U-Link TRx
Radio DATA MODEM
User Guide

Table of Contents

About this document

This guide describes the U-Link TRx devices, their options and accessories.

Compliance to FCC US/CANADA

This equipment has been tested and found to comply with the limits of Part 90 of the FCC Rules and CNR 119 for CANADA. 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 connected.
-- Consult the dealer or an experienced radio/TV technician for help.

CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY MAGELLAN COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

RF Exposure Warning: During operation, the user may keep a minimum separation distance of 1 meter with the RF devices.

Overview

The modem is the new MAGELLAN UHF Radio Link working in the 450-470MHz frequency range. This equipment converts data from a serial link into a radio frame to be sent to a similar piece of equipment.
The operating parameters of these modems (serial link, radio management...) can be updated through commands on the serial link.
The products are available in a metallic IP65 case with an external antenna.

Product Power supply

To perform wiring of these products, the bottom part of the housing has to be opened by unscrewing the four stainless steel screws on radiator/antenna side.

The U-Link TRx must be supplied from a DC voltage source. The input DC power voltage range is 9V up to 28V, and the total power consumption is less than 1.5A under 12V at full RF power with an antenna connected on the RF port output.

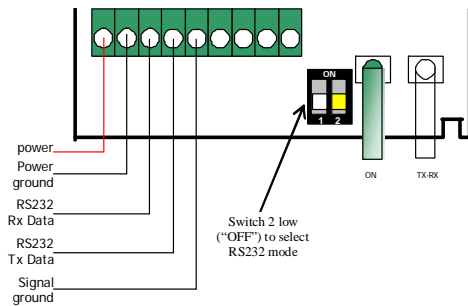This input is protected against reverse polarity, and short transient voltage by a Transil protection.
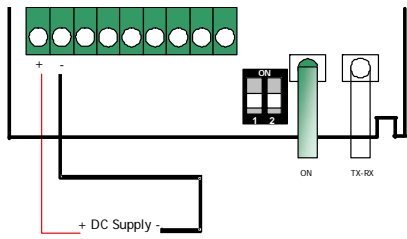
A light continuously on when the transceiver is powered on. The color of this light is changed according to the selected serial link mode (RS232 → Green, or RS422 → Red). Corresponding marking of the light shall indicate "ON
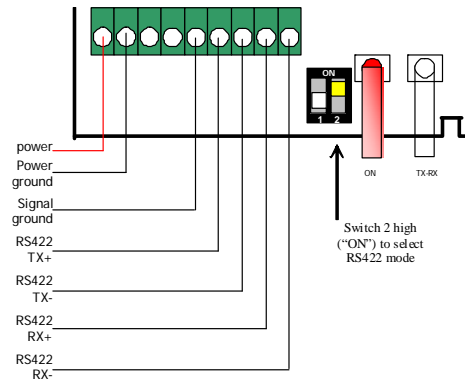
Serial link wiring

U- link Trx proposes 2 types of serial link : RS232 and RS422. No hardware flow control is used.

RS232 wiring

power
Power ground
RS232 Rx Data
RS232 Tx Data
Signal ground

Switch 2 low ("OFF") to select RS232 mode

ON   TX-RX

RS422 wiring

power
Power ground
Signal ground
RS422 TX+
RS422 TX-
RS422 RX+
RS422 RX-

Switch 2 high ("ON") to select RS422 mode

ON   TX-RX

RF Modes

Two RF modes are identified :

- A UHF transmit only function. This transmitter is used with a Global Navigation Satellite System (GNSS) base station and broadcast GNSS differential message around the area of the base. The transmitter is available with different output power(0.5W, 2W, and 4W). The UHF transmitter is controlled and monitored by the connected GNSS unit through remote control commands.

- A UHF relay with receive and transmit functions. This transceiver is able to receive GNSS differential message from a base, and re-broadcast these data at the same frequency in order to increase the range of the radio link between a GNSS base and a rover. This transceiver is intended to be used as an autonomous device and can be controlled and monitored by software, run on PC.

