WAVETREND

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RX50 Solo User manual

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ABBREVIATIONS

Abbreviation	Meaning
CR	Carriage Return
EOM	End of Message
I/O	Input/Input
ID	Identity
LF	Line Feed
LSB	Least Significant Bit/Byte
m	Meter
mm	Millimetre
MSB	Most Significant Bit/Byte
NC	No Connection
PC	Personal Computer
Pwr	Power
RF	Radio Frequency
RFID	Radio Frequency Identification
Rx	Receive
SOM	Start of Message
TBA	To be Announced
Tx	Transmit
UPS	Uninterruptible Power Supply
RSSI	Received Signal Strength Indicator
PCB	Printed Circuit Board

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1 Overview

The RX50 is Wavetrend's entry level reader, it supports the majority of the RX202 and RX210 command set and either with an SMA to BNC adapter or the SMA equivalent of the RX202/RX210 BNC antenna achieves the same read ranges.

The RX50 is not a direct replacement for the RX300 and does not support the RX300 interface or protocol, it supports the RX202/RX210 protocol. It can be powered in one of three ways directly over the serial port*, over the serial port with external power or via the USB port

The RX50 can be supplied with the AN50

RX50

AN50 1/8 th wave stub antenna

*Not all serial ports deliver sufficient current hence the additional powering option.

The Reader is operated in standalone mode and performs the following functions:

- Receive, decode and validate data from Wavetrend L
- Output relevant tag data via USB or via RS232

The Reader comprises the following functionality and properties:

- RF Module (RF Receiver and Demodulator).
- Micro-controller
- LED indicators
- Micro USB socket
- 2.5mm Power plug
- RS232 DB9 Connector

2 Reader Properties

The new generation of Wavetrend readers are significantly different from their predecessors, these differences are summarised here and explained in more detail throughout the manual.

Front End Filtering
They utilise front end RF filtering allowing them to work extremely effectively in noisy RF environments including in direct proximity to other 433MHZ emitters including TETRA band.

RSSI Response
The current readers have a linear calibrated response which includes operation at both High and Low gain modes.
The sensitivity of the new readers is vastly superior to the RX201 and allows both greater read range at large distances and also RSSI granularity allowing readers to used for reading tags as close up as 10cm.
This close reading ability has obsoleted the requirement for PROX readers in the new product range , instead the user may simply apply a suitable RSSI filter.

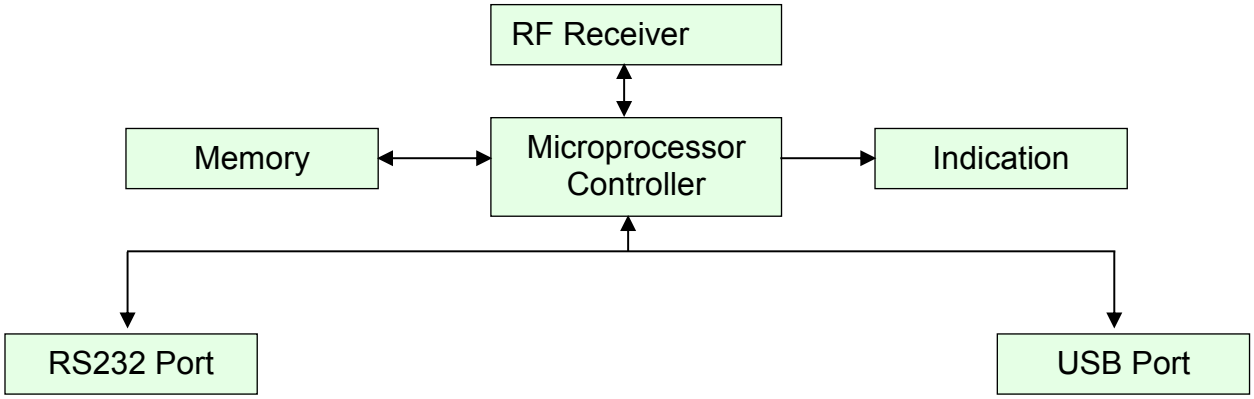
Buffer Size
The RX50/RX202/RX210/RX210 have a larger buffer size of 9 tags compared to the RX201 which was 5 Tags.

USB Connection
All the new generation of readers support configuration over USB.
Before you get excited and plug it in please install the FTDI drivers first as detailed later in the manual. This connection can be used for standalone applications.

