

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Radio Modem AT Command

The RCQ5-XXX module is a module with multiple features:

- Radio Modem with AT Command

(Transparent Transmission Protocol)

The RF modem is very simple to use and provides a wireless RS232 link with a RF data rate of up to 200kbps (2-GFSK modulation). The module can work also in Long Range Mode (LRM) with a RF data rate equal to 2.5kbps.

The transceivers has the functions of a complete radio modem and simply require CMOS/TTL data at the transmit input and the corresponding transceiver(s) output the same data. Preamble and CRC are automatically generated and added to the RF transmission.

- Over The Air Command (OTA Command)

The module has the ability to manage No. 4 digital outputs and No. 4 digital inputs both locally and remotely (OTA Command) by sending simple AT commands.

- Remote I/O Functionality

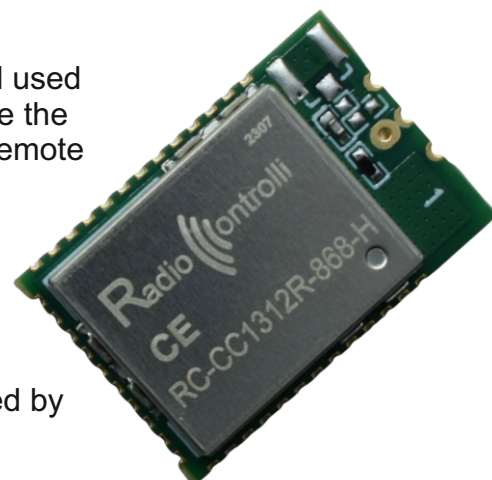
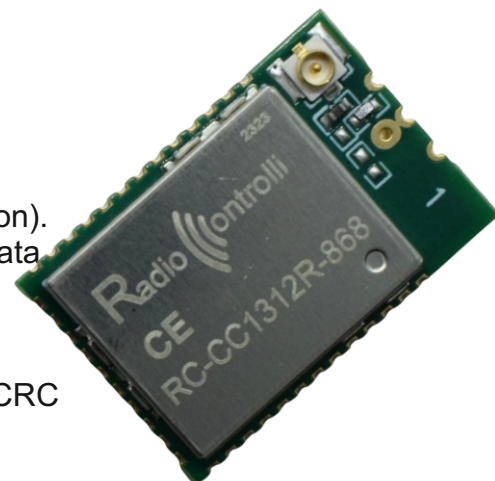
Remote I/O functionality, this is a type of transmission bidirectional used in the field of automatic controls. When you enable this, every time the digital input changes state on station A, also the digital output of remote station B it will reflect these states simultaneously and vice versa.

Working into European bandwidth : 433/868MHz
Available also the version at 915MHz.

The hardware is based on the module RC-CC1312R-XXX designed by RadioControlli (CC1312R based from Texas Instruments).

For more information and details, please refer to :

- RC-CC1312R-434 datasheet (www.radiocontrolli.com)
- RC-CC1312R-868 datasheet (www.radiocontrolli.com)
- RC-CC1312R-915 datasheet (www.radiocontrolli.com)
- CC1312R datasheet (www.ti.com)



Applications:

- Smart meters
- Wireless security systems
- Home and Building automation
- 6LoWPAN systems
- Automatic Measure Reading
- Low-Power Wireless Systems
- Wireless Sensor Networks
- Remote Control
- Street Lights System
- Parking Sensors
- Environmental Sensors
- Smart Grid and Automatic Meter Reading

RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

MODULE INFORMATION

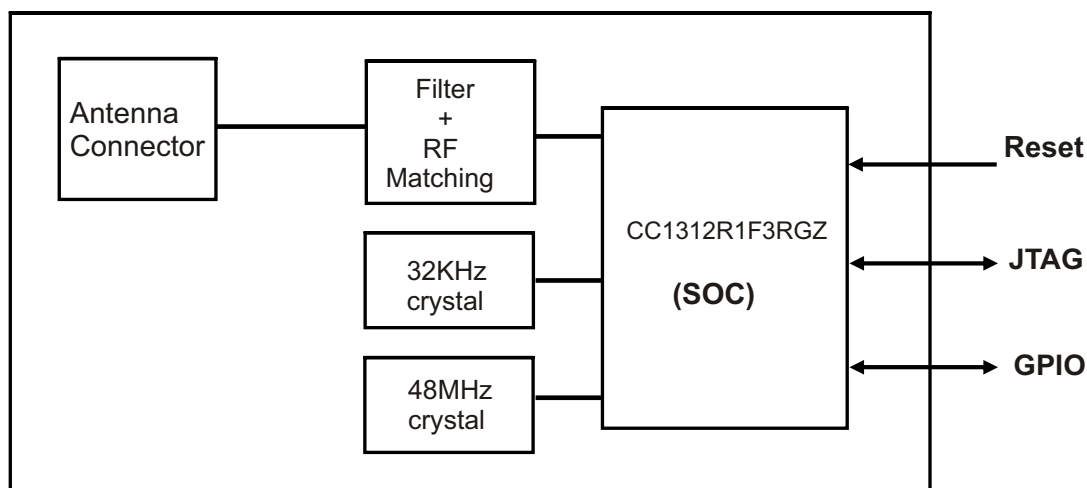
RC-RCQ5-433	—————>	433MHz standard Version (UFL Connector)
RC-RCQ5-433-H	—————>	433MHz pad version
RC-RCQ5-868	—————>	868MHz standard Version (UFL Connector)
RC-RCQ5-868-H	—————>	868MHz pad version
RC-RCQ5-915	—————>	915MHz standard Version (UFL Connector)

TECHNICAL CHARACTERISTICS

RC-RCQ5-XXX					
Parameter	Symbol	Min.	Typ.	Max.	Units
Operating Voltage	V_{CC}	1.8	3.00	3.8	VDC
Supply Current RX Mode	I_{CRX}		5.80		mA
Supply Current TX Mode +10dBm	I_{CTX1}		13.40		mA
Supply Current TX Mode +14dBm	I_{CTX2}		24.90		mA
Supply Current Standby Mode	I_{CSTB}		2.0		μ A
Supply Current Sleep Mode	I_{CSHU}		2.0		μ A
Operative Frequency	F_{of}		433/868/915		MHz
Frequency Error	F_{pp}		± 10		ppm
RF Power Output 50ohm (*)	P_{oo}	-10.0		+14.0	dBm
RF Sensitivity 50kbps	S_d		-110.0		dBm
RF Sensitivity Long Range Mode 2.5kbps	S_{LR}		-118.0		dBm
Data Rate (*)	D_{CC}	0,01		4.0	Mbit/s
Operative Temperature	T_{LR}	-20		+75	$^{\circ}$ C

(*) Programmable parameter.

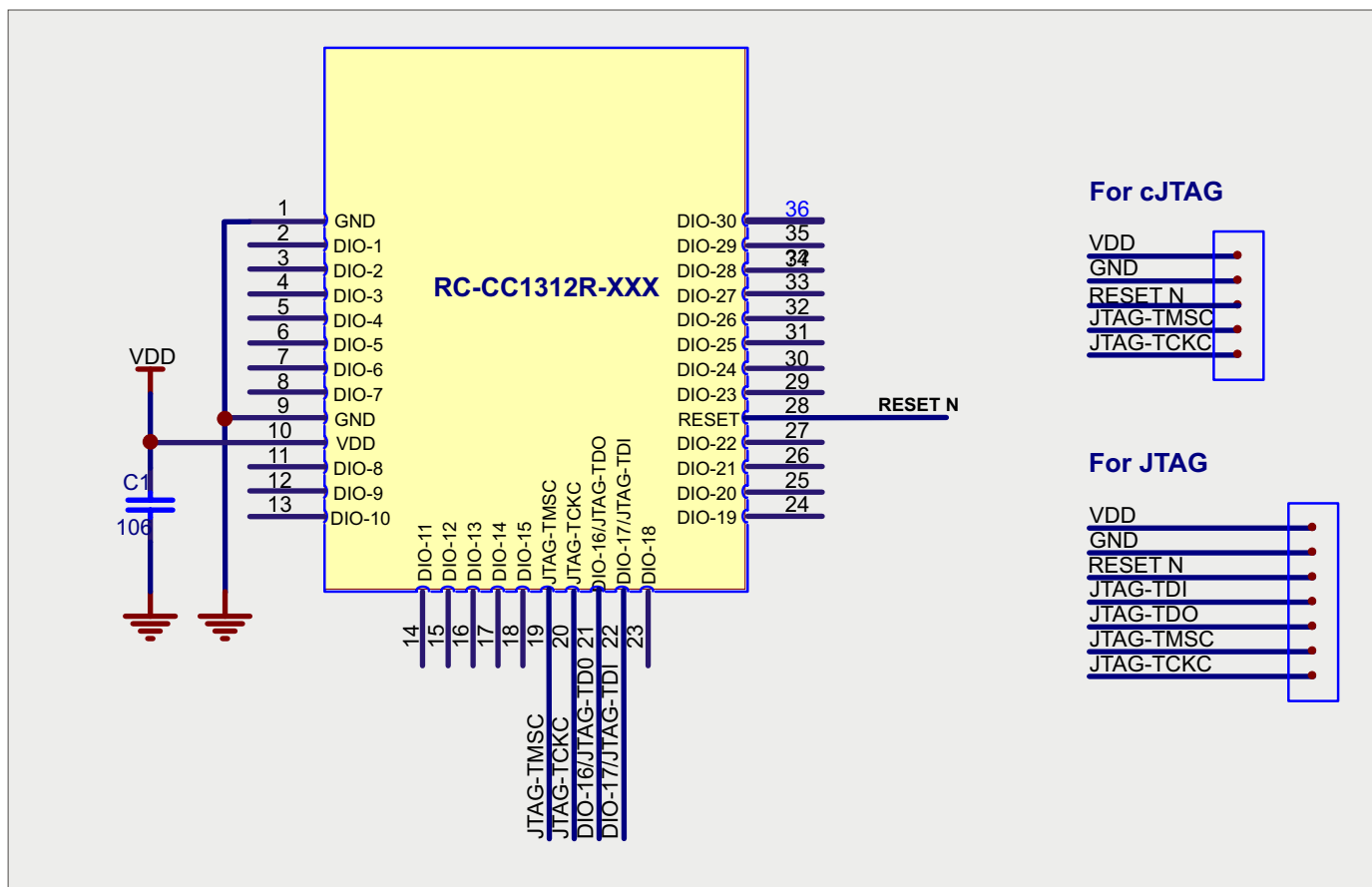
BLOCK DIAGRAM



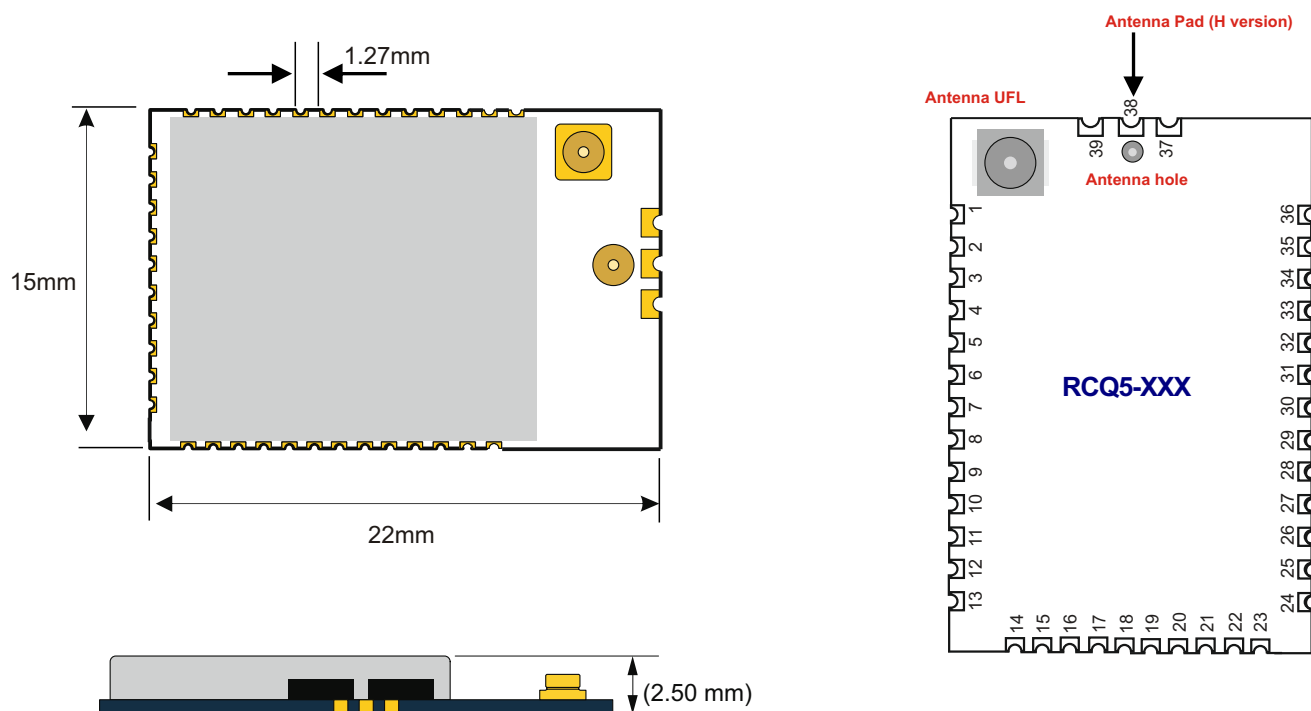
RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

