airelectronics

UAV AUTOPILOTS

U-Radiolink Manual

V 1.00

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1 General System Introduction

Airelectronics has developed a specific solution for radio communications between the air segment and ground station, i.e., U-Pilot and U-Ground. This solution, the U-Radiolink, should be placed on the aircraft (master) and connected to the ground station (slave).

The needed elements related to this device are:

- U-Radiolink (Box or OEM).
- 9-wire harness with Micro-D Glenair (supplied by Airelectronics).
- Antenna configured in 900MHz frequency (suppliable by Airelectronics).
- SMA/MMCX wires and connectors for antenna/U-Radiolink connection (suppliable by Airelectronics).

Connections available on the U-Radiolink device are:

- Micro-D Glenair connector with 9 pins, with multiple functions: power supply and RS232 communications (see attached table below for pinout details).
- SMA connector (indicated with the RADIO label if the U-Radiolink is the enclosed version) or MMCX connector (if the acquired U-Radiolink is the OEM version) for antenna connection

1.1 Concept of system operation

Normally, due to U-Radiolink has been designed in order to operate included on a complete Airelectronics UAV control system, the device will be connected to a U-Pilot or a U-Ground, but it’s possible to use the U-Radiolink for a general RF communication between two arbitrary systems.

Airelectronics’ UAV control system consists of a U-Pilot installed on an aircraft connected to a U-Ground through a radio link. (See figure 1 attached below)

U-Ground has its own radio link to communicate with the U-Pilot and a RS-232 port to relay the data and command between a PC running U-See and the U-Pilot on-board the vehicle.

Under certain circumstances such as aircraft integration and characterization, a Futaba Emitter is recommended in order to provide manual override of the vehicle.

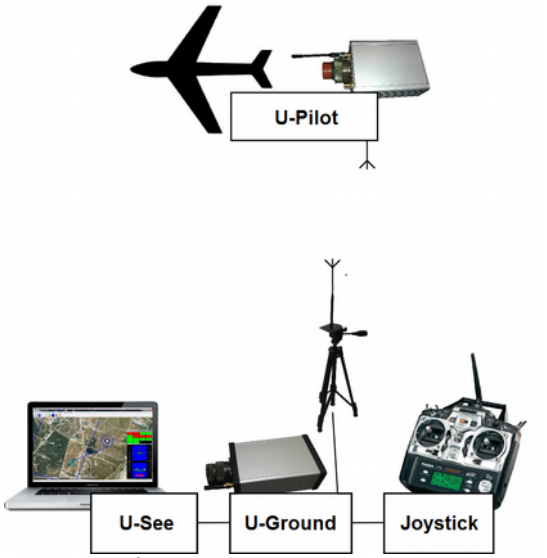


Figure 1: System concept

Although U-Pilot and U-Ground can be supplied with their own radiolink module, the user can be interested in U-Radiolink due to the following applications:

- The system needs a second radiolink, i.e., the operation has to be two possible ways of communication between U-Pilot and U-Ground in case one of them is damaged during the mission. This option has been considered by Airelectronics and its system is prepared for a second radiolink full support.
- The user wants to place the module attached to the U-Pilot far from it. U-Radiolink can replace this module.

A basic scheme of the U-Radiolink operation is shown below.