No Nulls
One of the criticisms of the RX201 network configuration was that in auto poll the system always reported NULL TAG packets when a reader that had an empty tag buffer was polled. There is now an option to turn this off in the Protocol setting.
Please note this option is only available for autopoll, a manually polled reader will always respond back with a full or empty tag packet as its ACK.

2.1 Functional Diagram

The RX50 Reader has the following functional structure.



This receiver consists of a microprocessor controller with onboard firmware that communicates directly with the RF Receiver module and connects to the outside world via the DB9 RS232 interface or the USB port. Connection to the USB port is made via a standard USB mini type B plug.

2.2 Powering an RX50

Within the RS232 specifications there is no mechanism for providing direct power, the RX50 draws its power parasitically from pins 4 DTR and pin 7 CTS .
Provided the RS232 source can drive 8mA the RX50 can operate from just the DB9 connection. When powered over just the DB9 source the green and yellow LED's will not be illuminated.

Please note that the RX50 maximum baud rate when powered only parasitically is 57600 baud, when powered directly the maximum baud rate is 115200.

It should be noted that the majority of USB to serial converters will not have sufficient current to power the RX50 over the DB9 alone.

When connected over either USB or externally powered RS232 the yellow and green LED's will illuminate, the external power is regulated from 3.3V to 15V .

3 Hardware Configurations.

Wavetrend recommend the following configuration methods

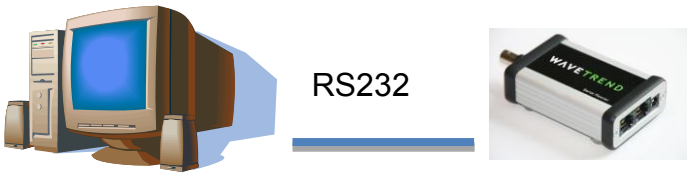
USB

The RX50 when used as a standalone unit can draw power over the USB

RX202

RS232

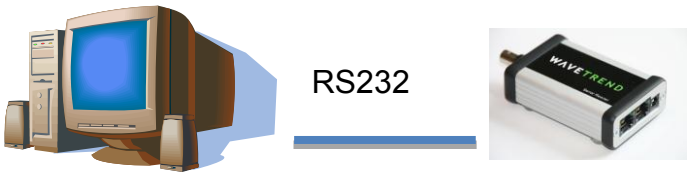
If powered directly from a RS232 port the RX50 may be able to draw sufficient power to operate.



RX202

RS232 with external power

The RX50 can be powered from 3.3V – 15V through the 2.5mm jack connector.



RX202

4 Protocols and Addressing

The data protocol consists of command packets starting AA and response packets 55

4.1 Command Packets

All bytes are HEX Values

0xAA Length NetID ReaderID NodeID Command Data Checksum

1.	Header	1 Byte [0xAA]
2.	Length	1 Byte (Number of Bytes in data section)
3.	Network ID	1 Byte
4.	Receiver ID	1 Byte
5.	Node ID	1 Byte
6.	Command	1 Byte
7.	Data	Up to 64 Bytes of Data
8.	Checksum	1 Byte

CHECKSUM = [Length] XOR [Receiver ID] XOR [Node ID] XOR [Command ID] XOR [Data]…XOR [Data]

I.e. if there are 2 data bytes the calculation would be as follows

Checksum = Length XOR ReaderID XOR NodeID XOR CommandID XOR Databyte1 XOR Databyte2.

4.2 Response Packets

All bytes are HEX values.

0x55 Length NetID ReaderID NodeID Command Data Checksum

9.	Header	1 Byte [0x55]
10.	Length	1 Byte (Number of Bytes in data section)
11.	Network ID	1 Byte
12.	Receiver ID	1 Byte
13.	Node ID	1 Byte
14.	Command	1 Byte
15.	Data	Up to 32 Bytes of Data
16.	Checksum	1 Byte (XOR from Length to Last Data Byte),

CHECKSUM = [Length] XOR [Receiver ID] XOR [NodeID] XOR [Command ID] XOR [Data]…XOR [Data]

Command and Response packets are essentially identical except for the header character

5 Commands

5.1 Command shortlist

Shortlist of commands and requests (Command ID's):