REFERENCE SCHEMATICS



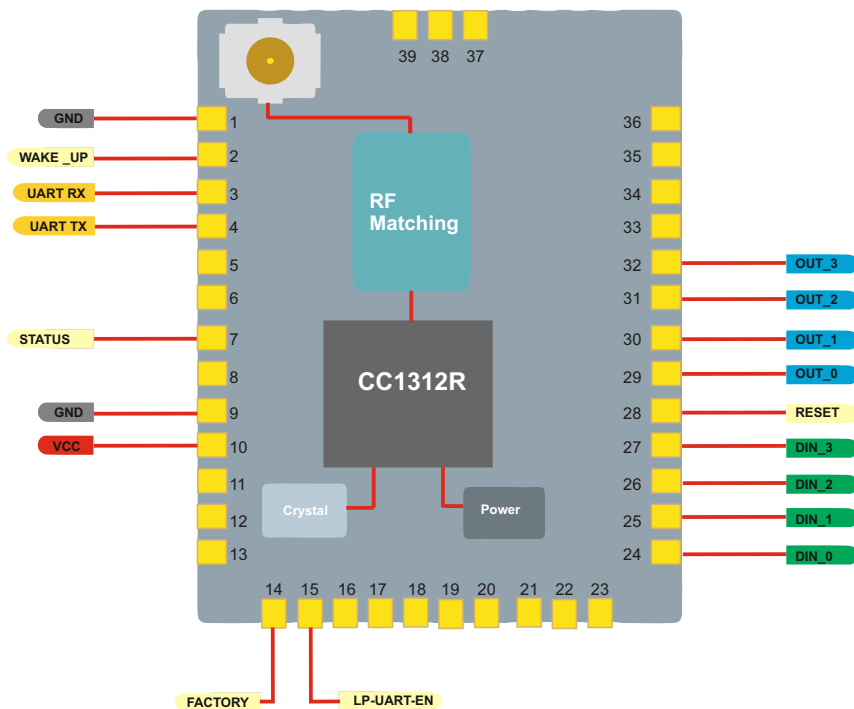
MECHANICAL DIMENSION



RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

PINOUT

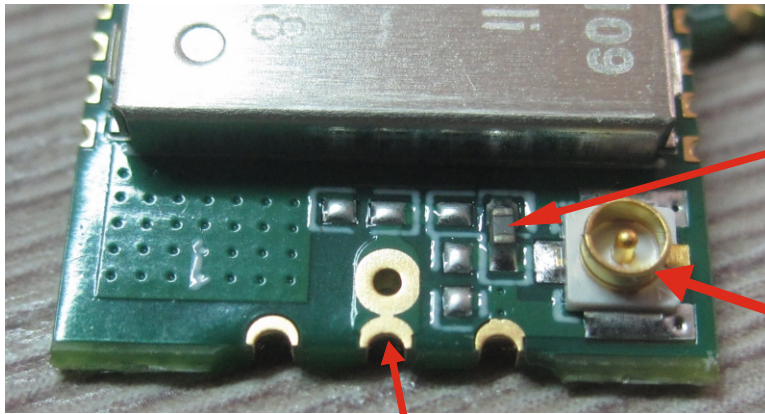


Pin Descriptions			
Pin Number	Name	Pin Type	Description
1,9,37,39	GND	Ground pin	Connect to GND
2	Wake-Up	INPUT	Wake Up from Sleep mode (Low Active)
3	RX	INPUT	UART RX
4	TX	OUTPUT	UART TX
7	STATUS	OUTPUT	- When the system operates normally is HIGH - When the system is in Sleep mode is LOW - When will use Factory Reset this will flash
10	VDD	POWER	1.8Volt + 3.8Volt main chip supply
14	FACTORY	INPUT	- Factory Reset Low Active After pull down this pin, and then powering ON again the pin 7 (STATUS) will flash 5 times and then stay on, means that the factory reset has been restored.
15	LP-UART	INPUT	LP-UART enable low active
24	DIN-0	INPUT	Digital Input DIN-0
25	DIN-1	INPUT	Digital Input DIN-1
26	DIN-2	INPUT	Digital Input DIN-2
27	DIN-3	INPUT	Digital Input DIN-3
28	RESET	INPUT	RESET (Active Low internal pullup)
29	OUT-0	OUTPUT	Digital Output OUT-0
30	OUT-1	OUTPUT	Digital Output OUT-1
31	OUT-2	OUTPUT	Digital Output OUT-2
32	OUT-3	OUTPUT	Digital Output OUT-3

RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

TYPE OF ANTENNA CONNECTION

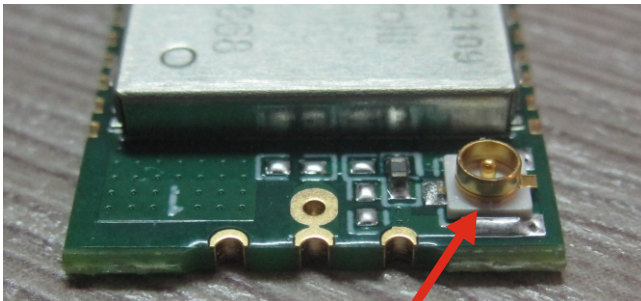


Chip selector

UFL connector

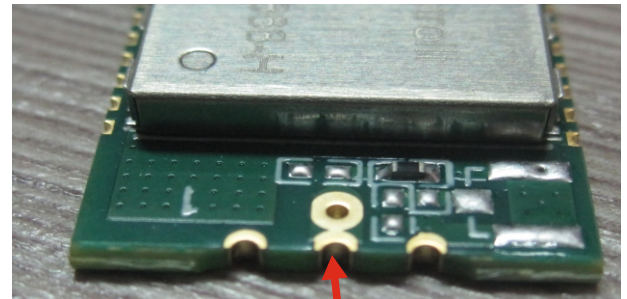
Antenna pad connector

Difference between standard version and «H» version



RCQ5-XXX

- With UFL Connector
- Antenna connection to the UFL connector



RCQ5-XXX-H

- Without UFL Connector
- Antenna connection to hole and pad

RECOMMENDED HARDWARE DESIGN

1) Hardware

All unused pins should be left floating; do not ground.
All GND pins must be well grounded.
Traces should not be routed underneath the module.

2) Power Supply

The transceiver module must be powered from a regulated voltage.
It is recommended to keep the power supply line for VCC as short and low impedance as possible. Near the power pins it is recommended to insert a ceramic the decoupling capacitor (100nF).

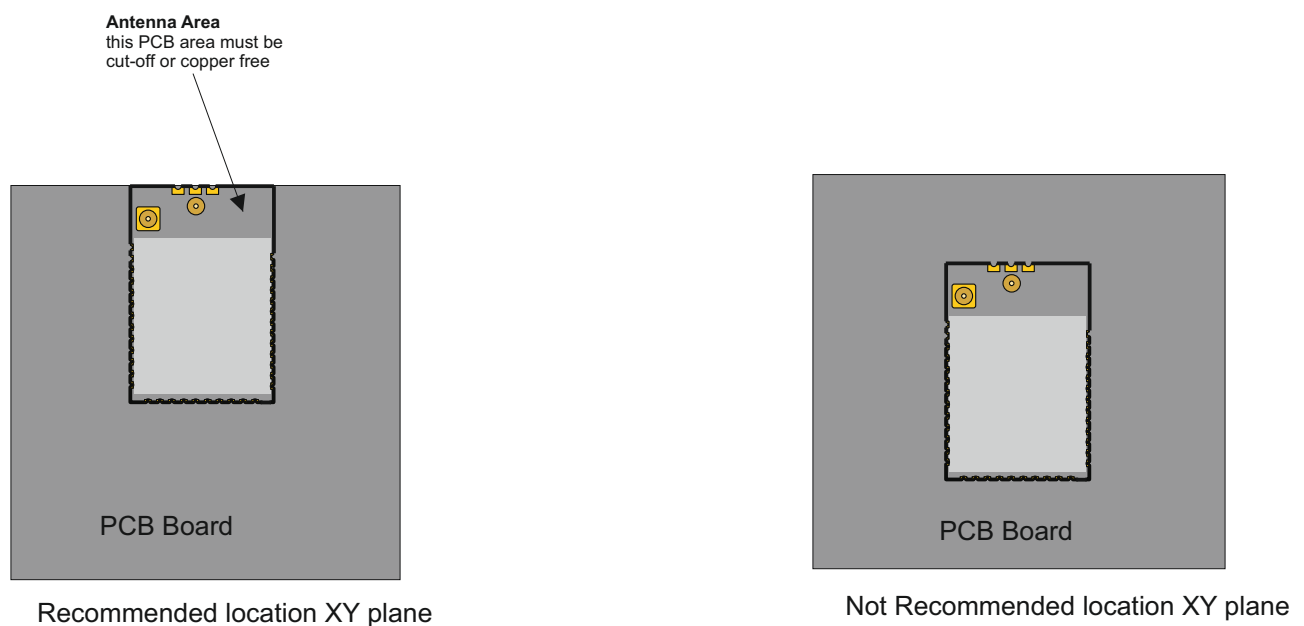
3) Ground Plane

It is recommended to have a copper ground plane under the shielded zone of the module. The ground plane should be unbroken.



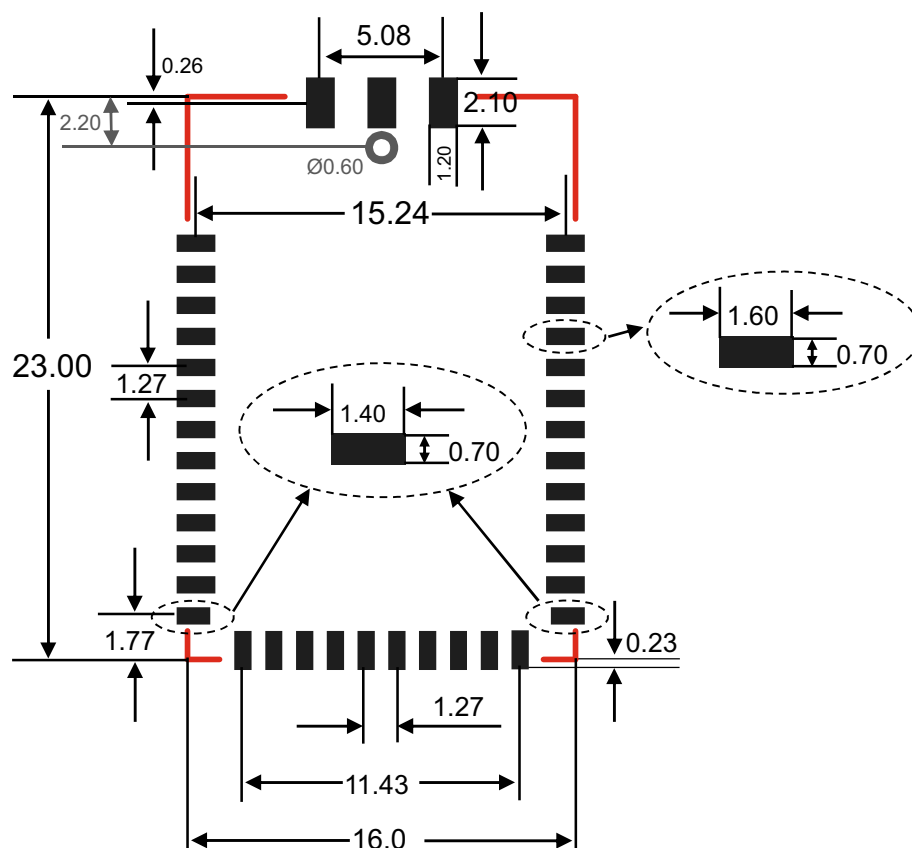
4) Module Placement

The antenna on the PCB has an omnidirectional radiation pattern. To maximize antenna efficiency, an adequate grounding plane must be provided under the module. Instead the areas underneath and surrounding the antenna area must be free of copper.