Switch 1 allows the selection of the mode according the following schemes :

RELAY mode
Switch1 low ("OFF")

ON   TX-RX

TRANSMIT mode
Switch 1 high ("ON")

ON   TX-RX
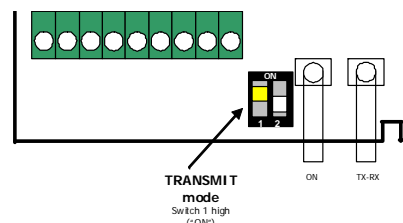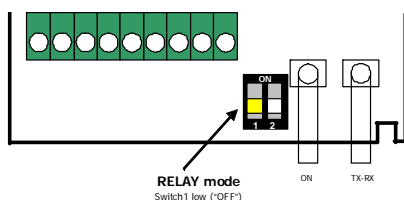
A dual color light indicates the stae of the U-Link TRX :
- Green when the data are received, and red when data are transmitted. Green light indicating data reception, shall represent the activity on the serial link of the receiver, and the red light indicating data emission, shall represent RF activity at the output of the transmitter.
- Given that data are transmitted in a burst mode (every second), as a result the light shall flash at 1 second periodicity or more if repeater mode is activated (2 seconds). Corresponding marking of the light shall indicate "TX-RX".
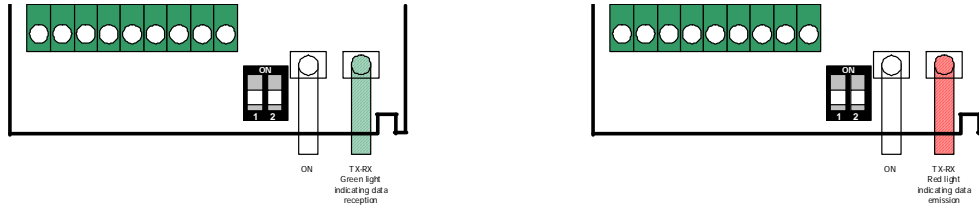
Framing Modes

U-Link TRx proposes two modes of transmission described below.

Transparent Mode

In transparent mode, data transmitted on serial link are "rough" data without frame coding.

DSNP Mode

Data sent to the serial link must be the following:

Type		Content	Length
Synchronization block	Start of text	ASCII Character STX	1 char
	Type of message	"C","P","R","T","X" char	1 char
	Address	Station number in BCD	1 char
	Length of message	Length of the message	1 or 2 char(s)
	Cadence	Periodicity of the message in seconds	1 char
Message		Content of the message	N char
Checksum	Checksum	Sum of all the bytes of the message	2 char
	End of text	ASCII Character ETX	1 char

For RTCM (type R) messages, the synchronization block and checksum is not transmitted to the GPS rover. Only the RTCM message (content of the message) is sent to the GPS rover.

Operating modes

Two operating modes are available:
1- Command mode (usage of AT commands)
2- Normal mode (Serial data are transmitted on radio link)

At power up the UHF radio device is in normal mode: it is able to send or receive data to or from the radio link according to its current parameter configuration.

Command mode

The command mode is used to read and update the UHF radio configuration registers using AT command. In command mode the UHF receiver or transmitter is inhibited (Rx and Tx), excepted when using test command.

Entering command mode: issues on the serial link a +++ sequence. The sequence of three consecutive + characters is accepted only if no character have been sent before and after the +++ sequence. Register S214 defines the silence duration.
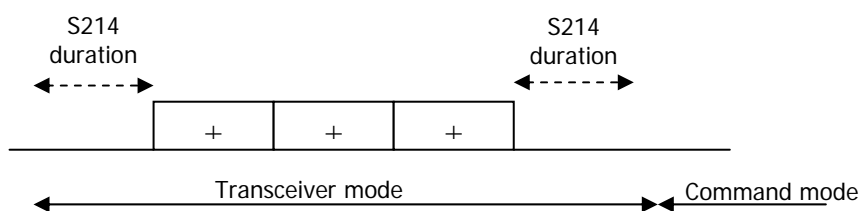
Exiting command mode (return into normal mode): send the serial command ATO<cr>

Normal mode

At power on the UHF transceiver is in normal mode, and is ready for receiving data or transmitting data.