0x00	Reset Network	Reply Packet
0x01	Start/Enable Auto Polling	Continuous
0x02	Disable Auto Polling	Reply Packet
0x03	Ping Reader	Reply Packet + Error
0x04	Set Network ID	Reply Packet Disabled*
0x05	Set Reader ID	Reply Packet Disabled*
0x06	Get Tag Packet	Tag Packet
0x07	Get RSSI Value	Reply Packet + RSSI
0x08	Set RSSI Value	Reply Packet
0x09	Set Site Code	Reply Packet
0x0A	Get Site Code	Reply Packet + Site Code
0x0B	Set Receiver Gain	Reply Packet
0x0C	Get Receiver Gain	Reply Packet + Gain
0x0D	Set Alarm Filter	Reply Packet
0x0E	Get Alarm Filter	Reply Packet + Status
0x0F	Get Number of invalid Tags	Reply Packet + Counter
0x10	Get Supply Voltage	Reply Packet + Voltage
0x11	Start RF white noise	Reply Packet
0x12	Get RF white noise result	Reply Packet + Result
0xFE	Set Baud Rate	No Reply – Broadcast only
0xFF	Get Version Information	Reply Packet + Version

Command Shortlist

*It should be noted that because the RX50 is deployed as a single reader the commands 4 and 5 have been disabled.

5.2 Command Details

Reset Network Command

The function of this command is to reset the entire network, and re-establish the NODE ID addresses. The NODE ID address in the command packet should hold a 255 (broadcast value) to ensure that the entire network enters into the reset sequence. Only reader 1 will respond with the reply packet. This is the only condition under which a response is sent from a broadcast command.
Note: receiving a reset network reply packet at any point where no reset command was sent, will imply that a spontaneous reset has occurred. This would probably be as the result of a power problem.

Command

0xAA	0x00	0x00	0x00	0xFF	0x00	Checksum

Response

0x55	0x00	Network	Receiver	0x01	0x00	Checksum

Start / Enabling Polling Mode Command

The function of this command is to set Reader 1 into an Automatic Polling sequence. It sets the Auto Polling flag in the Data EEPROM to enable Auto Polling after power up.
It will establish the size of the network by sending out tag requests until such time that it gets no response. This will determine the number of readers on the network. Once this has been established, it will sequentially poll each reader indefinitely. Data responses from the readers pass through reader 1 and onto the PC. Readers without a valid tag will respond with an empty packet of data. This will enable the monitoring software to determine if any readers are no longer responding. This command can be addressed directly to reader 1, or on a broadcast basis. When broadcasting, any reader that is not Reader 1, will disable its Auto Polling flag in its Data EEPROM to avoid any problems in the future because of incorrect parameters.
This command is used to restart the Auto Polling if it has been stopped by a break character. (See Auto Polling section)

Command

0xAA	0x00	Network	Receiver	Node ID	0x01	Checksum

Response

0x55	0x00	Network	Receiver	Node ID	0x01	Checksum

Disable Auto Polling Command

The function of this command is to disable future Auto Polling after power up by resetting the Auto Polling flag in the Data EEPROM. This command can be addressed directly to reader 1, or on a broadcast basis.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x02	Checksum

Response

0x55	0x00	Network ID	Receiver ID	Node ID	0x02	Checksum

Break Poll

This command should always be sent to a network in autopoll before a disable AutoPoll is sent. It does not follow any of the standard format nor does it have a response , but its very effective !!!!!

It consists of sending the following recurring string of HFF and an asterix 400 times.

HFF; X 400 (In Hex)
255 ; X 400 (In decimal)

Ping Reader Command

The Ping Command is simply used to check if a reader is on the network and responding correctly. It can be used to read back Network ID's, Reader ID's and Node ID's. Inserted into the response from a Ping Command is and Error Number. This number refers to the last error the respective reader has experienced. Once read, this number is cleared.
To clear all the errors on all the readers, simply broadcast a Ping Command.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x03	Checksum

Response

0x55	0x01	Network ID	Receiver ID	Node ID	0x03	Er Number	Checksum

Error Numbers are as follows:

0	No errors encountered
1	Unknown reader command received
2	Tag Table underflow error
3	Command Packet checksum error
4	RF Module - Unknown command response
5	RF Module - Unknown general response
6	RF Module - Re-sync failure

7	RF Module - Command response failure
8	RF Module - Receive response failure
9	No response packet received from polled reader

Set Network ID Command Disabled

The function of this command is to assign the Network ID as well as commit it to the Data EEPROM.