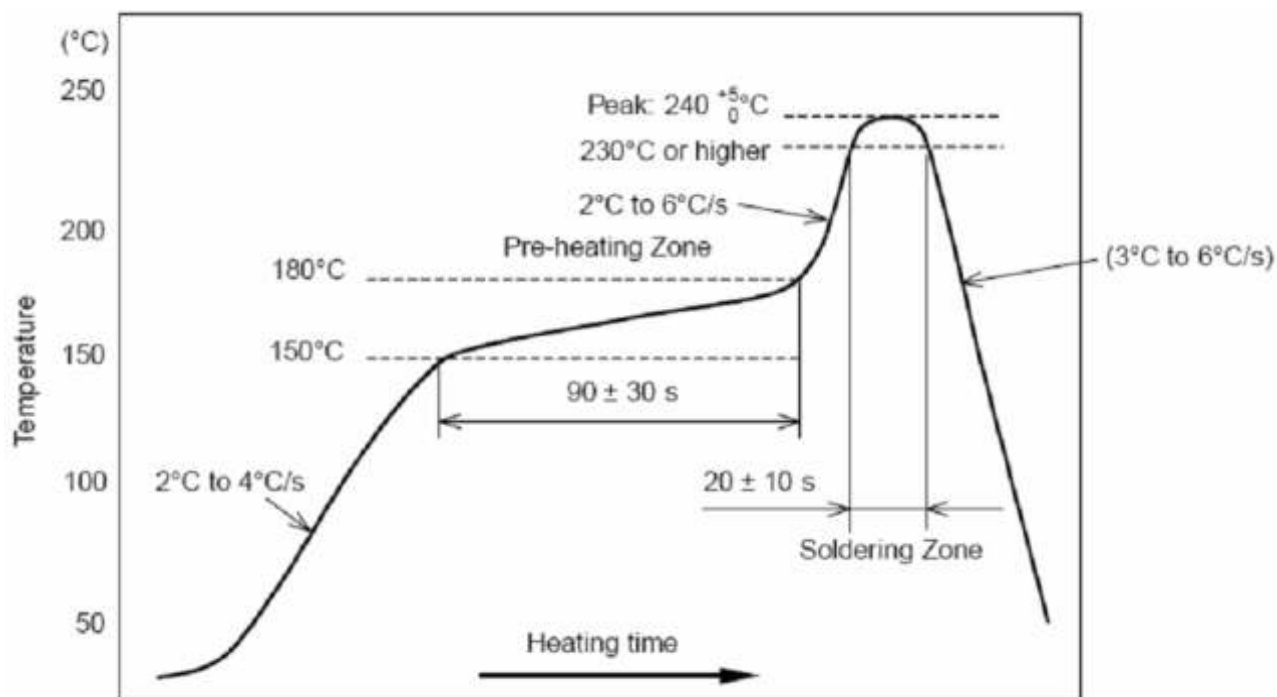


- Radio Modem
- Over The Air Command
- Remote I/O Functionality

RECOMMENDED PCB LAYOUT



Recommended Reflow Profile for Lead Free Solder



AT Command instruction

AT command is based on ASCII code.

Request message: AT+<CMD>[OP][parameter-1,parameter-2,...,parameter-n]<CR><LF>

The default UART baudrate is 115200bps.

token	Description
AT+	prefix
CMD	command name
OP code	operational character, use OP code : [OP1]"=" : setting [OP2]"?" : inquiry current command instruction [OP3]"'" : execution [OP4]"=?" : inquiry current command content
Parameter-1, parameter-n	Parameters setting
<CR><LF>	

Response format : <CR><LF>[+CMD:] [parameter-1,parameter-n]<CR><LF>

Or <CR><LF><STATUS><CR><LF>

token	Description
+CMD:	command
Parameter-1 ... parameter-n	Back to current character
STATUS	execution status "OK" : exe success "ERROR": exe failure

EVENT Actively report events

When a specific state occurs, the module will send an Event by itself.

Event events are show in the table below.

ID	EventType	Description
01	+EVT:TXDone	TXDone
02	+EVT:RXDone	RXDone
03	+EVT:FACTORY_RESET	Factory reset
04	+EVT:RSSI=xxxdBm	Report RSSI value

AT Command List

No.	Command name	Op code	description
01	AT+VER	=?	Get FW version number.
02	AT+DEVID	=?	Get device ID
03	AT+LpNode	=? =[val]	Set\Get whether the module is an LP node.
04	AT+RX	""	Let the RF enter the receiving state.
05	AT+Standby	""	Let the RF enter the Standby state.
06	AT+Freq	=? =[val]	Set\Get the RF operating Frequency
07	AT+TXPW	=? =[val]	Set\Get the RF operating TX power
08	AT+SYNC	=? =[val]	Set\Get the RF operating SYNC Word
09	AT+Group	=? =[val]	Set\Get the RF operating Group ID
10	AT+DR	=? =[val]	Set\Get the RF operating DataRate
11	AT+Baud	=? =[val]	Set\Get the UART baudrate
12	AT+AutoRx	=? =[val]	Enable/Disable AutoRx mode.
13	AT+ACKRSSI	=? =[val]	Enable/Disable auto report RSSI mechanism.
14	AT+Sleep	""	Enter sleep mode.
15	ATZ	""	Reset the module
16	AT+FACTORY_RESET	""	Factory reset
17	AT+LpUart	=? =[val]	Enable/Disable Low Power UART mechanism.
18	AT+UDT_EVT	=? =[val]	Enable/Disable EVT report mechanism.

AT Command List

No.	Command name	Op code	description
19	AT+OUTX	=? =[val]	Set \ Get the local Digital Output OUT-0 ÷ OUT-3
20	AT+DINX	=?	Get the local value of the Digital Input (DINO ÷ DIN3)
21	AT+OTA_OUTX	=? =[val]	Set \ Get the Remote Digital Output OUT-0 ÷ OUT-3
22	AT+OTA_RDINX	=?	Get the Remote value of the Digital Input (DINO ÷ DIN3)
23	AT+RDINX	=? =[val]	ALARM FUNCTION If this parameters is setted at 1, when the INPUT go to low level will be trasmitted an ALARM (throught UART) to Remote device
24	AT+REMOTEIO	=? =[val]	REMOTE I/O FUNCTION Remote I/O functionality actived.

Parameter Default value

Parameter	Default value
LpNode	0
SYNC	Aabbccdd
Group	170
AutoRx	1
ACKRSSI	0
LPUart	0
UDT_EVT	1
WOR_Duration	1
DR (DataRate)	0
UART BaudRate	0
TX Power	0

Data Rate List

	Deviation	Bandwidth	Symbol rate
0	25KHz	98KHz	50Kbaud
1	50KHz	195.9KHz	100Kbaud
2	100KHz	273.1KHz	200Kbaud
3	5KHz	34.1KHz	2.5Kbaud

TX Power table

0	14dBm	8	6dBm
1	12.5dBm	9	5dBm
2	12dBm	10	4dBm
3	11dBm	11	3dBm
4	10dBm	12	2dBm
5	9dBm	13	1dBm
6	8dBm	14	0dBm
7	7dBm	15	-3dBm

UART BaudRate

0	115200
1	57600
2	38400
3	19200
4	9600
5	4800
6	2400

AT Command (**Basic Command**)

Description	Read Firmware version
Syntax	+VER=?<CR><LF>
Format	AT+VER=? <CR><LF>
Response	<CR><LF>+VER:[parameter-1]<CR><LF>
ResultCode	<CR><LF>OK<CR><LF>

```
1[12:19]>>>AT+VER=?
[12:19]<<<
+VER:v1.2.2_1
OK
```

Description	Read Device ID
Syntax	+DEVID=?<CR><LF>
Format	AT+VER=? <CR><LF>
Response	<CR><LF>+DEVID:[parameter-1]<CR><LF>
ResultCode	<CR><LF>OK<CR><LF>

```
[12:22]>>>AT+DEVID=?
[12:22]<<<
+DEVID:035f272a004b1200
OK
```

Description	Sleeping Mode
Syntax	+Sleep=[parameter-1] <CR><LF>
Format Command	AT+Sleep<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

```
[[12:35]>>>AT+Sleep
[12:35]<<<
OK
```

AT+Sleep means that both BB (BaseBand) and RF enter the lowest power consumption state. After this command the module will no longer respond to any AT command, it will be necessary to use the wake-up pin to return to the previous conditions.

AT Command (Basic Command)

Description	Reboot the module
Syntax	ATZ
Format	ATZ <CR><LF>
Response	<CR><LF>OK<CR><LF>

```
[14:12]>>>ATZ
[14:12]<<<
OK
```

Description	Reset to default value
Syntax	+FACTORY_RESET
Format	AT+FACTORY_RESET<CR><LF>
Response	<CR><LF>OK<CR><LF>
	<CR><LF>+EVT:FACTORY_RESET<CR><LF>

```
[14:16]>>>AT+FACTORY_RESET
[14:16]<<<
OK
+EVT:FACTORY_RESET
```

Description	Get/Set UDT_EVT
Syntax	+UDT_EVT
Format Command	AT+UDT_EVT=[parameter-1] <CR><LF>
Response Command	<CR><LF>
Format Query	AT+UDT_EVT=? <CR><LF>
Response Query	<CR><LF>+UDT_EVT=[parameter-1]<CR><LF>
	<CR><LF>OK<CR><LF>

parameter-1 = 0 disable 1 enable

```
[[14:23]>>>AT+UDT_EVT=1
[14:23]<<<
OK
```

```
[[14:22]>>>AT+UDT_EVT=?
[14:22]<<<
+UDT_EVT:1
OK
```

If is not necessary to report +EVT:TxDone and +EVT:RxDone during transmission and reception, this command can be used to turn off EVT reporting events.

Description	Change RF to be wait mode
Syntax	+Standby
Format	AT+Standby<CR><LF>
Response	<CR><LF>OK<CR><LF>

```
[[14:34]>>>AT+Standby
[14:34]<<<
OK
```

When we want to leave the receiving state, is possible to use this command to leave the receiving state.

AT Command (Low Consumption)

Description	<i>LpNode functionality</i>
Syntax	+LpNode
Format Command	AT+LpNode=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+LpNode=? <CR><LF>
Response Query	<CR><LF>+LpNode:[parameter-1]
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 disable 1 enable

```
[14:54]>>>AT+LpNode=1
[14:54]<<<
OK
```

```
[14:54]>>>AT+LpNode=?
[14:54]<<<
+LpNode:1
OK
```

When LpNode is turned on (enabled = 1) , when transmitting data, a longer preamble will be added to wake-up the remote receiving module.
When the receiving module is receiving a sleep wake-up reception mechanism will be used to reduce average power consumption.

Description	<i>Get/Set WOR Duration</i>
Syntax	+WOR_Duration
Format Command	AT+WOR_Duration=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+WOR_Duration=? <CR><LF>
Response Query	<CR><LF>+WOR_Duration:[parameter-1]
Result Code	<CR><LF>OK<CR><LF>

*parameter-1 = 0 = wakeup every 1000ms
1 = wakeup every 500ms
2 = wakeup every 250ms
3 = wakeup every 125ms*

```
[[15:09]>>>AT+WOR_Duration=1
[15:09]<<<
OK
```

```
[15:10]>>>AT+WOR_Duration=?
[15:10]<<<
+WOR_Duration:1
OK
```

When LpNode is turned on (enable = 1) , entering the receiving state will periodically wake up to receive. This command can set how many seconds to wake-up and enter the receiving state.

AT Command (Low Consumption)

This is another instruction to reduce the consumption when the module is managed from UART.

Description	<i>Get/Set LpUART</i>
Syntax	+LpUart
Format Command	AT+LpUart=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+LpUart=? <CR><LF>
Response Query	<CR><LF>+LpUart:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

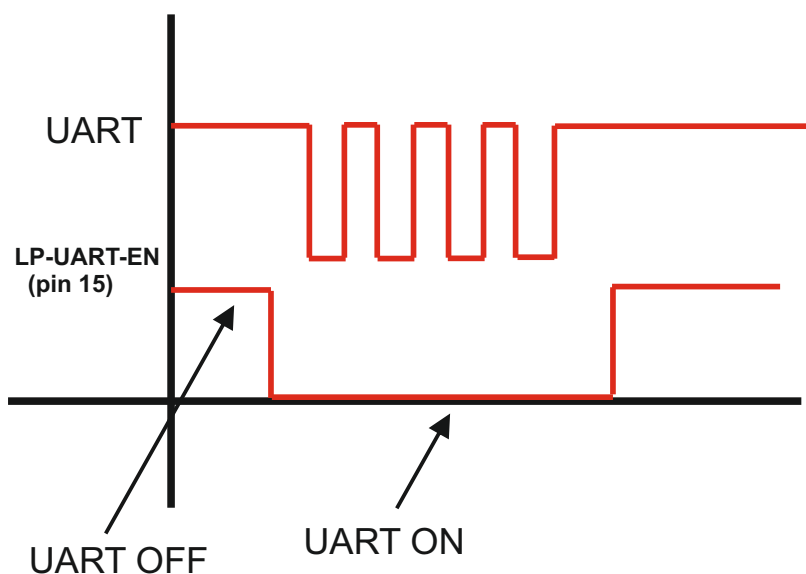
parameter-1 = 0 disable 1 enable

```
[10:04]>>>AT+LpUart=1
[10:04]<<<
OK
```

```
[10:05]>>>AT+LpUart=?
[10:05]<<<
+LpUart:0
OK
```

When LpUart is turned on, when we need to send text or AT command to the module, we need to pull down LP_UART_EN, then the module can receive the command.

