



Purpletooth™

2.4GHz Spread Spectrum Wireless Modem

PT-108U

User Manual

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This document is produced for users of Purpletooth™ PT-108U, the spread spectrum wireless modem from REnex Technology Limited. It covers the operating principles and capabilities of Purpletooth™ PT-108U. It is highly recommended to read this document before using Purpletooth™ PT-108U in order to operate it correctly and have its best performance.

WARNING

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This manual contains information of proprietary interest to REnex Technology Limited. It is supplied in confidence to purchasers and other authorized users of Purpletooth™ PT-108U Wireless Modem. By accepting this material, the recipient agrees that the contents will not be copied or reproduced, in whole or part, without prior written consent of REnex Technology Limited.

The electronic equipment described in this manual generates, uses, and radiates radio frequency energy. Operation of this equipment in a residential area may cause radio interference, in which case the user, at his/her own expense, will be required to take whatever measures necessary to correct the interference.

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FCC Declaration of Conformity

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

NOTE: 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 or more 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 needed.
- Consult the dealer or an experienced radio/TV technician for help.

RS-232 DB9 shielded cable with ferrite must be used with this unit to ensure compliance with the Class B FCC limits.

CAUTION: The model number PT-108U has maximum transmitted output power of 0.5 Watt. It is recommended that the transmit antenna be kept at least 20 cm away from nearby persons to satisfy FCC RF exposure requirements. The antenna and transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

WARRANTY

REnex Technology Limited (REnex) warrants this product to the original owner purchased directly from RENex or an authorized distributor to be free of defects and workmanship for a period of one year from the date of purchase.

REnex's obligation under this warranty is limited to replacing or repairing defective parts of our product under normal use and service. RENex is not liable for any damage, which results from abnormal use, abuse, improper operation, accident or inability to use this product.

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1. General

1.1 Product Overview

PurpleTooth™ PT-108U Direct Sequence Spread Spectrum (DSSS) Wireless Modem is a high performance wireless modem. It is designed to provide a long distance, high data rate and robust platform for applications. It offers data communication capabilities to application equipment via a standard RS232 interface. Neither additional hardware nor software modification is required in the application equipment to work with PT-108U. By using a pair of PT-108U modems, users can transfer data between almost any types of equipment that use asynchronous serial interfaces. The small size and superior performance of PT-108U make it an ideal solution for many applications. Typical examples are:

- Traffic control
- Remote monitoring
- Telemetry
- Remote camera/robot control
- Mobile video transmission
- Environmental monitoring
- Emergency rescue
- Premises security
- Logistics

1.2 Features

Key features of PT-108U:

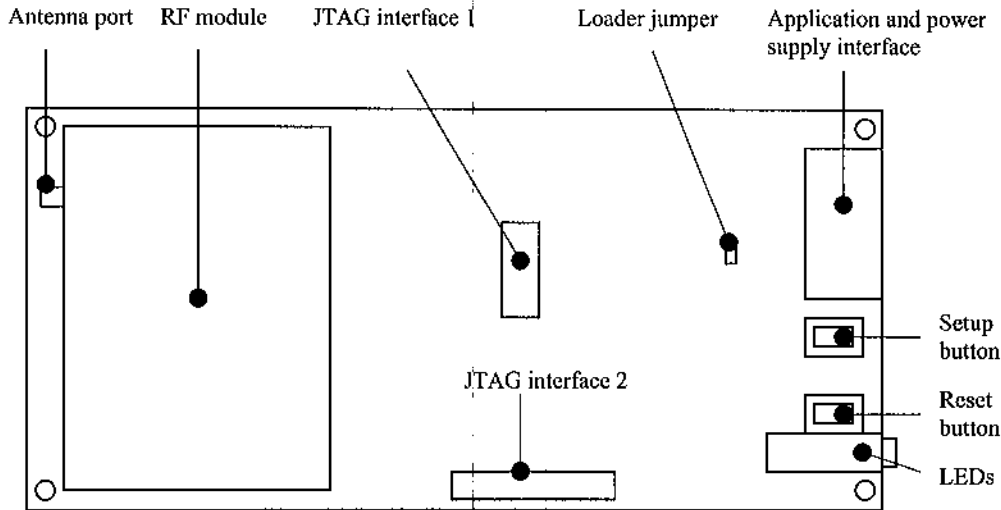
- Operate in license-free frequency band
- Support serial data I/O with handshaking and hardware flow controls
- Provide error-free data connections via built-in CRC-16 error detection and automatic re-transmission
- Offer high data rate and support long distance
- Adopt the advanced Direct Sequence Spread Spectrum (DSSS) technology to provide high interference immunity to protect on-air data from signal interferences and malicious data trappings
- Support various data applications with efficient communication protocols
- Easy to use, plug-and-play without specific software requirement