AT commands

The list of AT commands supported by the UHF radio is :

General commands

Commands	Description
Operating mode selection	
ATO	Return into normal mode
<silence>+++<silence>	Command mode activation
Registers management	
ATSn ?	Displays the Sn register content where n represents the register number. The response has the following format: Sn=y<cr><lf>
ATSn=m	Set the register value with 'm'. n represents the register number.
AT&W	Saves the new register configuration in EEPROM. Each time you switch on the modem, the EEPROM configuration will be loaded in the modem registers
AT/S	Displays all register values. The response has the following format: Sxxx=y<cr><lf> for each register. The command ends with a double <CR><LF> sequence.
AT/V	Software version display. The response has the following format: "TRx Magellan : Narrow band 450-470MHz 12.5kHz UHF transceiver Vxx.yy<cr><lf>"
ATR	Restore the register default values. Note that S235 is not restored by ATR.
Test modes	
ATT1	Pure carrier () transmission using current channel. The output of this mode is achieved by reception of any character on the serial link.
ATT2	Modulation using current channel. Modulation (55)hex data. The output of this mode is achieved by reception of any character on the serial link.
ATT3	Modulation using current channel. Modulation with 512 bits pseudo random data (DM2), allowing BER evaluation. The output of this mode is achieved by reception of any character on the serial link.

Registers description

Type	Register	Function	Description	Default Value	Note
			Radio management		
R/W	S200	Channel table	Set channel table	-	
R/W	S201	Channel number	Select radio channel from the table: From 0 up to 15	10	
R/W	S204	Preamble duration	Preamble duration unit in ms: From 10 to 100	40	
R/W	S217	Serial Time out for radio	Serial timeout before starting radio transmission, unit ms. From 3 up to 240	3	
R/W	S231	RF out level	Adjust the RF output level 0→ 500mW (27dBm) 1→ 2W (33dBm) 2 → 4W (36dBm)	2	
R/W	S250	Receiver Frequency BW	Indicates the bandwidth adjustment of the helical receiver filters. Format is 460.0125	000.0000	

R/W	S251	Over the air format	0 → transparent mode 1 → DSNP mode	1	
R/W	S252	CSMA mode	0 → Disable CSMA mode 1 → Enable CSMA mode Check if channel is free with RSSI before transmitting. Response is "OK" if channel is free, and "KO" if channel is busy.	0	1
R/W	S253	CSMA mode RSSI threshold	S253=-xxxdBm<cr><lf> with xxx decimal value. The RSSI range is –130dBm to –70dBm	-70	1
R/W	S254	RF link speed	0 → 4800 bps 1→ 7680 bps 2 → 9600 bps	0	1
R/W	S255	Squelch	0 → High (as low as possible) 1 → Medium (about -114dBm) 2 → Low (-60dBm **TBC**)	1	
			Serial link management		
			The serial link configuration is 38400 bits/s, 8 data bits, no parity, 1 stop bit.		
R/W	S214	Command time out	Time out duration for detecting the +++ pattern, unit in ms. From 3 up to 240ms	100	
			Miscellaneous		
R/W	S233	Transmited Call Sign	S233=NZI206211 (FCC ID + product reference)	NZI206211	1
R/W	S234	Call sign activation	0 → disabled 1 → enabled When enabled, transmit to the air the FCC ID by using international Morse code, with a carrier at 1200Hz for short or long. The Morse code data rate shall be between 20 and 25 words per minute.	0	1
R/W	S235	Serial Number	The serial number is made up of 11 digits: yyyywwnnn. Where : yyyy : year ww : week in the year nnn : number in the week	00000000 000	
R/W	S236	Date of the last configuration	8 digits: yyyymmdd Where: yyyy : year mm: month dd: day	00000000	
R/W	S237	Owner	10 characters max	Blank	

Note 1: Only specified for US version. It's mandatory to fix ATS254=2 (datarate = 9600bps) when using the equipment in US.

Electrical Specifications

Frequency Range	The frequency range is 450MHz up to 470MHz. Input RF filters bandwidth is the central frequency adjusted in factory +/- 3MHz.
Channel Spacing	The channel spacing is 12.5 kHz.
Modulation	The transceiver is able to process GMSK BT=0.5 modulation with raw data throughput of 9600 bits/s.
Transmitter output power	The RF output power on 50ohms load is software selectable between: 0.5W (27dBm), 2W (33dBm), and 4W (36dBm).
Receiver RF sensitivity	The digital sensitivity is typically –110 dBm at 10^{-5} BER.
RF Connector	The RF connector is a 50 ohms standard TNC female connector.
Antenna	The product will be used with the PROCOM ANTENNA FSP70/460-FME .
Temperature range	From -30°C to +55°C
Regulatory	Compliant with FCC CFR47 part 90