Command

0XAA	0x01	Network	Receiver	Node ID	0x04	New Network	Checksum

Response

0X55	0x00	Network	Receiver	Node ID	0x04	Checksum

Reader ID Command Disabled

The function of this command is to assign the Reader ID as well as commit it to the Data EEPROM.

Command

0XAA	0x01	Network	Receiver	Node ID	0x05	New Reader ID	Checksum

Response

0x55	0x00	Network	Receiver	Node ID	0x05	Checksum

Get Tag Packet Command

This will be the most used command on any system. Its function to request a Tag from the reader if there is one ready for sending. A tag is removed from the tag buffer, and returned with this command, making room for a new tag.
New tags from the RF Module are written over existing tags in the Tag Buffer in order to keep the data fresh.
Should no tag be ready for sending, and empty packet is sent back. That is, no data in the Data field.

Command

0XAA	0x00	Network	Receiver	Node ID	0x06	Checksum

Response (empty)

0x55	0x00	Network	Receiver	Node ID	0x06	Checksum

Response (Tag Packet)

0x55	Data Length	Network ID	Receiver ID	Node ID	0x06	Data	Checksum

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The Data Field would have this format:

1	!
2	*
3	*
4	Interval
5	Reed Switch Counter
6	Firmware version
7	B
8	C
9	Movement switch counter
10	Age byte MSB
11	Age byte
12	Age byte
13	Age byte LSB
14	Site code MSB
15	Site code
16	Site code LSB
17	Tag ID MSB
18	Tag ID
19	Tag ID
20	Tag ID LSB
21	Type of tag flag
22	Reader ID
23	RSSI signal strength
24	Checksum
25	20H (reserved)
26	Alarm byte
27	Node ID
28	Network ID
29	Reader Set RSSI Value
30	Firmware Version
31	LF
32	CR

Set RSSI Value Command

This command will set the RSSI value and commit it to the Data EEPROM. It also initiates an RF Module reset and writes the new value to the RF Module. Broadcasts here are useful to set all the readers to their most sensitive etc. The RSSI Value ranges from 0 to 255. 0 being the most sensitive.

Command

0xAA	0x01	Network ID	Receiver ID	Node ID	0x07	New RSSI	Checksum

Response

0x55	0x00	Network ID	Receiver ID	Node ID	0x07	Checksum

Get RSSI Value Command

This command will return the RSSI value it is currently using, and defined in the Data EEPROM.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x08	Checksum

Response

0X55	0x01	Network ID	Receiver ID	Node ID	0x08	RSSI	Checksum

Set Site Code Command

The Site Code or Site Code is a group of 3 bytes assigned to each tag. Its function is to enable the reader to filter out any tags that it receives that is not part of the site it is monitoring. These values are committed to the Data EEPROM.
When a Site Code of 0 value is assigned, then all the tags read are reported.
Entering a separate code, will result in any tags other than those meeting this code to be rejected by the reader.

Command

0xAA	0x03	Network ID	Receiver ID	Node ID	0x09	SC 1	SC 2	SC 3	Checksum

Response

0x55	0x00	Network ID	Receiver ID	Node ID	0x09	Checksum

Get Site Code Command

This command will return the active Site Codes.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x0A	Checksum

Response

0x55	0x03	Network ID	Receiver ID	Node ID	0x0A	Site 1	Site 2	Site 3	Checksum

Set Receiver Gain Command

This command will set the RF Module into its 2 different gain levels.

Command

0xAA	0x01	Network ID	Receiver ID	Node ID	0x0B	Gain	Checksum

Gain = 0 (Low Gain Mode – Short range reader)
Gain = 1 (High Gain Mode – Long range reader)

Response

0x55	0x00	Network ID	Receiver ID	Node ID	0x0B	Checksum

Get Receiver Gain Command

This command will return the Receiver Gain Mode.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x0C	Checksum

Response

0x55	0x01	Network ID	Receiver ID	Node ID	0x0C	Gain	Checksum

Gain = 0 (Low Gain Mode – Short range reader)
Gain = 1 (High Gain Mode – Long range reader)

Set Alarm Tag Filter Status Command

This command will filter out tags with a specific Alarm condition.