- 1) Send the command : AT+LPUart=1**
When you execute this command the UART has been turned off and therefore there will be no response to the commands sent.
- 2) Pull down pin 15 (LP-UART-EN)**
When you pull down pin 15, UART will be opened. This is the condition of lowest possible consumption. It is recommended that after using Pin 15 to turn on the UART, there is a short delay to 20ms to allow the UART to complete initialitation.
- 3) Pull up pin 15 (LP-UART-EN)**
After you pull high pin 15, the UART will be turned off again.



AT Command (Radiofrequency Command)

Description	Get/Set Frequency
Syntax	+Freq
Format Command	AT+Freq=[parameter-1] <CR><LF>
Response Command	<CR><LF>
Format Query	AT+Freq=? <CR><LF>
Response Query	<CR><LF>+Freq:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 433000000-436000000 ---> 433Mhz version
 parameter-1 = 866000000-870000000 ---> 868MHz version
 parameter-1 = 913000000-917000000 ---> 915MHz version

```
[[15:25]>>>AT+Freq=868100000
[15:25]<<<
OK
```

```
[15:26]>>>AT+Freq=?
[15:26]<<<
+Freq:868100000
OK
```

Description	Set and get TX power
Syntax	+TXPW
Format Command	AT+TXPW=[parameter-1] <CR><LF>
Response Command	<CR><LF>
Format Query	AT+TXPW=? <CR><LF>
Response Query	<CR><LF>+TXPW:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 : 14dBm 9 : 5dBm
 1 : 12.5dBm 10 : 4dBm
 2 : 12dBm 11 : 3dBm
 3 : 11dBm 12 : 2dBm
 4 : 10dBm 13 : 1dBm
 5 : 9dBm 14 : 0dBm
 6 : 8dBm 15 : -3dBm
 7 : 7dBm
 8 : 6dBm

```
[15:34]>>>AT+TXPW=4
[15:34]<<<
OK
```

```
[15:34]>>>AT+TXPW=?
[15:34]<<<
+TXPW:4
OK
```

AT Command (Radiofrequency Command)

Description	Get/Set Datarate
Syntax	+DR
Format Command	AT+DR=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+DR? <CR><LF>
Response Query	<CR><LF>+DR:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1

	Deviation	Bandwidth	Symbol rate
0	25KHz	98KHz	50Kbaud
1	50KHz	195.9KHz	100Kbaud
2	100KHz	273.1KHz	200Kbaud

```
[15:51]>>>AT+DR=0
[15:51]<<<
OK
```

```
[15:51]>>>AT+DR=?
[15:51]<<<
+DR:0
OK
```

Description	Rx Mode
Syntax	+RX
Format	AT+RX<CR><LF>
Response	<CR><LF>OK<CR><LF>

```
[15:56]>>>AT+RX
[15:56]<<<
OK
```

AT+RX, it is only valid for one time. Once the module is restarted or you transfer a piece of data, its state machine will change to idle mode after the transfer is completed.

Description	Get/Set AutoRx
Syntax	+AutoRx
Format Command	AT+AutoRx=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+AutoRX=? <CR><LF>
Response Query	<CR><LF>+AutoRX:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 disable 1 enable

```
[16:01]>>>AT+AutoRx=1
[16:01]<<<
OK
```

```
[16:01]>>>AT+AutoRx=?
[16:01]<<<
+AutoRx:1
OK
```

When AutoRx is turned on (enabled = 1) the system will be in the RX connection state when idle, waiting to receive data.

AT Command (Radiofrequency Command)

Description	Get/Set SYNC word
Syntax	+SYNC
Format Command	AT+SYNC=[parameter-1] <CR><LF>
Response Command	<CR>OK<LF>
Format Query	AT+SYNC=? <CR><LF>
Response Query	<CR><LF>+SYNC:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = Default is « aabbccdd »

SYNC word is consisting of a total of 4 bytes. The SYNC word in TX and RX need to be consistent and the Group ID also needs to be consistent to transmit data to each other.

```
[16:25]>>>AT+SYNC=aabbccdd
[16:25]<<<
OK
```

```
[16:25]>>>AT+SYNC=?
[16:25]<<<
+SYNC:aabbccdd
OK
```

Description	Get/Set Group Id
Syntax	+Group
Format Command	AT+Group=[parameter-1] <CR><LF>
Response Command	<CR>OK<LF>
Format Query	AT+Group=? <CR><LF>
Response Query	<CR><LF>+Group:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = value between 0÷255 (default is 170)

When receiving and transmitting, both the SYNC word and the Group Id need to be consistent to transmit data to each other.

```
16:34]>>>AT+Group=170
[16:34]<<<
OK
```

```
[16:35]>>>AT+Group=?
[16:35]<<<
+Group:170
OK
```

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

AT Command

Description	<i>Get/Set UART baudrate</i>
Syntax	+Baud
Format Command	AT+Baud=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+Baud=? <CR><LF>
Response Query	<CR><LF>+Baud:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = value between 0-6
 0=115200 1=57600
 2=38400 3=19200
 4=9600 5=4800
 6=2400

```
[09:58]>>>AT+Baud=0
[09:58]<<<
OK
```

```
[09:58]>>>AT+Baud=?
[09:58]<<<
+Baud:0
OK
```

Description	<i>Receiving data setting, reply RSSI report</i>
Syntax	+ACKRSSI
Query Command	AT+ACKRSSI=?<CR><LF>
Response Command	<CR><LF>+ACKRSSI:<parameter-1><CR><LF>
Format Command	AT+ACKRSSI=<parameter-1> <CR><LF>
Response Query	<CR><LF>+ACKRSSI:[parameter-1]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 disable 1 enable

```
[15:44]>>>AT+ACKRSSI=1
[15:44]<<<
OK
```

```
[15:45]>>>AT+ACKRSSI=?
[15:45]<<<
+ACKRSSI:1
OK
```

AT Command (local GPIO functionality)

Description	Get/Set OUT0÷OUT3 local GPIO
Syntax	+OUT[parameter-1][parameter-2]
Format Command	AT+OUT[parameter-1]=[parameter-2] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+OUT[parameter-1]=? <CR><LF>
Response Query	<CR><LF>+OUT[parameter-1]:[parameter-2]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 : OUT0 1: OUT1 2:OUT2 3:OUT3
 parameter-2 = 0 : Low Level 1: High Level

```
[[10:21]>>>AT+OUT0=1
[10:21]<<<
OK
```

```
[10:21]>>>AT+OUT0=?
[10:21]<<<
+OUT0:1
OK
```

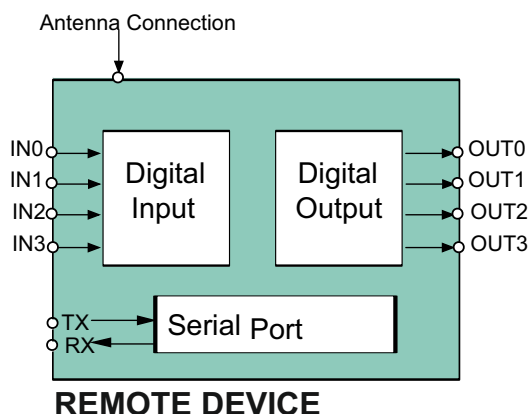
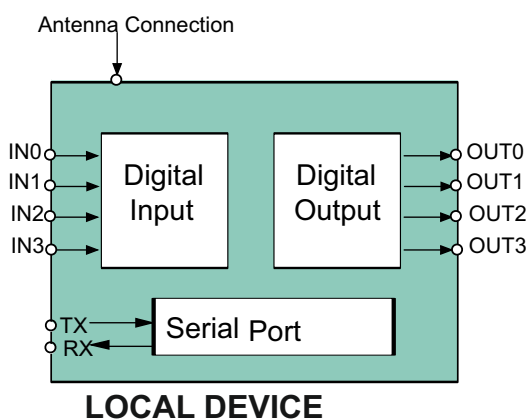
With this command is possible to set the OUTPUT (OUT0÷OUT3) of the local device to the desired logic state (0 - 1).

Description	Get IN0÷IN3 local GPIO
Syntax	+RDIN[parameter-1]
Format Query	AT+RDIN[parameter-1]=? <CR><LF>
Response Query	<CR><LF>+RDIN[parameter-1]:[parameter-2]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 : IN0 1: IN1 2:IN2 3:IN3 parameter-2 = 0 : low level 1: high level

```
[10:34]>>>AT+RDIN0=?
[10:34]<<<
+RDIN0:1
OK
```

With this command is possible to interrogate the 4 digital inputs of the local device (IN0÷IN3).



AT Command (Over The Air GPIO functionality)

Description	Get/Set OUT0÷OUT3 Over The Air GPIO
Syntax	+OTA_OUT[parameter-1][parameter-2]
Format Command	AT+OTA_OUT[parameter-1]=[parameter-2] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+OTA_OUT[parameter-1]=? <CR><LF>
Response Query	<CR><LF>+OTA_OUT[parameter-1]:[parameter-2]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 : OUT0 1 : OUT1 2 : OUT2 3 : OUT3
 parameter-2 = 0 : Low Level 1 : High Level

```
[10:41]>>>AT+OTA_OUT1=1
[10:41]<<<
+EVT:TxDone

OTA_OK
+EVT:RxDone
```

```
[10:42]>>>AT+OTA_OUT1=?
[10:42]<<<
+EVT:TxDone

+OTA_OUT1:1

OTA_OK
+EVT:RxDone
```

With this command is possible to set the OUTPUT (OUT0÷OUT3) of the remote device to the desired logic state (0 - 1).

Description	Get IN0÷IN3 Over The Air GPIO
Syntax	+OTA_RDIN[parameter-1]
Format Query	AT+OTA_RDIN[parameter-1]=? <CR><LF>
Response Query	<CR><LF>+OTA_RDIN[parameter-1]:[parameter-2]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

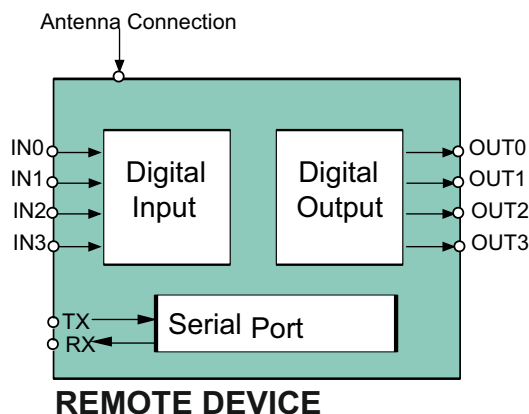
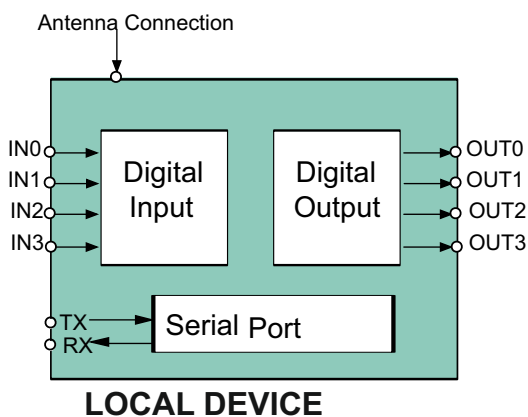
parameter-1 = 0 : IN0 1 : IN1 2 : IN2 3 : IN3 parameter-2 = 0 : low level 1 : high level

```
[10:47]>>>AT+OTA_RDIN1=?
[10:47]<<<
+EVT:TxDone

+OTA_RDIN1:1

OTA_OK
+EVT:RxDone
```

With this command is possible to interrogate the 4 digital inputs of the remote device (IN0÷IN3).