NOTE1: *This manual has been provided as a guide and reference for installing and using PT-108U wireless modems. It is assumed that users of PT-108U modem have either system integration or system design experience.*

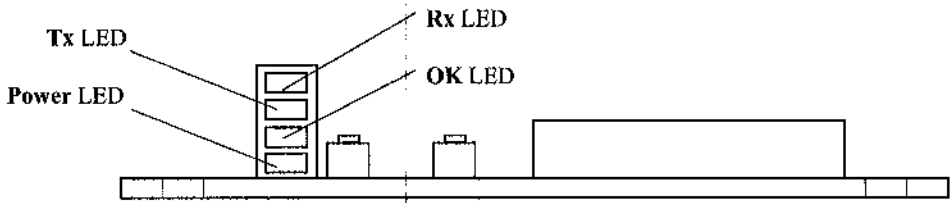
2. Physical/Electrical Attributes

2.1 Physical Layout

The following diagram illustrates the layout of PT-108U where only major components and connectors are shown.



(a) Top view



(b) Front View

Figure 1. Layout of PT-108U modem.

A UMP-to-reverse-SMA assembly (model no.: RA-SN-109-0.05M, from Radial) is attached to the antenna port to connect to the antenna (model no.: RO-IK-0502 from Radial). The connection is illustrated in Figure 2.

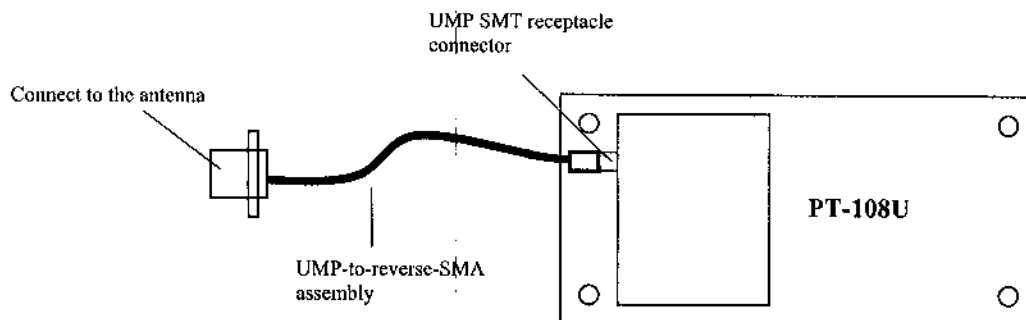


Figure 2. Antenna installation.

A photo of a PT-108U is depicted in the following figure:



Figure 3. Photo of a PT-108U modem.

2.2 LED Indications

Four LED's are installed in a PT-108U modem as shown in Figure 1 (b). They indicate the status of the modem and their definitions are listed in the following table:

Table 1. LED indications

	On	Off	Dim	Flash
Rx LED	-	No data receive	Data link in active	Receiving data
Tx LED	-	No data send out	Data link in active	Sending out data
OK LED*	Procedure success	No procedure/ procedure failed	-	Procedure in progress
Power LED	-	Power down	Power up	In power saving mode

* Procedure means the slave registration/de-registration procedures. It is off in normal operations.

2.3 Pin Assignments

Figure 4 is a close shot of the application interface from the top. Pin numbers are assigned from the top left corner.

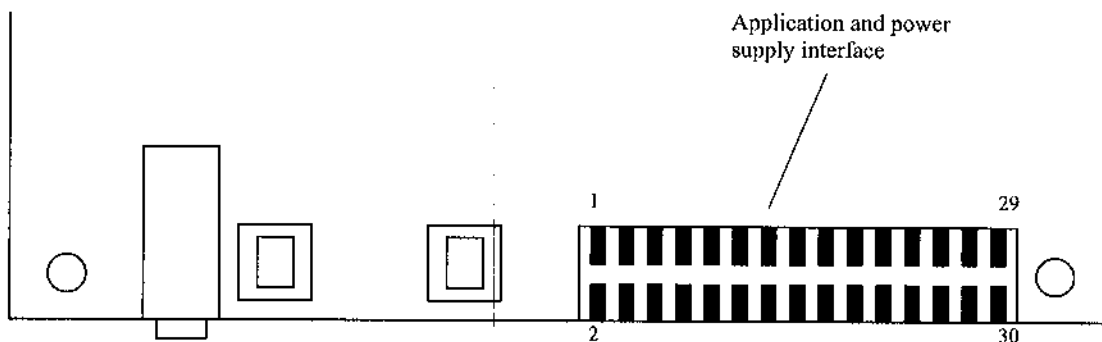


Figure 4. Top view of PT-108U modem and pin layout of the application interface.