Command

0xAA	0x01	Network ID	Receiver ID	Node ID	0x0D	Status	Checksum

Status = 0 - Report all tags
Status = 1 - Report only tags with an Alarm condition
Status = 2 - Report only tags without any Alarm condition

Response

0x55	0x00	Network ID	Receiver ID	Node ID	0x0D	Checksum

Get Alarm Tag Filter Status Command

This command will return the current Alarm tag filtering status.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x0E	Checksum

Response

0x55	0x01	Network ID	Receiver ID	Node ID	0x0E	Status	Checksum

Status = 0 - Report all tags
Status = 1 - Report only tags with an Alarm condition
Status = 2 - Report only tags without any Alarm condition

Get Invalid Tag Count

This command will return the number of Invalid Tags received by the RF module since the last read. This data is calculated by the RF Module and is a direct interpretation of tag collisions or read failures. This is a 2 byte value.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x0F	Checksum

Response

0x55	0x02	Network ID	Receiver ID	Node ID	0x0F	Count_H	Count_L	Checksum

Count_H – Counter High Byte
Count_L – Counter Low Byte

Get Power Supply Voltage

This command will return the voltage of the power supply at this reader. It is a single byte and represents the power in 0.1 voltage increments. E.g. Value 131 = 13.1 Volts
Returns the voltage that the reader is receiving, via either its RJ45 ports or via the 2.5mm power socket. It will not return the voltage that it is receiving via the USB socket if this option is being used.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x10	Checksum

Response

0x55	0x01	Network ID	Receiver ID	No	0x1	Voltage	Checksum

Start Environmental Noise Level Value Calculation

This command will set the reader into an evaluation mode in order to calculate the environmental white noise level at 433.92 MHz. The unit will remain in evaluation mode for a time period of 40 seconds. During this period no tag transmissions will be decoded. Once the calculation has been completed, the reader will resume normal operation.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x11	Checksum

Response

0x55	0x00	Network ID	Receiver ID	Node ID	0x11	Checksum

Get Environmental Noise Level Value

This command will retrieve the calculated value (between 0 and 255) of the environmental white noise level. Take note that this command can only follow after the *Start Environmental Noise Level Value Calculation*. If a command is send down to the unit, while still in evaluation mode, the reader will cancel the calculation process, reset and continue normal operation.

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0x12	Checksum

Response

0x55	0x01	Network ID	Receiver ID	Node ID	0x12	Noise	Checksum

Reset Network Baud Rate Command

This command will reset the network Baud Rate. It will only accept a broadcast command and there is no response sent. Changes are immediate will result in communications loss if the PC does not change its baud rate accordingly.

Command

0xAA	0x01	0xFE	0xFF	0xFF	0xFF	Rate	Checksum

Rate 0 = 115200 baud
Rate 1 = 57600 baud
Rate 2 = 38800 baud
Rate 3 = 19200 baud
Rate 4 = 9600 baud

The fastest baud that an RX50 will run at when powered only by the Serial port is 57600.

Get Receiver Version Information Command

This command will return the Receiver Version Information. These include
Controller Firmware Version
RF Module Firmware Version
Controller Hardware Version
RF Module Hardware Version

RF Module versions are read directly from the module itself. This data is in the following format:

Value = 13 = Version 1.3

Command

0xAA	0x00	Network ID	Receiver ID	Node ID	0xFF	Checksum

Response

0x55	0x04	Network ID	Receiver ID	Node ID	0xFF	CFV	RFV	CHV	RHV	Checksum

CFV - Controller Firmware Version
RFV - RF Module Firmware Version
CHV - Controller Hardware Version
RHV - RF Module Hardware Version

Set Protocol

The RX202, RX210 and RX211 support the L series+ protocol as well as the existing L series protocol. The Set Protocol has 3 options

Command

0xAA	0x02	Network ID	Reader ID	Node ID	0x40	Data	Checksum

Data (2 bytes): Protocol: 0 = legacy, 1 = no nulls, 2 = L-Plus
RS 232 enable: 0 = OFF, 1 = ON

Response

0x55	0x00	Network ID	Reader ID	Node ID	0x40	Checksum

1) **Legacy,** the reader will receive - standard L series tag packets and will generate Null tag packets in the event that no tags are within range. Null packets are empty tag packets that some Legacy software uses as a form of heartbeat to check the network is operating.
2) **No Nulls,** the reader will receive - standard L series tag packets. No Nulls will be generated
3) **L Series**+, the reader will receive both L series and L series+ tag packets. No nulls will be generated**. (Not Implemented)**