AT Command (**ALARM Notification Function**)

Description	Get/Set DINX
Syntax	+DIN[parameter-1]=[parameter-2]
Format Command	AT+DIN[parameter-1]=[parameter-2] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+DIN[parameter-1]=? <CR><LF>
Response Query	<CR><LF>+DIN[parameter-1]:[parameter-2]<CR><LF>
Result Code	<CR><LF>OK<CR><LF>

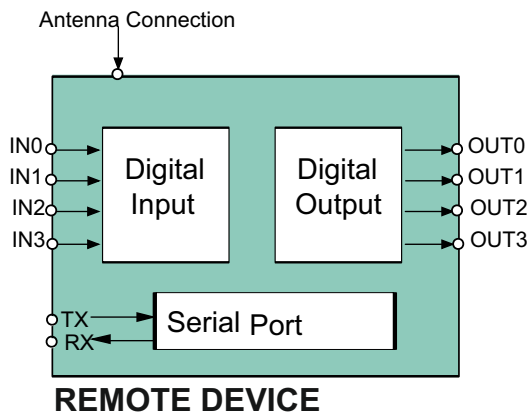
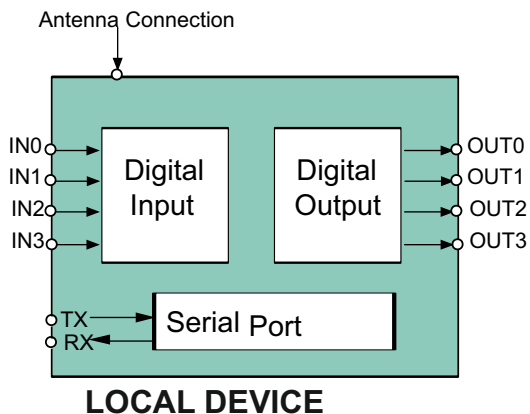
parameter-1 = 0 : DIN-0 1: DIN-1 2: DIN-2 3: DIN-3

parameter-2 = 0 : Low Level 1: High Level

```
[15:38]>>>AT+DIN0=1
[15:38]<<<
OK
```

```
[[15:38]>>>AT+DIN0=?
[15:38]<<<
+DIN0:1
OK
```

When this function is enable (on the single DIN-0 ÷ DIN-3) if for any reason the DIN_X input will go to low level, the module will send the «Alarm_X_1» string throught the AIR. When we restore DIN-X to a high level, it wil send the «Alarm_X_0» string throught RF.



- Radio Modem
- Over The Air Command
- Remote I/O Functionality

AT Command (IO Mirroring Function)

Description	Get/Set RemoteIO
Syntax	+RemotelON=[parameter-1]
Format Command	AT+RemotelO=[parameter-1] <CR><LF>
Response Command	<CR><LF>OK<CR><LF>
Format Query	AT+RemotelO=? <CR><LF>
Response Query	<CR><LF>+RemotelO:[parameter-1]
Result Code	<CR><LF>OK<CR><LF>

parameter-1 = 0 : disable 1: enable

```
[16:07]>>>AT+RemotelO=1
[16:07]<<<
OK
```

```
[16:07]>>>AT+RemotelO=?
[16:07]<<<
+RemotelO:1
OK
```

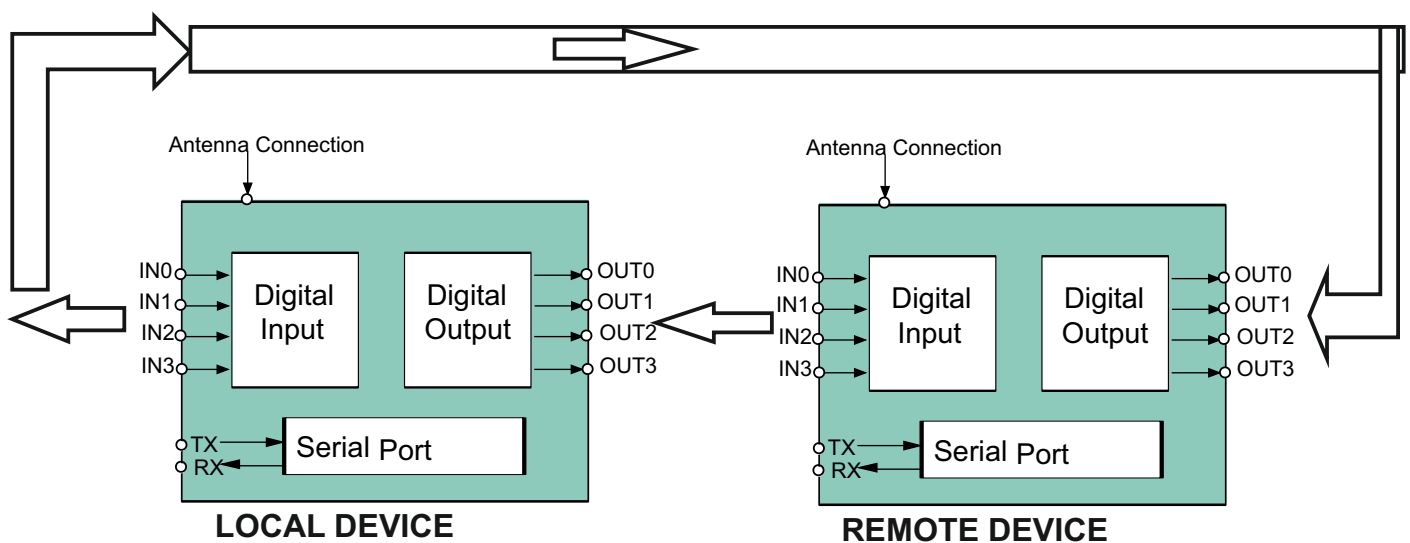
When the RemoteIO function is enabled :

- the status value of the digital inputs IN0÷IN3 (local device) is mirrored on the digital outputs OUT0÷OUT3 (remote device).
- the status value of the digital inputs IN0÷IN3 (remote device) is mirrored on the outputs digital OUT0÷OUT3(local device).

Point to point transmission

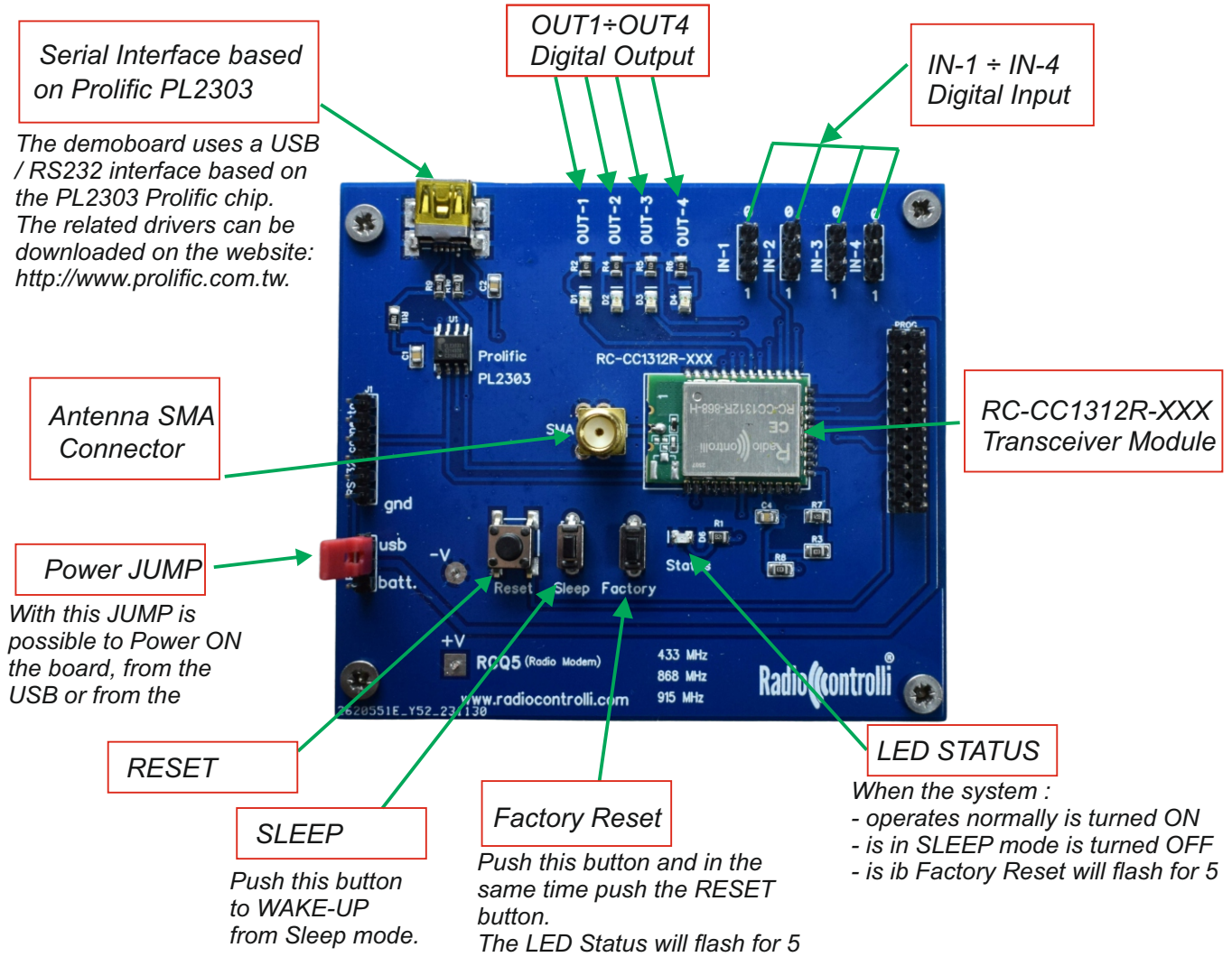
When the RemoteIO function is turned on, the AutoRx function will be automatically enabled.

When the RemoteIO function is turned on, AT+OUTx and AT+DINx will be temporarily disabled.



- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start Guide (Evaluation Board)



The Evaluation KIT is composed :

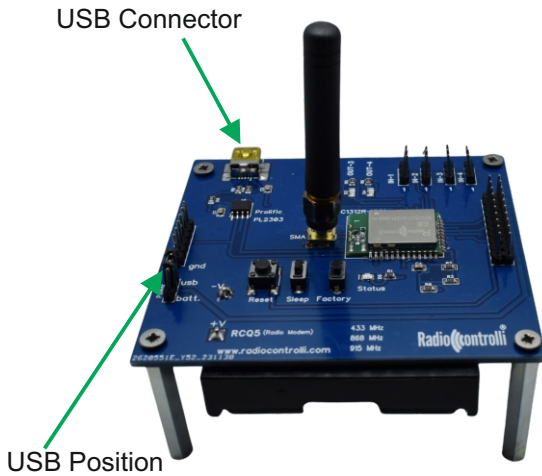
- N.2 Evaluation board
- N.2 Antenna SMA
- N.2 Battery Pack
- N.2 USB Cable



RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start Guide



- Make sure the jumper is in the USB position (USB powered)
- Connect the Personal computer to the USB connector check the correct recognition of the drivers Prolific, in case of problems these drivers can be downloaded from the website: <http://www.prolific.com.tw>.