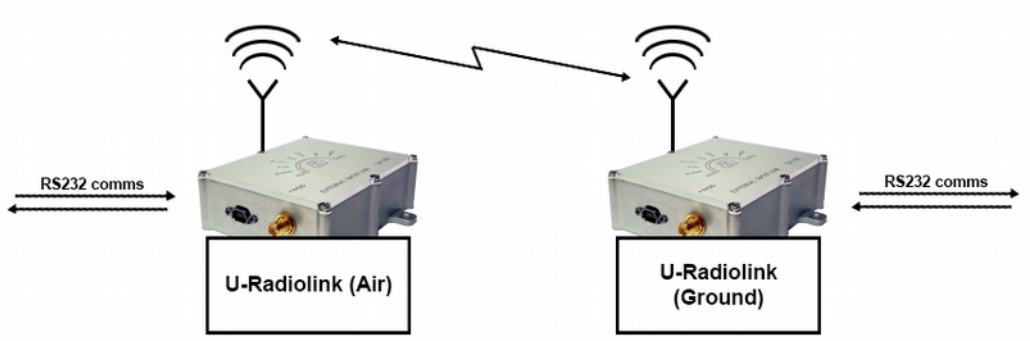


Figure 2: U-Radiolink basic operation

U-Radiolink communicates with the element that has to send/receive data using a standard RS232 interface. Again, these devices will be the U-Pilot and the U-Ground typically. Additionally, two U-Radiolink devices are needed for an effective communication. Once the two devices are supplied with 5V, and if they are configured correctly, a RF link will be established. Finally, if the connection with the devices to communicate have been made and the antennas are attached, both devices should be sharing information.

2 U-Radiolink

The U-Radiolink is powered only to 5V (view Power Supply). If the U-Radiolink is connected with a U-Pilot, the power installation can be done in several different ways described in Power Supply and U-Pilot/U-Ground connections sections.

There are 2 serial ports available for sending/receiving data to/from external devices, one associated to the telemetry data and the other one associated to radiolink module' diagnostic data.

Serial ports are automatically adapted to the baud rate of the devices connected to it. The voltage levels for the serial ports are the standard +12V/-12V.

Connector pin configuration is detailed on U-Radiolink Connections section.

The U-Radiolink works on 902-928 MHz frequency range and transmits up to 1W power. It's line of sight can reach up to 100km.

2.1 U-Radiolink and U-Radiolink OEM

U-Radiolink can be acquired in two versions, the standard version, enclosed in an aluminium box, and the OEM version that is not enclosed, ready to be embedded into the customer system.

Unless told otherwise, the explanations provided by this document are valid for both versions. When different explanations are required, this document will state it.

2.2 Power supply

U-Radiolink power supply only accepts 5V.

CAUTION: Power the device at a voltage OUT of range can cause IRREVERSIBLE DAMAGE to the system. Please read carefully this manual and do not hesitate to contact us (www.airelectronics.es) if needed.

Typical power consumption about 2 Watt. This consumption will mean an intensity consumption of 0,4 Amp. at 5V.

2.3 U-Radiolink Connections

This section provides the required information about U-Pilot connections, including:

- Main connector connections
- U-Pilot/U-Ground connections
- Antenna connection.

2.3.1 U-Pilot Main Connector

The aerial part of connector used for the U-Radiolink is provided in the Installation Kit. Cables in the aerial connector are colour coded. The following table describes the function of every pin in the main connector in U-Radiolink and the corresponding colour coded cable in the supplied aerial connector.

NOTE: Please, take into account than in these tables, Tx and Rx suffix are referred to U-Radiolink. This is: a line marked as "Data Rx" is the pin dedicated to receive data from the external device, and thus, must be connected to the sending pin in the device connector.

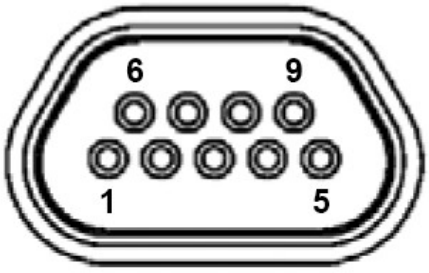


Figure : Main connector on U-Radiolink as seen from the front.

PIN	I/O	Cable Colour	Function
1	DC in	Black	5V
2	GND	Brown	Ground
3	Out	Red	RADIO CD
4	In	Orange	RX DIAG (TTL)
5	Out	Yellow	TX DIAG (TTL)
6	GND	Green	Ground
7	Out	Blue	RX (RS232)
8	GND	Purple	TX (RS232)
9	GND	Grey	Ground

2.3.2 U-Pilot/U-Ground connection

If the U-Pilot or the U-Ground doesn't have an internal radio-link module, the aluminum box will have a 5-pin connector in order to manage an external radio-link power supply and communications instead of SMA connector. Airelectronics offers a harness for the U-Pilot/U-Ground and U-Radiolink connection using this connector.