Get Protocol

Returns the Protocol setting

Command

0xAA	0x00	Network ID	Reader ID	Node ID	0x41	Checksum

Response

0x55	0x02	Network ID	Reader ID	Node ID	0x41	Protocol	Checksum

Data (2 bytes): Protocol: 0 = legacy, 1 = no nulls, 2 = L-Plus

RS 232 enable: 0 = OFF, 1 = ON

RS232 Control is a RX210 command and is not supported in the RX202 as the RS232 is always available

Set Info

The serial readers are part of the larger Wavetrend Reader family, some of which include GPS. In order to harmonize the software interface between the serial readers and the GPS enabled units RX910, RX1010, RX1310 the command allows the user to set the following fields

1) Latitude (4 bytes)
2) Longitude (4bytes)
3) User Data (10 bytes)

Command

0xAA	0x12	Network ID	Reader ID	Node ID	0xF0	Data	Checksum

Data (18 bytes): Location: Latitude – 4 bytes
Longitude – 4 bytes
User Data: 10 bytes

Response

0x55	0x00	Network ID	Reader ID	Node ID	0xF0	Checksum

Get Info

Returns the Set Info settings as well as the following values

Model number (1 byte): 1= RX210, 2 =RX211, 3 = RX202

Reader serial number (4bytes)

Location: Latitude (4bytes), Longitude (4bytes)

User Data (10bytes)

Command

0xAA	0x00	Network ID	Reader ID	Node ID	0xF1	Checksum

Response

0x55	0x17	Network ID	Reader ID	Node ID	0xF1	Data	Checksum

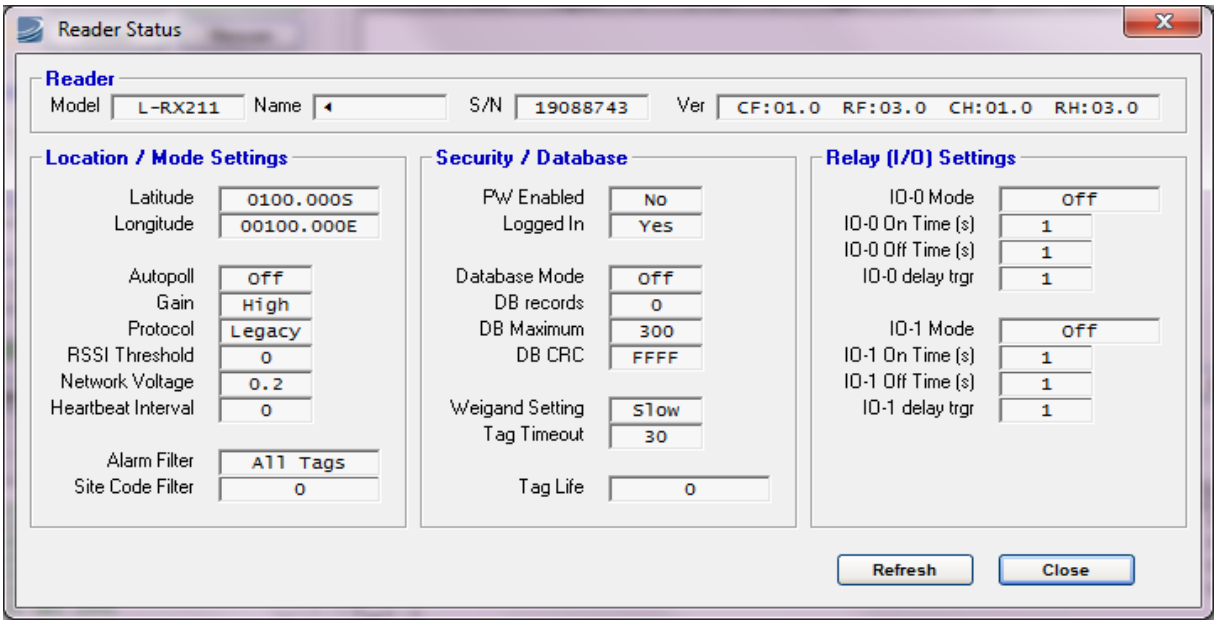
Data (57 bytes): Model number:(1 byte): 1= RX210, 2 =RX211, 3 = RX202
Status:bit 0: Not used
bit 1: Not used
bit 2: Autopol setting

bit 3: Gain setting
bit 4: Not used
bit 5: Not used
bit 6: RS232 enable setting
bit 7: Not used