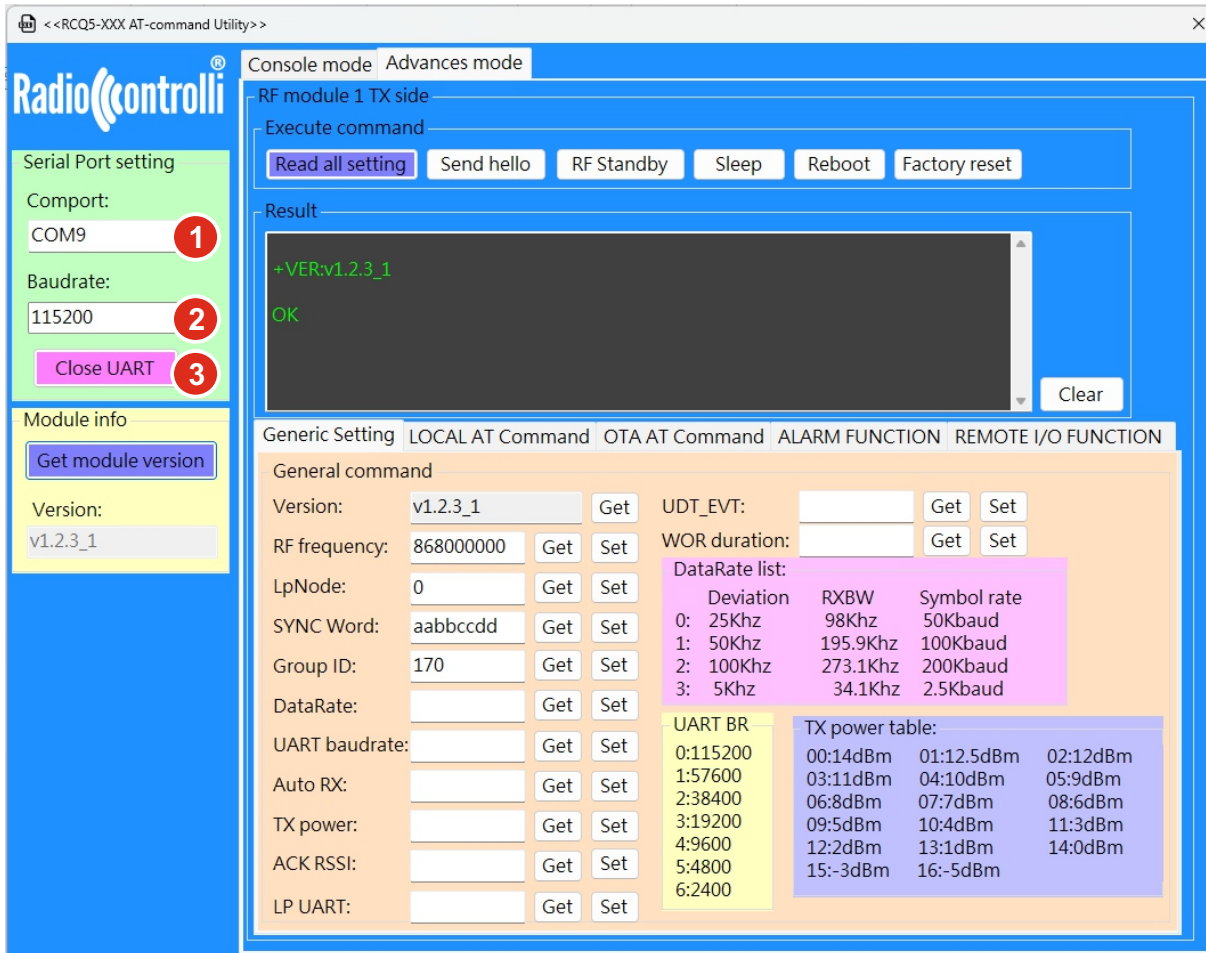
For user to start quickly to use the smart radio modem RCQ5, it will be necessary to use a standard windows serial terminal (for example Putty, Real Term ect) or you can use a RadioControlli application downloadable from the following link :

[DOWNLOAD AT COMMAND](#)

The test will be done using two modules : one as RX, the other as TX. Launch the application denominated RCQ5-XXX.exe.

Quick Start : Station-1 and Station-2

- 1) Input the Comport and set the baudrate (115200 by default).
- 2) Click «Open UART»



- 1) Entry the port number
- 2) Entry the baud rate default (115200)
- 3) Open serial port

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start : SETTING Station-1 and Station-2

1) It is possible to verify the single parameter through the «GET» command

433MHz Default Setting

RF Frequency	433920000
DataRate	0 (25KHz 50Kbaud)
TX Power	+10dBm
LpNode	0
SYNC Word	aabbccdd
Group ID	170
UART Baudrate	0 (115200)
AutoRX	1
ACK RSSI	0
Lp UART	0
UDT_EVT	1
WOR_duration	1 (wake-up 500ms)

868MHz Default Setting

RF Frequency	868000000
DataRate	0 (25KHz 50Kbaud)
TX Power	+14dBm
LpNode	0
SYNC Word	aabbccdd
Group ID	170
UART Baudrate	0 (115200)
AutoRX	1
ACK RSSI	0
Lp UART	0
UDT_EVT	1
WOR_duration	1 (wake-up 500ms)

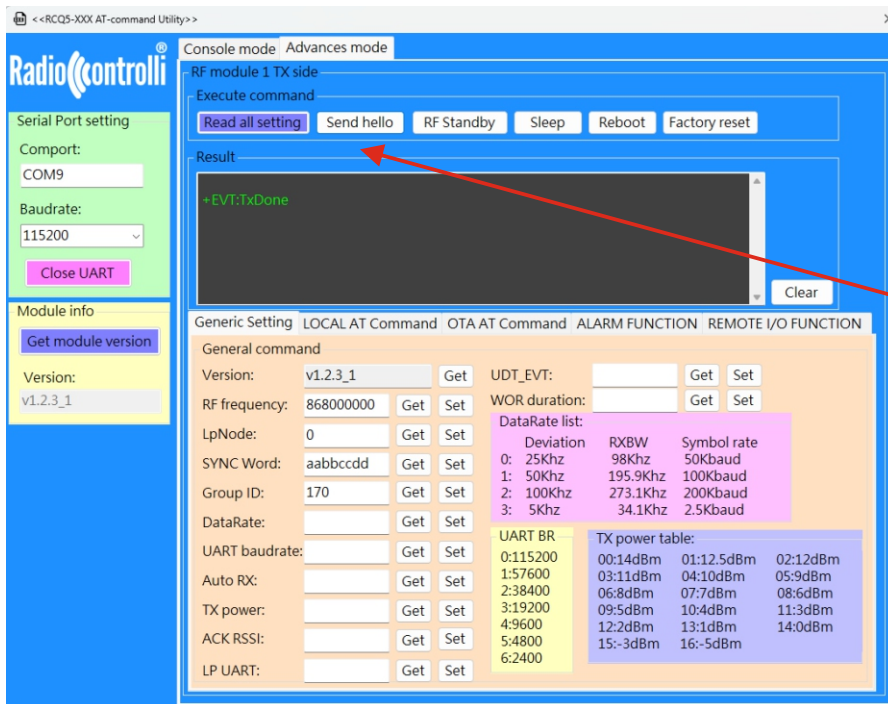
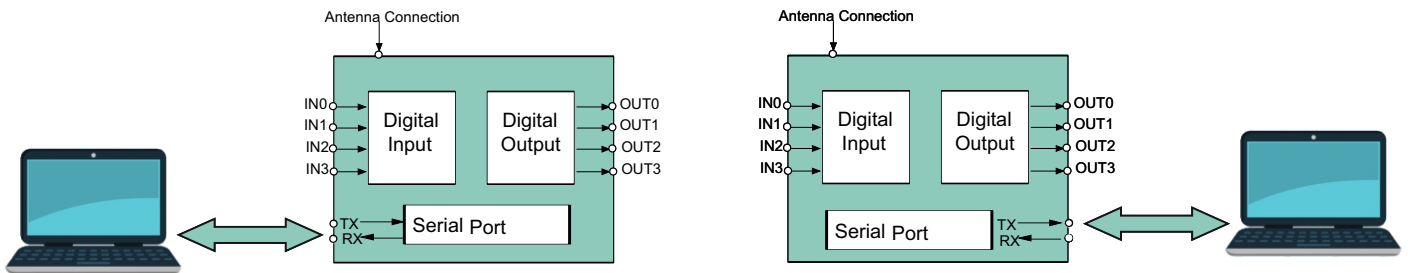
915MHz Default Setting

RF Frequency	915000000
DataRate	0 (25KHz 50Kbaud)
TX Power	+14dBm
LpNode	0
SYNC Word	aabbccdd
Group ID	170
UART Baudrate	0 (115200)
AutoRX	1
ACK RSSI	0
Lp UART	0
UDT_EVT	1
WOR_duration	1 (wake-up 500ms)

RC-RCQ5-XXX

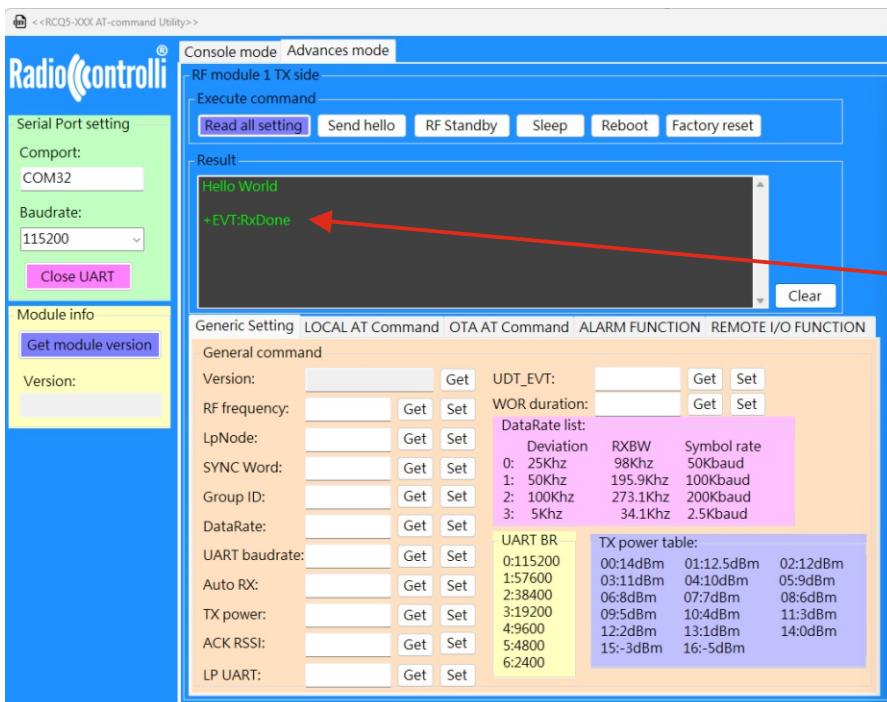
- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start : RADIO MODEM ==> First message sent
 After all these sets, we are ready to send the first message :



Transmission Station :

Push this button

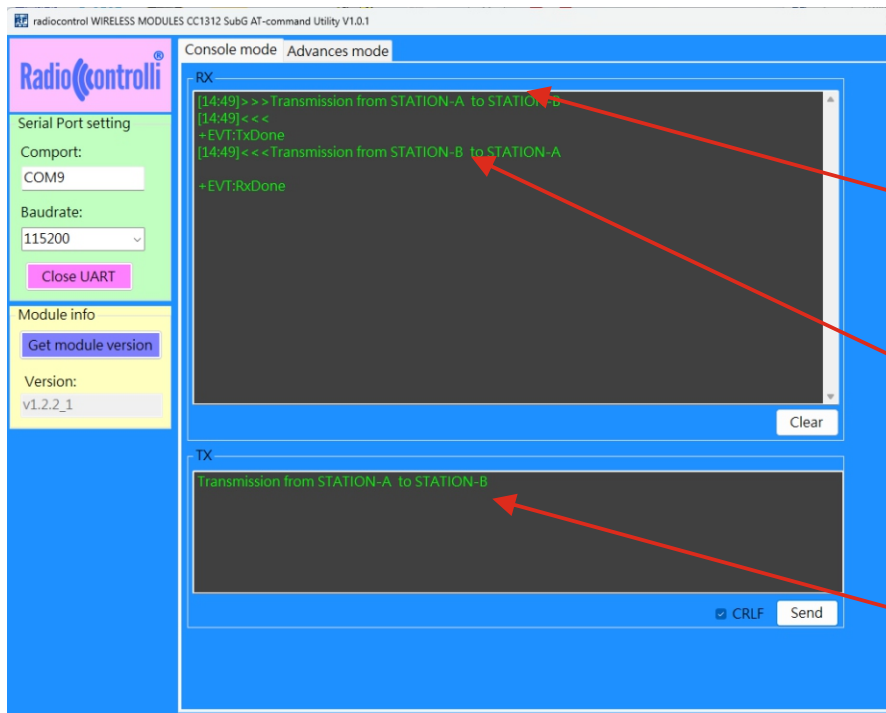
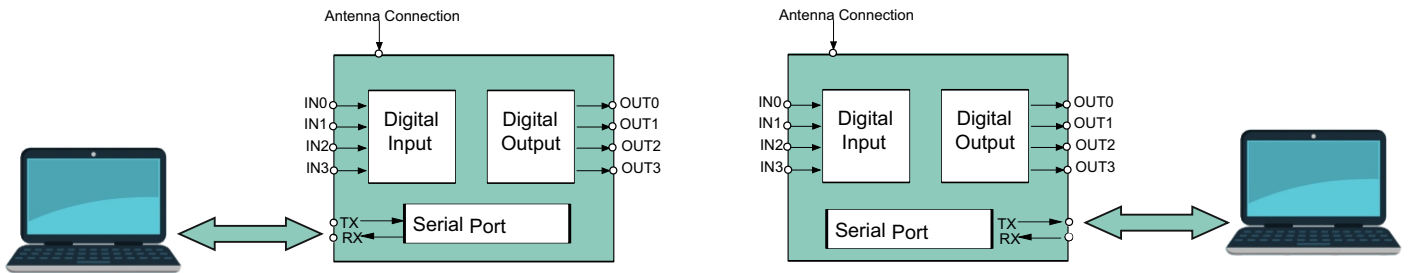


Receiving Station :