The pinout is shown below:

Figure 3: External radiolink connector on U-Pilot as seen from the front if internal radio module is not included

PIN	I/O	Function
1	In	Radio Diagnostics Rx
2	Out	Radio Data Tx
3	In	Radio Data Rx
4	V_{Out}	V_{Out} (5V)
5	**Ground**	**Ground**

NOTE: Take into account than in the table, Tx and Rx suffix are referred to U-Pilot.

In this case, a clearance distance of 45mm is required at the front of the U-Pilot box because of the aerial connector.

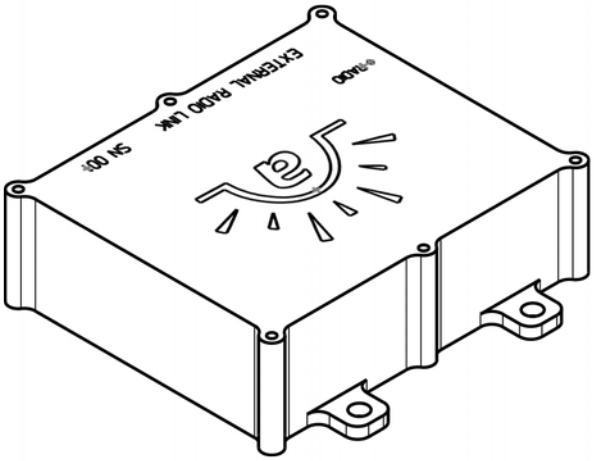
In addition, future versions of the U-Pilot and U-Ground hardware will supply 5V power from its main connector in order to provide power supply to an external radiolink.

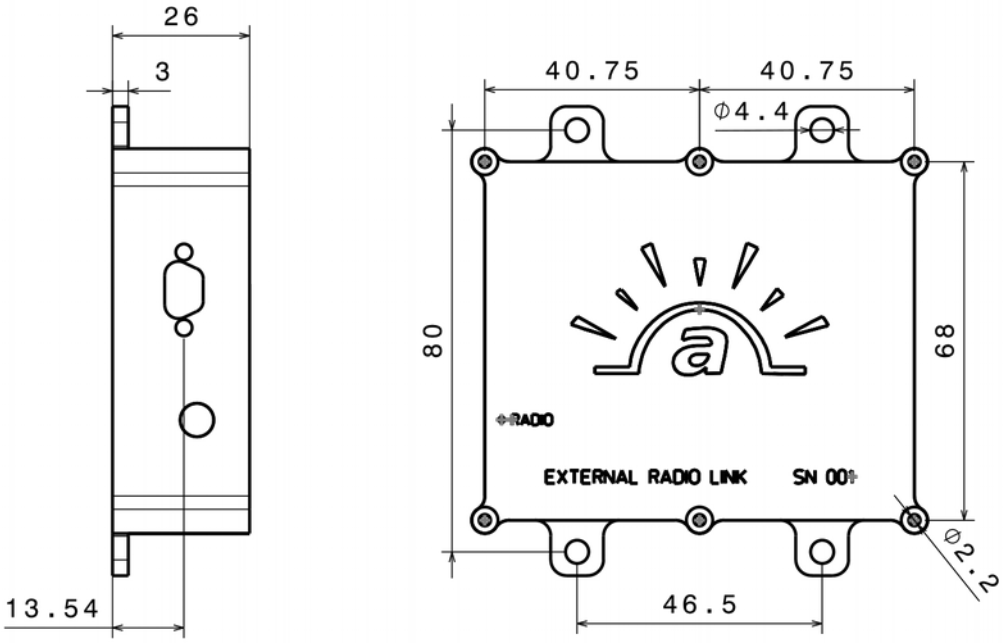
2.3.3 Antenna connection

U-Radiolink needs a connection with an antenna in order to make effective the RF communications. For this, the U-Radiolink has a SMA connector.