Table 2. Pin descriptions

Pin no.	Description	I/O	Pin no.	Description	I/O
1	USB power (+)	I	16	RS-232 Receive Data, RXD	I
2	USB ground		17	RS-232 Data Set Ready, DSR	I
3	USB D-		18	Ground	
4	USB D+		19	RS-232 Data Terminal Ready, DTR	O
5	Ground		20	RS-232 Clear to Send, CTS	I
6	Ground		21	RS-232 Request to Send, RTS	O
7	Ground		22	-	
8	Ground		23	Ground	
9	-		24	Ground	
10	Ground		25	Positive 7.4V power supply	I
11	-		26	Ground	
12	-	I	27	Positive 7.4V power supply	I
13	-	I	28	Positive 7.4V power supply	I
14	-		29	Battery 7.4V power supply	I
15	RS-232 Transmit Data, TXD	O	30	Ground	

2.4 RS-232 DB-9 Connection

To connect the application interface to a standard DB-9 female connector, the pin mapping is as follows:

Table 3 Pin mapping between a DB-9 connector and the applications interface

DB-9 female connector pin no.	Pin Name	Application interface pin no.
1	DCD	-
2	RXD	15
3	TXD	16
4	DTR	17
5	GND	18
6	DSR	19
7	RTS	20
8	CTS	21
9	RI	-

3. Setup PT-108U

3.1 Setting up Connections

PT-108U modems are supposed to work properly when they are delivered from REnex. Hence, the only thing users need to do is to make the appropriate application interface connections and power up. The master and slave(s) shall communicate properly.

The pin definitions of the application interface are listed in Table 2. Users may connect the RS-232 pins to their equipment according to their practical situations. For any enquiry, please contact REnex for further information.

3.2 Checking the Link

After finishing the physical connection setup mentioned above, PT-108U should be ready. If the performance of the communication links is not satisfied or any linking problem is found, the following steps may help you locate the problem.

1. Install DB-9 connectors to the PT-108U modems as described in Section 2.4.
2. Connect each modem to a serial port of a PC.
3. Start a terminal program such as *Hyper Terminal* (<http://www.hilgraeve.com>, it may be found in Microsoft Windows OS) for each serial port. Make sure the baud rate and data format settings agree with those of PT-108U.
4. Type characters to the master's terminal should appear at that of the slave's and vice versa.
5. The TX LED should flash during transmitting data to the RF link.
6. The RX LED should flash during receiving data from the RF link.
7. Adjust the modem separations and the antenna direction to locate positions with the best performance.

NOTE 2: *PT-108U is highly sensitive to obstacles in its communication path. Make sure the communicating modems are in line-of-sight. Otherwise, the performance would drop significantly.*