Message received

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

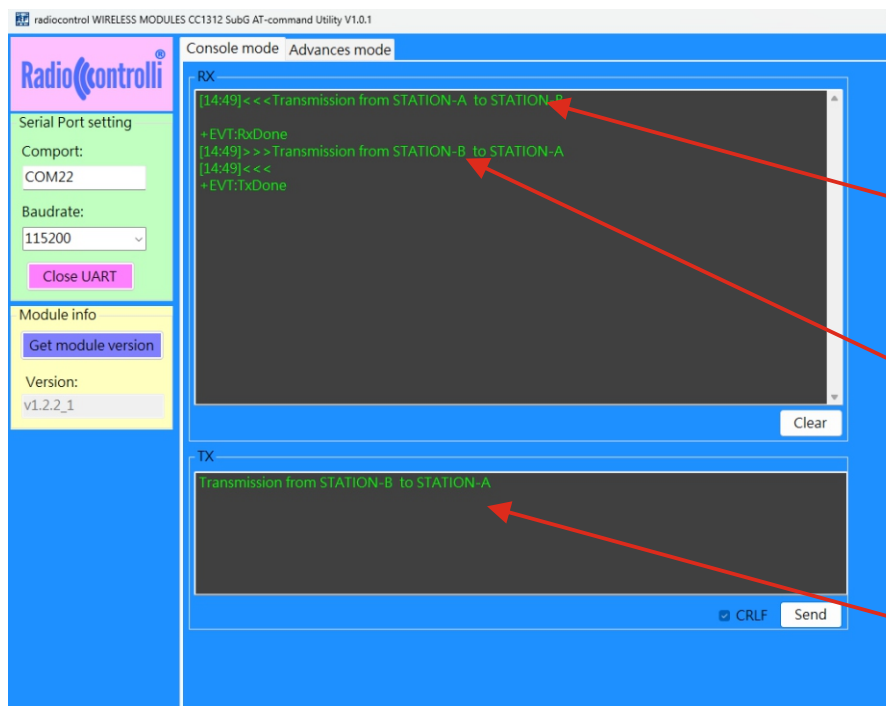
Quick Start : RADIO MODEM ==> Second message sent with Console mode



Message Sent

Message Received from STATION-B

Message Sent



Message Received from STATION-A

Message Sent

Message Sent

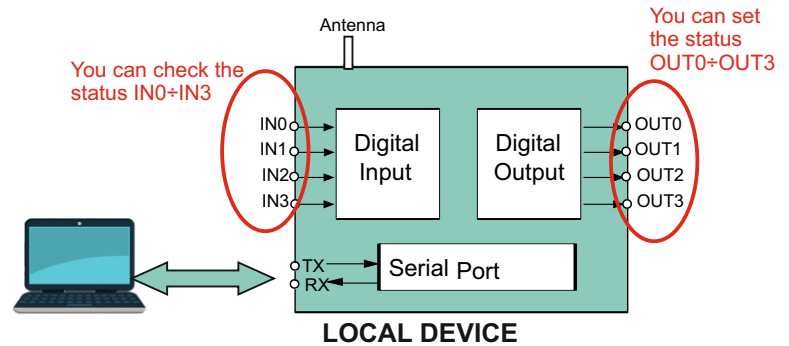
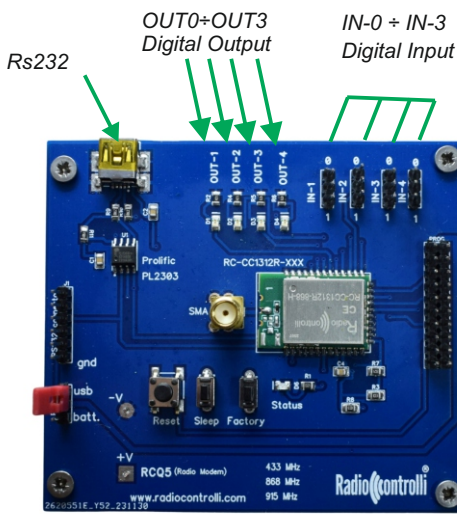
RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start : LOCAL AT COMMANDS

It is possible to :

- Set The Digital Output OUT0÷OUT3 to the desired logical state.
AT+OUT1=1 with this command the OUT1 go to high level.
AT+OUT1=0 with this command the OUT1 go to low level.
- Verify the logic state of the Digital Output OUT0÷OUT3
AT+OUT1=? the value of the logical state of the OUT1 output will be returned.
- Verify the logic state of the Digital Input IN0÷IN3
AT+RDIN1=? the value of the logical state of the IN1 input will be returned.



Radiocontrolli Console mode Advances mode

RF module 1 TX side

Execute command

Read all setting Send hello RF Standby Sleep Reboot Factory reset

Result

```
+EVT:TxDone
+EVT:TxDone
+EVT:TxDone
```

Clear

Generic Setting LOCAL AT Command OTA AT Command ALARM FUNCTION REMOTE I/O FUNCTION

OUT0÷OUT3				IN0÷IN3			
DO0:	<input type="text"/>	Get	Set	DI0:	<input type="text"/>	Get	
DO1:	<input type="text"/>	Get	Set	DI1:	<input type="text"/>	Get	
DO2:	<input type="text"/>	Get	Set	DI2:	<input type="text"/>	Get	
DO3:	<input type="text"/>	Get	Set	DI3:	<input type="text"/>	Get	

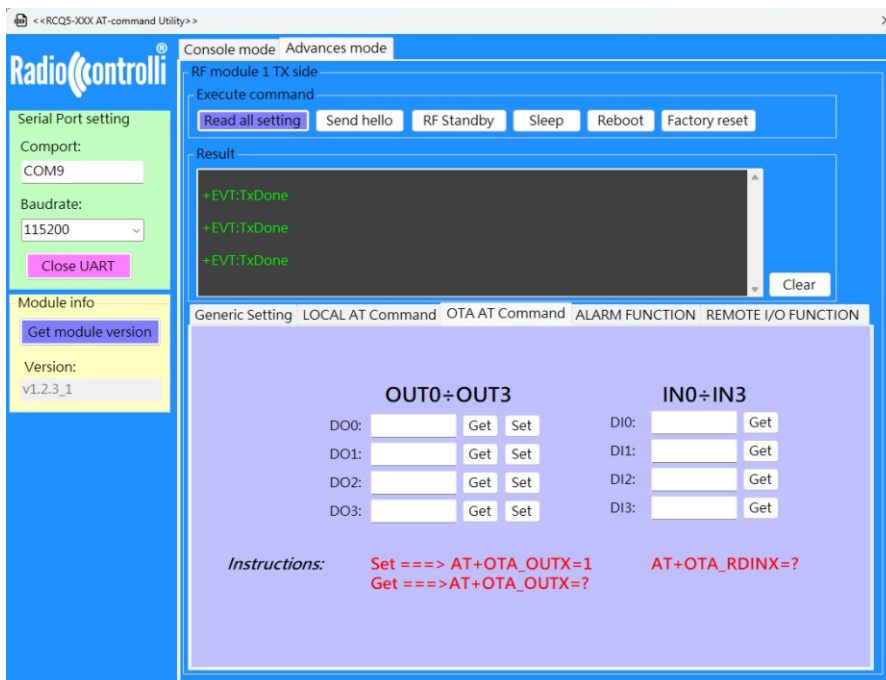
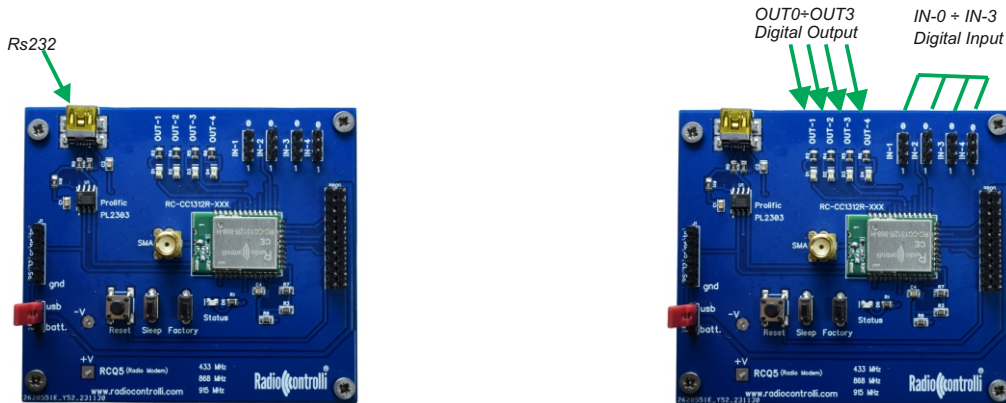
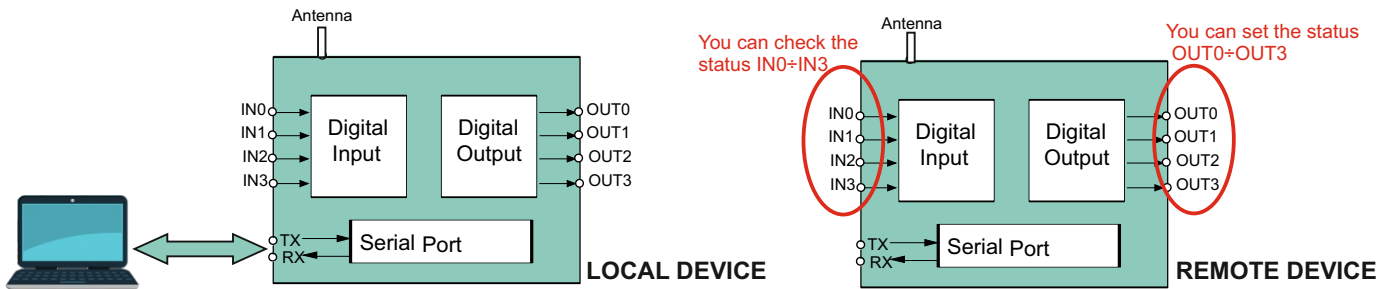
Instructions: Set ==> AT+OUTX=1 AT+RDINX=?
Get ==> AT+OUTX=?

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start : OVER THE AIR (OTA) AT COMMANDS

It is possible to :

- Set The Digital Output OUT0÷OUT3 of the REMOTE DEVICE to the desired logical state.
 AT+OTA_OUT1=1 with this command the OUT1 of the REMOTE DEVICE go to high level.
 AT+OTA_OUT1=0 with this command the OUT1 of the REMOTE DEVICE go to low level.
- Verify the logic state of the Digital Output OUT0÷OUT3
 AT+OTA_OUT1=? the value of the logical state of the OUT1 output will be returned.
- Verify the logic state of the Digital Input IN0÷IN3
 AT+OTA_RDIN1=? the value of the logical state of the IN1 input will be returned.



RadioControlli Application
OTA AT Command

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start : ALARM FUNCTIONS

It is possible to Enable the ALARM FUNCTION for every Digital Input with the following AT command :

