = 4dBm			-60	

		+/-800kHz	dBc	PR9000 = 4dBm			-65	
4	GPIO	GPIO = HIGH	-	GPIO = ALL HIGH		HIGH		
		GPIO = LOW	-	GPIO = ALL LOW		LOW		
5	Impedance		Ω			50		RF I/O
6	DC Power		V			3.6		
7	OperatingTemperature		°C		0		50	
8	Operating Humidity		%		0		60	
9	Consumption Current	SHDN	mA			2		
		IDLE				16		
		ACTIVE		PR9000 = 4dBm		500	550	
10	Modulation		-		DSB - ASK			
11	Size		mm		35x45x8			
12	Weight		g		11			

Cautions

Modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Information to User

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

• Reorient or relocate the receiving antenna.
• Increase the separation between the equipment and receiver.
• Connect the equipment into an outlet on a circuit different from that to which the receiver is con-nected.
• Consult the dealer or an experienced radio/TV technician for help.

FCC Compliance Information : This device complies with Part 15 of the FCC Rules. Operation
is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

FCC WARNING:

This equipment may generate or use radio frequency energy. Changes or modifications to this equipment may cause harmful interference unless the modifications are expressly approved in the instruction manual. The user could lose the authority to operate this equipment if an unauthorized change or modification is made.

FCC RF EXPOSURE:

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user.