



## USER MANUAL

TELESTO-I USB RADIO STICK

AMB9665 / 2607056291001

VERSION 1.4

OCTOBER 28, 2024

**WÜRTH ELEKTRONIK** MORE THAN YOU EXPECT

\*\*\*\*\*

## **MUST READ**

### **Check for firmware updates**

Before using the product, make sure you use the most recent firmware version, data sheet, and user manual. This is especially important for Wireless Connectivity products that were not purchased directly from Würth Elektronik eiSos. A firmware update on these respective products may be required.

We strongly recommend including the possibility of a firmware update in the customer system design.

## Revision history

Manual version	HW version	Notes	Date
1.0	2.0	<ul style="list-style-type: none"><li>• Initial version of the manual</li></ul>	April 2019
1.1	2.0	<ul style="list-style-type: none"><li>• Updated address of Division Wireless Connectivity &amp; Sensors location</li></ul>	October 2019
1.2	2.0	<ul style="list-style-type: none"><li>• Updated Declaration of EU conformity Regulatory compliance information</li></ul>	February 2021
1.3	2.0	<ul style="list-style-type: none"><li>• Updated document style</li><li>• Function description is part of the Telesto-I user manual [1]</li></ul>	April 2023
1.4	2.0	<ul style="list-style-type: none"><li>• Added chapter Supported UART baud rates</li></ul>	October 2024

## Abbreviations

Abbreviation	Name	Description
BDM	Business Development Engineer	Support and sales contact person responsible for limited sales area
HIGH	High signal level	
LOW	Low signal level	
RF	Radio frequency	Describes everything relating to the wireless transmission.
UART		Universal Asynchronous Receiver Transmitter allows communicating with the module of a specific interface.
VDD	Supply voltage	

# Contents

<b>1</b>	<b>Introduction</b>	<b>4</b>
1.1	Ordering information . . . . .	4
<b>2</b>	<b>Functional description</b>	<b>5</b>
2.1	Taking into operation . . . . .	5
2.1.1	Supported UART baud rates . . . . .	6
2.1.2	Usage of CBUS pins . . . . .	7
<b>3</b>	<b>Regulatory compliance information</b>	<b>8</b>
3.1	Important notice FCC . . . . .	8
3.2	FCC - Federal Communications Commission . . . . .	8
3.3	IC - Industry Canada . . . . .	8
<b>4</b>	<b>References</b>	<b>9</b>
<b>5</b>	<b>Important notes</b>	<b>10</b>
<b>6</b>	<b>Legal notice</b>	<b>10</b>
<b>7</b>	<b>License terms</b>	<b>11</b>

# 1 Introduction

The Telesto-I is a radio sub module that provides wireless connectivity capabilities in the 915 MHz frequency band. The Telesto-I USB radio stick incorporates the Telesto-I in a USB stick form factor enabling easy interfacing with any USB enabled device like personal computer or laptop. The Telesto-I USB radio stick allows quick set-up of a radio link between PC and any system with integrated Telesto-I radio module.

## 1.1 Ordering information

WE order code	Former order code	Description
2607056291001	AMB9665	USB radio stick 915 MHz with SMA connector

Table 1: Ordering information

## 2 Functional description

The Telesto-I USB radio stick consists of Telesto-I radio module along with an serial-to-USB adapter that enables direct connection to any USB compatible device. A FTDI serial-to-USB converter chip **FT232R** connects the USB interface of the Telesto-I USB radio stick to the UART pins of the integrated radio module. Besides UART, additional digital GPIO pins (CBUS) are connected to the radio module to provide special functions like reset. Figure 1 illustrates all the functional components of Telesto-I USB radio stick.