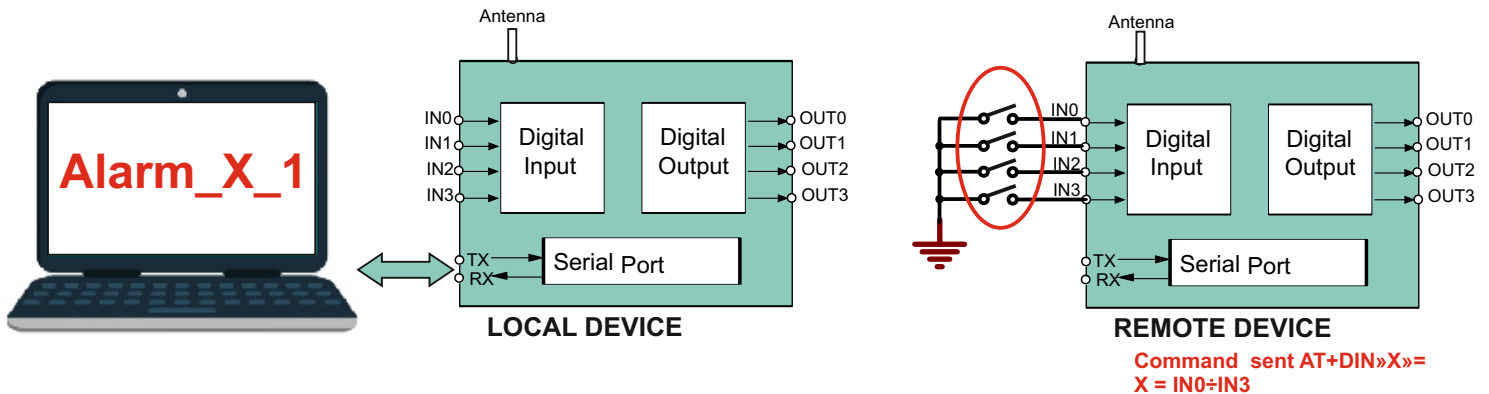
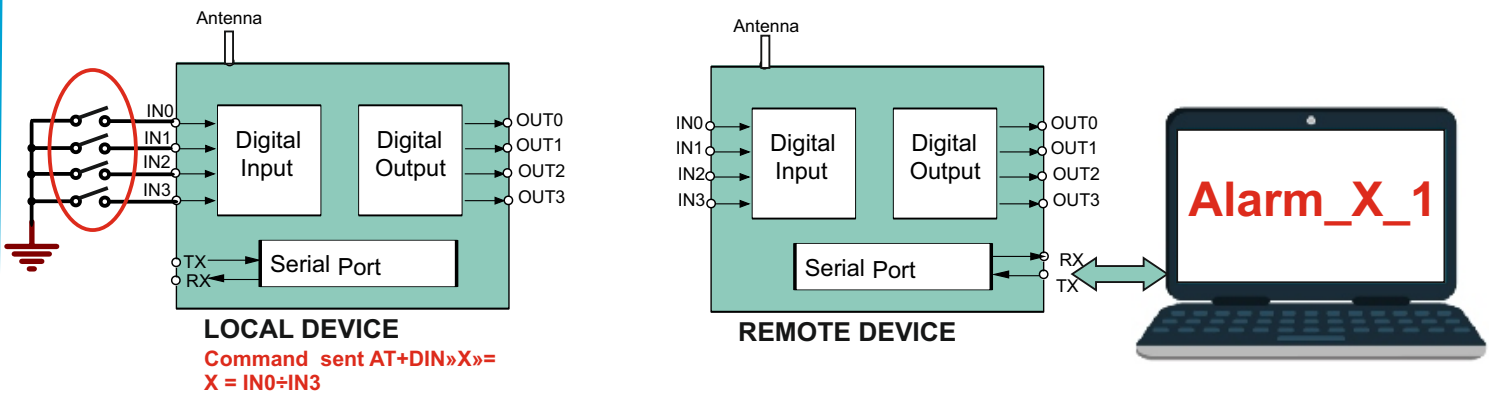
AT+DINX=1 with this command, when the digital input INX (DEVICE A IN0÷IN3) change status a message will be transmitted via UART to the DEVICE B : **Alarm_0_1** mean : The input IN0 has moved to logical level 1.
when this digital input come back to low level a message will be sent via UART : **Alarm_0_0**

This is valid for all 4 digital input IN0÷IN3.

When an digital Input go to LOW LEVEL the message will be transmitted via UART to the REMOTE DEVICE.

IN0 -----> **Alarm_0_1** IN1 -----> **Alarm_1_1** IN2 -----> **Alarm_2_1** IN3 -----> **Alarm_3_1**

If the digital Input change status from LOW LEVEL to HIGH LEVEL another message will be transmitted via UART to the REMOTE DEVICE : **Alarm_X_0**

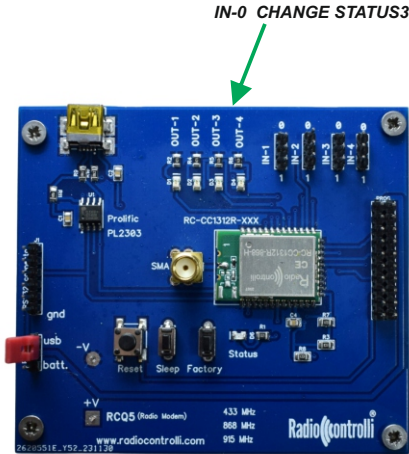


RC-RCQ5-XXX

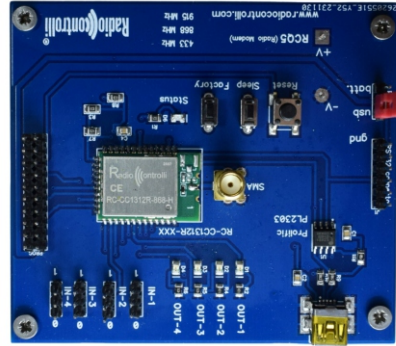
- Radio Modem
- Over The Air Command
- Remote I/O Functionality

Quick Start : ALARM FUNCTIONS

Below the RadioControlli application to verify this functionality.
On the remote station the alarm had been enabled on IN0.



DEVICE A



DEVICE B

RadioControlli AT-command Utility

Console mode Advances mode

RF module 1 TX side

Execute command

Read all setting Send hello RF Standby Sleep Reboot Factory reset

Result

```
Alarm_0_1
+EVT:RxDone
Alarm_0_1
+EVT:RxDone
```

Generic Setting LOCAL AT Command OTA AT Command ALARM FUNCTION REMOTE I/O FUNCTION

ENABLE ALARM FUNCTION (Local Device)

DIN0: 1	Get	Set
DIN1:	Get	Set
DIN2:	Get	Set
DIN3:	Get	Set

ALARM Received

RDIN-0 RDIN-1 RDIN-2 RDIN-3

Instructions: Set ==> AT+DINX=1
Get ==> AT+DINX=?

Alarm Received

mean that the digital input In0 of the remote station went to logical level 0

Quick Start : REMOTE I/O FUNCTIONS

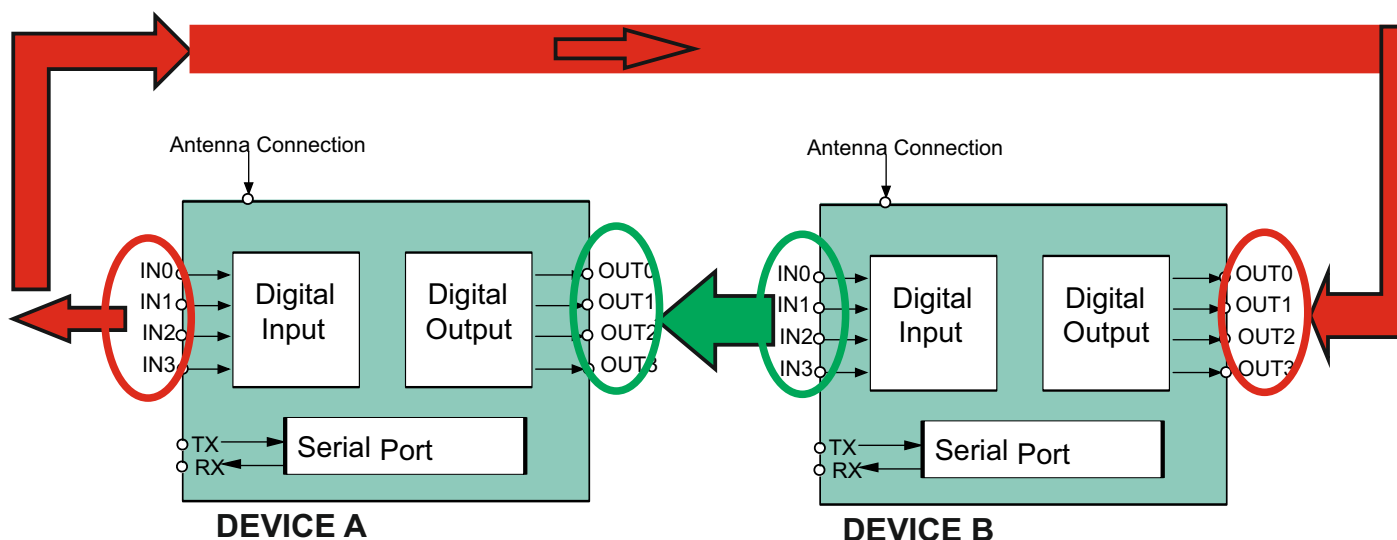
It is possible to Turn ON and turn OFF the remote IO mirroring function.

When we enable the Remote I/O function, if any Digital Input is changed on the Station A, the digital output of the remote Station B will also mirror these states at the same time.

The instruction to turn ON this functionality is : `AT+RemoteIO=1`

The instruction to turn OFF this functionality is : `AT+RemoteIO=0`

- Since this is two-way mirror, it is recommended to use point-to-point transmission.
- When the RemoteIO function is turned on, the AutoRx function will be automatically enabled.
- When the RemoteIO function is turned on, `AT+OUTx` and `AT+DINx` will be temporarily disabled.



When this function is enabled :

The digital outputs of Station B will follow the states of the digital inputs of Station A in lockstep.

If the digital input IN_x (Station A) is at logical zero level then the digital output OUT_x (Station B) will be at logical level 0, if the digital input IN_x (Station A) is at logical level 1 the output will also digital OUT_x (station B) will be at logic level 1.

The digital outputs of Station A will follow the states of the digital inputs of Station B in lockstep.

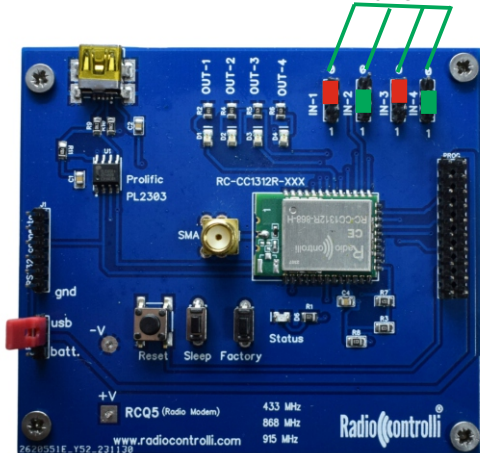
If the digital input IN_x (Station B) is at logical zero level then the digital output OUT_x (Station A) will be at logical level 0, if the digital input IN_x (Station B) is at logical level 1 the output will also digital OUT_x (station A) will be at logic level 1.

RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

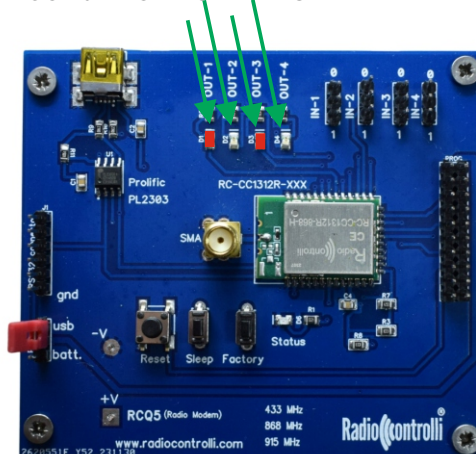
Quick Start : REMOTE I/O FUNCTIONS

IN-0=CLOSE=LOW LEVEL
 IN-1=OPEN=HIGH LEVEL
 IN-2=CLOSE=LOW LEVEL
 IN-3=OPEN=HIGH LEVEL



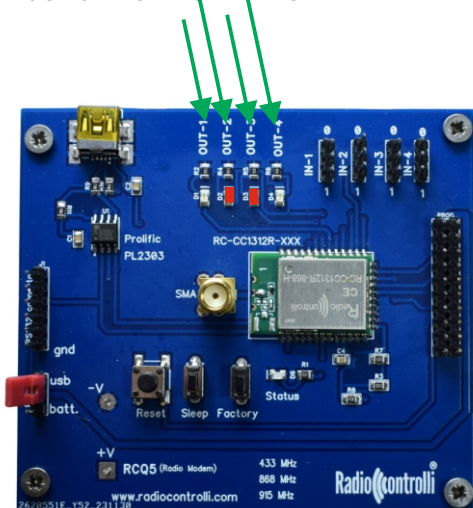
DEVICE A

OUT-0 = TURN ON = LOW LEVEL
 OUT-1 = TURN OFF = HIGH LEVEL
 OUT-2 = TURN ON = LOW LEVEL
 OUT-3 = TURN OFF = HIGH LEVEL



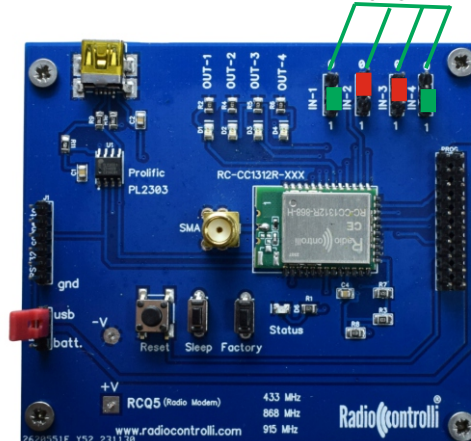
DEVICE B

OUT-0 = TURN OFF = HIGH LEVEL
 OUT-1 = TURN ON = LOW LEVEL
 OUT-2 = TURN ON = LOW LEVEL
 OUT-3 = TURN OFF = HIGH LEVEL



DEVICE A

IN-0=OPEN=HIGH LEVEL
 IN-1=CLOSE=LOW LEVEL
 IN-2=CLOSE=LOW LEVEL
 IN-3=OPEN=HIGH LEVEL



DEVICE B

RC-RCQ5-XXX

- Radio Modem
- Over The Air Command
- Remote I/O Functionality