The antenna has to be tuned on the same frequency range of the U-Radiolink, i.e., 902-928 MHz. Airelectronics recommends a specific antenna for U-Radiolink and can supply it to the customer: ANT-916-CW-HW-SMA, from Linx Technologies.

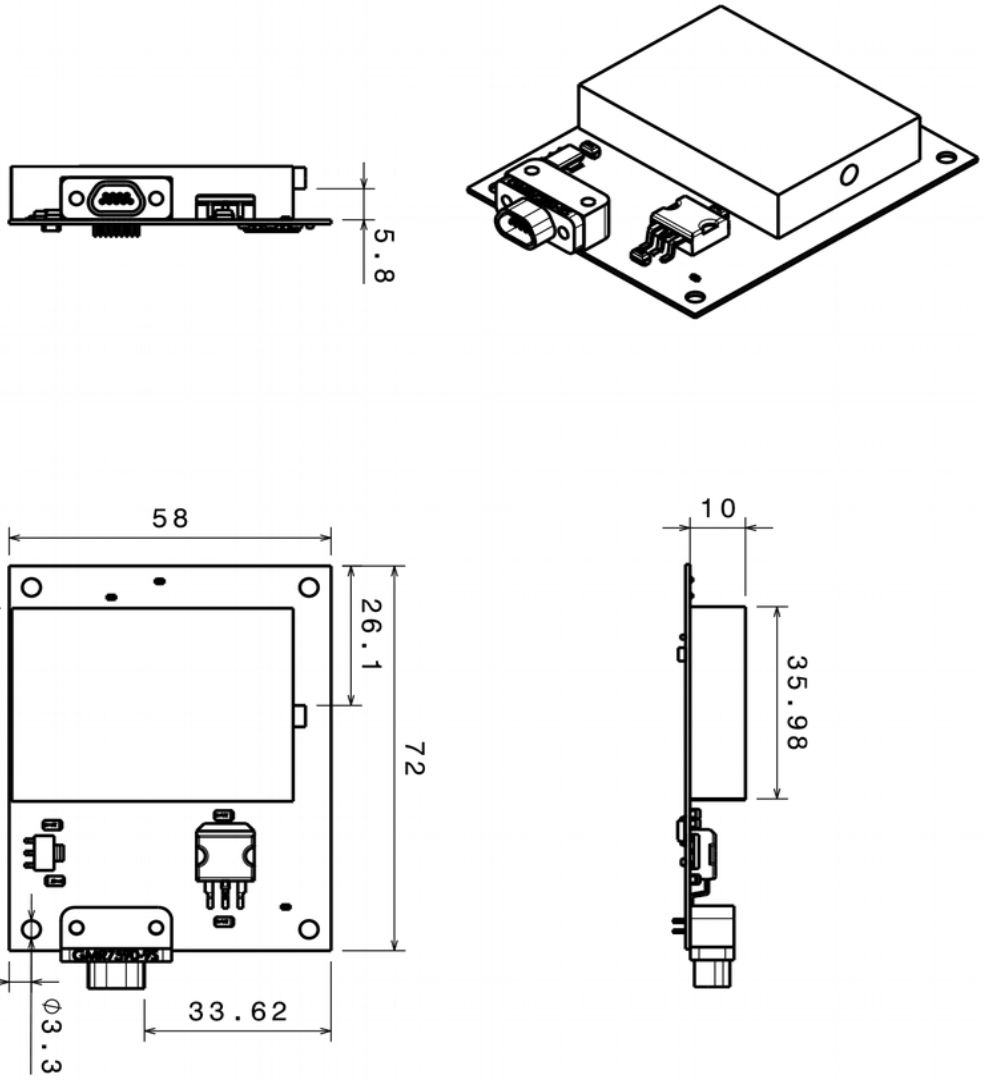
Appendix A Box Mechanical Drawing





All distances are expressed in mm

Appendix B OEM Mechanical Drawing



All distances are expressed in mm

Appendix C Changelog

This annex describes changes introduced to this document.

Date	Changes
2019/01/23	• First version 1.00

If you need a previous version of documentation, please, contact us at info@airelectronics.es