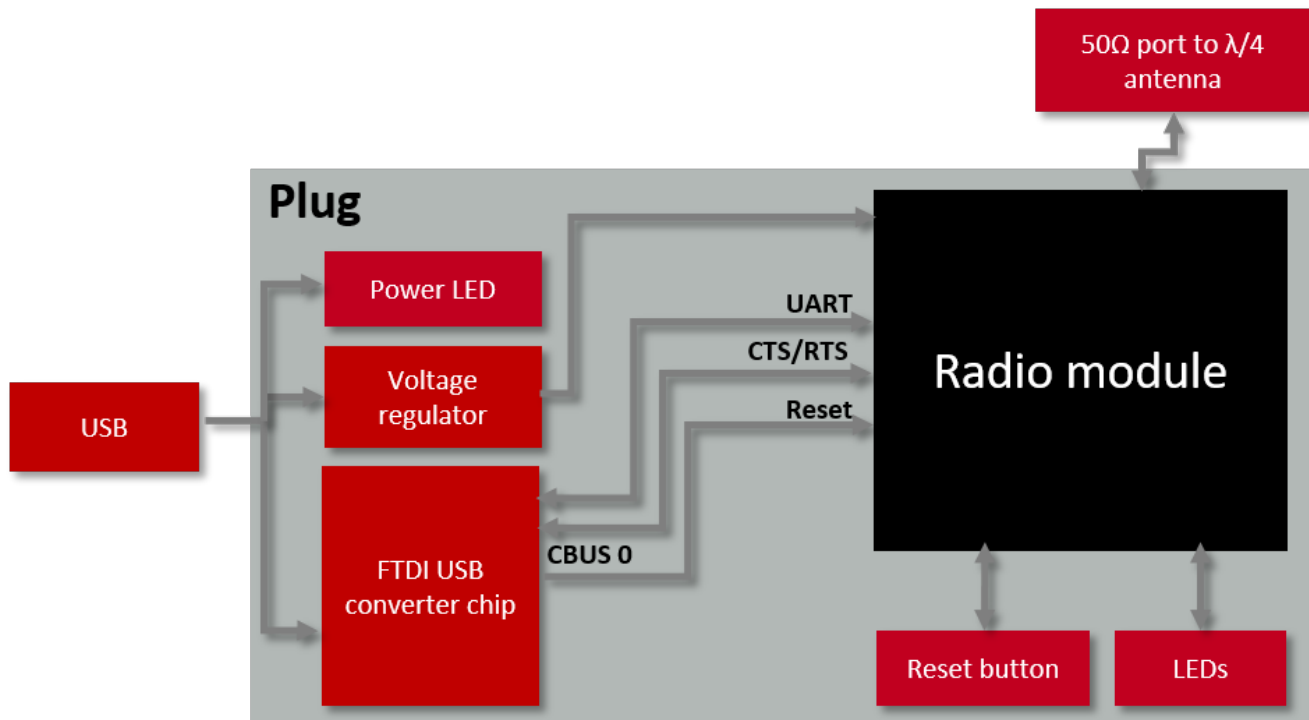


Figure 1: Block diagram of the Telesto-I USB radio stick



For detailed function description of the Telesto-I USB radio stick, please refer to the user manual of the underlying radio module Telesto-I [1] .

### 2.1 Taking into operation

To use the Telesto-I USB radio stick, the VCP driver of FTDI has to be installed by following the installation guides of FTDI:

<https://www.ftdichip.com/Drivers/VCP.htm>



It is recommended to restart the PC after installation of drivers.

On proper installation of the drivers, the module appears as a virtual COM port on the PC. This COM port can be opened in any serial emulator program to communicate with the radio module. The radio module responds to commands in a specific format. Please refer to the corresponding user manual [1] for the complete description of the command set.

**2.1.1 Supported UART baud rates**

In order to establish a stable UART communication between the FTDI USB to UART converter chipset and the radio module’s chipset, the difference between the baud rates of each entity must not exceed the respective immunity level. Both devices use an internal clock to generate the configured UART baud rate. Due to the fixed clock frequency, only specific baud rates can be run without frequency error.