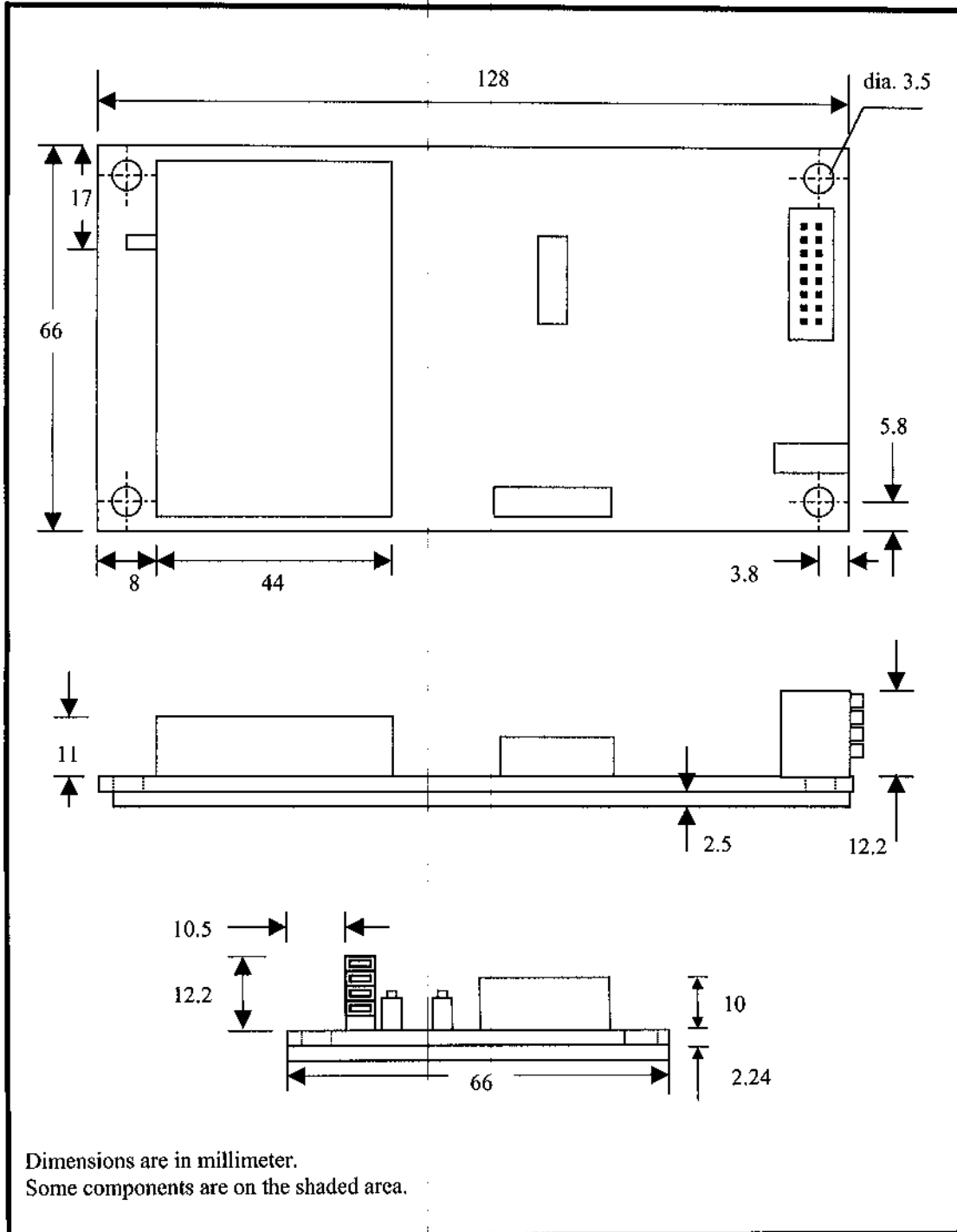
NOTE 3: *Antenna height is a critical factor. Try to put the antenna to a position as high as possible.*

A. Technical Specifications

RF Frequency	2.400 to 2.4835 GHz
Spread Spectrum	Direct Sequence (DSSS)
Processing Gain	11.2 – 17.4 dB
Antenna	Sleeve dipole antenna from Radiall (model no. RO-IK-0502), 50 ohm load
Operating Range	Up to 2 km in line-of-sight
Maximum Transmission Power	0.5W (27dBm)
Receiver Sensitivity	-84 dBm at 10 ⁻⁶ BER
RF Channel Bandwidth	16 MHz (Null-to-null)
Communication Method	Time division duplex (TDD)
Network Protocol	Purpletooth™ Adaptive Intelli-Polling
Error Control	CRC and ARQ
Baseband Modulation	BPSK and QPSK
Channel Data Rate	Up to 1Mbps
I/O Interface	RS232, #USB ports
Supply Voltage	7.4V +/- 5% (Battery for portable)
Maximum Current Consumption	830 mA at 7.4V during transmission 250 mA at 7.4V during reception 60 mA at 7.4V during sleep
Operating Temperature	-20°C to 70°C
Humidity	20% to 90% non-condensing
Dimensions (W × L × H)	128 × 66 × 17 mm
Weight	116 grams

#PC side application software for the USB port will be supplied in the next version.

B. Mechanical Drawings



C. Antenna Specifications



ANTENNA SPECIFICATION

MODEL : RO-IK-0502

ELECTRICAL ITEM	SPECIFICATIONS	REMARKS
Type of antenna	Sleeve dipole antenna	
Frequency range	2.40~2.48GHz	
Electrical length	1 / 2 λ	
Nominal impedance	50 Ohm	
Polarization	Vertical	
V.S.W.R	Less than 2.0	
Gain	1.5 dBi	

MECHANICAL ITEM	SPECIFICATIONS	REMARKS
Element	$\phi 0.1 \times 7$ CuAg -wire	
Sleeve	Urethane	Black
Connector	SMA (body-male, pin-jack)	Right angle/Gold plate
Antenna total length	93 \pm 3mm	