Serial number (4 bytes)
Location: Latitude – 4 bytes
Longitude – 4 bytes
User Data: 10 bytes
RSSI threshold: 1 byte
Site code filter: 3 byte
Alarm filter: 1 byte
Network Voltage: 1 byte
Not used: 21 bytes
Protocol (1 byte):0 = legacy, 1 = no nulls, 2 = L-Plus
Controller Firmware Version (1 byte)
RF Module Firmware Version (1 byte)
Controller Hardware Version (1 byte)
RF Module Hardware Version (1 byte)

Status

The Status tab command shows the user all of the reader settings in response to the Get Info command, displayed below in Wavetrend Analyser.



6 Interfaces and Connections

6.1 Interfaces

The interface standards are as follows:

- Interface Serial RS232 / USB
- Baud 115 kB/s, 57.6 kB/s, 38.4 kB/s, 19.2 kB/s, 9.6 kB/s Selectable via program port
- Parity None
- Start bit 1
- Stop 1
- Data Bits 8

6.2 Connections

The RX50 has a DB9 RS232 and USB connector at the back.

The DB9 is configured as follows

DB9 Pins	Description
1	Unused
2	RX
3	TX
4	DTR
5	Unused
6	Unused
7	RTS
8	Unused
9	Unused

The RX50 parasitically powers it self from pins 4 and 7 provided it can draw sufficient current.

Please ensure in the host device that these pins are connected and powered , in a lot of RS232 DLLs pins 4 and 7 are not automatically powered and need to be enabled.

The RX50 has a SMA female antenna socket and a 2.5 mm power socket at the front.

Please note the 2.5 socket is a internal regulated supply and can take 3.3- 15V

6.3 USB Connection.

The USB port can be found on the top of the reader , it accepts a standard USB B micro plug.

Before accessing the reader via the port the user must pre install the latest FTDI drivers for their operating system. These can be downloaded from the following URL.
www.**ftdi**chip.com.

7 Diagnostics

7.1 Diagnostic LEDS

The 2 LED's on the back of RX50 are diagnostic LEDs.

Green Power on LED

When connected over external power or Via the USB the Green LED will be permanently Illuminated, this is the power LED.

This LED will **NOT** be illuminated if the RX50 is being powered by the RS232 alone.

Yellow Tag Read LED

When connected over external power or Via the USB the Yellow LED will flash to indicate a tag read.

This LED will **NOT** be illuminated if the RX50 is being powered by the RS232 alone.

8 Specifications

Environmental ▪ Operating temperature ▪ Storage temperature ▪ Humidity	 : -40°C to +85°C : -20°C to +70°C : 5% to 90% (non condensing)
Physical ▪ Size ▪ Weight (unit) ▪ Colour ▪ Material ▪ Connections	 : 55 mm x 50mm x 28mm : 80 grams : Aluminium Grey : Aluminium : 1 RS232 DB9 socket : 1 Mini USB type socket : 2.5mm Power socket
Radio Frequency ▪ Receive Frequency ▪ Modulation ▪ RF Input	 : 433.92 MHz : ASK : 50 Ohm SMA Female
Electrical ▪ Supply Voltage ▪ Max. current consumption	 : 3.3 -15Vdc Via Power Socket : 9mA
Protocol Specification ▪ Standard Data Rate ▪ Interface	 : 9,600 ~ 115,200 (baud rate) : RS232 / USB connectors

9 Certification

The following standards applied in accordance with Article 5 of the directive, 1999/5/EC:

- EN 300 220-1 V1.2.1 (1997-11)
- ETS 300 683 (1997-03).

Summary of tests:

Test Type	
Effective radiated power	25 MHz-4 GHz
EN55022	Radiated emissions 30 MHz – 1 GHz
EN55022	Conducted emissions 150 kHz – 30
EN61000-4-3	Radiated immunity 80 MHz – 1 GHz, excl 433.92 MHz ± 20 MHz
EN61000-4-4	Electrical fast transients
EN61000-4-2	Electrostatic discharge
EN61000-4-6	Conducted immunity 150 kHz – 80

The RX50 has been tested and certified to meet FCC Part 15 1.01 for unintentional radiators.

The RX50 is produced in the UK to ROHS standards and contains no Lead