To figure out which baud rates of the radio module can be evaluated using the mounted FTDI chipset (FT232R or FT231X), it is important to know the real baud rate  $B$  with its introduced error. To get them, the FTDI’s clock of 3000 kHz must be divided by the respective prescaler  $P$ :

$$B = \frac{3000}{P} \text{ [kBaund]}$$

The supported prescalers  $P$  can be chosen as:

$$P \in \{1, 1.5\} \text{ or } P = 2 + (N \cdot 0.125) \text{ with } N \in \{0, 1, 2, 3, 4, \dots\}$$

When a baud rate is configured in the FTDI chip, the prescaler is chosen that meets the closest baud rate. In that case, the real baud rate differs from the configured one, introducing a UART clock error, which may lead to UART communication issues.

**Example:** In case the desired baud rate  $B_{desired} = 1250$  kBaund, the desired prescaler is  $P_{desired} = \frac{3000}{1250} = 2.4$ . The closest prescaler  $P$  is determined by  $P = 2 + (N \cdot 0.125) = 2.375$  with  $N = 3$ . This results in a real baud rate  $B = \frac{3000}{2.375} = 1263$  kBaund, which introduces an error of  $\frac{B - B_{desired}}{B_{desired}} = 1.04\%$  with respect to the desired baud rate.

Desired baud rate [kBaund]	Closest prescaler $P$	Real baud rate $B$ [kBaund]	Error [%]
3000	1	3000	0
2500	1.5	2000	-20
2000	1.5	2000	0
1500	2	1500	0
1250	2.375	1263	1.04
1411.764706	2.125	1411.764706	0
⋮	⋮	⋮	⋮
1000	3	1000	0



921.6	3.25	923.0769231	0.16
⋮	⋮	⋮	⋮
230.4	13	230.7692308	0.16
⋮	⋮	⋮	⋮
115.2	26	115.3846154	0.15
⋮	⋮	⋮	⋮
38.4	78.125	38.4	0
⋮	⋮	⋮	⋮
19.2	156.25	19.2	0
⋮	⋮	⋮	⋮
9.6	312.5	9.6	0
⋮	⋮	⋮	⋮

Table 2: Example baud rates

### 2.1.2 Usage of CBUS pins

To switch the CBUS pins high or low and thus to use the provided pins functions of the Telesto-I radio module, the D2XX driver of FTDI has to be used. This driver is part of the previous mentioned VCP driver installation.

Examples codes for "how to use the D2XX driver within your own software tool" can be found in the software example section of:

<https://www.ftdichip.com/Support/SoftwareExamples/CodeExamples.htm>

## **3 Regulatory compliance information**

### **3.1 Important notice FCC**

The use of RF frequencies is limited by national regulations. The Telesto-I USB radio stick has been designed to comply with the FCC Part 15.

The Telesto-I USB radio stick can be operated without notification and free of charge in the area of the United States of America. However, according to the FCC Part 15, restrictions (e.g. in terms of maximum allowed RF power and antenna) may apply.

### **3.2 FCC - Federal Communications Commission**

The device has been FCC Part 15 B tested.

Contains FCC ID: R7TAMB9625

The enclosed 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.

### **3.3 IC - Industry Canada**

This device contains ISED: 5136A-AMB9625

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

## 4 References

- [1] Würth Elektronik. Telesto-I user manual. <https://www.we-online.de/katalog/de/manual/2607021191000>.

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Some products within the product range may contain substances, which are subject to restrictions in certain jurisdictions in order to serve specific technical requirements. Necessary information is available on request. In this case, the Business Development Engineer (BDM) or the internal sales person in charge should be contacted who will be happy to support in this matter.

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We recommend you to be updated about the status of new firmware and software, which is available on our website or in our data sheet and manual, and to implement new software in your device where appropriate.

By ordering a product, you accept these license terms in all terms.

## List of Figures

1	Block diagram of the Telesto-I USB radio stick . . . . .	5
---	--	---

## List of Tables

1	Ordering information . . . . .	4
2	Example baud rates . . . . .	7



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